The

CEECEC

Handbook:

Ecological Economics from the Bottom-Up

List of CEECEC Partner Organisations

NGO Partners

• Centre for Science and Environment, India

• Centre pour l'Environnement et le Développement, Cameroon

• Acción Ecológica, Ecuador

• Ecological Society Endemit, Serbia

• A Sud - Ecologia e Cooperazione, Italy

• Vlaams Overleg Duurzame Ontwikkeling, Belgium (Flanders)

• Sunce, Association for Nature, Environment and Sustainable Development, Croatia

• Instituto Rede Brasileira Agroflorestal, Brazil

Research Institutions

• ICTA, Universitat Autònoma de Barcelona, Spain (CEECEC Coordinators)

• IFF, Universität Klagenfurt, Austria

• GEPAMA, Universidad de Buenos Aires, Argentina

• Foundation of the Faculty of Sciences and Technology, New University of Lisbon, Portugal

• Université Libre de Bruxelles, Belgium

• SERI Nachhaltigkeitsforschungs und Kommunikations GmbH, Austria

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Introduction

This handbook, comprised of 14 chapters and a glossary, is the product of collaborative efforts between environmental activists and ecological economists from around the world, all belonging to the CEECEC network (see List of Partner Organisations). CEECEC (www.ceecec.net) is a project funded by the European Commission's Science in Society programme, running from April 2008-September 2010, under the Seventh Framework Programme (FP7). Its overarching objective is twofold: to build the capacity of civil society organisations (CSOs) to participate in and lead ecological economics research on sustainability issues for the benefit of their organisational goals, while at the same time to enrich ecological economics research with highly valuable activist knowledge.

CEECEC has taken an approach illustrative of what Andrew Stirling of SPRU (Science and Technology Policy Research), University of Sussex, has called cooperative research. This is a new form of research process which involves both researchers and non-researchers in close co-operative engagement, encompassing a full spectrum of approaches, frameworks and methods, from interdisciplinary collaboration through stakeholder negotiation to transdisciplinary deliberation and citizen participation. This is not new in practice. For instance, the first reports on the State of the Environment in India were put together in the 1980s by drawing on knowledge of both activist organizations and academics across the sub-continent. In CEECEC, CSO partners with total autonomy chose the conflicts they wanted to focus on to develop case studies. The CEECEC team at ICTA UAB, other academic partners, and other participating CSOs, further developed the case study drafts, deciding on the appropriate concepts from ecological economics to be applied or presented in those contexts. Environmental CSOs, particularly those concerned with environmental justice (we refer to these as Environmental Justice Organisations, or EJOs), frequently carry out research on environmental conflicts, writing reports as part of their advocacy work. What CEECEC provided to these EJOs was a critical audience of interested activist and academic partners who asked questions, gave encouragement, made comparisons, and suggested key words and references, keeping in mind the final objective of developing a Handbook (as well as a series of lectures) useful for teaching ecological economics from the "bottom-up" instead of from first principles.

The resulting Handbook chapters are the product of cooperatively written case studies of environmental conflict, real examples through which the concepts and tools of ecological economics are taught from the bottom-up. Chapter one, entitled *The Manta–Manaos Project: Nature, Capital and Plunder* comes from Accion Ecologica in Quito, Ecuador, and describes conflicts related to plans for a multimodal transport corridor that will eventually connect Ecuador to Brazil. Chapter 2, also transport related, comes from A Sud in Rome, Italy. Entitled *High Speed Transport Infrastructure (TAV) in Italy*, it looks at the conflict that arose in Val di Susa near Torino. Chapter 3 also comes from Accion Ecologica in Ecuador, and as the title *The Mining Enclave of the Cordillera del Cóndor* suggests, is related to mining and mineral extraction by transnational companies in the Ecuadorian and Peruvian Amazon in territory belonging to the Shuar people. Chapter 4, from the Institute of Social Ecology in Vienna, Austria is called *Aid, Social Metabolism and Social Conflict* in the Nicobar Islands and looks at the impacts on the local population of the tsunami of 2004 and the emergency "aid" that followed, and how the use of materials and energy changed in these communities. Chapter 5, written by the Centre for Science and Environment in New Delhi, India moves on to the topic of *Participatory Forest Management in Mendha Lekha,* a tribal or adivasi village in Maharashtra, relying on the good management of the commons for their livelihood. Chapter 6, also on the topic of forestry is set in Cameroon, is called *Forestry and Communities in Cameroon*, submitted by the Centre pour Environnment et Developpment, a member of the Friends of the Earth International (FoEI) network. It deals with international trade in forest products, highlighting export prices, local social impacts, and problems of corruption. The focus of Chapter 7 from ICTA at the Autonomous University of Barcelona, Spain is also set in Africa and looks at land grabbing, with the title *Let Them Eat Sugar: Life and Livelihood in Kenya's Tana Delta*. Chapter 8, another contribution from India's CSE, is called *Local Governance and Environmental Investments in Hiware Bazar, Mahrashtra, India*, focusing particularly on successful water harvesting and new institutions for water use. Chapter 9, from Sunce in Split, Croatia is called *Nautical Tourism Development in the Lastovo Islands Nature Park*, and as the title suggests, looks at the negative impacts of increased nautical tourism in this protected area, discussing possible policy tools for promoting the development of sustainable tourism. Similarly, Chapter 10 from Endemit Ecological Society in Belgrade, called *Local Communities and Management of Protected Areas in Serbia* is concerned with national park management, but also analyses the costs and benefits arising from the construction of a large dam on the Danube. Chapter 11 is the third chapter to come from CSE, entitled *Payments for Ecosystem Services (PES) in India from the Bottom-Up*, and deals with a case that arose in the Himalayas, long before PES came into vogue. Chapter 12 from REBRAF in Rio de Janeiro, Brazil takes a different approach to PES. This chapter, *The Potential of REDD and Legal Reserve Compensation in Mato Grosso, Brazil* proposes new means for paying for carbon storage and capture. Chapter 13, a second contribution from A Sud in Italy looks at the complex situation of *The Waste Crisis in Campania, Italy*, looking at debates on the risks from waste incineration, and the role of different actors in Italian society in this crisis from activists to the so-called "eco-mafia". Finally, Chapter 14 comes from VODO, based in Brussels, Belgium, and raises important questions about corporate accountability in a case study entitled *Environmental Justice and Ecological Debt in Belgium: the UMICORE Case*.

The glossary and its entries to which the case studies are hyperlinked, was also written by CEECEC partners to complement the case study chapters by explaining in greater depth the concepts presented within them. Glossary entries were produced by drawing upon knowledge already in the public domain (on the internet and in other publications in ecological economics and political ecology), and in some cases, on the original research of the authors. There are over 90 entries in all, covering topics in alphabetical order from Access and Use Rights to Well Being. Many of the Glossary entries are key words of the respective chapters, but not all.

The end product, this CEECEC Handbook: Ecological Economics from the Bottom-Up, is a stand-alone toolkit for teaching and learning ecological economics through front-line activist experience and knowledge. The chapters deal with high-stakes environmental conflicts and issues, and while the contents are mainly geared to environmental justice organizations and to civil society, they will also be most useful to academics researching and teaching in the sustainability sciences, and policy makers working to promote sustainability at different levels.

TRANSPORT

Chapter 1: THE MANTA–MANAOS PROJECT: NATURE, CAPITAL AND PLUNDER

Author: Omar Bonilla for Acción Ecológica, Quito, Ecuador

The Manta-Manaos Route
(Source: Accion Ecologica)

Abstract

The focus of this paper is the Manta-Manaos project, a transport corridor from the port of Manta in Ecuador to Manaos in Brazilian Amazonia. The objective is to identify the potential economic, environmental and social impacts of the project, while assessing its feasibility, and identifying the stakeholders that promote it and how these stakeholders would benefit once the infrastructure is built. Special attention is paid to the role played by the Ecuadorian state due to its position as a main productive agent within the country. In achieving its goal this article explores the underlying economic ideas and value systems on which arguments in favour of the project are based, so as to understand the ideology behind this venture. Local populations form the focus of the study as we believe that they have the capacity – through their potential to mobilize – to significantly alter the international dynamics at work. Local knowledge, as legitimate as Western 'scientific' knowledge, has been silenced during the planning of the Manta–Manaos project. The authors therefore use a combination of local knowledge and information obtained through research as the basis for arguments against the project.

Keywords: Social Metabolism, Material Flows, Transport Infrastructure, Amazon, Local Knowledge, Resource Extraction Conflicts, Chinese Economy, Free Trade Treaties, Languages of Valuation, Commodity Chains, Commodity Frontiers, Mega-Projects

1. Introduction

1.1 Background to the Manta-Manaos Project

The Manta–Manaos axis (**Figure 1**) is a planned transport corridor that will stretch from the port of Manta in Ecuador, to Manaos in Brazilian Amazonia. The axis will carry goods for **consumption** by road, hydro-way, port and airport, but also aims to encourage the

Figure 1: Manta-Manaos Axis in South America
(Source: GoogleEarth)

construction of multiple modern industries in the territory, including “maquilas”, or factories. The Manta-Manaos axis is part of plans made under the South American Regional Infrastructure Integration Initiative (IIRSA), a set of projects that aims to reorganize the South American territory, making it more functional to the needs of global goods production and circulation (**Figures 2 and 3**). The axis is part of a larger plan to connect Latin

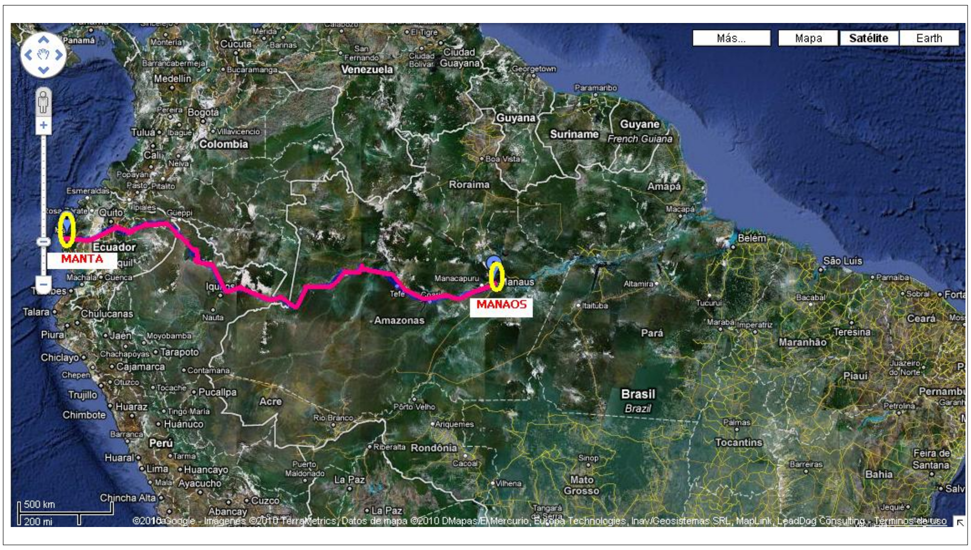

Figure 2: Manta-Manaos Axis and Amazonia basin
(Source: GoogleEarth)

America with Asian markets, by connecting the Pacific and Atlantic Oceans, and areas with high concentrations of strategic resources. Among the poles of development are the cities of Manaos and Belem, currently two important tax free zones, and the city of Manta in Ecuador that is increasing its port capacity.

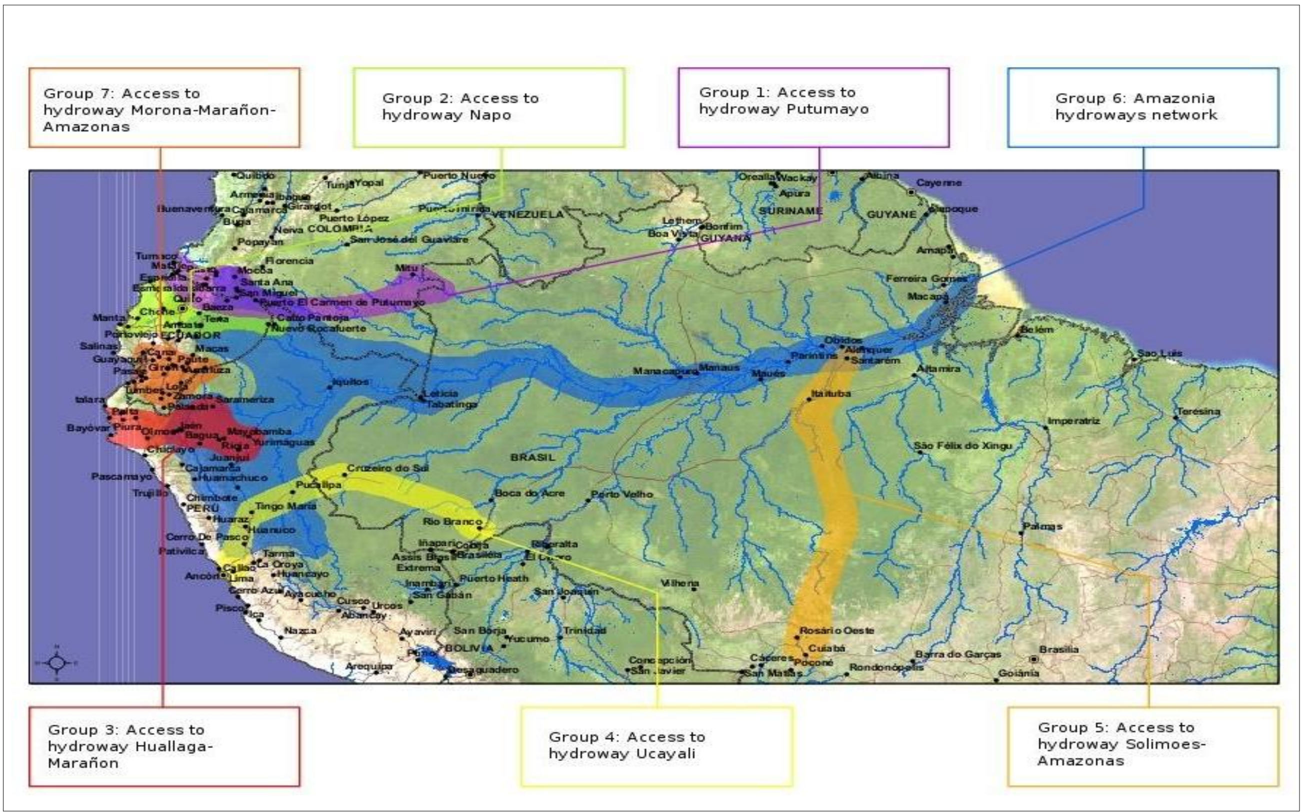

Figure 3: IIRSA group of projects planned for the Amazon and Andean region
(Source: IIRSA http://www.iirsa.org/)

At the national level, different commodities would circulate through this route: hydrocarbons, mining products, agricultural and fishing products, wood and biofuels. The movement of industrial capital associated with the building of the Manta–Manaos axis is a necessary function of the ongoing global integration of **commodity chains**. In the case of Manta-Manaos, this integration requires the development of an intermodal transport system that will allow the rapid transport of containers between different production zones, with a view to enabling ever-faster links between various chains of production.

Completion of the axis will require the creation of a large number of networks, particularly roads, to enable access to strategic resources by key markets. Originally, this plan had a strong linkage to American and Brazilian interests in market expansion under the logic of free trade (see Stages of Implementation below), with proponents within the IIRSA claiming then as now, that the axis would lead to regional infrastructure development, and the physical integration of South America. It was agreed on in 2000 at a meeting of South American presidents that took place in Brasilia, and promoted by the Inter American

Development Bank (IDB), the Andean Foment Corporation (AFC), the Financial Fund for the Development of the Plata Basin (FONPLATA), the European Investment Bank (EIB) and the Brazilian Development Bank (BNDES). The estimated costs of the project are not clear. Initially, they were estimated at around 400 million USD, but the present government calculates that costs would total closer to 800 million USD for Ecuador alone, with some estimates significantly higher, up to 2 billion USD.

Stages of Implementation

The **first stage** of this project was promoted in conjunction with planning of the Free Trade Agreement of the Americas (FTAA), promoted by the United States to gain control of strategic territories within the region. The axis was a fundamental part of the South American Regional Infrastructure Integration Initiative (IIRSA). The Minister of Public Works, under the presidency of Lucio Gutierrez, stated that the goal was "to create the infrastructure that promotes regional integration focusing on strengthening exports and the consolidation of the dollarization system".

A **second period** began after the FTAA was rejected by several Latin American governments. Ecuador's was one such government, one that also had rejected a bilateral free trade agreement with the United States of America in the face of pressure from social protests in 2005. The Manta–Manaos corridor was promoted by Brazilian companies that saw its potential for integrating Brazilian-controlled oil territories that would benefit from infrastructure construction. However, due to irregularities in these companies (particularly Odebrecht) the Ecuadorian State was forced to deal with numerous difficulties that culminated in a crisis between Ecuador and Brazil in 2008.

The **third period** is marked by the commissioning of Chinese firms. Instead of being cancelled, the project was championed by a group of businessmen from Manta and Hutchinson, a Chinese company running the Manta port. However, these actors also abandoned the undertaking in 2009.

Technical innovations designed to increase the speed of transport have already reconfigured space across South America through the homogenization of infrastructure and vehicles and the standardization of containers. Across the Andean Amazon region a series of corridors have been designed in this manner, including the Andean Axis, and the Peru – Brazil – Bolivia and the Amazonas Axis, which includes routes between Perú and Brazil, the Puerto Maldonado–Río Branco, and the Pucallpa–Cruzeiro do Sul (see www.iirsa.org).

1.2 The Future of the Manta–Manaos Axis

Since the beginning of this research the push to implement the Manta–Manaos project has lost urgency and a highway that crosses the Andean Amazon lowlands, called the Andean Axis, or "Troncal Amazonica" (IIRSA. 2010) in Ecuador, has gained support from the government. However, the Troncal Amazonica links oil and mining areas in Ecuador to other resource rich and often highly conflictive areas in Peru and Colombia. In Peru, the Andean Axis crosses the eastern foothills of the Andes via Bagua, an area that saw a clash on June 5, 2009 between military police and the indigenous population protesting against laws that would allow the construction of highways and the extraction of oil and minerals in that territory. On the Colombian segment, the Andean Axis connects several of the most conflictive and violent areas in the country, an area home to three American military bases. The Troncal Amazonica continues around Venezuela and Bolivia encircling Amazonia through highly biodiverse zones home of tens of thousands of indigenous peoples and several nations.

The connection to Asia through the Amazonian corridor could also be attained through two alternative routes, the main one being via the Putumayo River, which represents a smaller distance across the continent. However this route has two problems: the Putumayo River is too shallow in places, and its basin is a high risk area due to the Colombian conflict. The second alternative for the Amazonian corridor in Peru, a highway, is technically finished. Passing over the Marañon River, it crosses the Andes and ends in Paita. This route however has functionality problems due to the high cost of crossing the Andes, and while all corridors including the Amazonian axis suffer from Brazilian disinterest, there are other existing routes that connect the most productive areas of Brazil with the southern Peruvian coast, through Puerto Maldonado in Peru.

2. Potential Impacts of the Axis: A Social Metabolic Approach

2.1 The Manta-Manaos axis and the circulation of goods

The Ecuadorian Government officially describes Ecuador as a country that has abandoned neo-liberalism. This implies that the State will be an important agent in generating wealth and one in which economic development will be accompanied by various measures of social protection. The Government has also stated its aims to develop new economic relations by linking with other countries from the hemisphere, and its intent to prioritize contacts with Asian countries over traditional markets.

On the surface, the Manta–Manaos project appears to support this agenda. Yet, this project, linked to other infrastructure developments, in fact adheres to the neoliberal model: to extract, in the quickest way possible, increasing amounts of natural resources for the market. From its inception, this project was promoted by neoliberal interests and powerful proponents of free trade, including international financial institutions and development banks. The main project envisions the construction of ports, maquilas and electricity lines able to accelerate the extraction and transformation of raw materials for export. These plans are typical of neoliberal economic policies, yet they must also be understood as a requirement of the **social metabolism** of the industrial global system.

Sustainable metabolic processes imply that the species – including humans – are able to interchange energy and matter with Nature, expelling a certain amount of waste that is assimilated, but at a level that enables the survival of the species. This sustainable pattern was altered in the region through processes of urbanization, linked to the dispossession and destruction of peasant life. The area's metabolism has now reached a point where it requires an ever growing amount of resources and energy from Nature, and one in which the amount of waste produced can no longer be processed by ecosystems. Instead of ensuring the maintenance of the species, the production of goods (useful or not) has been prioritized, making less possible a sustainable exchange with nature (Foster, 2000).

The metabolism of metropolitan centres everywhere has come to depend on cheap imports of energy and materials. Most analysts seem to agree that China's primary interest in Latin America is to gain greater access to much needed resources – such as oil, copper and iron – through increasing trade and investments. China's imports from Latin America grew from almost $3 billion in 1999 to $21.7 billion in 2004, a more than 600% increase in five years. China's exports to Latin America have also grown considerably in the last five years, from $5.3 billion in 1999 to $18.3 billion in 2004, with major exports including electrical appliances, woven and knit textiles (Dumbaugh and Sullivan, 2005). Furthermore, export markets and capital are no longer limited to Europe and the United States; they are expanding for example, to China and India. The Manta–Manaos axis must therefore be understood as part of a strategy to export from the commodity frontiers of Latin America to feed the social metabolism of industrialized and wealthy regions of the world. There is a general agreement on such policies amongst many countries with very different governments, as can be seen by the extraordinary willingness of Brazil to expand its exports of agrofuels.

Every day the manufacture and circulation of commodities, the production of raw materials and the emergence of new extractive industries increase. The Amazon has come to be seen again as *El Dorado*, an imaginary place of unlimited wealth, that will not only provide highly necessary raw materials but will also somehow also offer refuge from the destructive consequences of capitalist production, in the form of carbon sinks for example. This situation is clearly one of structural **ecologically unequal exchange** (Hornborg, 1998, Naredo and Valero, 1999), and whether a country's economic policies are neo-liberal or social-democratic is of no consequence. Brazil under President Lula for example, has become more of a bulk commodity exporter than ever in its history.

2.2 Social and environmental Impacts

This continuous circulation of materials enabled by the exploitation of Amazonian products – incorporating the Amazonian region into the logic of the global capitalist system – will have serious impacts on the economic logic and capacity for social reproduction of Amazonian societies, with of course serious impacts on biodiversity, since capitalist extraction does not only mean the production of commodities, but also of waste (see text box below for a summary of possible environmental and social impacts). For example in the oil industry, for each oil barrel extracted, 9 barrels of toxic wastes are produced. The project would also require storage and transfer areas for transport containers, and these would necessitate the construction of several infrastructures, namely (1) completion of the Salcedo-Tena highway, a route across the Andes that would shorten the distance between Tena and Manta; (2) the creation of Bi-national Centres of Border Attention (CEBAF) in Nuevo Rocafuerte–Cabo Pantoja (see www.iirsa.org); and (3) the modernization of the Manta Port, that has a population of 250 000 people. In Ecuador itself, the project would cross the Napo River basin, the Amazon, the Llanganates National Park in the Ecuadorian highlands, and other regions with delicate ecosystems on the Ecuadorian coast.

The Napo River basin crossing (**Figure 4**) would be particularly significant for indigenous communities and peasants that live on the banks of the Napo River (one of the main tributaries of the Amazon River), as this river would require dredging to make it a navigable

Environmental impacts:

Impacts on natural resources and reserves. The ecological cost of this corridor would be very high. It would cut through the Limoncocha Biological Reserve, the Llanganates, the Yasuni National Park, Cuyabeno, Sumaco National Park and the Napo Galeras.

New colonization pattern. There would be settlement processes in the region with permanent or temporary populations generating more waste.

Chaotic urbanization on sensitive sites. An increase in transportation, and in general in contamination due to the expansion or creation of unplanned urban centers.

High impact, new industrial activities. Incentive for destructive activities such as wood extraction, expansion of the agricultural frontier and monocultures.

Destruction of water habitats and riverbanks.

Pressure on wildlife.

Destruction of forests and alteration of hydrological and climatic cycles.

Social impacts

Displacement of peoples and communities. The planned infrastructure would be built on ancestral territories – including those of voluntarily isolated indigenous peoples such as those in the northern Ecuadorian Amazon.

Socio-environmental impacts. The construction of highways, hydro-ways and dams and related extractive and agrobusiness industries would directly affect biodiversity and therefore peasant livelihoods.

Militarization is likely to occur in order to protect infrastructure and to confront social protests against the project.

The *reconfiguration of space* implies a redefinition of frontiers, not for human or even state necessity, but in response to the needs of external interests – specifically of the countries investing in the project.

Loss of sovereignty. With the reconfiguration of space, sovereignty would progressively be lost. Decisions over these territories would be subject to the interests of investors and companies operating along the axis

hydro-way for the corridor. It has been estimated that initially it would be necessary to mobilize 82 million m^3 of sediment, or 17 million truckloads, to be deposited in huge pools (Martinez, 2008). An important aspect to take into account is the fact that the Yasuni National Park is located nearby as well as hundreds of indigenous and settlers' communities (Accion Ecologica, 2008).

This is also a river in which other Amazonian rivers converge, so the presence of accumulated chemical waste means that sediment removal on such a large scale would create major impacts (Villavicencio, 2007). Furthermore, to remain navigable, the Napo River would require permanent ongoing dredging. This would constitute an environmental disaster for the region and its river. Although the Napo drainage proposal is complex and has generated much criticism across Ecuador, up until now it has only reached the stage of expanding Puerto Providencia, a small port near Coca that connects with Shushufindi.

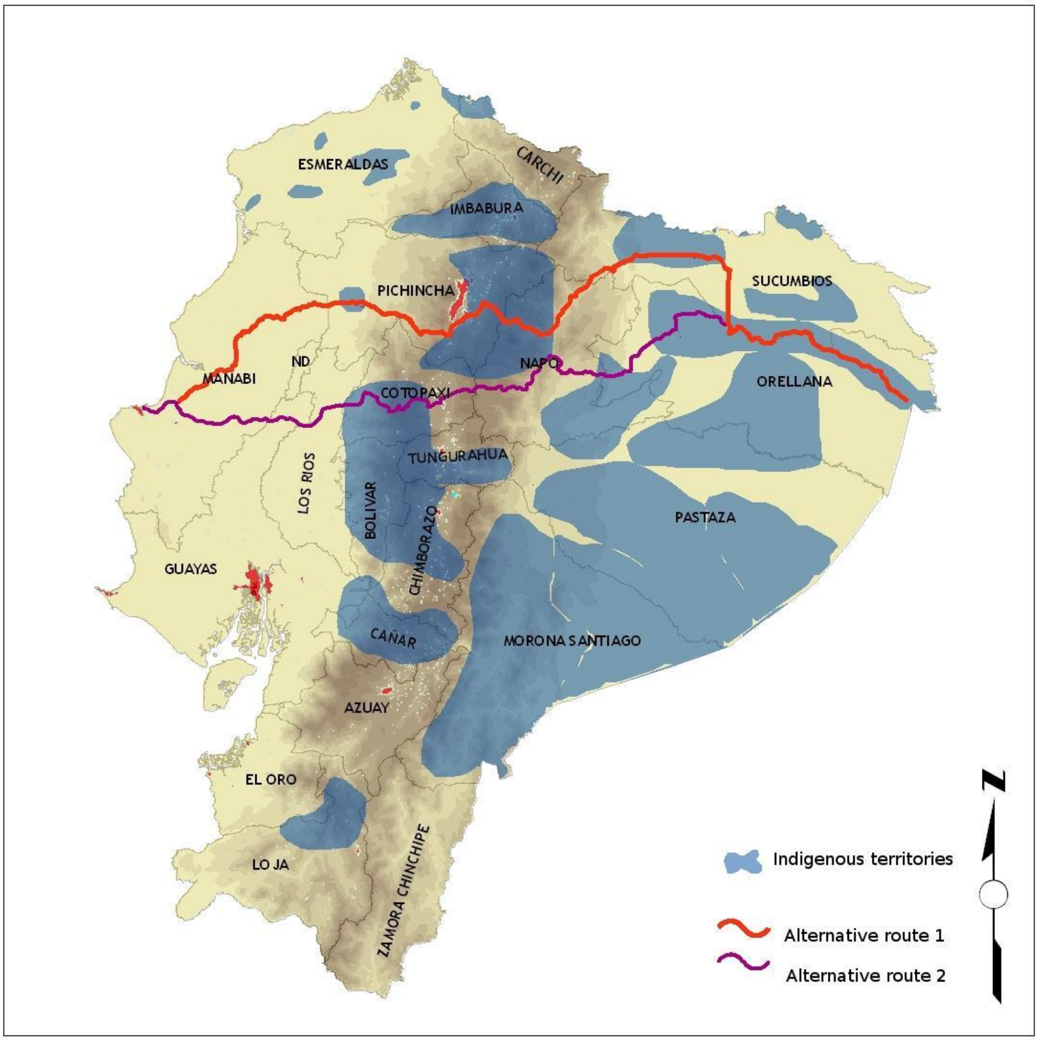

Figure 4: Alternative routes of the Axis Manta-Manaos and indigenous territories
(Source: Acción Ecológica. 2009)

3. Implementation: Promises and Probabilities

Many promises have been made by proponents of the Manta-Manaos axis regarding the benefits that would accrue to the development of industry, energy and trade sectors. Here we present an overview of some of those put forth by supporters of the axes, along with what we anticipate to be more probable outcomes of the implementation of the axis.

3.1 Industry

In the beginning it was hoped that the axis would be similar to multimodal transport corridors in Mexico, which featured the proliferation of maquilas. In fact, one of the promises made in the year 2000 was that maquilas would help the development of depressed economic regions. However, this promise was diluted later, as it was acknowledged that maquilas destroy other local productive forces and create dependency for local populations. In addition, most of the maquilas that were built in Mexico during the 1990s have now moved to China, where labour is cheaper.

As Ecuador has a minimum salary of 1 dollar and 30 cents per hour that the Ecuadorian government wants to be respected, maquilas have lost their promise of good business in Ecuador. Nor does the distance to the markets of the United States of America and beyond benefit the contribution of the axis to industrial development in the region. Existing industry on the route of the axis is minimal, and linked to extractive or agricultural export activities, with few maquila areas in Manta. This is not likely to change with the implementation of the axis (Barreda, 2010).

3.2 Energy

The plan for the axis at the outset was to integrate the different oil fields (**Figure 5**) located along the Napo route in Ecuador, Peru and Brazil (Efrain, 2006). Most of the concessions along the route belonged directly or indirectly to Petrobras, a Brazilian oil giant. Petrobras for example operated oil block 31 in Ecuador and wanted tried to gain control of the adjacent block 43, better known as ITT (Ishpingo Tambococha Tiputini). In Peru (see

Figure 5: Oil blocks on the Ecuador-Peru border
(Source: Perupetro, adapted by Acción Ecológica, 2010)

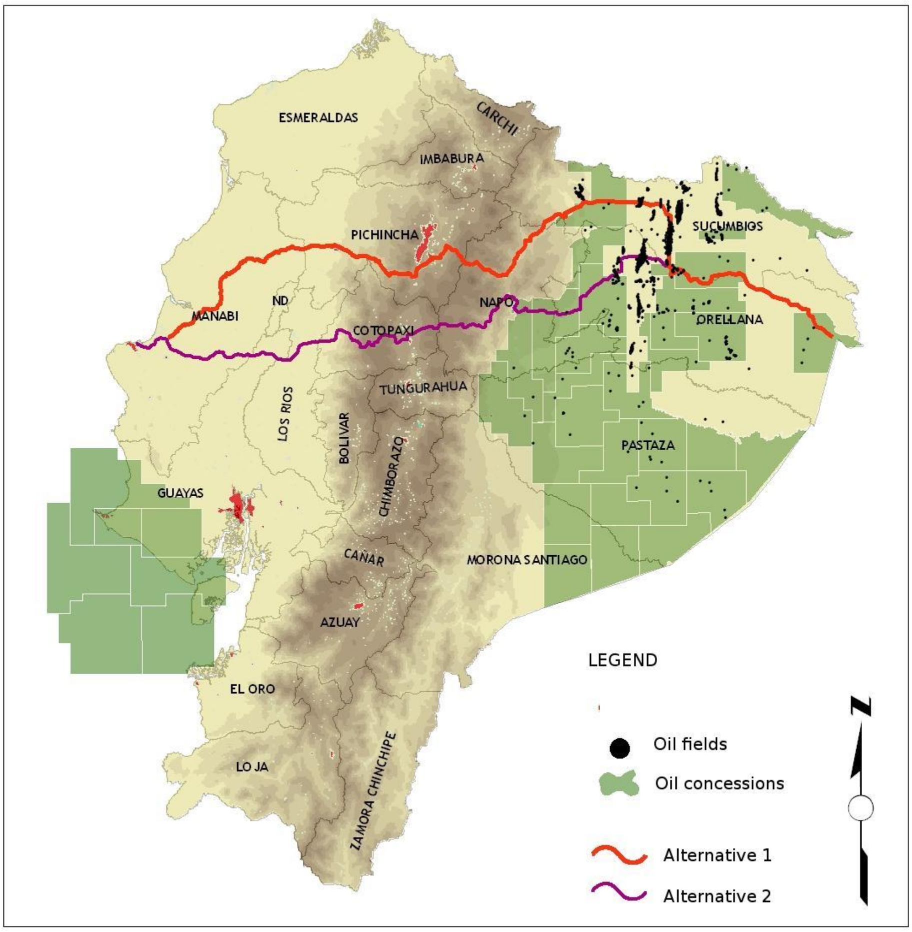

Figure 6: Alternative routes and oil concessions
(Source: Acción Ecológica. 2009)

Figure 6), Petrobras have the concession of block 117 and together with Pluspetrol Perú the areas XXVI, XXVII, XXVIII, and XXIX located in the Napo Basin.

When Ecuador launched the initiative of not exploiting oil in ITT however, and block 31 went back to State control, the oil companies lost interest in the axis, leaving only agrofuel companies interested. One of these companies was EMEPA, the Argentinean construction company that is also involved in the agrofuel business. National agrofuel companies such as Palmeras del Ecuador and Palmeras del Río are now interested in this project because they have expanded their territories to the Orellana and Sucumbios provinces around the Manaos–Manta axis (**Figure 7**). The appeal is that they are able to buy land and labour cheaply due to the amount of environmental degradation inflicted by oil companies in the area. It has indeed been easy for them to buy land because pollution forced peasants to abandon their lands or sell them to palm oil companies. The government is also planning to add 100 000 hectares of oil palm and 100 000 of sugar cane (El Comercio, 2009).

3.3 The petrochemical complex and refinery

In Manabi province, the construction of a petrochemical complex and refinery is planned, with the aim of transforming Manta into an international connection port. The Pacific Refinery, is a 6.6 billion dollar project run by Petroecuador and PDVSA (El Universo, 2008) for refining heavy oils and producing agrochemicals. This project will go ahead with or without the Manta–Manaos axis, and is projected to have the capacity to refine 300 000 barrels of oil per day, but the curious fact is that there is no heavy oil to refine at the moment, because the 125 000 barrels already being produced are going to the existing refinery in Esmeraldas. This implies future intentions to refine oil from the ITT (Accion Ecologica 2008), or to import heavy oil for refining. Numerous environmental impacts are foreseen with the operationalisation of this refinery: intensive contamination that comes along with this type of infrastructure; destruction of the region's remaining forests; and competition for water in one of the driest areas of the country. For the time being, Venezuela has lost interest in this project. Yet, President Correa maintains it is on stand-by, and has presented it on his tours to Iran and China.

3.4 Trade and transport

The objective of the axis is to integrate the Atlantic with the Pacific through the development of highways, hydro-ways, ports and airports, all designed to articulate transport throughout the route. There could be a marginal amount of trade in Ecuador if the whole corridor was a free trade zone; however the trade that would be encouraged is mainly linked to the industrial centres of China, and is unlikely to promote principles of **fair trade**. The Chamber of Commerce of Ecuador has anticipated an increase in agricultural products and tuna fish exports, however, this would only be possible with the roads that connect Manta with Quito and Guayaquil with southern Colombia completed.

Hutchinson Port Holding, a Hong Kong-based company specialized in container transfer, signed a contract for 3 years with the government of Ecuador in November 2006, initiating a port mega-project in Manta. This new port was to be part of the Pacific–Atlantic bi-oceanic corridor seen as an alternative route to the Panama Canal for cargo transport. The goal of Ecuador is to take advantage of its geopolitical situation and its deep water port. However, the contract was cancelled in 2009 due to issues of non-compliance and the company left the country.

While promoters have promised benefits with the implementation of the axis in terms of industry, energy and trade, there are important arguments over the feasibility of the project. The tonnage of goods that would circulate through the axis has never been seriously estimated, although proponents claim there would be clear economic advantages compared to going through the Panama Canal. Gallo *et al* however have questioned this assumption arguing that low water levels during the months of the dry season could impede transportation on the Napo river. This could actually make the cost of transport higher and add days to the journey (Gallo et al, ND).

4. Conflict and the Manta Manaos Axis: A Clash of Values

As stated in the introduction to this chapter, from the beginning the project has been supported by powerful interests dominated by an underlying neoliberal economic ideology, an ideology that values the generation of profit by large companies over all else. Opponents to the project in contrast, prioritise a range of different values that cannot be

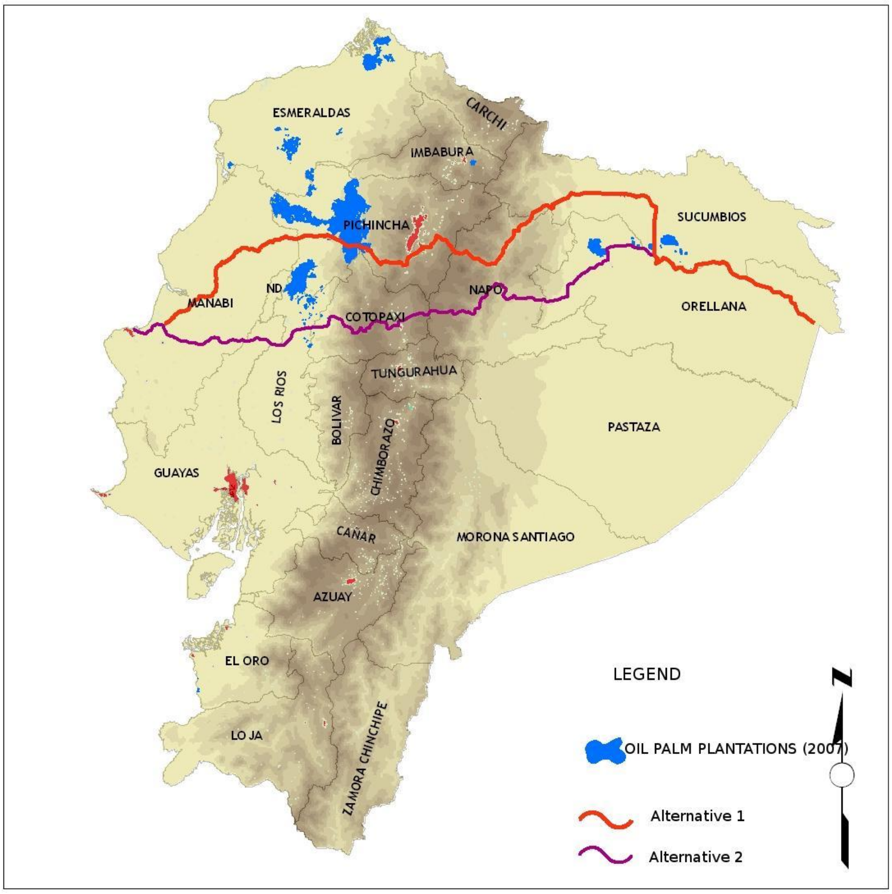

Figure 7: Alternative routes and oil palm plantations
(Source: Acción Ecológica, 2009)

compensated for in monetary terms should they be threatened by the implementation of the axis. Thus the issues presented by the existence of different **languages of valuation** are key to understanding the conflict surrounding this project.

4.1 Promoters of the project

4.1.1 Financial institutions

Financial institutions have played a fundamental in promoting and funding the implementation of the Manta–Manaos project. Their role was linked initially to the creation of Free Trade Zones that would supposedly address problems of underdevelopment and promote the economic integration of Latin America. The Inter American Development Bank was the first organization interested in the project. It loaned significant sums, including an 800 000 dollar loan to carry out a study aimed at assessing the feasibility of navigating the Napo River, a study that was never completed. In recent years, the state-controlled Brazilian Development Bank (BNDES), in its efforts to displace the World Bank as a major lender, has presented itself as a financing source more sensible to the realities of the region. This bank is closely linked to Brazilian companies and has been proven to be protecting certain illegal investments, as shown by an external debt audit carried out by the Ecuadorian government itself. After the audit, several of its loans were suspended.

4.1.2 Business interests

In the beginning, construction companies were able to negotiate with local authorities to adjust infrastructure plans in line with local demands. The Brazilian Norberto Odebrecht Company, for example promoted the idea of creating jobs for local people. However, its life in Ecuador was cut short as explained previously, and its role was handed to the Army's Engineer Force in 2009.

There have been other notable parties interested in the development of the Manta–Manaos axis. These have included the Brazilian construction companies that, before the conflict with Odebrecht, were selected to build the infrastructure of the project. Petrobras, as already mentioned, wanted to control the oil fields along the Napo river basin in Ecuador and Peru. There are also the Manta port authorities; the Argentine company EMEPA that would dredge the Napo river; and the oil palm companies of the Ecuadorian Amazon. While the key interest of building contractors lies in the potential revenue to be obtained for infrastructure construction, other groups (like traders exporting to China through the axis) are focused on the economic advantages of more rapid commodity transport and acquiring areas in which to set up maquilas.

Business interests in Manta related to the port have been particularly active promoters of the axis, to the point of succeeding to appoint their most influential agent, Trajano Andrade, as Minister of Transport and Public Works. However, Andrade resigned in 2008, and while there are many actors still promoting the construction of the axis, the most important ones are now constrained for a variety of reasons: among them the geopolitics and energy strategy changes of Brazil, the financial crisis, and other national priorities.

4.1.3 The public sector

For a long time the Manta–Manaos project has had the support of Ecuador's President. The promotion of the axis was a top priority throughout 2008 and part of 2009 nationally, and in bilateral negotiations. More recently however, it has featured in a more marginal way, presented as one of a group of projects necessary for the development of the country. Even so, the Ecuadorian government argues in favour of this project, maintaining that it will yield high economic returns by enabling the increase of exports, and linking Ecuador to world markets. In addition, it is said that Ecuador will gain a better position in geopolitical terms by becoming closer to Brazil and China, two BRIC countries (Brazil, Russia, India, and China). In a country like Ecuador, the presence of the public sector tends to be complex due to the fact that the State has poorly delimited functions and deficient internal coordination. With the rise of Rafael Correa, the modernization of the public structure has been prioritized. However, the fact that such a low feasibility project has maintained its importance shows that bureaucratic inertia still serves neoliberal interests.

4.1.4 The army

The army is of great political importance in Ecuador, and features an Engineer Force that sometimes works in association with other construction firms. This Force is also in charge of customs as well, and is temporarily in charge of the management of Petroecuador. Although its mission is to protect national sovereignty, the army has to a certain point a particular interest in building the axis. Nevertheless, in contrast to other potential beneficiaries, the army sees the potential problems as a risk.

4.2 Opponents of the project

4.2.1 Peasants

What peasants value most is the land for its importance as a place for producing food but also, the produce it yields for sale. Peasants also value their animals such as cattle, chickens, horses, etc. Large families value the possibility of living together as well as of having good relations with their neighbours. They also value the possibility of staying where they are now established, in a context where many peasant families have had to migrate to cities, due to low levels of income, land shortages, and indebtedness.

4.2.2 Indigenous communities

For indigenous communities, the territory that surrounds them is of **incommensurable value**, including plants and animals, but also the air, water and land. Within the territory, sacred sites are of particular importance, including the ancient paths where the ancestors' spirits live. Self-sufficiency in agriculture remains practiced and valued. The knowledge of elders is also respected as it enables survival in the forest.

4.2.3 Conservationist organizations

Some conservationist organizations have had an important role in denouncing the impacts of the axis and demanding transparency for the project. Nevertheless, these organisations have tended to take a mainstream stance, focusing on negotiating the mitigation of environmental impacts, rather than confronting the impacts of, or ideology underlying the project. Their main objective has been to work to ensure the reduction of environmental impacts and to facilitate consensus negotiations in which they advocate as intermediaries.

4.2.4 Ecologists and human rights organizations

Ecologists and human rights organizations that work in the area have shown their opposition to the project, aware of the environmental and social impacts of extractive activities and transport infrastructure construction. Their opposition that privileges the **well-being** of communities and nature however, tends to stigmatized as insensitive to the country's need for economic growth. However, the initiative to leave the oil underground in the Yasuni National Park has also raised the profile of criticisms of the Manta–Manaos axis.

5. Conclusions

The promise of development implied in the Manta–Manaos axis is still to an extent seen as a priority for the government. However, this project would create economic, social and environmental impacts by disturbing the area's ecological balance and destroying the existing social web. Moreover, it would increase the foreign debt of Ecuador, forcing larger amounts of exports to pay it off. It would also undermine the multiple metabolic systems in the Amazon and viable ways of living. National governments and multinational organizations have not seen the potential environmental impacts of the project and related extractive activities as obstacles to be carefully considered, nor have they taken **activist knowledge** into account. A few voices against this project, such as the Mayor of Coca and those of some local organizations, such as the Amazon Defence Front and the Forests Network, have been heard, but these constitute a small minority. Meanwhile some important environmental organizations – with the justification of making the project more transparent – have collaborated to facilitate the construction of the axis.

Through a variety of different modes, the Amazon will be connected to new developed areas – especially in the Asian-Pacific area – thereby responding to the old development dream of creating more inter-oceanic routes. The most sophisticated proposal is the Manta–Manaos axis. It will accelerate the already existent extractive industries such as oil and logging. It will also support the creation of new industries such as agrofuels, increase the transportation of agricultural products, and boost the arrival of industries to the free trade zones. Ecuador's multiannual Plan of Development claims to hold sustainability as its central axis, but in practice this is not the case. The multimodal corridors are not aligned with a strategy of geographical integration designed for the needs of local populations and their social structures. Rather, this project has been engineered in response to shifts in the geopolitical interests of the United States, Brazil and China.

This project has ultimately been elaborated from a narrow logic of development that considers the accelerated extraction of resources more important than the conservation of biodiversity. It is based on a logic that excludes knowledge and experiences of the farmers and original inhabitants, as well as critics of this development model. The contemporary history of Ecuador is full of instances of community resistance against infrastructure projects or extractive enterprises that occupy their territories or use their resources. Some communities have recently begun to refuse to take part in the prior consultation process, and while some legal cases opposing infrastructure projects have resulted, these have so far only managed to slow down, but not prevent their implementation.

It is certain from the authors' point of view that the Manta-Manaos axis will fail to deliver anticipated benefits of economic integration given its low feasibility. If implemented, it will instead seriously damage fragile areas and indigenous lands. In Ecuador, many unviable projects have been executed under the promotion of private and business interests with serious social and environmental consequences. For the time being, the project's promoters still lack the physical, economic and social conditions to launch the Manta–Manaos axis. But if at some point, they achieve these conditions, improving the project's technical feasibility, decision-makers will have to face and consider different valuation systems. This very preliminary glance however allows the authors to assert with certainty the counter-productiveness of this project to the long term well-being of the majority.

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Chapter 2: HIGH SPEED TRANSPORT INFRASTRUCTURE (TAV) IN ITALY

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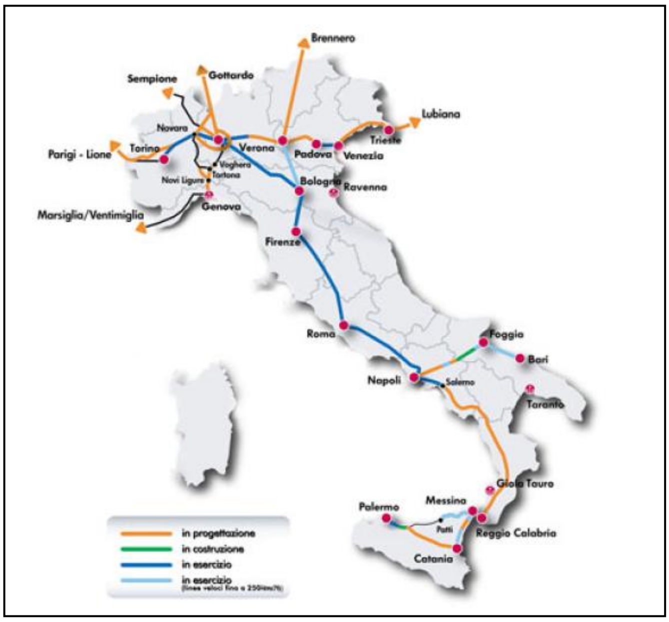

The TAV System
(Source: Ferrovie dello Stato)

Abstract

The Susa Valley, situated between Maurienne, France and Turin, Italy, has been urbanised by the economic development of the region. Scarred by infrastructure like the Frejus highway, an international railway, and numerous dams, tunnels and industries, this "development" has had significant environmental and social impacts. The high speed train line (Treno Alta Velocita in Italian, or TAV) between Turin and Lyon is planned at the intersection of 2 main European axes to complement the European railway network by increasing the transport of passengers as well as goods. The train will pass through the Susa Valley, the main tunnel to cross the Alps. The "NO TAV" movement is the grass-roots movement of the Susa Valley population against the construction of the tunnel. This case study explores the motives and rationale opponents and proponents, highlighting the role of power relations and an underlying clash of ideologies, and suggesting how tools and concepts of ecological economics might be applied to support alternative proposals from civil society.

Keywords: Transport and Energy, Material Flows, Participative Democracy, Cost Benefit Analysis, Multi Criteria Evaluation, High Speed, NIMBY (Not In My Back Yard), Activist Knowledge, Externalities, Weak Sustainability

1. Introduction

The early 1990s saw the development of high speed train lines (Treno Alta Velocita, or TAV) across Italy as massive sums of public money were invested in order to provide the country with a railway network that could compete at the European level. Not only is it part of a national railway development plan, it is also one of the priority infrastructure projects of the European Union (EU), as the Turin–Lyon segment will form the intersection of two main axes connecting northern Europe to the south, west and east of the region. It is a key element of “Corridor n°5” on the west-east axis that will link Lisbon to Budapest initially and

Figure 1 : Location of the crossing of the TAV Turin-Lyon between France and Italy
(Source: Google Maps)

to Kiev eventually, completing the European railway network by developing passenger and goods transport.

The Susa Valley (**Figures 1 and 2**), between the French area of Maurienne and Turin in Italy, is a highly urbanized area. Divided between the Lower and Upper Valleys, the Lower Valley has 66 162 inhabitants with a population density of 468 per km^2 (ISTAT, 2001). Since World War II its economy has shifted from agriculture to industry, mainly steel, services and trade. The Upper Valley has 12 909 inhabitants with 579 persons per km^2 (ISTAT, 2001). Its economy is based on tourism, as well as on more traditional activities such as dairy production and livestock grazing. (Leonardi, 2007)

The development of transport infrastructure in the beginning of the 1990s coincided with the decline of industry, particularly in the Lower Valley. To boost the local economy, Susa Valley officials began to invest not only in industry and transport, but also in the development of the local territory, especially mountain tourism and skiing activities, as the area has a rich historical and cultural legacy of popular celebrations and a scenic protected area. These local development plans based on traditional activities (handicrafts, agriculture) and nature tourism were highly incompatible with the development of industrial and transport infrastructure that threatened to transform the Valley into a transit corridor. It is not surprising then that a conflict between national and local development plans rapidly erupted, dividing the country into Pro TAV, and NO TAV groups.

The community of the Susa Valley is a historically united population, renowned for its anti-fascist resistance and struggles dating from the 1980s against big infrastructure projects (Leonardi, 2007). The first local committee, "Habitat" was born in 1991 and the first coordinated group of civil society and local institutions was created in 1994. The decades-long struggle of the Susa Valley people is very complex and cannot be reduced to a **NIMBY** (Not in My Backyard, see text box below). The NO TAV movement against high speed grew to become one of the strongest in the country, successfully blocking the implementation of the project for nearly two decades by presenting obstacles for Pro TAV advocates. The struggle against the Treno Alta Velocita (TAV) Turin-Lyon has become one of the most important social movements in Italy in the last 20 years.

The NIMBY Syndrome (Not In My Back Yard) is a label often applied to discredit valid local opposition to projects that could have negative externalities on the environment in a territory. Such projects could be for example incinerators, quarries, and industrial, mobility, or energy infrastructures. The use of the concept implies the necessity of such projects' regardless of citizens' opposition to their implementation in their own territory, or "backyard".

This case study looks at the TAV conflict through the lenses of ecological economics and political ecology, drawing on both scientific sources and "**activist knowledge**". As background to the TAV project, this paper presents a brief description of the infrastructure plan and its evolution through the years. The roles of various actors and their arguments are then examined to better understand the context and dynamics of the conflict, and to identify the influence of values regarding health, environment and ecology, safety, speed, cost, territory, transport, economy and quality of life.

2. The Infrastructure Project

The high-speed line is divided into 3 segments (**Figure 2**): The French one managed by Réseau Ferré de France (RFF) would go from Lyon to St Jean de Maurienne. The international section, with Lyon Turin Ferroviaire (LTF), an Italo-French company in charge, would connect St Jean de Maurienne, France, with San Didero, Italy through two main tunnels of 52 and 12 km in length (Figure 4). The Italian section, under the control of the Italian railway network company Rete Ferroviaria Italiana (RFI) will be 43 km long passing through the Garvio – Musinè tunnels (**Figure 3**), respectively 12 and 21km long, with service access points at Condove, Caprie and Almese. The TAV will then reach Turin via trenches and viaducts (Allasio, 2006).

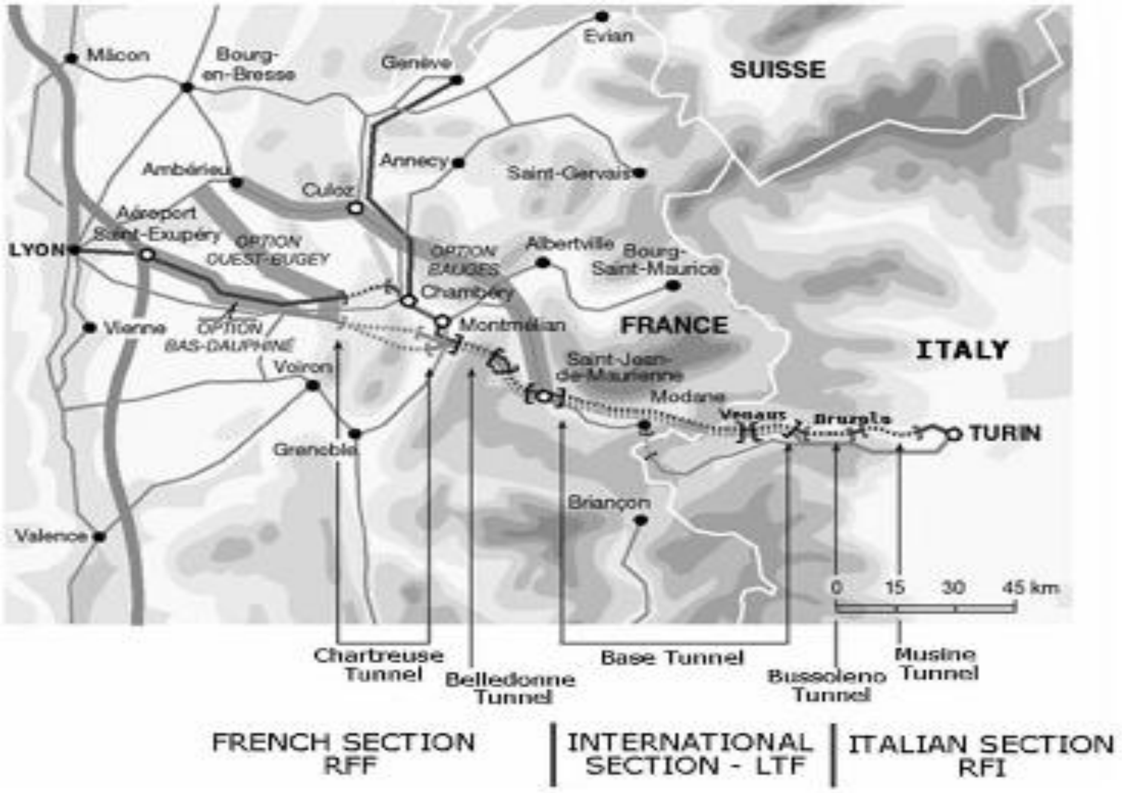

Figure 2: The 3 sections of the main project for TAV Turin-Lyon
(Source: Appiotti, Marcincioni, 2009)

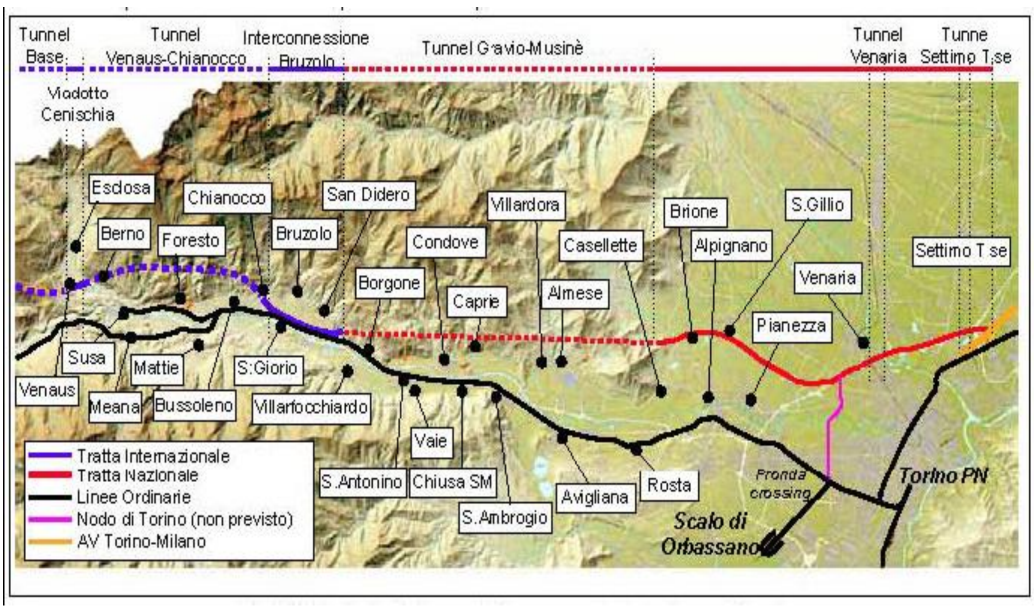

Figure 3: TAV line from Venaus to Turin, the Italian part in red; the international part in blue, the existing line in black, and the Susa valley municipalities
(Source: Leonardi, 2007)

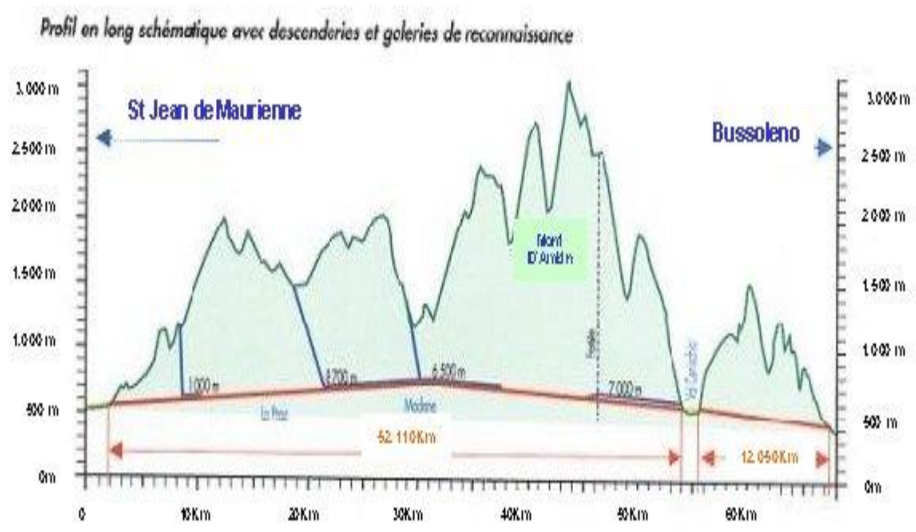

Figure 4: Altitudes of the main tunnel (in red) and the Bussoleno tunnel (in black)
(Source: www.notavtorino.org)

The TAV project proposals have evolved and expanded for almost two decades. Over the years, emphasis has shifted away from passenger comfort and convenience toward increased transport of goods across Italy and Europe, which is now the main driver of the construction of the TAV Turin-Lyon. On February 29th, 2001 France and Italy ratified an international agreement for the construction of the Lyon-Turin railway connection. On May 5th, 2004, another agreement was made regarding equal investment (to be supported by EU funding) in the international project by these two countries. In December 2008, new funding from the European Commission was allocated for feasibility studies and construction. Although numerous changes and proposals have been made, plans for the line have remained basically the same (**Figure 4**).

The TAV Turin-Lyon Observatory, created in 2005 to assess feasibility and evaluate alternative proposals, met numerous times in 2007 and 2008 to discuss the potential of the existing line, and the exploration of possible alternatives to the TAV Turin-Lyon project. The planning agreement it presented, recommended a slight reduction of land use for the construction of the line and changed the entrance and exit of the international tunnel, enlarging it by some kilometres to end up with a 57 km tunnel. The new path would go from Lyon to Settimo and then join the existing TAV Milan-Turin. Mainly, the document draws “orientation indications” for improved use of the existing line, for the “united “ management of the implementation of the new line, and for the organisation of the project design and construction, highlighting the necessity to draw project guidelines and ”respect the commitment taken towards the community and its participation” (Accordo di Pracatinat, 2008, Verbale Palazzo Chigi, 2008).

Later, on July 29th, 2008 the Ministers' Council resolved to: create a working group within the Observatory representing the Ministry of Infrastructure and Transport, the Piemonte region and the Agency for Mobility to define the intervention and improve local transport; plan a similar process (for October 2008) for goods transportation on railways; update the so-called "Dossier de Bruxelles" for the European Union on the basis of the "Pracatinat document"; begin planning for the new Lyon-Settimo-Turin line; and define responsibility in the Observatory for monitoring the project and its united governance according to guidelines for resource coordination.

At the moment the Tav Turin-Lyon remains in the "project design phase", with geological soundings for the first construction works set to commence at the beginning of 2010. (Trabucco, 2009)

3. History and Dynamics of the Project

3.1 The Periods of the Conflict

Figure 5: TAV train
(Source: Legambiente)

Following the analysis of Leonardi (2007), four distinct periods can be identified in the TAV conflict. The first from 1990-1995 marks the beginning of the conflict when the TAV Turin-Lyon project was developed along with other High Speed Train projects in Italy. Both promoters and opponents from local and regional levels gathered in groups to express their views. The first national march against High Speed happened in 1995.

The second period between 1996 and 1999 was characterised by the development and reinforcement of the NO TAV movement. The Institutional Committee was founded in 1996 to put into practice the theory of **participative democracy**. Composed of local administrators and organisations' delegates, it was designed for the exchange of information and for decision-making, especially in crisis moments. (Leonardo, 2007). The Provincial and the Regional Government reiterated their will to implement the project in the face of the NO TAV protests and the uncertainties of the National Government, as reflected in an announcement in 1999 by the Minister of Environment that there would not be a TAV Turin Lyon.

The third period, 2000-2003 was characterised by advances made by promoters for the TAV Turin Lyon: preliminary projects were proposed, changed and passed, and the EU added the TAV Turin-Lyon as a priority infrastructure project. Strong protests resulted and the NO TAV movement grew. The main contested issue was the assessment of impacts and the **externalities** of a new line.

The fourth period, 2004-2008 corresponds to the escalation of the conflict, in which promoters reinforced their position and unity while the NO TAV (**Figure 6**) movement mobilised in response to the initiation of geological soundings without local consultation. In 2005 around 50 000 inhabitants of the valley occupied the excavation site and set up permanent pickets, paralyzing all work until the demonstration was repressed by the army. As a result of the mobilisation, the Observatory was established to undertake an **environmental impact assessment** to examine possible health and environmental risks. However, beyond the perception of risks, the two sides continued to disagree fundamentally on what kind of development they envisioned. Despite a financial scandal in 2005 within the TAV S.p.A, the EU granted 671 million € in funding for the TAV Turin-Lyon for 2007-2013.

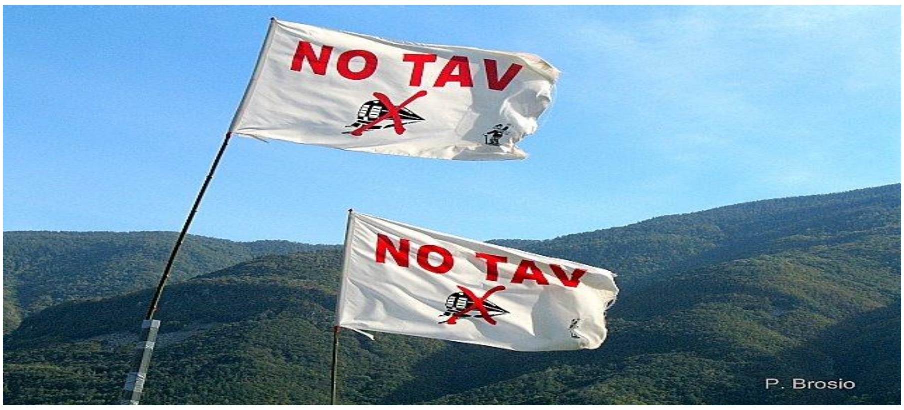

Figure 6: NO TAV flags
(Source: P. Brosio)

3.2 Actors, Motives and Rationale

Over the years the debate between the project’s proponents and opponents has grown more radicalised. Taking the Pro TAV side were the province and city of Turin, the Piemonte Region, the National government, the Ministry of Environment and the Ministry of Transport and Infrastructure, Banks, Firms, the Italian and French Railway Companies, the Province and City of Turin, and the majority of the national mass-media.

The NO TAV movement was initially comprised of: the Comunità Montana Bassa Valsusa (The Mountain Communities of the Val de Susa), other local municipalities; residents associations, the local Green Party, and the Italian Communist Party. NO TAV movement members now count among them environmentalists, administrators from all political parties, youth from self-managed social centres and from the Scouts, religious delegates, researchers, and other men and women of all ages and backgrounds. It has a horizontal structure characterised by the diversity of its foci.

The TAV Turin-Lyon Observatory was founded in 2005 at the height of the conflict by the Italian government, to research project externalities and the development of project alternatives with civil society participation. Its members come from the Ministries of Environment, Infrastructure, Internal Affairs, and Health, the CIG, the Piemonte Region, the Turin Provinces, the Susa Valley Mountain Communities, the RFI, and the LTF. Officially, it aims to encourage dialogue between members, address and resolve conflict, and provide technical assessment of the environmental, social and economic impacts of the international and Italian segments of TAV Turin-Lyon, and the outputs of the Observatory have focused on improvement of existing rail infrastructure and on the planning of a new line. As such this body is rejected by the NO TAV movement, which suspects that emphasis was only placed on the improvement of the existing line to distract attention from its implicit support for TAV construction. The work of the Observatory has in fact fuelled protest and reinforced the mistrust of organised civil society.

Discontent with the Observatory has not been limited to its civil society detractors. Shortly after the establishment of the Observatory, some Mayors and the President of the Susa Valley Mountain Communities began to express discontent with its work. In addition, the Director of the Observatory in December 2008 was forced to resign over a disagreement with some technicians of the Lower Susa Valley, who had refused to vote for a revision of project plans believing that this was not their mandate. Despite these internal conflicts, the Observatory presented a "united" image, to convince the European Union of the legitimacy of its representation, its capacity for monitoring the project and to develop public support for the TAV.

4. Pro vs. NO TAV – a closer look

While Pro TAV arguments are generally based on the benefits of increased competitiveness in European markets and on economic and ecological advantages of rail transport, NO TAV arguments are founded on politics, environment and health, transport needs and infrastructure costs, territory and quality of life. The Pro and NO TAV positions can be seen as representative of a much larger debate on substitutability between the economy and environment, a debate captured in terms of **"weak" versus "strong**" sustainability. According to Neumayer (2003) weak sustainability (WS) can be interpreted as the view that what matters for future generations is only the total aggregate stock of 'man made' and 'natural capital (and possibly other **forms of capital** as well) but not natural capital as such. WS implicitly assumes that investments in manufactured capital or human capital are perfectly adequate substitutions for natural capital, so that countries with a history of resource depletion and ecosystem damage may actually appear "sustainable" (Ayres, van den Bergh and Gowdy, 1998). WS also addresses the role of environmental indicators in relation to GDP, viewing an overall reduction in carbon emissions per unit of GDP as "sustainable". From the Pro TAV point of view then, the environmental destruction anticipated in implementing the TAV will be justified by the creation of modern, large-scale infrastructure that will bring jobs and prosperity to the region, particularly since it is anticipated that each tonne transported will have a lower environmental impact through reduced CO_2 emissions.

In contrast, the essence of strong sustainability (SS) is that natural capital is regarded as non-substitutable, both in the production of consumption goods and as a direct provider of utility. The SS paradigm aims to maintain life opportunities through conservation of the stock of human capital, technological capability, natural resources and environmental quality. This requires the independent maintenance of minimum amounts of a number of different types of capital (economic, ecological, social) in real physical/biological terms, as natural resources are seen as essential inputs in economic production, consumption and welfare that cannot be substituted for by physical or human capital. Acknowledgment of environmental integrity and the `rights' of nature is another driver of the SS approach, but key is the understanding that some environmental components are unique and that some environmental processes may be irreversible (Ayres, van den Bergh and Gowdy, 1998). A SS perspective is advocated by NO TAV supporters, evident in their arguments based on foreseen (and unforeseen) impacts on environmental and human health and security, preservation of ecosystems and quality of life. In other words the Pro TAV vision of sustainability is one of carbon and energy efficiency; while the NO TAV vision argues for an absolute **dematerialization** of the economy.

4.1 Pro TAV Arguments

4.1.1 Infrastructure Modernisation

Initially, the TAV project was presented as a technological advance to promote faster and safer travel and the modernisation of the national network. Over the last decade however, promoters have put more emphasis on goods transport rather than passengers, using the terminology of high capacity instead of high speed. One of its main objectives is to improve the accessibility of the Turin area so the region and the country can compete more effectively in the European economy (Torino Internazionale, 2004).

4.1.2 Reduced Emissions and Road Congestion

TAV project supporters have also proclaimed the ecological advantages of reduced noxious emissions compared to air and road transport. The Turin–Lyon line would reduce CO_2 emissions (AA. VV., 2002) they argue, as road and air transport is reduced with the shift to high speed rail, powered by electricity instead of fuel (**Figure 7**). However, the main argument of the Pro TAV supporters is the potential benefits from solving the road transport bottleneck assuming increased demand (**Figure 8**). Of the 38 million tonnes (t) of goods transiting between Italy and France, only 9 million are currently transported by train. In 2015, they estimate the projected goods transport will be about 60 million t (AA. VV., 2002).

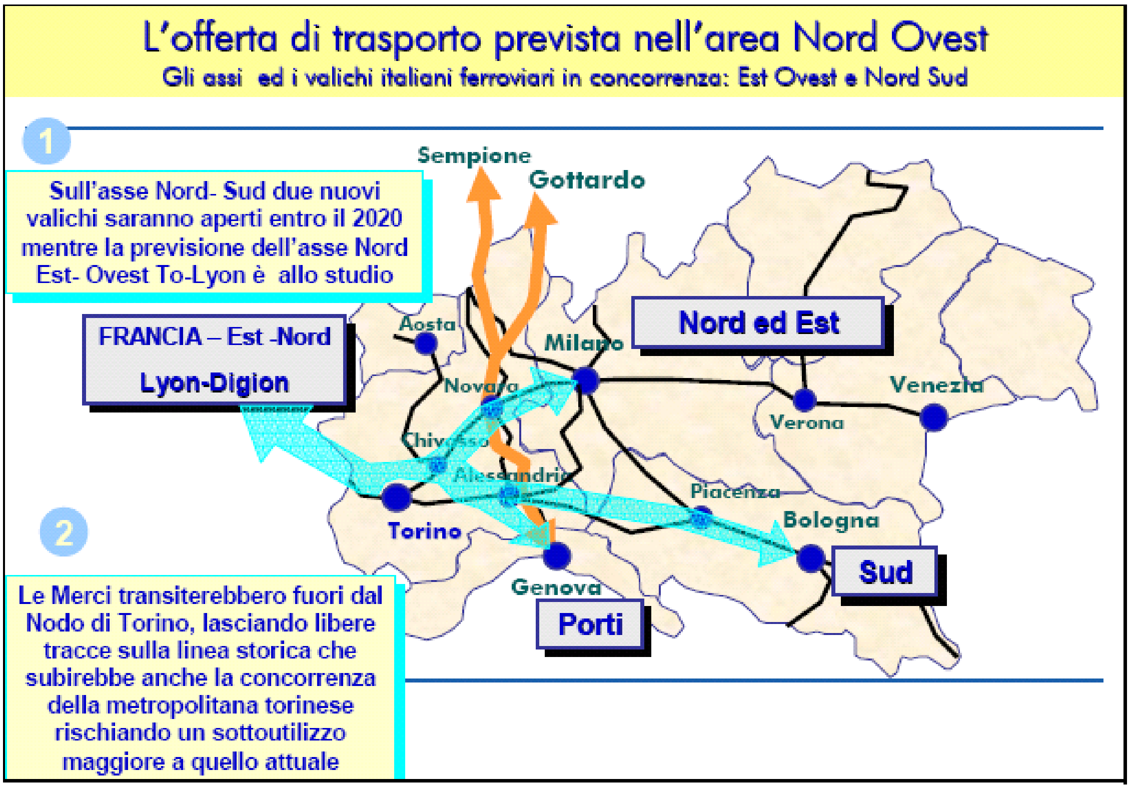

Figure 6: Planned transport offer for the North West, Italian railway axes and areas of conflict
(Source: Legambiente, 2003)

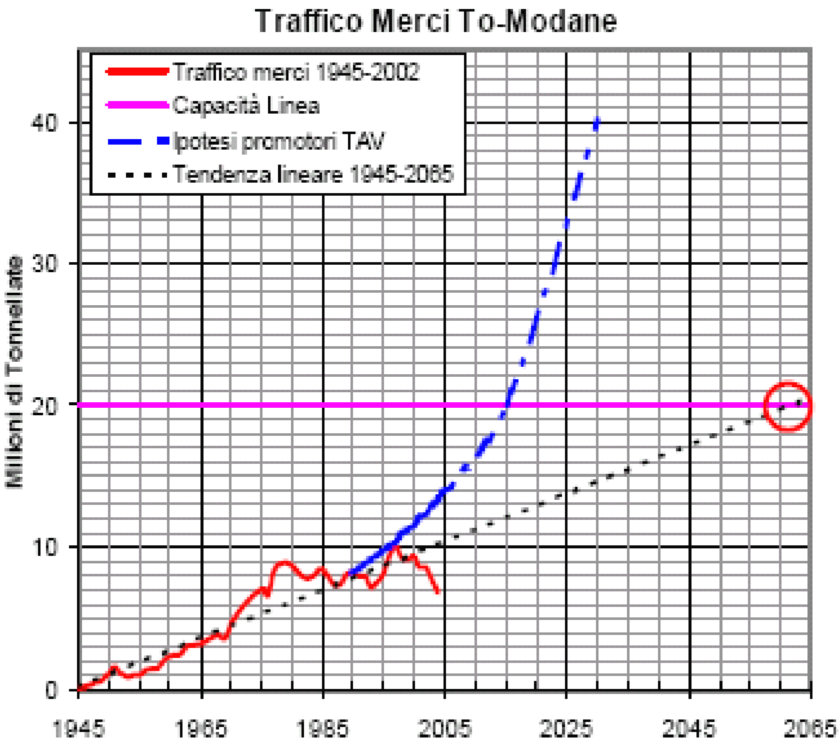

Figure 7: Goods traffic through Modane by train per year in millions of tonnes between 1945 and 2002 (in red), present line capacity: 20Mt (in purple), Pro TAV hypothesis (in blue), and linear tendency for 1945-2065 (in black)
(Source: Allasio, 2006)

4.1.3 Economic Advantages

With unemployment increasing in Italy, TAV proponents also have a convincing argument in terms of the economic advantages the project will offer vis a vis increased tourism and employment. It has been estimated that the project would employ about 500 workers in the first year growing to 3 000 workers in the fourth year, and 250 workers in the sixth year of construction (AA.VV., 2002).

4.2 NO TAV Arguments

4.2.1 Hydro-geological issues

The construction of such a massive infrastructure in this area of complex geological composition raises a variety of hydro-geological issues. For NO TAV, the highly technical level of digging required due to the length of tunnels, and the type and quantity of rocks to be extracted that will require transport and treatment are highly problematic. It has been estimated that the main tunnel alone (between France and Italy) will create about 7.5 m^3 of material for extraction, which corresponds to a tower 750 m high with a base of $100m^2$. (AA.VV., 2002, p. 11). These processes imply indirect **material flows**, which in the case of rocks containing dangerous substances such as asbestos will require transport treatment locally and beyond.

The construction of TAV Turin-Lyon is also seen as a threat to watercourses and the natural water cycle in the Valley. The use of mines and more generally the activity of digging could dangerously modify underground watercourses vital for feeding springs, and could dry out entire mountain areas, as experienced during the construction of highway tunnels and the hydro-electric power station in the Upper Susa Valley. Moreover, TAV opponents argue that the laying of cement for the deviation of underground and superficial watercourses could divert water more rapidly to the plains, increasing the risk of floods in the lower part of the Valley. (Pavia, 2006; ARPA, 2005, pp.22-23)

These geo-hydrological and contamination issues exemplify the problem of risk and uncertainty in decision making. Normal science usually reduces uncertainty to a probable risk. In this case, however, the potential impacts on human health from the extraction of materials, flooding and other damage to the environment, have been dismissed by the Pro TAV position, who are not concerned with the application of the precautionary principle in the face of clearly identifiable risk and uncertainty.

4.2.2 Threats to Health and Ecosystems

NO TAV also argues that uranium and asbestos would be released into the atmosphere during the works. The extraction of uranium from the Ambin mountain range could expose workers and the local population to radiation and therefore to tumours and leukaemia (Pavia, 2006). Other studies by Sienna University's Geo-technological Centre have shown that over one million cubic meters of materials containing asbestos would be extracted from the tunnel passing under Mount Musiné (Maccheri M., Monaci Naldini D., Antompaoli M. L., 2003). It is possible to safely treat asbestos but such procedures would increase the cost and the duration of the project and would still not completely rule out all danger.

In addition NO TAV also bases its opposition to the Turin-Lyon line on grounds that it would pass through a highly valuable environmental area that offers a vast and interesting variety of ecosystems. In Turin Province, 24 out of 69 Sites of Communitarian Interest (SIC), proposed by the Piemonte Region during the development of the European Natura 2000 Network (UE Dir. 43/92 CEE "Habitat") (Arpa Piemonte quotation) are situated on Val di Susa territory, as are two special Nature Reserves and one Provincial Park.

Initially, the main project foresees the construction of the tunnel between the two nature reserves of Foresto and Chianocco and the Orsiera-Rocciavrè park, jeopardising the connecting zone between the protected areas crossed by terrestrial and aquatic fauna. Local wildlife will also be affected by the extensive fences that will block its movements, as was the case with previous highway construction (ARPA, 2005, p. 23). Not only will animal species be disturbed, the flora (this part of the Alps alone is home to 47 of the 120 species of orchids present in Italy) will suffer intense noise and vibration, and be at risk of spring and groundwater aquifer pollution. The tunnel would ultimately compromise the monitoring and conservation of the protected areas. In recognition of these risks, the management office of the park and reserves in 2005 voted in favour of a motion stating their disagreement on the implementation of the TAV Turin-Lyon.

4.2.3 Territory and Quality Of Life

TAV opponents point to evidence that the construction of the TAV Turin-Lyon will lead to environmental changes that will modify the morphology and appearance of the landscape. The space needed for the construction yards and the storage of extracted materials will necessitate a loss of cultivable lands, prairies and woods (AA.VV., 2002, ARPA, 2005, p. 23). This threat highlights the issue of landscape valuation in addition to those of valuation of environmental or health damage. Non-economic values not directly related to human health or environmental contamination are usually absent from decision making processes but valuation of landscape and natural beauty in money terms or in other “units” could become the basis of a strong argument for TAV opponents.

The quality of life of the local population would furthermore be seriously affected as construction yards would produce dust, dirt and an increase in traffic and noise. The vibrations alone from mining activities could cause cracks in houses (AA.VV., 2002). Research also shows that a high-speed train produces the same level of noise as a landing plane, and that such sudden and repeated noise can generate panic attacks, discomfort or aggression, altered behaviours, stress and insomnia (Saponetta, 2001). Avoidance of such impacts requires living at a minimum distance of 500m from the source, but for an area like the Susa Valley already crossed by numerous railways and highways, this would mean the forsaking of numerous villages and much farmland. Moreover, as the Valley is surrounded by high, narrow mountain chains, the echo would amplify the noise, dispersing it across nearby mountainside villages (Chiocchia G., Cancelli C., Clerico M., 2002).

Additional concerns of NO TAV relate to security issues. The first regards the potential for negligence in following safety measures and concerns over workers' security. The second relates to passengers security and the likelihood of accidents along a 57 km long tunnel, the avoidance of which would require very high standards of safety measures (AA. VV. 2002). The security argument is particularly relevant following accidents in the Mont Blanc tunnel in 1999 and in 2005.

5. Research Used by NO TAV

In contrast to Pro TAV assertions that the ecological impacts of increased transport through the Alps would be addressed with the construction of High Capacity lines, the NO TAV movement has responded with a body of research showing a new line is in fact unnecessary, since the project's objectives could be achieved simply through modernisation of the existing line (Debernardi, 2004, Boitani, Ponti and Ramella, 2007).

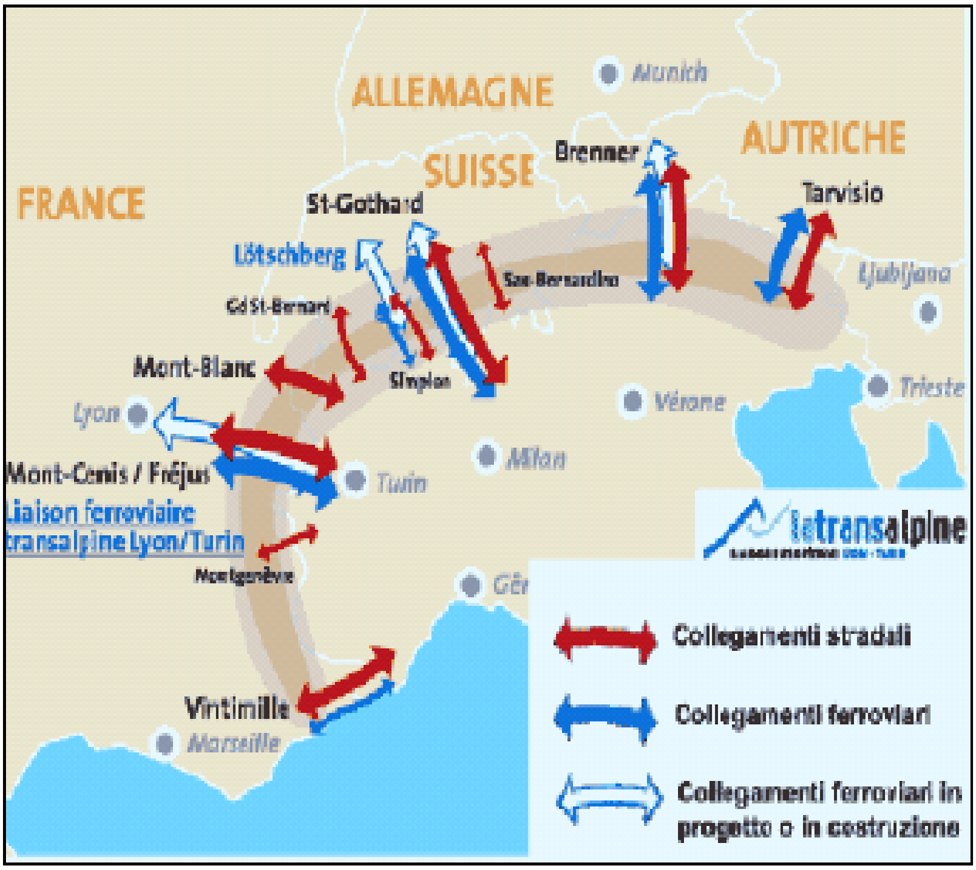

Figure 8: Estimation of the goods transiting through the Alps for 2030 (with a total 40MT by rail) red: road connections, blue: railway connections, transparent: rail projects or connections under construction. The larger the arrow, the greater the volume of goods transported

(Source: Allasio, 2006)

5.1 Potential of modernisation

First of all, if current flows across the Alps (see **Figure 9**) were to carry on for the next two decades, about 270 million t of merchandise would transit the Alps per year from 2020-2025, 80% (or 216 million t / yr) of which would continue to be transported by truck due to the low cost of road transport for stocks, semi-manufactured and finished products. Second, even if railway traffic were to expand, demand could be met by existing railway lines crossing the Susa Valley as they are only used at 38% of their capacity (trends show this traffic is actually decreasing). This is without accounting for improvements that would come from modernisation (Debernardi, 2004). In this context, the NO TAVs believe that modernisation of existing lines is the best means for meeting future transport demands.

5.2 Estimation of traffic between Italy and France

The work of French economist Prud'homme, provides a useful illustration of the value of passenger and goods transit between France and Italy, France's largest trading partner. He calculated that transit between Italy and France in 2007 amounted to about 2.5 million passengers and 37 million t of goods per year. The latter figure corresponds to both rail and road, but most of this was moved by truck. In the last decade, road traffic has remained constant but railway traffic has actually decreased by 25%. He shows the new line would initially be used by half of the passengers from the existing line, and another 30% would be new clients, totalling 2 million persons per year. He estimates the traffic of goods on the new train line as equal to a quarter of the goods currently transported (rail and road) plus new traffic from 10% of existing traffic, equalling about 13 million t per year. Calculating an increase of 2% per year he estimates that in 2037 the new line would transport 3.3 million passengers and 21.3 million t of goods (Prud'homme, 2007). This projection does not take into account the impact of a future axis through Switzerland.

5.3 Flows of import-export in Italy and through the Alps

The two main trans-alpine trade partners for goods transiting through the western Alps are France and Germany (**Tables 1 and 2**). From 2006-2008, the majority of products exchanged between Italy, France and Germany were: electrical appliances; automotive products; fashion; iron and steel; plastics; food products (including milk, eggs and honey); furniture (exported from Italy to France); medicines, medical and optical goods; electronics (imported to Italy from France); fruits (exported from Italy to Germany); and paper (exported from Germany to Italy)[1.] Debernardi however underlines some important characteristics of international Alpine rail traffic: first, its rate of increase is below average; second, there is a structural imbalance between the amount of traffic entering Italy (30 million t in 1997) and the amount leaving the country (15 million t in 1997); and third, transit exchanges are concentrated on France and central and northern Europe and very limited with the British Isles and the Iberian Peninsula (Debernardi, 2004).

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1 (from http://www.gtis.com, Global Trade Information Services, http://www.ice.it, Italian Institute for External Trade)

ROAD + RAIL (000 t)															
		1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	France		19.517						7	5	79	43	126		19.777
2	Italy	11.981		4.788	2.267	3.385	1.561	4.081	2.124					672	30.859
3	Spain and Portugal		4.150					2	10	46	73	21	19	3	4.324
4	United Kingdom		2.168								2		47		2.217
5	Belgium and Luxemburg		5.349								1	2	19		5.370
6	Netherlands		2.282												2.282
7	Germany		7.777	2											7.779
8	Switzerland	4	3.193	7											3.204
9	Austria			59											59
10	ex Yugoslavia	81		15	3										98
11	Eastern Europe	1		19											20
12	Greece and Turkey	55		19	17	9									100
13	Rest of Europe		997	1											998
Total		12.121	45.432	4.910	2.287	2.955	1.561	4.083	2.141	51	155	66	210	675	77087

Table 1: Goods transported by road and rail through the Western Alps by country in 1997
(Debernardi, 2001)

5.4 Financial Management: Costs and Corruption

NO TAV argues that the cost of the Turin-Lyon high-speed line project is very high. This is because it is a huge and technically complex infrastructure project but also because a great deal of debt has already been accumulated by the project. The construction costs of high-speed rail lines in Italy are much higher than the equivalent infrastructure in France or Spain (**Table 3**) as they are linked to the nature of Italian contracts and financial architecture.

The financial scandal surrounding TAV S.p.A illustrates how the project operation financial model promoted for the TAV implementation in Italy contributed to the public deficit and was unsustainable. In 1991, the national railway company released funding to TAV S.p.A. in the form of an "allowance for projecting, constructing and for the economic exploitation of the high-speed line" in Italy. The State Council ordered TAV SpA (40% of which was held by FS S.p.A, and the remainder held by privately owned companies) to raise private funds for investing in the undertaking of the project. TAV S.p.A. had mismanaged the TAV Turin-Lyon project however and could not come up with the necessary private funds. Instead public money from European funding was diverted through FS S.p.A. until 2005 when the European Union discovered the fraud through aTAV-related infraction procedure.

The Italian State was forced to reimburse the money, a sum of about 13 million € accumulated from 1994- 2005, assuming it as a public debt. Opponents to the TAV Turin-Lyon continue to protest the fact that although the Italian State eventually took responsibility for the debt, and its citizens paid for it, TAV S.p.A is still promoting the same financial model under the authority of the RFI (Cicconi, 2008, p. 1, Venosi, 2005).

RAIL (000 t)															
		1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	France		6.036												6.036
2	Italy	1.463		285	748	1.916	825	2.655	778					473	9.142
3	Spain and Portugal		428												428
4	United Kingdom		779												779
5	Belgium and Luxemburg		2.995												2.995
6	Netherlands		1.001												1.001
7	Germany		6.112												6.112
8	Switzerland		2.037												2.037
9	Austria														0
10	ex Yugoslavia														0
11	Eastern Europe														0
12	Greece and Turkey														0
13	Rest of Europe		867												867
Total		1.463	20.255	285	748	1.478	825	2.655	778	0	0	0	0	473	29.397

Table 2: Goods transported by rail through the Western Alps by country for 1997
(Debernardi, 2001)

6. Other Critiques of the Pro TAV Rationale

One of Pro TAV's arguments in favour of the project is the potential for alleviating pressures on road infrastructure for goods transport in the face of predicted increases in demand. TAV proponents claim that the project would be ecologically advantageous through reducing emissions of CO_2, but It could also be argued according to the **Rebound Effect** or Jevons's Paradox, that these environmental benefits could be cancelled out as implementation of the TAV would actually lead to increased material flows. The rebound effect warns that improvements in efficiency might in fact lead to increased resource use. For example, improving the fuel efficiency of cars could contribute to increased car use as the cost of driving goes down per km. The increased capacity available on the TAV could actually lower transport prices, thereby increasing international trade with negative environmental impacts.

	France		Spain		Italy	
	Length (km)	Average Cost / km (M €/km)	Length (km)	Average Cost / km (M €/km)	Length (km)	Average Cost / km (M €/km)
Operational Lines	1548	10	1030	9	564	32
	South East Atlantic Rhone-Alps North Europe Paris Interconnections Mediterranean		Madrid-Barcelona Madrid - Seville		Florence-Rome Rome-Naples Torino-Navara	
Lines in Development or in Construction	990	13	1490	15	647	45
	East Europe Perpignan-Figueras Rhine-Rhone Nimez-Montpellier South Atlantic		Toledo-Madrid-Seville Connection Madrid-French Border Malaga-Costa del Sol Valladelid-Madrid Madrid-Alicante-Murcia		Navara-Milan Milan-Bologna Terzo-Valico Milan-Venice	

Table 3: Construction costs in Italy, Spain and France, by M. Moretti (FS Spa.) in 2007, showing the length of rail lines and the average cost per km for France, Spain and Italy. Data in blue denotes existing lines, while data in red represents lines in development or under construction (Cicconi, 2008)

In addition, while high-tech new trains are promoted as sleek and eco-friendly, a **life cycle analysis** would reveal the true environmental impacts of retiring old trains and their infrastructure to build new lines and trains. Contrary to expectations, extending the use of an old car for example, can generate less emissions than buying a new fuel-efficient car due to the energy used in the manufacture of the latter, which can account for up to a quarter of emissions over the car's lifetime.

7. Civil Society Organisations and Research in the TAV Conflict: Cost Benefit Analysis and Multi Criteria Evaluation

7.1 Cost/benefit analysis for Turin-Lyon TAV

Cost Benefit Analysis (CBA) was developed by promoters of large dam construction projects in the United States seventy years ago and later expanded around the world by the World Bank in order to support their projects by demonstrating how losses from dam construction were lower than the benefits they produced. Different from a purely financial analysis, a CBA takes into account (in monetary terms) all facets of the project. For instance, benefits from dams include hydroelectricity and irrigation water and possibly also flood control. Costs include building costs, indemnities to displaced people, and also the loss of fisheries and beautiful landscapes (all valued in monetary terms).

Benefits and costs are given in "present values", applying a **discount rate** to future benefits and costs. Which discount rate to apply is as much an ethical as a technical question. This is because the higher the discount rate, the less we are valuing future generations and privileging present welfare. For example, a cost or benefit of 100 euros occurring 50 years from now, with a 5% discount rate per year would have a present value of only about 10 Euros. While applying a 5% discount rate to economic profit from a business perspective makes sense since money invested today can bring returns tomorrow, this logic does not necessarily hold when applying the same discount rate to an environmental good which offers sustained social benefits in time. We cannot assume that in the future the financial capital gained will be able to replace lost natural capital, or that the following generations will be richer than the present one.

CBA is frequently used in support of infrastructure construction, mining or industrial projects, Nevertheless, CSOs have begun using CBA to demonstrate the inappropriateness of projects and to argue against them. The application of CBA in the context of ecological economics can be relevant to environmental conflicts, as it takes into account estimates of environmental externalities (positive or negative), while at the same time pointing out conceptual difficulties in assigning money values to non-market goods and services, and in choosing one particular discount rate.

Be that as it may, the fact of the matter is that for a long time the NO TAV movement asked promoters to undertake a study on the costs/benefits of the project. A pertinent cost/benefit study "scientifically" illustrating the argument of the NO TAV movement was finally carried out in 2007 by Rémy Prud'homme (see Text Box below). His research on the main tunnel demonstrated that the TAV would not be an advantageous alternative. He acknowledged that railway transport capacity would obviously be improved but that this did not imply that road transport would diminish. His research calls into question whether the TAV would really provide an efficient alternative to road transport, even though trains are safer and have less ecological impact.

Rémy Prud'homme: CBA of theTAV

In formulating his estimations, Prud'homme took into account socio-economic and environmental indicators (time economies, decreased pollution, CO_2 emissions, reduced number of road accidents) to calculate the benefits of the TAV compared to road transport. For example, he calculates that time savings would mean benefits of 88 million € annually, while positive externality of the reduced atmospheric emissions would be worth 4 million € annually and the avoided $C0_2$, at 25€ a tonne, would be worth 10 million €. In total he calculates that all the benefits would account for 136.7 million € per year, with the bulk of this due to economic gains (106.7 million €) due to time savings and with the rest (29 million €) due to avoided environmental externalities and reduced accidents. He calculates these benefits over a period of 45 years with a discount rate of 4% and the assumption that traffic would increase at a rate of 2% a year.

To calculate the project costs, he then calculates the investment and maintenance costs of the line, estimating that the first five years of construction will cost 4.16 billion per year, then 427 million € per year thereafter for running of the line. He arrives at an estimation whereby the costs exceed the benefits by 25 billion € over 45 years. With this calculation, he concludes that the project would not even cover its infrastructure costs and would create debts and deficits for both the Italian and French governments.

It should be noted that Prud'homme does not quantify or take into account any negative externalities caused by the TAV project enumerated above, such as noise pollution or loss of **landscape value**. A more complete CBA could try to quantify these costs and benefits to get a more realistic view of the social and environmental impacts and benefits.

Bearing in mind the huge costs of the project vis a vis the benefits, NO TAV's alternative proposal of improving the existing line appears unarguably as the more sensible option, and a sufficient response to the needs of transport transiting through the Susa Valley. Economic studies produced by the Milan Polytechnic School show that an improved line could transit 48 million t of goods with 200 trains transporting 800 t for 300 days a year. Over a period of five years, this amount (240 million t) covers a significant portion of the 270 million t of trans-alpine demand projected by Debernardi (M.Brambilla, M.Ponti and S.Erba, 2005).

The Prud'homme study is an example of how cost benefit analysis can be a useful tool for the NO TAV movement. Combined with arguments of the likely environmental risks and the weight of debt that would be incurred by the project, the Prud'homme CBA casts serious doubts on the wisdom of TAV and its sustainability. It is true, however, that alternative assumptions about the money value of negative externalities and a different discount rate would produce a CBA with very different results. This highlights the vulnerability to political manipulation that cost-benefit analyses can be subject to, and why social groups often argue in favour of more participatory inclusive decision-making mechanisms such as **multicriteria assessment.**

7.2 Multicriteria Assessment

A **social multi-criteria evaluation** (SMCE or MCA) of various indicators or criteria could also be used to demonstrate the plausibility of alternatives to current plans for the development of the TAV. Using methods of participatory deliberation, several alternatives including 1) Use of the existing line only 2) TAV Turin-Lyon main project, 3) alteration of the existing TAV path following recommendations of the Observatory, and 4) improvement of the existing line, can be ranked according to how well (or how badly) they score with respect to the various criteria, for example: economic indicators; environmental externalities; health and security risks; landscape effects; and cultural values. The draft matrix below (**Table 4**) suggests how an MCA might be structured in order to capture dimensions of reality that cannot be reduced to money values.

Table 4: Multicriteria Evaluation Matrix

	C1. Economy					C2. Environmental externalities				C3. Impacts on health (disease , noise)	C4. Security and risks (roads, construction works, tunnel security requirements)	C5. Landscape damage impacts
	C1.1 Construction costs	C1.2 Employment	C1.3 Impacts on local activities	C1.4 Price /km and speed *	C1.5. Cost /benefit analysis	C2.1 Impacts on CO_2 emissions (passengers and goods, air and road transit)	C2.2 Contamination risks (uranium and 42sbestos)	C2.3 Impacts on flora and fauna	C2.4 Hydro-geological impacts			
A1. NO TAV existing line project												
A2. Main TAV												
A3. Alternative TAV path												
A4. Modern-isation of existing line												

* Criteria C1.4: (Relation between speed, price and kilometre) On a scale of speed (300km/hour=0.08 high speed, 70km/hour 0.01 very slow) we have calculated that the TAV travels at a rate of 83.3km /hr (0.02) and the existing line moves at a rate of 70km/hr (0.01). Since the price of TAV travel is 0.3€/km (or for example 75€/250km) and that of the existing line 0.16€/km (or 45€/250km), the cost to travel at only a slightly faster speed is double.

8. Discussion

8.1 Power and Decision Making

It is clear from the description of this conflict that there is, as is generally the case in environmental conflicts, an imbalance in the weight of power between the TAV proponents and opponents. The Pro TAV side has from the beginning had superior economic and political power and the ability to effectively influence decision making. It has also benefited from prejudices developed in the course of the conflict that portrayed the NO TAV group as a merely a NIMBY movement, and criminalised it by launching military interventions against peaceful demonstrations. The Pro TAV side is furthermore bolstered by support from mainstream politicians and public opinion who argue in favour of developing green transport and increasing Italian integration within the European Community and economy. While the Pro TAV argument was to an extent destabilised by the financial scandal surrounding TAV S.p.A., the overall impact was negligible, and apart from causing some hesitation of the French government and the European Commission did not influence allies' support for the project.

Meanwhile, NO TAV has tried to draw attention to the lack of environmental impact assessment, lack of consultation with local communities and poor project planning. Their criticisms have been based on solid argumentation and scientific research, embodying a **post-normal science** approach through which organised citizens assimilated expert knowledge complemented by scientific research to support the development of concrete alternatives. The strength of the movement stems from its capacities for network organisation, multi-sectoral collaboration and research which enabled credible alternative proposals.

As for the Observatory, created to facilitate civil society participation and its proposals, it has ultimately prevented public participation and excluded it from the decision making process. This happens in many environmental conflicts whereby those who hold procedural power can choose to exclude or allow concrete arguments and values into decision-making processes. This becomes obvious in the case of TAV if one looks at the opposition between Pro and NO TAVs' ideological perspectives.

8.2 Clash of Ideologies: Economic Growth and High Speed vs. Degrowth and Participative democracy

If the TAV conflict is characterised as one of power imbalance it can also be seen as one of conflicting ideologies. The weak sustainability approach of Pro TAV is grounded in neo-classical economics and the primacy it places on economic growth as the means for achieving human welfare. The High Speed and/or High Capacity concept in fact embodies a central tenet of the global market system, calling for the circulation of material and energy flows, labour and profit at maximum speed in order to facilitate the expansion of economic growth.

In contrast the NO TAV position, favouring a strong sustainability paradigm, directly questions the need to exponentially increase the movement of goods, preferring instead more localised forms of consumption and decision making. Their struggle aims to defend the environment and the health of the Susa Valley people but it is also part of a greater struggle against economic strategies of globalisation and in support of the promotion of self-governance. As such the NO TAV position is closely aligned with the concept of economic **de-growth,** which evolved out of realization of the failures of the dominant growth-based economic model and its disregard for sustainability. Degrowth theorists reject the use of GDP and consumption indicators as measures of human development and happiness, and propose the development of an economic framework that takes into account the limits of natural resources and understands that the increased production of goods does not imply an improved quality of life. The Pro/NO TAV conflict can be seen as a struggle between these two contradictory economic ideologies

8.3 A Matter of Self Governance

No-one disagrees with the proposition that rail is a greener option than road transport, but it does not automatically follow that rail projects should be developed with no respect for the environment or the rights of local populations to take part in local development decisions. Rooted in a vision of development on a human scale through participatory democracy, the NO TAV movement has not merely criticised Pro TAV arguments. It has based its critiques and proposals on scientific research and technical expertise to increase public understanding of the issues and potential impacts at stake, developing and proposing sustainable and efficient alternatives. In doing so, NO TAV has put into practice of a true form of democracy where people, through information sharing and participation have endeavoured to make decisions for themselves and their territories using science to inform self-governance.

The NO TAV mobilisation has stimulated much independent research and the development of alternatives that have constructively criticised and effectively challenged thinking behind the TAV project. These accomplishments provide a perfect example of constructive cooperation between science and social movements for the common good. Unfortunately this conflict is also driven by the continuing will and influence of economic and political institutions to increase the flows of materials in the economy and increase profits, without regard for costs to the environment and human health, or grassroots participation and self-determination.

8.4 Remaining Questions

Seen in this light, this study raises important questions: Why was the project first publicly promoted as a high speed line for passengers and then later as a high capacity line for goods transport, when these two uses imply significantly different needs? How will its proponents be able to develop a socially and environmentally friendly project that is economically feasible when so much incompetence was obvious in the project planning phase? Why should citizens trust TAV proponents who have proven themselves unable to manage the project, wasted money on corruption, and produced inadequate environmental assessments and project plans? Why should the public trust those who want to transform their valley into a transit corridor, forsaking the opportunity to implement the development they want for their own territory?

Perhaps more importantly, the main point of interrogation of the TAV conflict remains, “Why should plans for the high capacity line, with high environmental risks and at enormous expense go ahead when the improvement of the existing line would result in achieve the same results at less environmental /social cost? It is in pursuit of the answer to this question that the application of cost benefit analysis and multi-criteria evaluation could be of use, sustaining and legitimizing civil society proposals to improve existing rail transport. More generally, deliberative processes could go a long way to improve consultation processes and support the sustainable development of the Turin-Lyon axis.

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MINING

Chapter 3: THE MINING ENCLAVE OF THE "CORDILLERA DEL CÓNDOR

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Hilidaes in the Cordillera del Condor
(Source: Afredo Luna)

Abstract

In southeast Ecuador and across the border in Peru, a number of large-scale copper and gold mining projects to be undertaken by Canadian companies are moving forward. These projects, set to take place in the territory of the Shuar indigenous people, will require the creation of massive quantities of waste and the use of huge amounts of water and energy, as well as the construction of new roads. Among the actors in this conflict are also international and national conservationist organizations that, paradoxically, are not opposed to mining, and the Shuar people, who have resisted for the last 20 years, albeit not without division. The government of President Rafael Correa is inclined towards the exploitation of mining resources, as demonstrated by the adoption in 2009 of a new Mining Law that contradicts the Constitution of 2008 and its goal of "Buen Vivir" (living well). Repression has been used against those who oppose open-pit mining, targeted at local, national and international sources of resistance. This case highlights the importance of weighing the economic benefits of mining operations against the socio-environmental liabilities, calling for an alternative to Ecuador's chosen neo-extractivist development strategy.

Keywords: Open-Pit Mining, Non-Renewable Resources, Biodiversity Hotspot, Corporate Social Responsibility, Environmental Liabilities, Hydroelectric Dams, Canadian Mining Companies, International Conservationism, Commodity Frontiers, Weak Sustainability, "Accumulation by Dispossession", Environmentalism of the Poor

1. Introduction

On September 30, 2009, news arrived that a Shuar bilingual schoolteacher, Bosco Wizuma, had been killed in a clash with the police in his native province of Morona Santiago. It was during a protest demonstration against a proposed new water law, which would have severe impacts on the southern region of Ecuador, and particularly the Cordillera del Cóndor (Condor Mountain Range). Following the incident the government attempted to shut down the Shuar radio station Arutam for allegedly inciting civil disobedience – a move that was successfully blocked by human rights organizations. Such episodes of extreme violence are less frequent in Ecuador than in Peru or Colombia, fortunately, giving cause to look more closely at the background to this incident.

Ecuador's economy has traditionally been based on the extraction of natural resources. As a result, it has used and abused the environment, which has suffered the effects of the pollution created by extractive activities. At the same time, this model of development has mired the country in a state of dependence, while leading to the growth of the external debt and the destruction of ecosystems. For the past 40 years the Ecuadorian economy has depended on oil in particular. Ecuador's oil industry has predictably, reached its point of maximum annual production (known as the Hubbert peak, see **Peak Oil**) and is currently experiencing a decline in both the quantity of oil produced and its quality. Despite this situation, however, the current Ecuadorian government has opted to increase oil exploitation by expanding production to reserves of low-quality heavy crude oil, while also opening the country up to large-scale mining activity.

The Ecuadorian president, referring to mining and oil drilling, has stated that "everyone is against the destruction of nature but if our development depends on it… it will be exploited." He also added that there will be "zero tolerance for anyone who tries to call strikes or generate chaos." [2] President Correa claims that mining activities will be carried out with the most advanced technology and high standards "like in Canada, which is a developed country." These statements were made in the context of a new Mining Law and a financial crisis, with declining mineral prices since 2008, which will make operating conditions profitable only through the use of the cheapest and most highly polluting technology.

The Cordillera del Cóndor project is paradigmatic for understanding the scope of the potential impacts of open-pit mining, because this is an area of high biodiversity and part of the ancestral territory of the Shuar people; it is also an area of great importance for the regulation of the water cycle of the whole region. This study addresses the subject from the perspective of Ecuador, but there are also conflicts on the Peruvian side of the border.

2 President of the Republic of Ecuador, Rafael Correa, National Radio Network, December 1, 2007.

1.
2. Characteristics of the Project

2.1 Location

The Cordillera del Cóndor, located in southeastern Ecuador, is a mountain chain stretching 150 kilometres from north to south, with its highest peaks reaching an altitude of 2,900 metres above sea level. It is also one of the biologically richest regions in South America.[3] It falls within the Amazon region provinces of Morona Santiago and Zamora Chinchipe, and forms part of El Cóndor Binational Park, which was strategically established at the end of the war between Ecuador and Peru in 1995. (See **Figure 1**).

The Cordillera del Cóndor is also the ancestral territory of the Shuar indigenous people. Their organization, the Interprovincial Federation of Shuar Centres (FICSH), represents 120,000 members in 500 centres (communities).[4] Additionally, the Cordillera del Cóndor forms part of the Tropical Andes biodiversity "hotspot", which encompasses the entire Andes mountain chain, from Colombia to Chile. It also encompasses the Abiseo-Cóndor-Kutukú Conservation Corridor, which stretches from Sangay National Park in Ecuador to Cordillera Azul National Park in Peru, covering a total area of some 13 million hectares.

Figure 1: Southern Ecuadorian Copper Belt
(Source: Corriente Resources Inc.)

The location of the Cordillera del Cóndor between the Andean and Amazon regions makes

3 Neill, David. The Cordillera del Cóndor Region of Ecuador and Peru: A Biological Assessment. Conservation International. Washington. 1997.
4 Interview with José Acacho, president of the FICSH, Macas, July 7, 2009.

it a unique area in terms of flora and fauna. There are many endemic tree species that were recorded for the first time anywhere in this region of Ecuador.

2.2 Production model

The current government of Ecuador has condemned the country to a development model based on the export of raw materials, which will inexorably affect agricultural lands, fishing grounds, indigenous territories and protected areas. (**Figure 2**). With the regard to the Cordillera del Cóndor specifically, the government's "development" policy development, in line with principles of so-called **sustainable extraction,** aims to turn it into a mining region (see **Figure 3**).

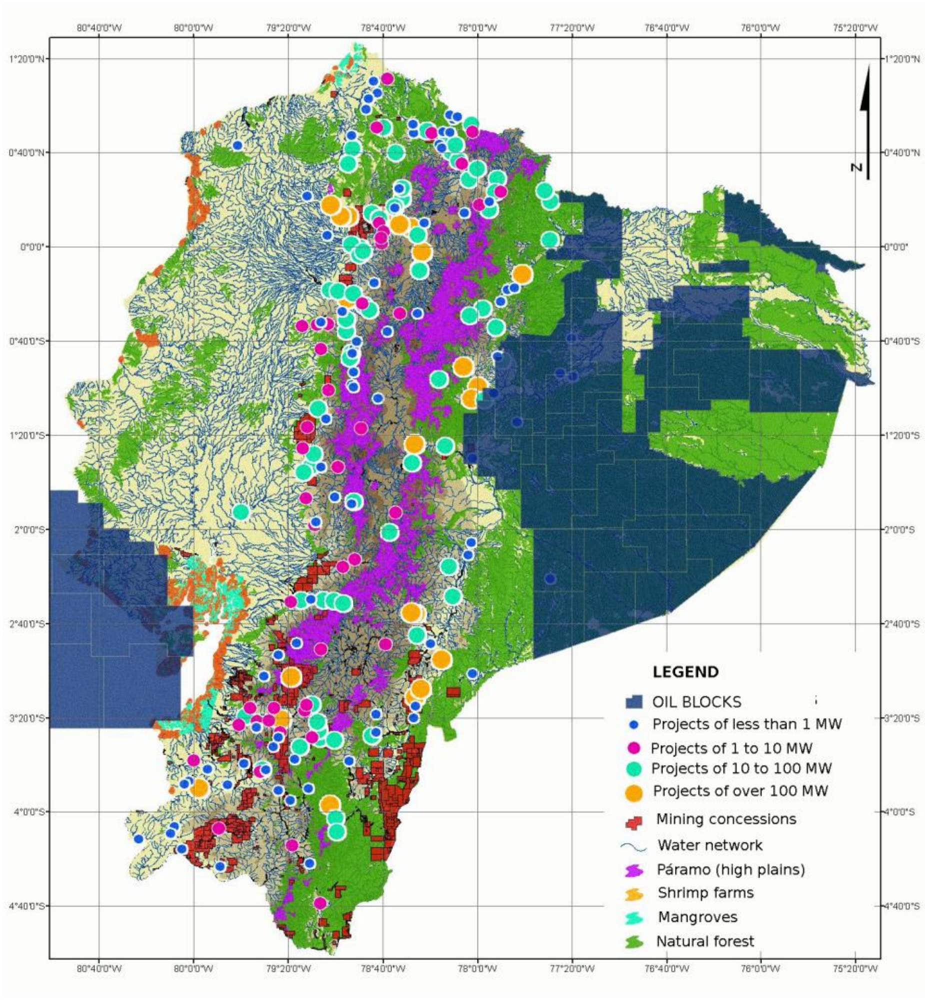

Figure 2: Oil blocks, mining concessions and natural forests
(Source: Acción Ecológica, . 2009)

The Mirador mining project planned for the Cordillera del Cóndor is based on open-pit mining operations. According to the **environmental impact assessment** (EIA) for the project, the pit will measure 115 hectares. There will be two waste dump sites, of 75 hectares and 47.9 hectares each, as well as two tailings facilities of approximately 56.6

hectares and 312 hectares in size.[5] The processing plant will occupy an area of 20 hectares. It should be kept in mind that the Mirador project is the first of a number of projects planned for the Cordillera del Cóndor by the same company, Ecuacorriente, which

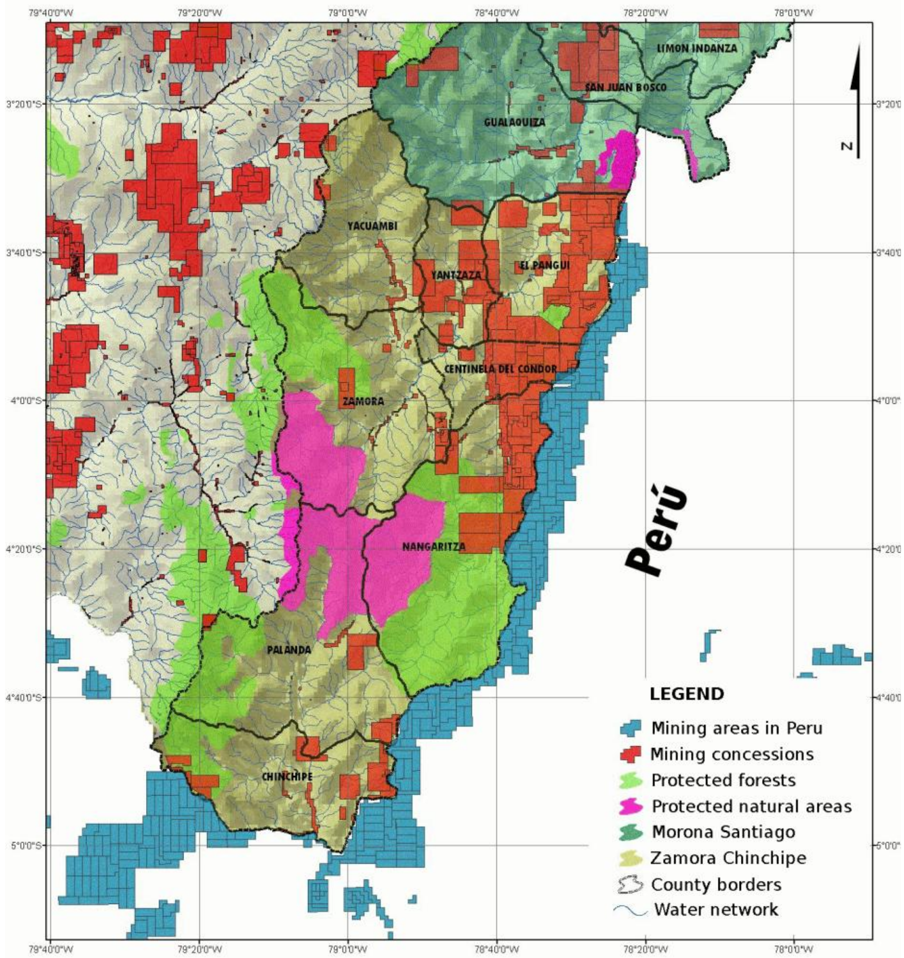

Figure 3: Ecuador-Peru border mining concessions
(Source: Acción Ecológica, 2009)

means the impacts will be further multiplied.

2.3 Use of resources

According to the information available on the Mirador mining project, an estimated 27,000 tons of mineralized rock will be processed daily, resulting in the production of close to 600 tons of copper concentrate and more than 26,000 tons of waste. This would imply the creation of around 180 million tons of waste during the 18 years of the project's life, leading to the need for large areas of land to store that waste. In a fragile tropical rainforest ecosystem like the Cordillera del Cóndor, this could cause irreversible environmental impacts. The removal, transportation and processing of 27,000 tons of material would have considerable impacts on:

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5 Terrambiente Consultores. Alcance del Estudio de Impacto Ambiental Ampliatorios Mirador. 2006.

2.3.1 Water

Large amounts of water are needed to produce a ton of copper,[6] According to its environmental impact assessment, Ecuacorriente will use 40 litres of water a second, equivalent to the amount used by 16,000 people living in Ecuador's cities. However, nothing has been said about the amount of water that Ecuacorriente will use to fill the pit that has been excavated with fresh water, as stipulated by the environmental impact assessment,[7] nor the water that will be affected by surface water and groundwater contamination, acid mine drainage, and the extraction of contaminated water in the process of drying the copper paste before export (referred to as "grey water" in **virtual water** accounting methods). There has also been no assessment of how many people will be affected with regard to their right to access to water, in terms of both quantity and quality.

This project is supported under the proposed water law that has sparked indigenous protests resulting in a number of deaths. Article 73 of the bill states in its second paragraph: "Authorization will be granted for the economic exploitation of water for mining activities, with priority placed on projects of national interest contemplated by the National Development Plan."[8]

2.3.2 Electric power

The electric power necessary for the mining operations will be supplied by transmission lines between the Hidroabanico hydroelectric power plant and the Mirador project. The above-mentioned water bill, with regard to electric power, states in Article 70: "The Central Water Authority will grant authorization for the economic exploitation of water for the generation of electric or hydrothermal power to be used in industrial activities, with priority placed on projects designated as national priorities within the National Development Plan."[9]

Power generation is not included in the mine's total production costs, since it will ultimately be subsidized by the state, leading to the need for the construction of new hydroelectric dams. Moreover, Ecuacorriente has announced other operations alongside the Mirador project, in Pananza and San Carlos.

2.3.3 Chemicals and explosives

The use of chemicals and explosives is not clearly specified in the Mirador project impact assessment, but there is data available on the Bingham Canyon copper mine in the United States, which uses a million pounds of explosives a year. These are mainly a mixture of ammonium nitrate and fuel oil, which cause enormous environmental problems that are little known to the public.

With regard to chemicals, Ecuacorriente plans to extract copper and also gold, which will require the use of sodium cyanide. However, this process for separating gold from other

6 Zorrilla, Carlos. La Minería de Cobre. Ecuador. 2007.
7 Terrambiente Consultores. EIA Proyecto Mirador. 2006.
8 Asamblea Nacional del Ecuador. Proyecto de Ley de aguas. Quito. 2009.
9 Ibid.

minerals is not explained in the Mirador mine management plan. There is widely known opposition to the use of cyanide in open-pit mining in Europe, where it is prohibited in various countries, and also in Argentina, where a number of provinces have made its use illegal.

2.4 Infrastructure and transportation

There are plans for the construction of infrastructure along the Peruvian border to serve the purposes of mining projects, El Cobre Port and a mining railway. The mining projects that begin in the Cordillera del Cóndor will expand towards the Pacific coast, to the port of Machala, in El Oro province. According to Ecuacorriente, "a fleet of 32 trucks with a capacity of 32 tons each will travel a total of 418 kilometres to the port in Machala. While 16 trucks leave the mines for the port, the other 16 will return from the port to pick up more material. The full circle from the mine to the port will be covered in two days. The goal is to transport no less than 520 tons daily. "The transport route will pass through the towns of El Pangui, Zumbi, Zamora, Loja, Catamayo, Chaguarpamba, Balsas, Santa Rosa and Machala, until finally arriving at El Cobre Port."[10] Each ship will also carry 12,000 tons of copper concentrate, resulting in the shipment of 190,000 tons of copper concentrate annually.[11] Before being shipped, the concentrate needs to be dried, which will lead to the production of toxic waste water. The EIA says nothing about this risk to human health and fishing. El Cobre Port could also be used, among other purposes, for exporting minerals from Peruvian mines in the Cordillera del Cóndor, since there is no infrastructure on the Peruvian side of the border to allow for transportation to a port.

3. Impacts

According to the EIA, a concentrate pipeline will be built to the coast as of year seven of production. But until then, highways to the coast will be built or upgraded using public funds. The anticipated environmental impact of these public works is considerable.

3.1 What minerals and where will they go?

The countries where minerals from Latin America end up have changed over the years due to variations in demand, consumption habits, the use of other types of metals, economic growth rates and technological advances. Peru and Chile have long been the main producers of minerals in the Andean region and are also prime examples of a model of economic growth that is unsustainable and can even lead to greater impoverishment of exporting countries[12] while supplying importing countries with gold and copper. New countries like China have joined the list of major importers.

3.2 Waste production and impacts

The environmental impact assessment of the Mirador project uses weighting methodology to classify the majority of main impacts as having little relevance. Nevertheless, based on other similar cases, there is ample data to demonstrate the severity of these impacts:

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10 Ecuacorriente S.A. Transporte al Puerto y Carga de Buques. http://www.ecuacorriente.com
11 Ibid.
12 Caputo, Orlando. "La renta minera en la ciencia económica y la distorsión del mercado mundial del cobre". Santiago. April 2004. www.areaminera.com/Contendidos/Opinion/46.act

Soil use: irreversible impacts, near the source, localized.

Landscape: irreversible impacts, near the source and at a distance, extensive.

Archaeological assets: irreversible impacts, near the source, localized.[13]

Terrestrial fauna and flora: irreversible impacts on habitats, ecosystems, endemic species and biodiversity.

Water: “The greatest impact on water quality during operations will come from the tailings dam and waste dumps, due to the increase in suspended solids and the potential production of acid rock drainage.[14] For both of these, channels will be built to divert surface water; however, the rainwater that falls on the mine pit and waste dumps and is not captured by the diversion channels will be contaminated by acid rock drainage and suspended solids.”[15] In the area around the mine, waste dumps and tailings dams, as well as on a regional level, due to changes in geomorphology and terrain, the impacts will be irreversible. In addition, there is no guarantee against the rupture of the tailings dams, which would lead to heavy metal contamination of a much larger area.

In conditions like these, it is highly unlikely that any other type of activity could be undertaken in this region in the future. The entire parish of Tundayme in the Cordillera del Cóndor will be turned into an industrial mining area. According to the company however, the total area affected by the project encompass 600 hectares, not including the processing area. However, the total area of influence that could be affected, although not officially stated anywhere by the project, could reach an estimated 1,000 hectares. When the Mirador project shuts down, after 18 years, the company says it will leave a tourism lagoon in the artificial crater. It is important to note that the Cordillera del Cóndor has high levels of rainfall, which increases the potential for surface-water and groundwater contamination.

Open-pit mining in the Cordillera del Cóndor is an example of an enclave economy model, in which a foreign company comes in, occupies the area, extracts everything possible, destroys the area and leaves. Who will pay the resulting environmental and social debts? Who will be responsible for the socio-environmental liabilities? Activities like these leave behind neither development, nor technology, nor sustainable production chains. The latter are established only temporarily, for the duration of the project, and mainly contribute to creating dependence on the international market. When the minerals are gone, after a mere 18 years, the business is gone. All that is left is waste, contamination, and local populations with health problems. Displacement of the population is caused by the establishment of the project and resulting loss of local sources of sustenance, or when the project comes to an end and the people who moved to the area to work in the mines are suddenly unemployed. Social breakdown is caused by the inevitable arrival of alcohol and drugs, prostitution, and other external agents that tend to permanently alter the social relationships that existed prior to the project.

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13 Sociedad Nacional de Minería Petróleo y Energía. Informe Quincenal. Perú. March 2009.
14 Minería y Medio Ambiente WWW.ECOAMERICA.CL /MAYO/200
15 Terrambiente Consultores (Eco005-22) p. 8.

3.3 Characteristics of the Area Affected

3.3.1 Migration

Beginning in the 1960s, an aggressive process of colonization of the Amazon region commenced and was consolidated by the enactment in 1964 of the Agrarian Reform and Colonization Law. Large numbers of people moved into the Amazon region, particularly from the province of Loja to Zamora Chinchipe and from the provinces of Azuay and Cañar to Morona Santiago. Population growth, drought and the crisis in agrarian structures, among other factors, led to this mass migration. The resulting conflicts between the new migrants who moved to the southern Amazon region and its ancestral inhabitants were one of the main reasons for the creation of the Shuar federations. The Catholic Church intervened, and the Salesians in particular promoted the creation of federations so that the Shuar could have access to privately and individually owned land.

The large-scale occupation of the Amazon region required the clearing of forests as a prerequisite for title to the land, the growth of numerous population centres, and artisanal mining activity, causing major impacts within indigenous communities and the shrinking of the rainforest, with a subsequent loss of biodiversity. The provinces that encompass the Cordillera del Cóndor also underwent a series of changes as a result of the 1941 and 1995 wars between Ecuador and Peru, in which they were turned into a sort of human shield or "living border" as part of a national security strategy.

3.3.2 Biodiversity: new species and endemism

The Cordillera del Cóndor is made up of dense rainforest with a relatively low canopy, ranging from five to 20 metres high. The vegetation here contains a large number of species that are endemic or unique to this area. Many belong to the genus *Clusia*, of which the majority of species have yet to be identified. What is most important however is not the number of species found here, according to biologist Alfredo Luna, but rather the fact that there are still a great number of new species still unknown to science. The Cordillera del Cóndor region could have "the richest flora of any area of similar size anywhere in the Neotropics."[16] Its flora is believed to encompass over 4,000 vascular plant species (close to 1,900 species have been identified from collections made up until now) and 300 to 400 bryophyte species.[17] It almost certainly has one of the highest concentrations of vascular plant species still unknown to science of any place on earth. It is also home to 11 mammal species that fall under the top three categories of risk of extinction: critically endangered, endangered and vulnerable.

According to the environmental impact assessment for the Mirador project and the Ecuacorriente website, the proposed mining activities – which will also include gold and molybdenum in addition to copper – will involve the excavation of a pit measuring over one square kilometre in area and 250 metres deep, in addition to two waste dumps and two tailings dams.[18] However, the area of influence that will be affected by the project will be much greater. In an area with such a high degree of vulnerability, these activities will cause

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16 Serrano, Felipe. Reserva de Biosfera Podocarpus – El Cóndor. XXXII Jornadas de Biología. Loja. 2008.
17 Neill, David. The Cordillera del Cóndor Region of Ecuador and Peru: A Biological Assessment. 2005.
18 Terrambiente Consultores. Alcance del Estudio de Impacto Ambiental Ampliatorios Mirador. 2006.

impacts of enormous proportions. In Ecuador, many of the country's so-called protected areas suffer the effects of mining and oil drilling activities within their borders. In Ecuador, there are mining projects within areas classified as reserves. This is something that happens in other parts of the world as well. The new **commodity frontiers** are in indigenous territories that are also areas of great environmental wealth.

3.4 The mining project and its environmental costs

In the province of Zamora Chinchipe, on the Peruvian border, there are plans for the two biggest mining projects ever undertaken in the country. One is the Fruta del Norte project, in which the Canadian company Kinross intends to mine a deposit of 13.7 million ounces of gold, according to company estimates. To the north, also in the Cordillera del Cóndor mountain range, is the Mirador copper and gold mining project being undertaken by another Canadian company, Corriente Resources, as described above. According to the company, the deposit to be mined has proven reserves of 11 billion pounds of copper, with an estimated value of USD 220 billion.[19]

If these mining projects are carried out, the incorporation of the costs of environmental recovery and monitoring all phases of mining activity would add up to extremely high costs for the companies. The environmental and social costs should also be calculated for the entire period of the mine's operations, in addition to the costs of rehabilitation and prevention of future damage after the mine is closed. But what price can be attached to the disappearance of an endemic species? What is the monetary value of the culture of a people abruptly destroyed forever?

Ecuacorriente has stated that it intends to spend only 2.5 million dollars to rehabilitate the Mirador project area, a laughable amount when compared to prior examples.[20] In the meantime, economist Alberto Acosta, former Minister of the Environment and Mines and former president of the Constituent Assembly of Ecuador, voiced the following considerations in a preliminary analysis of the figures put forward by the mining companies:

"They talk about 210 billion dollars. Without accepting these amounts as real, since they have not been confirmed, let's suppose that the state receives 5% in royalties, as is stipulated in the bill. Total revenues would amount, at best, to around 11 billion dollars in the 25 or 30 years that the contracts last. The annual revenues, in the case of 25 years, would amount – roughly speaking – to barely 400 million dollars, to which would be added (if they pay it) the revenue from income tax. These amounts, of course, are minimal if we imagine the costs that could be generated by these activities in environmental and social terms, and even the financial costs for the impacts on other productive sectors (for example, agriculture) as a result of activity that is not properly controlled or is carried out in areas of high population density or great biodiversity."[21]

19 El Comercio, Quito. March 15, 2009. www.ecuadorminingnews.com

20 The Sierra Club. Coping with Disaster: Protecting Wisconsin's Families and Environment from Mining Pollution Now and in the Future. Mining Impact Coalition. September 1998.

21 Acosta, Alberto. "Ser o no ser constitucional, reto de la nueva ley minera. Una primera aproximación". November 18, 2008.

According to MiningWatch, not a single mine has been successfully rehabilitated in Canada.[22] In the United States, the remediation costs of the mines in Summitville, Colorado and Yerington, Wisconsin were over USD 200 million.

4. Chronology of Conflict and Resistance

4.1 Background of the conflict in the Cordillera del Cóndor

In the two Amazonian provinces that encompass the Cordillera del Cóndor, there are a number of mining companies present. However, we will refer only to the conflicts provoked by the following: in the province of Morona Santiago, in the cantons of Limón Indanza, San Juan Bosco and Gualaquiza, the companies Lowell Mineral Exploration[23] and Canadian-based Corriente Resources, through its subsidiary Ecuacorriente S.A.; and in the province of Zamora Chinchipe, in the cantons of Pangui and Yanzatza, two Canadian companies, Corriente Resources and Kinross (following its acquisition of Aurelian). These mining companies are involved in activities along the 78 kilometres of borderline between Ecuador and Peru. The two countries have engaged in various border disputes in this region over the years, with numerous skirmishes and three major armed conflicts. The first was the 1941 Ecuadorian-Peruvian War that led to the signing of the Rio de Janeiro Protocol. It was followed by the Paquisha War in 1981 and the so-called Cenepa War in 1995.

In the provinces of Morona Santiago and Zamora Chinchipe, within the national security zone 25 kilometres from the Peruvian border, the Ministry of Energy and Mines granted mining concessions in 1992 and 1995. Gatro Ecuador Minera S.A., a subsidiary of South African-owned Gencor, and Antemin, a company with mixed U.S. and national capital – whose owners included Alicia Durán Ballen, daughter of the former Ecuadorian president[24] – were granted concessions to carry out mining operations on sites located within Shuar territory. In July 1997, Acción Ecológica visited the area at the invitation of the Shuar Association of Bomboiza, and witnessed the degree of conflict provoked by the presence of the mining companies, as well as the determination of the Shuar people to oppose mining activity in the region. It should be noted that the concessions granted during that period in the Cordillera del Cóndor did not take into account the pertinent legal provisions related to national security (Article 50 of the National Security Law) which expressly prohibit the occupation of areas that fall within the border zone.

There are close ties between the state administration and mining companies. A number of undersecretaries of mining (J. Paz Durini, C. Murriagui, S. Cordovez Noboa, A. Alancastro) and other officials and employees from the Ministry of Energy and Mines, as well as from the Ministry of the Environment (P. Terán Ribadeneira, M. Checa, S. M. Paz) have worked or continue to work in mining companies or mining sector organizations.

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22 http://www.miningwatch.ca/index.php?/Environment/Financial_Options_paper
23 Its largest shareholder is well-known geologist David Lowell.
24 Letter from Acción Ecológica to General Paco Moncayo, Commander General of Joint Command of the Armed Forces of Ecuador in 1997.

4.2 The strange combination of conservationism and mining

On October 26, 1998 the signing of the Brasilia Accord sealed the peace between Ecuador and Peru. The two countries also signed the "Agreement on Border Integration, Development and Neighborly Relations" which states that priority would be given to irrigation, tourism, transportation, agriculture, energy and "coordinated exploitation of the mining resources found in the border areas between the territories of both countries."[25] One of the objectives of the peace agreement between the two countries, therefore, was large-scale mining activity in the border area. In order for this to happen, one important strategy was the creation of "Adjacent Zones of Ecological Protection", a category proposed by the IUCN to "create peace parks between two or three states, or transfrontier protected areas."[26]

For transnational conservation organizations like the IUCN or Conservation International, or national organizations like Fundación Natura, the creation of national parks on the border represented a concrete opportunity to symbolize and take advantage of the end of the armed conflict. As a result, Peace Parks were established on both sides of the border. El Cóndor Park, the Cóndor-Kutukú Conservation Corridor and El Cóndor Biosphere Reserve were also established in the area. The areas not included within the lands protected under these conservation categories are specifically the mining areas that also form part of Shuar territory. In the Cordillera del Cóndor, the conservationist strategy has given way to large-scale mining activity.

Shortly after the signing of the peace agreement, in April 1999, BHP Billiton signed a one-year contract with the Shuar community of Warintz. As a result, the indigenous membership of the FICSH opposed to mining dismissed the leaders who had signed the agreement from their posts.[27] That first agreement included authorization for the free movement of the mining company on Shuar territory and unconditional acceptance of all of its activities. In June 1999, under Ministerial Agreement No. 936, the El Cóndor Binational Park was created. While this decision was aimed at the goal of conservation, the park covers a very small area, leaving open the possibility of expanding the park to include an area that would correspond to part of the community of Warintz within Shuar territory – an area now granted in concession to Lowell. Between 2000 and 2002, BHP Billiton completed the transfer of the Panantza, San Carlos and Mirador projects to Corriente Resources, which now controls 100% of shares over a total of 60,000 hectares.

4.3 Attempts at conquest and Shuar resistance

In December 2000, during an extraordinary assembly in the community of Warintz, Ecuacorriente succeeded in negotiating a development proposal that led in January 2001 to the renewal of the agreement with the community for a period of five years. Ecuacorriente imposed obligations such as the right to prohibit entry or access to anyone not authorized by the mining company. Over the course of eight months, Warintz became

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25 Acuerdo Amplio Ecuatoriano Peruano de Integración Fronteriza de Desarrollo y Vecindad entre Ecuador y Perú. Brasilia, Brasil. 1998

26 www.globalresearch.ca

27 Interview with José Acacho, president of the FICSH, Macas, July 7, 2009.

the operations centre for exploration. This signified the entry of machinery, Shuar labour for loading and unloading, the clearing of roads and the construction of facilities.

The Shuar people were transformed from hunters and gatherers into paid labourers, with a schedule of 22 days of work and eight days off, and a salary of USD 100 a month. The community was given a lump sum payment of USD 25,000, which was divided among the families. Mining activity generated economic, social and cultural impacts, as well as environmental damage. The presence of mixed-race workers from outside the community, the rupture of the Shuar men's traditional activities in the community, such as gathering food, planting or harvesting crops and raising livestock, the income in dollars for paid labour, the time they spent away from their families and the obligation to fulfil a work schedule for the mining company inevitably led to conflicts within families, between the families in each Shuar centre, between the centres that comprise the Association, with the Association leaders, and between the Association and the provincial leadership.

Because of the radical opposition of some Shuar centres, like the Nunkuy and Sinip associations, the five-year agreement lasted barely a year. The intervention of the FICSH led to the termination of the contract. In response, the company filed complaints and a lawsuit against the president of the Federation, on the grounds of the suspension of mining activity and the failure to fulfil the work obligations for which payment had already been received. Beginning in early September 2001 and throughout 2002, Ecuacorriente suspended its exploration activities and the company's employees left the area, after the Salesian missionary air service, which serves the Shuar centres, decided to cease providing services to the mining companies. As a result, the company was no longer able to transport workers, food, machinery, etc.

Around the same time in 2001, without taking into account the conflict in Warintz, the Ministry of Energy and Mines granted the "Llanos Uno" mining concession to a foreign company represented in Ecuador by Fausto Román García. The concession covered an area of 2,500 hectares along the banks of the Zamora and Nangaritza Rivers. These rivers were a source of protein, through fishing, and of water for a number of communities in the parish of Los Encuentros, located in the canton of Yanzatza in the province of Zamora Chinchipe. Mining activities were begun in "Llanos Uno" without consultation or the presentation of an environmental impact assessment. As a result, in August and October 2001, the local communities organised a series of assemblies for collective, ongoing discussion with representatives of the Ministry. After this discussion process, through a signed agreement, the Ministry pledged to respect the decision of the local communities.

However, in early December 2001, the local leaders received notice that the concession holder had filed a writ of protection against the administrative orders and was charging the community leaders with terrorism, vandalism and other acts they had not committed. In mid-December, despite the agreement that established a deadline for the mining company's departure, the company started up its operations again, backed by military protection. This led the residents of Los Encuentros to head to the banks of the Zamora River, where they used their daily work tools to chop down the trees that supported the company's barge, thus bringing mining activities to a halt. The community gave the company a deadline of 12 hours to leave the area. Activities in Los Encuentros came to a standstill for two days, under the heavy pressure of the local population.

On March 10, 2002, a lawsuit was filed by the concession holder against the main leaders of the parish of Los Encuentros. In the suit, they were accused of attempted murder, kidnapping and other crimes. After more than a year of legal proceedings, the campesinos of Los Encuentros were fully acquitted in courts of first and second instance. In spite of these events, in 2003, near the area where “Llanos Uno” was successfully shut down, in the Zarza Reserve – also in the parish of Los Encuentros – the state granted 39 concessions that added up to approximately 95,000 hectares to Aurelian Resources, as well as two additional permits for gold mining. The project is located in the province of Zamora Chinchipe. The Aurelian concessions included a number of areas worked by artisanal miners. In December 2003, Lowell Mineral Exploration traded 10% of the shares it held in Corriente Resource’s concessions in Ecuador as a whole for 100% control of the project in Warintz, which includes four concessions in a total area of 20,000 hectares located in Shuar territory.

4.4 Conservationist NGOs enter into action

Between 2002 and 2004 a new “Peace and Conservation” project was undertaken in the Cordillera del Cóndor region, as a joint initiative of the Ministry of the Environment, the International Tropical Timber Organization (ITTO), which was responsible for funding, the Ecuadorian organization Fundación Natura, responsible for executing the project, and Conservation International (CI), responsible for international coordination. Within the framework of this project, a proposal was put forward for the creation of the so-called “Shuar Territory Multiple-Use Protected Area”, in which the “multiple use” was aimed at the possibility of mining activity. It has been established that within this initiative, 70% of the territory is to be devoted to conservation, and the remaining 30% to sustainable use. It is important to remember, however, that the mining sector views mining as a sustainable activity. Therefore, from this conservationist perspective, conservation activity in the Shuar territory protected area of the Cordillera del Cóndor is viewed as compatible with mining activity

This protected area is located in the province of Morona Santiago. It encompasses the cantons of Limón, San Juan Bosco, Tiwinza and Gualaquiza, the basins of the Zamora and Santiago Rivers, and the sub-basins of the Coangos Mayaik and Bomboisa Rivers. All of these areas are also encompassed by mining concessions. The Shuar Territory Multiple-Use Protected Area is part of the Cóndor-Kutukú Conservation Corridor, an initiative which includes Peru and is implemented by CI. For CI and other conservationist transnationals, one of the threats to fragile and highly biodiverse areas, such as the Cordillera del Cóndor, is population growth, which could endanger the forests and biodiversity, since cities with thousands of inhabitants could spring up. In the face of this supposed threat, CI, though various NGOs, has developed the implementation of the Cóndor-Kutukú Conservation Corridor. It includes, on the Ecuadorian side of the border, Podocarpus National Park, Sangay National Park, El Cóndor Park, and the Cordillera Kutukú and Cordillera del Cóndor mountain ranges; and on the Peruvian side, the Santiago-Comainas Protected

Area, Tabaconas-Namballe National Sanctuary and Cordillera Azul National Park. CI states that "other conservation efforts in the region include projects to mitigate the direct effects of the development of large-scale infrastructure and the extraction of resources."[28] CI's strategy is to place local settlements and extractive activities on an equal footing as threats to biological wealth

In the Cordillera del Cóndor there are ever more frequent alliances between indigenous peoples and conservationist organizations that translate into land management and administration plans, as well as initiatives like the Cordillera del Cóndor Peace and Conservation Project, which includes, in addition to CI, the ITTO, the Border Region Development Binational Plan, the Ministry of the Environment, and Fundacíón Natura, with the collaboration of German cooperation agency GTZ, Energy Green, Green Empowerment, and others.

4.5 The agreement between Lowell and the community of Warintz

In February 2004 the community of Warintz signed another agreement, this time with the company Lowell Mineral Exploration Ecuador. Although the contract did not specifically state the length of time for which it would be valid, it stipulated that "the duration and validity of this agreement will comply with the time periods established by the Mining Law,"[29] in other words, for a 30-year period automatically renewable upon completion (the Mining Law adopted in 2009 established a period of 25 years, also renewable). In terms of the commitments established in the agreement, it specifically states that "the money to be disbursed annually shall be considered as payment for the easement and use of community lands." It goes on to add: "Financial agreements with the occupants of the lands will be made in the future in accordance with the projects eventually executed by the Company, for the sole purpose of providing compensation for potential adverse effects, and to acquire the right to the use of the lands necessary for the mining activities planned. The price will be established by the State and once the mining project has ended, these lands will revert to the community."

This agreement violates the collective rights enshrined in the Constitution of Ecuador adopted in 1998, which establishes in Article 84: "To conserve the imprescriptible ownership of community lands, which shall be inalienable, non-seizable and indivisible, except for the power of the State to declare their public utility. These lands shall be exempt from the payment of property tax." In Warintz, the agreement committed the community to declare the public utility of its lands and to receive money annually as payment for granting an easement over those lands to the mining company. The community accepted that a financial agreement would be established in the future to concretize the use of the land by the mining company.[30] In practice, the community could have lost the rights to their lands and perhaps even been prohibited from entering them after the lands had been declared of

28 Conservation Interntional. www.conservation.org.pe/ci/hotspots/andestropicales.htm

29 Convenio de cooperación entre la comunidad Shuar Warintz y la Compañía Lowell Mineral Exploration Ecuador S.A. 2004.

30 Acuerdo entre la Compañía Lowell Mineral Exploration Ecuador S.A, y la Comunidad Warintz. Compromisos de las partes. Inciso quinto. Comunidad de Warintz. August 2004.

public utility. In other words, the community legally accepted that their lands could be taken away from them and used for mining activity.[31]

4.6 "No mining in Shuar territory"

In December 2004, at an extraordinary assembly of the Arutam Shuar territorial district held in Warintz, attended by 140 representatives of 13 Shuar centres, the agreement signed in February of that same year was discussed. The president of the federation at the time, Pablo Tsere, stressed at this assembly that both the agreement signed by the community of Warintz and the mining project contravened the resolutions adopted by the three indigenous federations in the region – the FICSH, FINAE and FIPSE – to oppose all mining activities, as well as logging and oil drilling, on their territory.

The divisions within the Shuar Federation became clearly evident at the assembly, as 95% of the members from Warintz supported mining activity on their territory, while only 5% were opposed. The leaders of each centre stated their position, and the result was that three Shuar centres were in favour of mining activity on their territory, while the other three were opposed. They subsequently resolved to call on the president of the FICSH to undertake the necessary proceedings in the pertinent ministries to bar the entry of mining companies into Shuar territory and denounce the schoolteachers who were promoting mining, in order to have them dismissed.[32]

For its part, in May 2005, Ecuacorriente, a subsidiary of Corriente Resources, announced that a feasibility study had established the profitability of its proposed mining project, and that it would begin preparations to start up mining operations. Its Mirador project, according to the company, would be the largest in the country and one of the largest in Latin America.[33] At the same time, in the provinces of Morona Santiago and Zamora Chinchipe, there was increasing concern over the social and environmental impacts that would result from gold and copper mining activities. With growing force, local communities, organizations, collective discussion forums, workshops and interprovincial committees raised their voices against mining. After exchanges with the communities of Intag, Molleturo, Pacto, Naves de Bolívar and others in Ecuador that live in a constant state of conflict because of mining, the local communities' opposition to mining activities was consolidated.

A prime example is the case of the parish of Yunganza, where the Ministry of Energy and Mines officially stated that authorization had not been granted for gold mining activities, and the Ombudsman's Office issued a resolution ordering the concession holders to cease mining operations. In addition, the National Cultural Heritage Institute determined that petroglyphs in the mining site had been damaged. As a result, the local Shuar communities and several member organizations of the Morona Santiago Campesino Federation evicted Dayanara, the company that was illegally mining gold in Yunganza. Resistance and mobilization continued to grow in both provinces.

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31 Beltrán, Bolivar. Personal communication. 2005.
32 Acta de la Asamblea Extraordinaria de la CTSHA. Warintz. December15, 2004.
33 Ecuacorriente. Descripción del Proyecto Mirador. http://ecuacorriente.bloginom.com/

4.7 The water for mining market

As resistance was growing in local communities, they learned of plans for hydroelectric projects aimed at supplying power to the mining companies. Jimbitono is a town in the southwest of the Amazon region in Ecuador. In September 2004, the Inter-American Investment Corporation (IIC) granted a seven-million dollar loan to the company Hidroabanico S.A. for the construction of a hydroelectric power plant near the city of Macas in Morona Santiago. Hidroabanico, according to the IIC, "will make it possible to expand generation capacity from 14.9 MW to 37.5 MW of power."[34]

In mid-January 2006, the hydroelectric plant entered into the first phase of operations. Due to operating problems and the illegality of the concession involved, the terms of the Agreement on the Supply of Power to the Mirador Project, signed between Hidroabanico and Corriente Resources, were made public. The letter of intent between Corriente Resources and Hidroabanico stipulated that 28.5 MW of power would be made available for the Mirador project for a ten-year period. In order to comply, Hidroabinico was required to complete the second phase of construction during the year 2006; this would entail the installation of 150 kilometres of power lines from Macas to the Mirador site, in order to supply the 37.5 MW required by Corriente Resources. In view of the fact that Hidroabanico would be able to fully satisfy the needs of the Mirador Project, Corrientes Resources decided not to go ahead with the Sabanilla project, which was originally intended to supply power for the mining operations. A strike began in Jimbitono on August 30, 2006 in opposition to both the mining and hydroelectric projects. It lasted a total of 75 days and the area became the epicentre of a protest staged by thousands of people from both Amazon region provinces.

In October 2006, the International Public Forum on the "True Face of Mining" was held in Pangui. It was attended by more than 500 participants, including members of Shuar and Saraguro Kichwa indigenous communities, peasant farmers, local authorities, journalists and international delegates from organizations involved in mining-related conflicts in Peru, Bolivia, Chile and Argentina. Shortly after this successful event, Ecuacorriente launched an aggressive smear campaign against a number of local organizations. Also in October 2006, the Shuar Indigenous Federation issued a series of statements against Lowell Mineral Exploration, demanding that the company permanently withdraw from Shuar territory by November 1 of that same year. The assemblies of the Shuar communities in the Cordillera del Cóndor unanimously decided to expel the workers and representatives of the mining companies Lowell Mineral Exploration and Corriente Resources.

On the morning of the day that the deadline elapsed, members of the communities involved in the resistance headed for the Lowell mining camp. They entered through the forests in order to surprise the Lowell workers from behind. The women and children, armed with lances, occupied the landing strip to prevent armed forces helicopters from landing. They stayed there all day, without food or water. When the Lowell representatives at the camp in Warintz received the first reports of the popular resistance action, they

34 The Inter-American Investment Corporation is an affíliate of the Inter-American Development Bank. http://spanish.iic.int/

called a helicopter in order to escape, but the women and children kept it from landing, using their own bodies. However, before noon on November 2, all of the mining company's personnel had managed to leave the camp on a light plane operated by one of the airline services in the region. After this successful expulsion, the people headed for the camp set up by Corriente Resources in San Carlos. They successfully made it past the military cordon around the camp, occupied the buildings and evicted the workers, who were given a deadline of three days to leave the area. At the end of the three days, all of the company's machinery and materials had been taken away in military trucks, despite the fact that there was no justification for a military presence, since no state of emergency had been declared. Corriente Resources had been completely evicted.

On November 6 an indefinite strike began throughout the province of Morona Santiago. The authorities responded with the militarization of Rosa de Oro and San Carlos, where there were another two mining camps run by Corriente Resources. The company, in an attempt to disrupt the Provincial Assembly, sponsored a counter-march whose participants physically assaulted the participants in the assembly. This resulted in a violent clash in which the police intervened with tear gas. Several days later, a group of 200 people headed to the site of the Mirador project, where they had stones thrown at them by supporters of the mining company. In the early morning hours, as they were walking along the highway, they were once again attacked by a group of around 40 hooded men, who tossed dynamite and shot at them. More than 15 people were wounded.

On November 12, 2006 the provinces of Morona Santiago and Zamora Chinchipe received an encouraging sign from the government. Minister of Labour José Serrano, acting on behalf of President Alfredo Palacio, signed an "agreement of commitment" in the city of Macas which stipulated, among other measures, the immediate suspension of mining activities in the two provinces, as well as the suspension of the second phase of the Hidroabanico hydroelectric power project.[35] In spite of this, Corriente Resources did not halt its operations. In addition, the company in counterattack, launched a campaign through the local media, spreading the claim that transnational mining companies with operations in Chile did not want Ecuador's copper reserves to be exploited, and had provided financing for foreigners to go to Pangui and create a bad image of mining, to prevent copper mining in the country.

On November 12, 2006, resistance forces from the provinces of Morona Santiago and Zamora Chinchipe met with the government representative in Jimbitono. At a massive public assembly in the municipal theatre, an agreement was signed which ordered the immediate and definitive suspension of the second phase of the Hidroabanico project and the installation of electrical power lines to supply the mining companies. The agreement also established the suspension of Corriente Resources' mining operations in Zamora Chinchipe, the immediate initiation of proceedings to bring about the definitive suspension of all of the company's activities, and the initiation of proceedings to have the province of

35 Acta de Compromiso entre el gobierno y las fuerzas vivas de Morona Santiago y Zamora Chinchipe. November 12, 2006.

Morona Santiago declared an ecological and tourism area. Finally, it was agreed that the national government would not take reprisals against the participants in the strike.

The resistance and unity of the indigenous peoples and campesinos of the southeastern Ecuadorian provinces were the key to these victories against mining. Nevertheless, the companies refused to comply with the agreement signed by the president's representative, nor did they heed the declarations made by numerous mayors in the two provinces and the governor of Zamora Chinchipe, demanding respect for the terms of the agreement signed on November 12, 2006. As a result, on December 1, 2006, a Bi-Provincial Assembly was held in Pangui, and attended by close to a thousand people from communities in the provinces of Morona Santiago and Zamora Chinchipe. The participants in the assembly resolved that they would go to the installations of Ecuacorriente (a subsidiary of Corriente Resources) to call on the company, through the highest authorities from the two provinces, to fulfil the terms of the agreement signed on November 12. At approximately 16:00 hours, the assembly participants were brutally repressed by troops from the Ecuadorian army, under the command of Captain Iván Felipe Córdova of Gualaquiza Jungle Battalion 63.

From this date on the two provinces have suffered an escalation of violence and repression at the hands of the army and police. Hundreds of campesinos and indigenous people, including a number of women, have been wounded or imprisoned, while others have been threatened with arrest warrants. One example is the army's detention of indigenous legislator Salvador Quishpe, who is a longstanding supporter of the people of these provinces. Quishpe's captors bound his hands and feet, gagged him, and covered his mouth and eyes with adhesive tape commonly used by the military. He was beaten and taken from Tundayme to Zamora, were he was kept incommunicado for several hours. He was finally released in response to a writ of habeas corpus in the city of Zamora Chinchipe, in the early morning hours of December 4, 2006.[36]

4.8 Mining Conflicts During the Rafael Correa Administration

4.8.1 The constituent process

President Rafael Correa took office in early 2007. The following year, 2008, was marked by the process of the drafting of a new constitution, and the constant mobilization of different communities, organizations and authorities around the Constituent Assembly's headquarters in Montecristi. One of the objectives sought was the declaration of Ecuador as a mining-free zone. It should be mentioned that one of the issues that sparked the most conflicts within the ruling party bloc in the Constituent Assembly was in fact the issue of mining.

Parallel to the constituent process, in March 2008, the Ministry of the Environment revoked the protection of the Bosques del Sur (Southern Forests) of Ecuador, thus eliminating the existence of the Bosques del Sur National Reserve, established in 1975. This reserve had one of the strictest conservation regimes in the country, comparable to that of "areas

36 Acción Ecológica. "Empresas mineras canadienses promueven violencia en el Ecuador". Boletín de Acción Ecológica. Quito. November 16, 2006.

intangibles” or no-go zones.[37] Also in the first half of 2008, the government repealed the Regulations on Consultation and Participation, in force since 2002, and the Regulations on Article 28 of the Environmental Management Law relating to citizen participation and prior consultation, in force since 2006. In their place, Executive Decree 1040 was issued to facilitate the rapid issue of permits to mining companies.

April 18, 2008 was a day of great significance for the mining conflicts in Ecuador, as the National Constituent Assembly issued the so-called “Mining Mandate”. In view of the many irregularities committed with mining concessions in Ecuador, the mandate revoked concession contracts for all cases in which the concession holders had not made investments as of December 31, 2007 or had not presented an environmental impact assessment by the deadline established. It also abolished all concessions for mining operations in protected natural areas, protected forests and buffer zones, and operations that threaten water resources. The mandate established a limit of three concessions per holder, and thus abolished any additional concessions granted to individuals, their spouses, companies and affiliates. The mandate additionally declared a moratorium on all mining activities in the country until the enactment of a new mining law.[38]

However, instead of implementing the mandate, the Ministry of Mines and Petroleum (now the Ministry of Non-Renewable Natural Resources) used Ministerial Agreement No. 172,[39] which established “impact criteria” based on rates of water pollution. In other words, action would be taken only in cases where an impact on water quality was proven through testing. Through this defiance of the Mining Mandate, the Ministry of Mines and Petroleum prevented hundreds of concessions from being revoked. It also prevented the concessions of mining companies concentrated in the southern region of the country from being affected. The agreement was another show of total disregard for the will of the Ecuadorian people as reflected in the Mining Mandate.

Rafael Correa took office on January 1, 2007. Throughout his election campaign, he had always supported popular struggles and spoken out in defence of people’s rights, but this position has changed over time. He has already lost two of the main collaborators in his initial political platform, the economists and former government ministers Alberto Acosta (in 2008) and Fander Falconí (in 2010). Both men disagreed with Correa’s stance on extractive projects, adopted as a result of pressures from the business sector, the demands of the world economy and its growing **social metabolism**, and the need to earn revenues for the national budget to assist the population and build public works. In 2008, the Correa administration ordered the nationalization of a number of mining concessions in cases where it was determined that these concessions were being used for the purposes of speculation. Of the 2.6 million hectares that were reverted back to state control, 45% had been controlled by a mere 25 individuals. Nevertheless, as noted earlier, a larger number of concessions remained in effect.

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37 Decreto Ministerial. Registro Oficial No. 317. 2007.
38 Asamblea Constituyente. Mandato Minero. Montecristi. April 18, 2008.
39 Acuerdo Ministerial No. 174. Registro Oficial No. 396. August 5, 2008.

4.8.2 Criminalization of social protest

Once the constituent process had been completed in Ecuador, the year 2009 began with large-scale mobilizations of campesino and indigenous communities primarily in the southern region of the country. In the provinces of Azuay, Morona Santiago, Zamora Chinchipe and Loja, roadblocks, marches and hunger strikes were organized to protest the imminent enactment of the new draft Mining Law. In the communities closest to the Mirador project, Ecuacorriente launched a frenzied series of visits that even included the Canadian ambassador, handing over thousands of dollars in funding for productive projects.

The communities where the mining projects in Southern Ecuador are based stressed the need for a mining law that could resolve the conflicts and impacts of mining operations already underway in the country. However, despite the opposition of thousands of campesinos and indigenous people, the newly reinstated Legislative Assembly approved an entirely different kind of mining law on January 13. The main thrust of the new law is the active promotion of the mining industry as a foundation for large-scale national production, through the granting of abundant incentives to mining concession holders. The law allows for any person to enter the territory of indigenous communities at any time to explore for exploitable mineral reserves and to make use of the water resources located there (Articles 60, 61 and 79). It essentially promotes national development through the forced displacement of indigenous and campesino communities and the destruction of peoples, cultures and natural wealth, while creating the conditions for increased social conflict.[40]

The approval of the Mining Law in January 2009 paved the way for other laws by stripping away the victories achieved by the Ecuadorian people in the new constitution: it conspires against the rights of nature, the plurinational character of the state, the right to "living well", collective rights, and the state's obligation to guarantee food sovereignty. Added to these violations of the constitution are the violation of the human right to water and the priorities for its usage, the principles of precaution and predominance, the right to participation and consultation, the right to resistance, and many others. Under the provisions of the new Mining Law, in June 2009 the Ministry of Energy and Mines and the National Water Secretariat issued the respective permits to authorize Ecuacorriente's Mirador project in the Cordillera del Cóndor. These anti-democratic and unconstitutional decisions sparked marches, roadblocks and other demonstrations throughout the different provinces of the country (**Table 1**).

There are numerous policies aimed at further consolidating large-scale mining, new mining regulations, and a project to promote small-scale mining. The Correa administration claims that Ecuador has emerged from the "long neoliberal night", a discourse echoed by the National Secretariat for Planning and Development (SENPLADES) in its National Development Plan. SENPLADES[41] has presented the country with an agenda expressed through regional maps that illustrate different strategies to achieve the goal of "Buen Vivir" or "Sumak Kawsay" (in Quechua), which roughly translates as "living well". Paradoxically,

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40 Acción Ecológica. Coadyuvancia presentada para la declaratoria de inconstitucionalidad de la Ley Minera. June 5, 2009.
41 SEMPLADES. Ecuador. http://plan.senplades.gov.ec/

the Plan's maps, such as the one presented in **Figure 4** below show that in some regions of the country the main lines of economic production promoted are extractive activities and particularly mining. These regions coincide with the four large-scale mining projects that were the source of ongoing conflict in the mobilizations against the Mining Law and Water Law in 2009 and 2010.

Table 1: Actors And Their Positions In The Mining Conflicts In The Provinces Of Morona Santiago (Ms) And Zamora Chinchipe (ZC)					
Actor		**Interest**	**General position**	**Location**	**Main arguments**
Mining companies	Corriente Resources of Canada Kinross of Canada, which has taken over from Aurelian Lowell, a company run by a geologist	Copper and Gold	They maintain that mining contributes to local and national development, and does not generate negative impacts because of the use of advanced technology	Corriente Resources is in 3 cantons in MS and one in ZC Kinross is in the canton of Yanzatza in ZC Lowell is in the community of Warintz	Economic reasons: Profits for shareholders. Payment of taxes and royalties to the government. Generation of employment and income.
Indigenous peoples	Shuar Saraguro Kichwa	Defence of their territory, legalization of land ownership, protection of waterfalls. Defence of "penker pujustín" or "living well" Defence of their lands and local economic activities (they are farmers)	Shuar: The majority of the ethnic group and the two main federations, FICSH (Interprovincial Federation of Shuar Centres) and FIPSE (Independent Federation of Shuar People of Ecuador) are opposed to mining and allied with the resistance Saraguro: Strengthening Shuar, mixed-race and Saraguro platforms, supporting the initiative to declare Zamora an Amazonian green lung and thus prevent mining, proposed by the prefect of Zamora, who is Saraguro	In MS and ZC: in population centres or inaccessible areas of the mountain range, which can only be reached on foot or by plane Saraguro: in the provinces of Loja and ZC, where they migrated from Loja	Indigenous land rights and sacredness of waterfalls. . Defence of agriculture
Mixed-race campesinos	Opposed to mining In favour of mining	Preservation of their lands and agricultural production activities Community members who work for the companies, their families, some schools	Allied with the Shuar people and the anti-mining resistance They defend their jobs, although they have problems with their employers (the companies); schools have been provided with scholarships and want to receive more money	Population centres in MS and ZC with road access Corriente Resources is in the MS cantons of Pananza, San Juan Bosco and Gualaquiza and has 100 workers at the Mirador site in ZC Kinross is in the canton of Yanzatza in ZC	Defence of agriculture Defence of jobs in the mining industry, handouts from the companies

Table 1: Actors And Their Positions In The Mining Conflicts In The Provinces Of Morona Santiago (Ms) And Zamora Chinchipe (ZC)					
Local authorities (prefects, mayors, parish councils)	Opposed to mining	Promoting local policies that keep mining out, responding to the needs of their communities (many are indigenous), local development projects	Building an Amazonian regional position on oil, mining and the government development plan formulated by SENPLADES	In MS the indigenous movement won elections in 8 out of 12 cantons as well as the provincial prefecture, while the ruling party won only 2 cantons	Regional development through alternatives to mining
	In favour of mining	Receiving financial resources for local projects, implementing plans with support from the mining companies, obtaining financial backing for future elections	They refer to the need for resources for local development and support the "citizens' revolution" and development of mining promoted by the national government	In ZC the indigenous movement won 2 out of 9 cantons and the provincial prefecture, while the ruling party won only 1 canton	Financial resources contributed by the mining industry for local projects
Cooperation agencies	GTZ, German public enterprise for technical cooperation	GTZ works with private and public sector clients, including governments, international organizations and companies, with whom it implements projects as partners or on a contract basis. It promotes efficient and effective management.	"A balance must be sought between the interests of the population, the government and the economy." Convincing all stakeholders of the benefits of a project through facilitation, arbitration and cooperation is crucial for GTZ.	Morona Santiago	Economic and technological development
	CARE USA	In Ecuador CARE works in the areas of education, health, sanitation, democracy and governance, natural resources, water and economic development	Since its arrival in Ecuador in the 1960s, CARE worked first in "social assistance", then in "social development", and now works towards overcoming poverty". Its main source of funding has been USAID.	Morona Santiago and Zamora Chinchipe	Social development
Conservationist NGOs:	Conservation International International Tropical Timber Organization Fundación Natura Energy Green Fundación Arco Iris	Biological corridors, protected areas, protected forests, peace parks, almost all involving financing for environmental services; management of state-owned protected areas	Protecting biodiversity but respecting economic activities that promote economic development, such as mining. Indigenous people and campesinos pose a threat to conservation. The most serious impacts of mining companies are indirect: the destruction caused by population settlements established around mining operations.	One of the most visible is the Cóndor-Kutukú Conservation Corridor, promoted by CI, which includes both Ecuador and Peru	The value of biodiversity The value of environmental services Poverty destroys the environment.
Ecological	Acción Ecológica	Strengthening the popular ecology	Indigenous peoples and their ways of life offer the most valuable proposals for change, not only for Ecuador but for the whole planet. We	Involved in processes in both	Popular ecologism with an

Table 1: Actors And Their Positions In The Mining Conflicts In The Provinces Of Morona Santiago (Ms) And Zamora Chinchipe (ZC)					
NGO		movement	should not only recognize and promote respect for their rights, but work with them to build a genuine plurinational state.	provinces	impact on public policy
State	Ministries responsible for mines, oil and citizens' participation SENPLADES	Developing the mining sector to obtain royalties and taxes. Primacy of economic growth.	Neutralizing local opposition by implementing joint strategies through local authorities and organizations, providing financing for municipal works, promoting the discourse of sustainable mining that contributes to local and national development	Permanent presence in MS and ZC; forums with indigenous organizations and local communities to "socialize" development plans	Public finances and economic development.
International environmental organizations	MiningWatch OCMAL	Networks that support the anti-mining resistance, provide information on other cases, internationally disseminate news on the conflicts in the Cordillera del Cóndor	Opposed to open-pit mining. Documents damages caused by transnational corporations.	Headquarters in Canada. Itinerant headquarters in Latin America.	Socio-environmental liabilities of large-scale mining. Impacts on indigenous peoples around the world. Pollution, use of water resources.

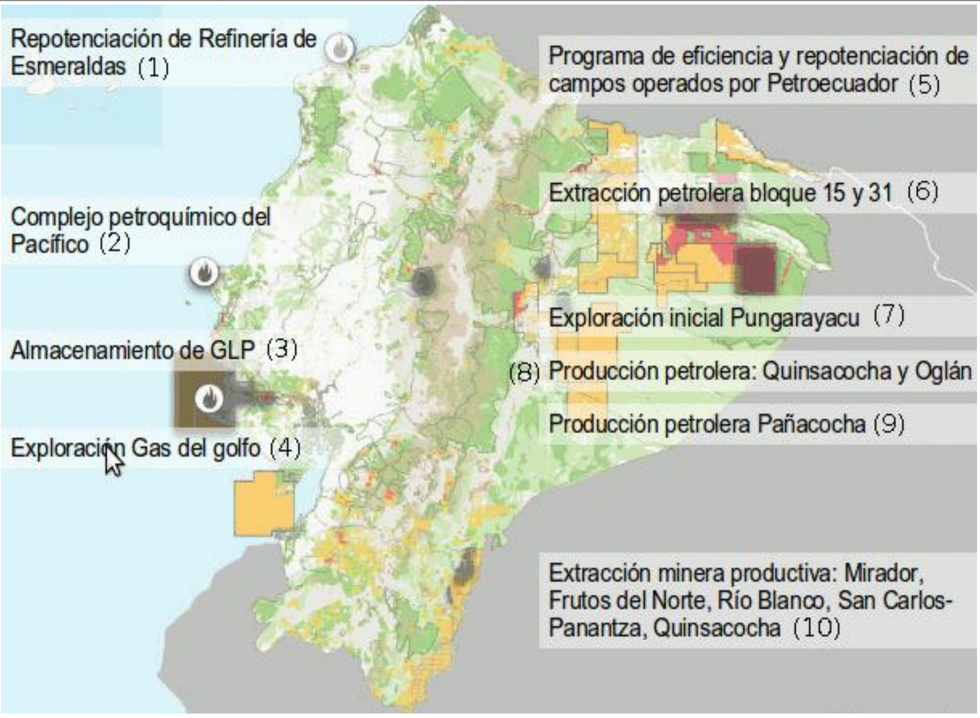

Figure 4: SENPLADES Natural Resource Projects
(Source: Accion Ecologica, 2009)

Legend for Figure 4: SENPLADES Natural Resource Projects:

1 Upgrading of Esmeraldas oil refinery
2 Pacific Petrochemical Complex
3 LPG storage facility
4 Gulf gas exploration
5 Increased efficiency and upgrading of Petroecuador oilfields
6 Oil extraction in Blocks 15 and 31
7 Initial exploration in Pungarayacu
8 Oil production: Quinsacocha and Oglán
9 Oil production: Pañacocha
10 Mineral extraction: Mirador, Frutos del Norte, Río Blanco, San Carlos-Panantza, Quinsacocha

4.9 How to Keep Canadian Mining Companies in Line

The abuses committed by Canadian mining companies abroad are so numerous that even the Canadian parliament has taken note, and some of its members are attempting to establish regulations to ensure that government support is not provided to companies that violate human rights and environmental standards through their overseas operations. Bill C-300 was introduced in the Canadian House of Commons on February 9, 2009 by John McKay, a member of parliament representing the Liberal Party. The bill builds upon a number of recommendations on the **corporate accountability** of Canadian extractive companies operating in “developing” countries that emerged from a series of **Corporate Social Responsibility** Roundtables involving a multi-stakeholder advisory group. These recommendations were deemed inadequate, however, because they did not contain mechanisms for receiving complaints or imposing sanctions.

Bill C-300 would regulate the relationship between Canadian extractive companies and the Canadian government agencies with which they work most closely, such as Export Development Canada, the Department of Foreign Affairs and International Trade, and the Canada Pension Plan (which could invest in shares in these companies). In order to receive support from these government agencies, extractive companies would have to meet eligibility criteria in the form of guidelines on international corporate accountability standards concerning environmental health and human rights. Bill C-300 also includes a mechanism through which complaints could be filed from abroad with the Ministry of Foreign Affairs and International Trade (as could be the case with the mining conflicts in the Cordillera del Cóndor). If a complaint is accepted, it would lead to an investigation of the company's compliance with the corporate responsibility and accountability guidelines and a public report on the findings within eight months. If these findings show that the company has not complied with the guidelines, it could be denied further government support.

5. Conclusions

This study leads us to reflect on an economic model that prioritizes the extraction of non-renewable resources such as hydrocarbons and minerals over the defence of water resources, agriculture, food sovereignty, indigenous land rights, and the preservation of biodiversity. The government of Ecuador has decided to move forward with the exploitation of gold and copper reserves in the Cordillera del Cóndor in southern Ecuador. The extractivist position of the Correa government is not a temporary strategy, a first stage marked by respectful exceptions in areas of environmental value or with indigenous populations, on the way to achieving a sustainable economy once the need for this short extractive period is overcome. On the contrary, it is becoming a strategy of rapid liquidation of natural assets and the subjugation of indigenous and mixed-raced populations on the commodity frontiers, which are now the frontiers of the country itself (as in the Yasuní or the Cordillera del Cóndor). The situation resembles what geographer David Harvey has called "accumulation by dispossession", that is, the accumulation of capital through the plundering of indigenous territories and peoples, something very old and very modern at the same time. But it is doubtful whether the accumulation of capital even applies here, since so much of what is obtained ends up leaving the country.

This approach is grounded in a perspective characterised by **weak sustainability**, which involves investing profits from the extraction of natural resources in new investments that will subsequently lead to a sustainable economy. In Latin America, this is what Venezuelan writer Uslar Pietri referred to as "sowing oil" back in 1936. In contrast, the concept of **strong sustainability** implies maintaining intact certain areas that have a great deal of environmental and social value, such as those where nature has created more biodiversity. If biodiversity is lost, what kind of investment could compensate for it? A recreational Jurassic Park? Mangroves must be preserved, Amazonian and coastal forests must be preserved, the high plains must be preserved, because if calculations are correct, what they offer is worth much more than what could be extracted through their destruction. Moreover, there are values that cannot be expressed in monetary terms, such as human rights and indigenous land rights. President Correa’s strategy however is neither an example of strong or even weak sustainability, since the profits from extractive activities will leave the country (mineral prices are low and also many of the companies involved are foreign), while the social and environmental costs will stay in Ecuador. Certainly there will be some increase in spending on education, health care and public works, but there will be an increase in public revenue expenditure as well.

The Cordillera del Cóndor is an area of extraordinary biodiversity and the ancestral territory of indigenous peoples, and is exposed to the threat of a number of large-scale copper and gold mining projects. The mining concessions in the Cordillera are held by Canadian mining companies, with no concern for the huge amounts of waste that will be created, the use of massive amounts of water and energy, and the destruction entailed by road construction. They are not even concerned about the demands from their own government in terms of increased accountability for social and environmental impacts. These companies should not only be accountable to their shareholders, but to the public as well.

The social and environmental liabilities that would be generated by mining operations will far outweigh the potential economic benefits, even if they are only measured in purely monetary terms. The indigenous peoples and campesinos are well aware of this fact, which is why they are opposed to open-pit mining and hydroelectric power projects that will monopolize water resources and primarily serve mining operations on their lands and territories. Their resistance has been criminalized, and clashes with the police have already led to the death of one Shuar community leader. A declaration of corporate responsibility on the part of Canadian mining companies is not enough, nor is the intervention of conservationist organizations whose purported aim is to protect the forests of the Cordillera del Cóndor. In fact, the conservationist organizations have been more than willing to share the territory with mining companies instead of allying themselves with the popular ecology and indigenous movements.

The Correa government’s National Development Plan and the mining activities it promotes in fact violate the new constitution of Ecuador, which safeguards food sovereignty and *Sumak Kawsay* (the concept of living well, in harmony with oneself, among other human beings and with nature). Ecuador, as a signatory to various international agreements such as ILO Convention 169 on Indigenous and Tribal Peoples, is furthermore obliged to recognize the right of these peoples to determine the type of society they want to live in. The country is in fact in a unique position as the source of some exemplary initiatives that could serve as a model for the rest of the world, such as the constitutional recognition of the rights of nature or the proposal to leave the Yasuní/ITT oil reserves in the ground. As indigenous organizations and their mobilizations continue to create opportunities for dialogue and reflection on the concept of living well, it will be crucial to find an alternative to the favoured extractivist model, which fuels and aggravates conflicts between communities and violates human rights and the rights of nature.

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Chapter 4: Aid, Social Metabolism and Social Conflict in the Nicobar Islands

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Trinket Island, post –tsunami
(Source: IFF)

Abstract
This chapter investigates the impact of humanitarian aid on the Nicobar Islands in the aftermath of a catastrophe. The tsunami of December 2004 not only took away the lives of thousands of indigenous Nicobarese inhabiting the archipelago, but also destroyed their material artefacts, livestock and the coconut economy. Humanitarian aid and in appropriate interventions that followed led to a situation we term 'complex disaster', reinforcing vulnerability in social and ecological terms. A society that previously lived off hunting, gathering, fishing and copra production, with a very low throughput of material and energy, as well as low labour inputs, was transformed to one of dependence on continued aid, the external market, and higher material and energy needs.

Keywords: Humanitarian Aid, Complex Disasters, Material and Energy Flows, Working Time, Property Rights, Community Ownership, Subsistence Economy, Natural Disasters

1. Introduction

Located in the Bay of Bengal, some 1200 km from the east coast of India, the Nicobar Islands are one of the lesser known parts of the country. This is despite the enormous publicity the archipelago received during the 2004 tsunami when thousands of indigenous Nicobarese, together with their physical artefacts, were wiped out in a matter of minutes. Aid efforts that followed, while essential and valuable in the immediate aftermath, boomeranged to create a condition we term '**complex disasters**', rendering the Nicobarese more vulnerable than what they had been before and after the catastrophe. Five years after the traumatic event, it is time to evaluate the aftermath in relation to what is termed as the worlds' largest fund-raising exercise. Well-intentioned efforts were exhibited not only by the aid sector, but governments, corporations, academic institutions and hundred of thousands of individuals involved themselves in some way or other to bring relief and rehabilitation to the victims. In short, very few on this earth remained untouched by the enormity of this disaster. In this chapter, we explore the impacts of humanitarian aid on the Nicobarese society, and outline some of the challenges the islands now face with respect to social and ecological sustainability.

The Nicobar archipelago consists of 24 islands spread over an area of 1841 km² and administered as a union territory. Of these 1542 km² are protected tropical forests and the remaining are mangroves, undulating grasslands, coconut plantations and settlements. Relatively flat, the highest point is Mt. Thullier on Great Nicobar with an elevation of 642 metres. These islands are not only home to a rich tropical biodiversity with several endemic terrestrial and marine species but 12 of the islands are inhabited by an indigenous community, commonly referred to as the Nicobarese. Mongoloid in origin and having migrated from the Malay-Burma coast over 2,000 years ago, the Nicobarese have remained relatively isolated for a long time. However, owing to their geographical location on an important sea route, these islands were often visited by passing vessels with the aim to replenish food and water supplies in the long and arduous sea voyages of colonial times. Consequently, a small amount of barter trade took place where the Nicobarese exchanged food and coconuts for cloth and iron, and later rice, tobacco, and other consumables from time to time. The British colonised the islands in 1869 and for the first time regulated trade and set up an administrative system under a colonial state. In 1947, the islands became part of independent India, and since 1956 the islands have been protected and access regulated under the legislation Andaman and Nicobar Protection of Aboriginal Tribes Regulation (ANPATR).

With a largely subsistence way of life, the (pre-tsunami) Nicobarese lived off hunting, gathering, fishing, coconut production, and pig and chicken rearing, with some maintaining horticultural gardens to grow fruits, vegetables and a variety of roots and tubers. Their link to the market was via the production and sale of *copra* (dried coconut flesh used in the extraction of coconut oil) in exchange for rice, sugar, cloth, fossil fuels, toiletries and other consumables. Thus, coconuts comprise an important source of livelihood, both on a subsistence level (a third of their coconut production is fed to pigs) and as an exchange item in the market in the form of copra.

Living in villages along the coast, their population numbered 26 565 (2001 census). As with most indigenous cultures across the world, the various segments of the socio-ecological system of the Nicobars are inextricably linked with each other. In other words, the socio-cultural and economic arrangements of the Nicobarese play an important role in maintaining and regulating the use of resources. Elaborate festivals, rituals and ceremonies, some lasting for months, reproduce society in terms of power relations, hierarchies, and access to and regulation of resources. For example, the shifts in the winds are marked by the *Oliov* festival. Although there are some variations on how different islands and villages organise this festival, even calling them different names, the main idea is to ensure abundance of fish, pigs, chicken and forest produce for the coming season by invoking nature spirits and those of the deceased. With the organisation of *Oliov*, several restrictions like the consumption of some varieties of foods during the last season, hunting and fishing of certain species etc. are lifted, and new ones imposed. These restrictions are invariably based on the occurrence and availability of the different food varieties. Such regulation through cultural expressions and social **institutions** ensures the availability of resources year round and prevents the overuse and eventual extinction of a particular food when it is scarce. Thus, any intervention into the Nicobarese socio-ecological system, if not carefully understood and designed, can trigger undesired dynamics with severe consequences. In the aftermath of the tsunami, this was precisely what had happened.

2. Impacts of the tsunami

The tsunami of December 2004 literally turned the world of the Nicobarese upside down. Owing to their close proximity to the epicentre and their flatness, the islands and their inhabitants were subject to immense devastation. In a matter of minutes, thousands had been swept away by the gigantic waves and the villages were either completely destroyed or affected beyond recognition, together with their material property, livestock and cultural artefacts - some of them hundreds of years old. All of the coconut trees (the main basis of the local economy) standing along the coast within a kilometre from the sea were washed away or rendered dead as the sea water passed over. Further, the loss of anchored boats led to a breakdown of communication between villages and the administrative headquarters. The earthquake and the consequent sinking of the islands resulted not only in the destruction of more than half of the mangrove forests and about 40% of the coral reefs (that had been a main source of protein-rich sea food) but also large areas of land were lost to the ocean, creating a new coastline and making navigation difficult.

2.1 Post-disaster "development"

While the disaster was in itself traumatic, the post-disaster phase has been no less. Confronted for the first time with the idea of aid and development, the Nicobarese have found it difficult to grasp its dynamics. Since the islands have been protected under the Andaman and Nicobar Protection of Aboriginal Tribes Regulation (ANPATR, 1956) and entry to them highly regulated, the Nicobarese' interaction with the outside world has been very limited. Now for the first time, they were approached by large donor organisations each of whom gave the impression of fulfilling a large part of relief and rehabilitation needs single-handedly. Originally, this was not what the Nicobarese wanted. Unable to work and rebuild their lives, they were extremely agitated and suffocated in the relief camps that were set up for them. ‘Leave us alone. We can manage on our own. We don’t need biscuits and chips. We need to make our homes and plant our gardens. Give us tools, if you wish to help us’, is what some had started to say. Some were even of the opinion that outside interference and non-indigenous settlers caused the Tsunami. ‘This is our land. Please leave us alone. Otherwise we are sure to die’, was the remark of a leader from Katchal.

Time and again the Nicobarese demanded tools so that they could begin making their shelters and plant their gardens to ensure food for the coming year. Kephus, the 50 year old chief of Bompooka Island, was unable to understand why he could not return to his island. The Administration considered the island unsafe and as it had only a few inhabitants, they had moved the Bompooka islanders to the neighbouring Teressa Island where relief camps had been set up. But the inhabitants of Bompooka were clear on what they would do upon their return. After building their shelters, they would establish a horticultural garden with bananas, pineapples, jackfruits, and other fruits and vegetables. “If we plant these before the monsoon, we can feed ourselves from next February. We will sell fish, fruits and vegetables to the non-tribal population living in the villages of Teressa, and with the cash we get, we can buy a few necessities from the market…but we have to hurry. This is a good time to start planting”, said Kephus in consternation. Unfortunately, what stopped Kephus and his people was the lack of boats and permission to leave the relief camp on Teressa. It was the same for the people of Chowra Island. Jonathan, the chief of Chowra made it clear that they had to go back. According to Jonathan, the government was using the lack of water as a pretext to keep them on Teressa. For centuries Chowra faced water scarcity; until recently they were even transporting water in coconut shells from Teressa. Jonathan failed to understand why water was now an issue. They would manage as they always did.

In a written request to the Chief of Nancowry, Jonathan begged for boats “to return to Chowra for at least 10 days to collect our left belongings… before the [southwest] winds, because then there will be many problems once the wind starts. We have to reach Chowra before that”. Despite this frustration, in the 18 months of ‘exile’ on Teressa, the persistent Chowrites built about 100 small canoes and 10 festive ones. Further, the men made regular voyages to Chowra to plant their gardens well before the monsoons. Within a month of their return to Chowra, it was incredibly touching to see how quickly they had repaired their houses and cleaned the debris. In fact, it was the only island that actually resembled the past. The anxiety to begin a new life and fend for themselves, despite a trauma not so long ago, reflects the resilience of the Nicobarese in the face of tragedy along with the ideology that life must go on, and singularly so, aid or no aid.

Meanwhile, the Chief of Trinket, Fortifer, gazes for hours at his island in total blankness. He cannot believe that his village located in the low-lying parts of the island is no more. Once a merry village with festivities, games and cheerful people is now split into three parts and all you hear is the roaring ocean amidst a handful of standing palms. His people wish to return, but where. The village land is washed out. Some families who own parts of the high grasslands are keen to return and set up a plantation before the monsoons. But there is no water until the monsoons that will eventually charge the small seasonal streams. The thought of his village disintegrating is something most distressing to Fortifer. Fortunately, he has enough land on Kamorta, facing Trinket, which he has offered to the people for setting up a new Trinket. At least they can all be together, and maintain their plantations on Trinket. However, grief still grips most of them. “I wish to send my two little sisters to Port Blair to school. They have stopped playing” says Samson, the son of the former chief who was taken away by the waves. Eventually they hope to return to Trinket one day but until then, all they can do is to occasionally cast a glimpse on what is left across. But some cannot wait. In the words of Amber, the young leader of Trinket, “We do not need anything. We are happy to die here if we cannot manage. But I want to be on my island.”

Indigenous people across the world are very much part of the ecosystem that has nurtured them. Their entire world-view and identity are inextricably linked to the life-support system that surrounds them. In comparison to the death of a family member, being alienated from their land is much more traumatic. For example, a father who lost his son in the Tsunami, when asked what he would like to do with the dead body that lay at his feet, simply replied, “He is dead. What should I do with him?”, and he went off to collect the remains from the debris where his hut once stood. While death, in their understanding, is a natural process, the loss of their lands is not. It means the very extinction of their roots, and hence their being in the world. Despite being part of a nation state for over 60 years, some Nicobarese still feel responsible for protecting their lands against foreigners. Kephus is worried that the Indonesian poachers who regularly visit Bompooka may come and take over their lands in their absence. They must, therefore, return soon and protect their “homeland” before they lose it. Jonathan of Chowra has categorically stated that, “We may die but we have to go back. What will we do here? We need to work...We have our plantations there and we cannot think of leaving our island”.

Ever since the catastrophe, Thomas Ton, the 60 year old Chief of Kamorta Island has been frail with depression. His village, Munack, is one of the very few places where one finds remnants of the once inhabited houses, stilts half under water. “It is a miracle, even though the waves crashed in as high as 20 meters” whispers Thomas. Thomas had heard from his grandfather that the Tsunami will come again. “After the earthquake everybody ran out of their houses and gathered on the seashore. I remembered the warning given by my father. I warned them to move away from the seashore. Then everybody went into the jungle”. Fortunately, there were no casualties in Munack. Yet, the loss of so many other lives and the present anguish of those surviving are more than he can handle. The once lively chieftain sits melancholic, and smoothens feebly a piece of wood that will be part of his new shelter some 100 meters inland. “The people are fighting,” he nods sadly. “They think that the world is coming to an end. They are scared. They feel insecure. Hence, they are fighting among themselves. Little things make them agitated”. Thomas is extremely sad and tries to advise his people not to fight. “Some people [outsiders] are just waiting to attack and take away our land. So we should not fight. We must stay united. Otherwise outsiders will take advantage and attack. We are too few. We cannot fight back”. Gripped by despair, Thomas still finds a ray of hope, that is, the revival of the old system based on values and traditional way of life, “If the old system is not adopted, things will go from bad to worse.”

2.2 Eager to help: The role of aid organisations

Dozens of local, national and international aid organisations established their offices in Port Blair. Unable to get permission to go to the Nicobar Islands, most of them catered to the few relief camps in town. Despite the fact that the government was providing food to the tsunami victims, the aid organisations were keen to provide add-ons such as noodles, cheese, chicken, soups, chocolates and cola, wrote Mohammed Abid, then Director of Social Welfare in his evaluation report. Competition among the various NGOs was evident. Each wanted to give more than the other. With such good care and no work to engage in, the Nicobarese took to alcohol that triggered several conflicts and cases of sexual harassment in the camps. It was reported that even the female police constables were not spared. Local people noticed the huge volumes of food and commodities the aid organisations purchased (not without a whiff of commissions), the wastefulness of food supplies rotting in warehouses due to mismanagement, the exorbitant salaries of the staff coming from the mainland, and the extravagant lifestyle in the best local hotels with extraordinary food bills. It did not take long for the tsunami victims and the local population to get the impression that aid organisations had an incredible amount of money and their biggest problem was under-spending. In Car Nicobar, it was widely reported that NGOs liberally distributed presents to the indigenous leaders to remain on the island and work there. Word went around that the need of an aid organisation is no less than the victims when it came to spending.

In the Nicobars, aid organisations had been engaged primarily in the distribution of relief materials (household goods, tools, clothes, boats, etc.) and in organising a few training and capacity building workshops in the first few months after the tsunami. Apart from this, most of the major interventions in the Nicobars were state-driven since aid organisations were not permitted to work there directly, except through or in cooperation with the government. This was mainly in the form of contributions to housing and infrastructure costs or undertaking similar projects planned by the government. There were a few exceptions though, such as Oxfam India who was able to strike a direct partnership with the indigenous council of the Central Nicobars. However, a year of working together was unsuccessful and the Council refused to renew the contract that terminated at the end of 2005. According to them, working with Oxfam revealed to them the hypocrisy of the aid sector that while propagating the ideologies of participation, transparency and accountability, do not actually practice these themselves. A Nicobarese leader once remarked, ‘They [aid organisations] are fooling both the donors and the community. They are great actors who come, create temporary sets for shooting, like in a film, and once the shooting is over, they leave, and the sets disintegrate. The toilets made by UNICEF fell down in no time, but look at the photo of the toilets in their annual report, they look so beautiful’. Abid notes in his report as well, ‘The toilets introduced by UNICEF-OXFAM, have been a virtual disaster since they did not take into account prevalent practices and water resource availability.’

2.3 Supply-driven aid

With little leverage to operate freely on the Nicobar Islands, several organisations turned to acting as watchdogs to government activities and as a pressure group, along with the media. Unfortunately, these activities were often misused in self-interest which not only discredited the aid organisations, but was unjust to those it was intended to help. For example, several dubious surveys were undertaken and results publicised to enhance their bargaining power with the government to implement projects (read products) they had ready "for sale". In most instances it was clear that projects were 'supply-driven' rather than 'need-driven'. The large volumes of money that had been collected had to be spent, no matter how, and tangible results reported back to the donors. This 'one-size-fits-all' approach was also criticised in Abid's report, 'These organizations are driven by their own agendas and they have heedlessly introduced new concepts, ideas, schemes and projects without taking into account the socio-cultural milieu of the district.' Sensational news is what the media of the day are after. And who could be better than the present aid organisations to report on the shortcomings of the government. Headings like 'Deadly Administration', 'India Islands Relief is Denied', 'Anger Over Two Rupee Tsunami Aid', etc. were splashed in the national and international media thus raising eyebrows against the ruling government. In order to circumvent the ensuing assault from opposing political parties and thereby the risk of giving rise to negative public opinion, the government was placed under much pressure to overemphasize their own role in rehabilitation. Thus, large amounts of money were allocated under various schemes to infrastructure, housing and as compensation to all victims.

3. The impact of State interventions

The role of the State added another dimension to the problem. Soon after the tsunami, the government announced an immediate relief package of Rupees (Rs) 2000 per family. When local officials realised that Nicobarese live in large extended families, they suggested (in good faith indeed) splitting up their families into nuclear units that could each be entitled to the sanctioned amount. It took quite a while to educate the Nicobarese on the concept of a nuclear family quite alien to them. The list, when finally ready, became the blue-print of all compensation packages that followed. Bank accounts were opened for all heads of nuclear families for the issuance of cheques related to several forms of compensation. This was the beginning of the disintegration of the extended family system and future conflicts.

3.1 Cash compensation

In compliance with the national policy, the Government announced a package of cash compensation to the next of kin for each person missing or dead due to the tsunami. Another package that was offered was to compensate land and crop loss per hectare. Put together, most families received amounts up to hundreds of thousands of Rupees. Conflicts arose in both cases since traditional rules did not match with the Indian legal framework. For example, in the Central Nicobars, it is the norm that the husband must go and live with his wife as *ungrung* (slave). This being so, he has no right over the wealth of his wife or her family. Now according to Indian law, the next of kin in case of the death of the wife is the husband. Without due consideration of **customary rights**, cheques were issued in the husband's name creating conflicts. Indeed, the possibility of receiving large sums of money further spawned greed and jealousy, visible in the conflicts over who is next of kin for those dead.

What's more, compensation for land and crop loss (also payable to nuclear families alone) caused the splitting of land which was previously jointly held, thus leading to conflicts in several households. Traditionally, land is owned by the joint family and only **use rights** are given to members when they start a new nuclear family. As a rule, only uncultivated forest land can be given away. Plantations are invariably owned by those who planted the trees, but in special circumstances, for example, in exchange for a service, usufruct rights for a period of time may be given. The Nicobarese have their own system of complex and often overlapping **property rights**, making a distinction between land-ownership and plantation-ownership. A family may own the land, but the harvest will go to the one who actually planted the trees. In this sense, a family may theoretically own the land, but to all practical purposes the benefits are reserved for those who planted the trees. In this new situation where land had to be translated into cash compensation, the confusion and conflicts between ownership and usufructs quite often arose.

Last but not least, the overt benevolence of the Government in compensating losses with cash was a predicament in itself. Never before had the Nicobarese had so much money at a time. Pre-tsunami, whenever something was required from the market, copra was made and immediately sold. In other words, capital accumulation in such amounts among the Nicobarese was rather rare, if not unknown. At the same time, the concept of investment and savings for future needs was also incomprehensible. When large amounts of cash are made available at once to a society where the concept of time is compressed to the present, there are repercussions. What we saw immediately was an increase in the purchase of consumer goods such as motor-bikes, TVs, DVD players, mobile phones, music systems and junk food. A Nicobarese village now is no longer a place where leisure time was used in fishing, playing, festivities and visiting neighbours. What strikes a visitor now are the long rows of motor-bikes, the young clinging to their mobile phones or watching television in splendid isolation. A visitor, if not an aid giver, is only a nuisance. The Nicobarese have a special liking for "red alcohol" (whisky and rum) and large amounts of money is used to purchase cheap "red alcohol" at exorbitant prices due to the fact that these bottles must be brought into the islands illegally. Besides the damage it does to their health, the money has been a burning hole in the tribal pocket as Nicobarese end up paying two to three times the going price to immigrant traders.

3.2 Loss of incentive

Consequently, the availability of sufficient money provided little incentive to engage in economic activities. The government's agriculture and 'cash for work' schemes suffered heavily. Of the coconut and cashew saplings that arrived, not even half of them were planted before the first monsoon. At the end of one year, hardly a quarter of the budget allocated towards the revival of agriculture was used due to the simple fact that manpower was not available. At a time when food rations were still being provided free of cost and money was lying in the bank, the willingness of the Nicobarese to work was rather low. In the understanding of an average Nicobari, one works when one needs food or money, something that can be easily misunderstood for laziness.

Humanitarian aid and intervention in general had a detrimental effect on social institutions. The death of a large number of elders in the community was in itself a great social loss. The institutions and individuals that survived were not only rendered ineffective but at times even contributed to further instability. Discontented families who received less than others began to stir up turbulence in the society. A large part of the discontent was shown by younger people who had got into the habit of alcohol and had realized that it was easy to make quick money with all the aid organizations around and the free distribution of cash by the government. Village captains were under pressure to contain this, but at times, the captains themselves were young and incompetent. In some villages, old and experienced captains that had died in the tsunami were replaced by temporary captains (cynically referred to as 'tsunami captains') who were ill-informed of the history of land-use and family structures. Nevertheless, their importance increased since they were the only ones authorised to deal with the aid organisations and the government. During land surveys, it was usually the captain who accompanied the officer and arrived at agreements. Several instances were reported when the captain agreed areas of land with the government for development projects and the revival of infrastructure such as school, hospital and shelters without consulting the community or the actual owners of land. Arbitrary decisions by such leaders only aggravated the problem, especially in cases where loss of land had to be compensated with cash. Claims to land were not always fixed on the basis of actual ownership or usufruct rights, but subjectively fixed for either personal gain, or to settle an old dispute, or to favour friends and family. The temptations were simply too high and social containment too weak.

4. Aid and sustainability

The word 'aftermath' has its roots in agriculture, meaning 'a second mowing' of grass or crop. Indeed, the aftermath of the tsunami is characterized by a second mowing of what has survived the disaster itself. The Nicobarese are unaware that they are not only subjects of a catastrophe, but of an aftermath, a phase dominated by the aid industry that thrives on it. The issue here is not reconstruction, but *reshaping* everything, using the desperation and fear caused by a catastrophe to engage in radical social, ecological and economic engineering that Naomi Klein calls "disaster capitalism". The major concern is not so much the material remains such as buildings and streets, but the immaterial attributes inherent in nearly all societies, that is, the ability to reorganize and rebuild one's future. Unfortunately, the logic of aid not only underappreciated these attributes, but contributed to their systematic elimination. The Nicobarese former anxiety to take control over their lives and rebuild their future is now hardly visible among them. Instead, the focus has shifted to acquiring more and more through aid, and in the continued experience of reckless spending.

4.1 Consequences of aid dependency

Increasing dependency on aid and the new affluent lifestyle does not come without consequences on the society and the environment. Research by the authors and colleagues at the Institute of Social Ecology reveal striking results. Instead of supporting the Nicobarese to construct their traditional dwellings as they always have, the Administration (in league with large construction companies) have taken it upon themselves to provide 7,000 houses for nuclear families made from materials not available on the islands. Construction materials for building these "permanent shelters" are brought in from the neighbouring Andamans or from the Indian mainland, which amounts to an estimated 200,000 MT, an eight times increase in the amount of built stocks per capita as compared to pre-tsunami figures. Needless to say, the maintenance of these houses will also require a ceaseless flow of materials in the future—at the expense of the Nicobarese. Once the permanent houses are complete, the per capita demand for water and **use of energy** will rise substantially. According to the Andaman Public Works Department (APWD) water consumption is likely to go up to 70–100 litres per capita per day (as compared to the Indian average of 40 litres). Energy load is estimated to increase from the present 300 KiloWatt Hours to 500 KWH by 2011 as predicted by the local electricity department. Preliminary calculations reveal that there is already a 30 times increase in the consumption of fossil fuels as compared to pre-tsunami figures, much of it used to produce electricity, and the remainder for motor-bikes, cooking gas and boats. Last but not least, there is a six times increase in the import of biomass (mainly as food) as compared to pre-tsunami, much of it goes waste in warehouses, or sold back into the black market by corrupted leaders.

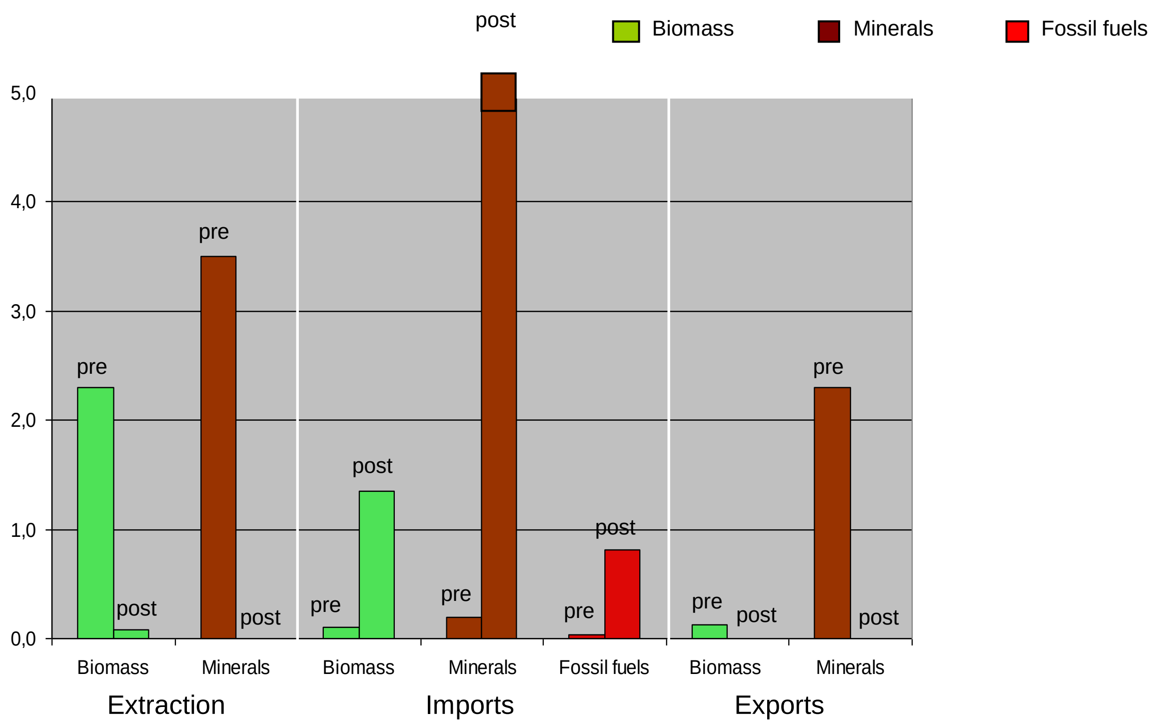

Figure 1: Changes in metabolic throughput of materials – pre-and-post tsunami (in tons / capita / year)
(Source: IFF)

4.2 A new lifestyle

Four years of incessant aid flow have led the Nicobarese to adopt a new way of living based on **consumption** that is much higher in quantity and fundamentally changed in quality compared to what is was before (**Figure 1**). The issue here is that hardly any of this is locally produced but must be obtained from outside as aid, subsidy, or trade financed by compensation money. Change in lifestyle is thus accompanied by an increased dependency on resources from outside the islands, a socio-ecological transition. It has been made clear by the administration that the Nicobarese will have to begin paying their electricity bills once they occupy their houses. This concern is further heightened when pondering what their new economy will be. As mentioned previously, the Nicobarese are a hunting-and-gathering society producing copra for the market only when there is a need for commodities. An economic activity such as this did not require a disciplined investment of working time. Coconut trees, once planted, provided fruit for nearly a hundred years all the year round without much maintenance and without having to worry about seasons. The pigs scavenged the forest for three-quarters of their diet, and hunting and fishing were combined with leisure. Most of the coconut trees, the main source of cash, were lost to the waves.

4.3 Dilemma for the future

So how will the Nicobarese sustain a newly-adopted lifestyle once the compensation money is utilized and food aid stops, given the fact that to replace lost plantations with new ones will take about 10 years before copra trade can resume? Results from the computer model developed at the Institute of Social Ecology reveals some interesting facts. Presumably, the only means of livelihood that is readily accessible to the Nicobarese is the selling of a variety of vegetables, fruits and fish for the local market. Unfortunately, very few know how to grow vegetables and fruits, and this will entail not only learning how to do that, but working with seasons and an investment of time. Another problem is lack of a market. Local consumption (by non-Nicobarese) can potentially absorb only 1,000 kg of vegetables and 500 kg of fish per day. Assuming the Nicobarese do produce all of that and manage to sell it, it would still meet only 40% of the total household income required to keep present consumption levels up. This requires a time investment of 3 hours/adult/day which is close to the maximum 'willingness to work' as indicated by the Nicobarese in their interviews. A further interesting question to the model was if it would possible for the Nicobarese to sustain their newly-adopted lifestyle once the coconut palms begin fruiting in 2015. The Nicobarese could then in 2015 actually meet their entire household income from the production and sale of copra, albeit at a high working time investment – 8 hours/adult/day. This is equal to the maximum disposable working time (leaving no time for festivities and rituals), and a six to eight times increase in the working time as compared to the pre-tsunami scenario.

Another issue is the impact on the environment as a result of this new lifestyle. Modelling results indicate that to meet present household demand (of cash and subsistence) would require between 3,500 – 4,000 hectares of land on Kamorta Island alone for coconut plantations. Consequently, forest and grassland would reduce by 15% and 10% respectively over the next 30 years with a high level of forest fragmentation. The combined effect of this will be a negative impact on drinking water quality and quantity, on soil erosion leading to lower productivity, on the availability of forest products and the conservation status of some of the endemic fauna and flora elements found on the island. The water situation could get even more critical if we consider the decline in water availability with a scenario where water demand is likely to increase due to population growth, and that agriculture would have to move from being rain-fed to irrigated due to climate change predictions. Finally, the erosion of the top soils might not only lead to land degradation but also have an undesired effect on the coral reefs surrounding the islands.

5. Conclusions

Apparently, the logic of sustainable development (based on scientific concerns and reinforced by political rhetoric) and the logic of humanitarian aid (market driven and embedded in the world political and economic structure) seem presently non-reconcilable. Aid programmes of the government and international aid organizations have changed traditional social and power relations, leading to an erosion of traditional institutions, values and rules of resources use. As a result, conflicts arise at various levels and the mechanisms to deal with them are few. Aid money has accelerated the transition from a formerly hunting-and-gathering subsistence based economy towards an economy linked more to the global market and dependency on aid money and goods. While on the one hand this entails changes in land use, at the same time we are faced with serious cultural constraints in terms of willingness to work. In other words, the only way to maintain a higher consumption lifestyle would be to establish new patterns of society–nature interactions that can provide higher productivity (from land and sea) by introducing new technology, establishment of a functioning market, while at the same time cope with the 'willingness to work' constraint on psychological and physical levels. Whether this is possible or not, and how long it will take, is yet to be seen. In any case, the original **affluence** of the Nicobarese with their 'limited wants and unlimited means' seems to be replaced by a condition of unlimited wants and insufficient means; from abundance to scarcity. Seemingly, the Nicobarese now tread on a ceaseless quest to overcome a state of permanent scarcity, the starting point of all modern economic activity. For the moment we can only observe the hopelessness of the Nicobarese with their 'bourgeois impulses and Palaeolithic tools' as they attempt to pull themselves out of a 'complex disaster'.

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Chapter 5: PARTICIPATORY FOREST MANAGEMENT IN MENDHA LEKHA, INDIA

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Youth training in Mendha Lekha
(Source: Supriya Singh)

Abstract

This case study looks at ways to quantify the benefits accruing from traditional, participatory forest management as practiced in the small tribal village of Mendha Lekha, Maharashtra. Community initiatives such as the one seen in Mendha could become role models for implementation of government programmes such as the Joint Forest Management (JFM) programme. The village is a microcosm of tribal life that has managed to preserve its 18km2 forest over the years using an exemplary “self-rule” principle which is central to their existence. Mendha achieved this feat through three pivotal rules, self study, self governance and participatory democracy (a consensus approach).

Keywords: Biomass Economy, Rural Development, Gross Nature Product, Well-Being, GDP Of The Poor, Joint Forest Management, Watershed Management, Social Capital, Property Rights, Consensual Democracy, Community Rights, Inclusive Institutions, Livelihood Security, Needs, Rights-Based Approach

1. Introduction

The extent of poverty in India has not been dented after 60 years of targeted anti-poverty programmes. Most rural programmes fail as the schemes are uniform and ignore ecosystem differences across regions in India. What might work for one particular part of the country fails miserably in another due to huge ecological, social and cultural differences. A majority of India still depends heavily and directly on its natural resources for sustenance, and people still draw their livelihoods and food directly from nature, despite the economic boom. Rural India does not define everything in monetary terms, especially not **well-being**. The idea of well-being is closely related to land, natural resources and cultural ideal types. Ecology directly sustains more than 60% of the population with over 234 million dependent on agriculture, fisheries and forests. This dependence on the ecology and agriculture is neglected by National Accounts figures but it is increasing as the population grows. The ecology 'indirectly' also sustains all industry through the provision of biomass.

Around 240 million hectares (ha) of India's 306 million ha of land is used for biomass production. Out of this, only on a very small fraction of agricultural lands has productivity improved due to irrigation. On the rest, productivity has decreased and is still on the decline. The economy is biomass-based thus dependent on ecology. Poverty is caused by ecological degradation as people lose out on their support system as soon as they lose hold over resources. This entails that we recognize rural poverty as ecological poverty (not income poverty) and redefine it as lack of access to resources. This concept of Gross Nature Product, proposed by Anil Argawal, is similar to the concept of "**GDP of the poor**" as defined by the TEEB report, "The Economics of Ecosystems and Biodiversity" in 2008.

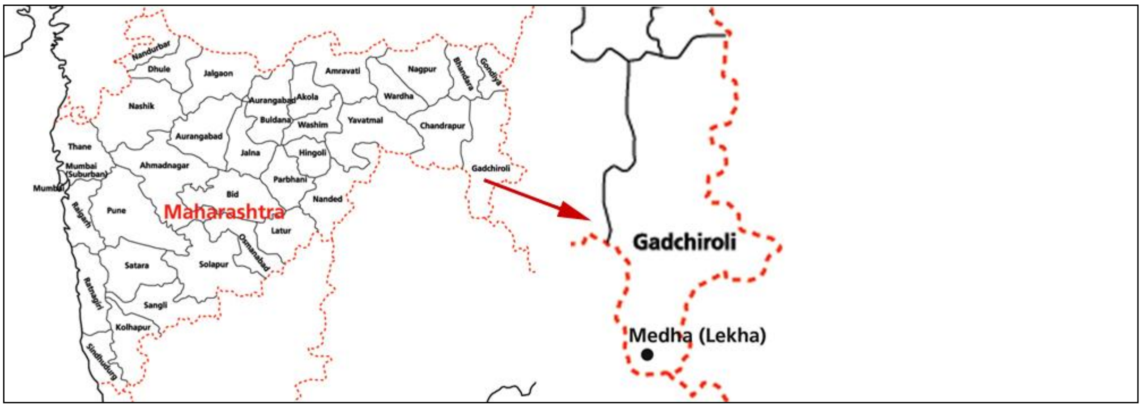

Figure 1: Mendha Lekha, Gadchiroli district
(Source:CSE)

It is but natural to highlight solutions as well when one is looking at problems. It is this perspective that drives the need to study the case of Mendha Lekha (See **Figure 1**), a small tribal village that sought to turn its fortunes around by investing more in its natural resources than anything else. The possibilities for scaling-up such a model of development are also an incentive to study the case. While this case resembles that of Hiware Bazar in many ways, it differs in that Mendha is a tribal forest community, not an agricultural caste village, and thus links to the market are not one of the keys of success.

Mendha : A snapshot

Total Area:	1930 ha
Forest Area:	1806.49 ha (98.73%)
Total population:	430
Total number of households:	82
Caste/Ethnic group Composition:	100% Maria Gond (a Scheduled Tribe)
Economic Activities:	Rainfed Agriculture is the mainstay followed by collection of non-timber forest produce
Distance from nearest Town/Market/Administrative centre:	3 km
Literacy:	30%
Assertion of village ownership over its forest:	1989
Main Institutions:	Gram Sabha (stronger than the Gram Panchayat) takes all decisions pertaining to the village by concensus only (participative and inclusive democracy as against representative democracy). The village also has a “Study Circle” comprising all adult villagers which holds meetings nightly in the village square to discuss and assess all matters related to the village.
Financial Institutions:	A village fund created by contribution from all households in the village & project support by PRIA, an non-government organisation based in New Delhi
Forest Committee:	Every household is a member. The committee guards the forest and is vested with the right to levy fines on offenders in conjunction with the Gram Sabha.
Assertion of rights:	Nistar rights or the right to use the village forest. Outside (government/forest department) interference in their forest stopped.

2. The Microcosm

Mendha is a small tribal (Maria Gond) village in the Lekha Panchayat. It is situated in the Gadchiroli district in the eastern end of the central Indian state of Maharashtra. The village is well known for its declaration of self-rule, its biomass-based subsistence economy and its self sufficiency. Gadchiroli district is situated at the tail end of the Satpura range of mountains and is largely forested. It is predominantly tribal and poor, with high dependency on its natural resource base. However, with appropriation of community forests by the State and the dwindling of forest cover due to increased population and extraction pressures, the rights of these tribals over their land have withered, deepening their level of poverty.

Freeing itself from the clutches of poverty and wrestling back its right to resources, Mendha has been an exception to the rule. Mendha rose against the Government’s policy of taking over community forest rights back in the 1930s when it initiated the struggle to assert control over its 18 km^2 forest. The village worked its way around the official policies and has invested its **social capital** in watershed development and protection of the forest as well as its judicious use. The State has over the years realized the folly of separating tribals from the forests which leads to problems in conserving them, thus introducing the **Joint Forest Management** (JFM) programme in the late 1980s. These programmes, due to their top-down approach have little community say/ stake in the preservation and use of forest and fail to address issues of land ownership and use.

The case of Mendha provides key insights into the nature of governance and judicious use of resources at the community level. It shows ways of making programmes work. Hence, evaluation of the benefits and costs of community initiatives (overleaf) provides a platform to show the potential of community managed schemes in tandem with the government that do not sacrifice livelihood, cultural and environmental values. An application of **multi-criteria evaluation** to the social, economic and cultural gains and processes in the village would go a long way in future research and for understanding such societal processes. The village level implementation of self-rule for the maintenance of its forest and its continued success and scaling-up requires building confidence in the positive impacts of these initiatives.

3. The Context

The present village boundary was demarcated in the early1920s by a British settlement survey team. The Gonds traditionally depend on the forest for food, grazing, timber, water and other resources. This dependence has continued even after independence. The village is one of the few remaining villages in the Gadchiroli district that control and manage a village forest. Since the village depends heavily on its forest, all decisions pertaining to the management and extraction of resources are taken collectively. As a result the resource base is still very good and the village seldom suffers from shortages of water or food or fodder. Far from being a **"tragedy of the commons"**, the village is a success in community resource management. The economy is self sustaining and unaffected by the vagaries of the market economy as the Gonds have managed to keep their economy relatively free of monetization.

Management of the forest in Mendha is interlinked with the struggle for tribal self-rule. Gonds, being forest dwellers, have always enjoyed unhindered use of the forest. In the pre-British era, the local caste landlords used to levy a tax on the use of the forest in exchange for which the collection rights were extended to the community. There was however, little interference in the forest itself by the caste communities. This system continued for a while under the British till they decided to consolidate all the forests in India as government property and centralized tax collection. The **customary rights** of the forest dwellers began to be severely curtailed as the commercial exploitation of forests began under the British rule. Modern India inherited this mindset and way of governance, further marginalizing communities and depleting forests for commercial gain.

Village Initiatives

A. Transparency & Participation: All decisions concerning the village are taken by consensus (strictly) in gram sabha (village assembly).

B. Self Study: A village level Study Circle for self-study has been organized and is functioning since 1987. It has reached a cyclical process: knowledge -> decision -> action -> knowledge.

C. Self Governance: Their slogan is: In our village we are the Government! At Delhi-Mumbai is our government! (**Figure 2**) Certain self-governance principles are always followed:

Participatory Forest Management: The Village Forest Protection Committee looks after the 18 km^2 forest. Even government agencies are not allowed to work within village boundary without prior permission from the Gram sabha

Ban on tree felling: A fine of Rs 101 is levied on illegal cutting of trees from the forest. All uses of the forest are to be cleared by the gram sabha.

Self Correction: Decided to prohibit the sale and purchase of liquor within the village allowing for brewing of traditional liquor only for ceremonial occasions like marriages, religious ceremonies, etc. after taking permission from the gram sabha.

No Subsidy: The village does not take any subsidy or grants and takes only loans.

Water Equity: Every individual in the village gets equal share of water be it surface water or underground water, in private or government land.

Build Tank By Eating Fish: Completed the remaining work of their community forest tank by implementing their own innovative program - "Eat Fish & Build Tank" i.e. catch fish and put in equivalent work for the tank construction.

Corruption Control: The gram sabha decreed that if one is to bribe government officials to get his/her work done, it is necessary to take receipt of the same. If not, then he/she must give the same in cash or kind to the Gram sabha.

Village Court: All internal disputes are settled within the village by the village court. No one goes to the police or court and accepts the decision of the Nyaya Panchayat i.e. gramsabha.

Change from Labour to Owner: Gram sabha acquired the exclusive rights over a stone quarry through a government scheme DWACRA innovatively.

Livelihood Rights: Fought successfully to gain back their Nistar Rights i.e. livelihood rights over natural resources surrounding the village.

D. Ecology conservation:

Eco friendly methodology for honey collection without destroying honeycomb or killing rock bees is followed strictly.

Soil & Water Conservation encouraged with village level watershed technician training camps and constructed more than 1000 gully-plugs in the forest to arrest erosion.

Integrated Approach: There is a ban on hunting and collection of timber from the forest.

Struggle against harmful ecological practices: The village opposed the wrong method of bamboo cutting by the local paper mills that involved rooting out the bamboo. They compelled the government contractors to take villagers along with their labourers so as to oversee and get the cutting right.

A nursery was set up by the women of the village for supplying plantation saplings.

People's Biodiversity Register: Decided to use P.B.R. as a tool for sustainable developmental planning.

The Gonds in Mendha faced similar exclusion and exploitation by neighbouring caste Hindus as well as the government. According to the elderly in Mendha, Nistar passes had been freely available to them from the village head, but after the forest act came into being in independent India the forest department started distributing such passes at concessional rates. This resulted in bribery of forest officials for granting of permits to collect grasses and other non-timber forest produce. Later when the villagers protested, the department marked a 2 km^2 zone in the forest for collection of produce. Corruption in the forestry department forced the people of Mendha to bribe officials for small favours. Their village forest was being exploited for bamboo to supply the paper mills. The Gonds bore all these injustices till things came to a tipping point.

Figure 2: Banner on the Panchayat building declaring, "In Delhi and Mumbai is our Government, in our village, we ourselves are the Government"
(Source: Supriya Singh)

Discontentment had been brewing since the 1950s as the tribals faced increasing oppression and discrimination from the forest department. There was a sustained effort to isolate the forest from the people. Traditional **institutions** like the Ghotul, a communal building for boys and girls, were discouraged strongly on grounds that the building is made from teak and the cutting of trees harms the forest. By the late 1970s, the tribals found a common cause to unite and fight against. The Maharashtra government proposed two **dams** in the Gadchiroli region. For the land-dependent tribals of the region, the project not only meant displacement from their traditional homes and possible social disruption but also the destruction of large stretches of forests on which their livelihood and culture heavily depended. Thus this project faced strong tribal opposition and was finally shelved by the government. Alternative ideas were to be born from resistance, as is often the case.

Figure 3: Training of village youth in the main square
(Source: Supriya Singh)

Mendha participated in the anti-dam movement as well as other movements. Mohan Hirabai Hiralal, a social worker closely associated with Mendha and Devaji Tofa, the dynamic leader of Mendha, teamed up to launch the *Jungle Bachao, Manav Bachao* (Save Forest, Save Humanity) movement. This movement laid the foundation for the tribal self-rule principle that Mendha went on to imbibe and symbolize. Mendha soon realized that the only way to ensure the safety of their forest was to take its governance into their own hands and reduce dependency on the government. In order to gather strength to reclaim their rights over the forest the village decided to revive its traditional governance structure. It pushed for all decisions to be taken at the village level hence strengthening the Gram Sabha.

The traditional system of Gram Sabha was reactivated in 1988 through the process of Adhyan Mandal (discussion group). Through regular discussions with researchers and NGOs, villagers came to know about their traditional Nistar (collection) rights granted in the Nistar Patrak (collection rights written in a document under the British era). The Gram Sabha started by acquiring all the legal, revenue and political documents about the village. The famous slogan "*Dilli Mumbai Amcha Sarkar, Amache Ganavat Amhich Sarkar*" (In Delhi and Mumbai is our Government, In our village we ourselves are the Government) was raised in Mendha and still holds a central place in the village square (see **Figure 2**).

The village also decided to revive its fledgling Ghotul, a cultural institution meant to teach adolescents the ways of tribal life and pass on traditional knowledge. The village constructed a new Ghotul using teakwood from the forest. The forest department destroyed the structure and seized the wood. Angered, the village called a 32 village Gram Maha Sabha (large assembly) and garnered support from other Gond villages. Twelve villages constructed Ghotuls along with Mendha and the defiant villagers threatened to resurrect a new structure every time the old one was destroyed. The Forest Department had to concede defeat thus handing Mendha a significant victory.

In order to facilitate discussion at the village level, the elders decided to hold daily meetings in the village square (**Figure 3**) to discuss all matters important to the village. They soon realized the importance of taking informed decisions based on detailed discussions. Initial discussions centered on self-improvement of the community and the first target was alcohol. Recognizing the need to reduce and possibly abolish alcoholism in the village prohibition was made a rule in the village. A blanket ban was imposed on procuring liquor from the market and it was decided that the Gram Sabha would control the production of traditional liquor in the village. Traditional liquor has certain ceremonial importance in tribal culture.

The success with the ban on liquor gave the village impetus to consolidate their efforts towards ownership and management of their forest. In 1987 the Gram Sabha, after several years of discussions, decided to stake a claim to the ownership of the forest. It passed a resolution stating that the village shall fulfill all its domestic requirements from the forest without paying a fee to the government. Rules of extraction were also set so as to make the use sustainable. All major extraction from the village was to be supervised by the Gram Sabha and each family was to take only what was needed. The village put a ban on the use of the forest by outside agencies- forest department or contractors without the explicit permission of the Gram Sabha. Commercial exploitation of the forest was banned. The Van Suraksha Samiti (Forest Protection Committee) was formed and patrol parties comprising two members of a household each guard the forest daily. The Gram Sabha levied fines on all illegal extraction, disallowed encroachment of forest land and aided in fire fighting whenever the need arose.

4. Towards Community Forest Management

The forest department did not recognize the efforts of the villagers in protecting their forest. In 1991 the Mendha forest was declared a Reserve Forest, an official category of protection that disallowed any community use of forest resources. The villagers were not even consulted. They continued to patrol the forest however, and use its resources in defiance of the law. They even got their Gram Sabha registered as a non-profit organization by the name of '*Gaon Niyojan Va Viakas Parishad*' (village planning and development organisation). The newly christened body decided to target the corruption in government offices first. It issued a decree that for every bribe given to Government officials for any work the villagers would have to get a receipt, failing which he/she would have to give an equivalent (to the bribe) amount to the Gram Sabha. This ended the corruption completely as all villagers demanded a receipt every time they were asked to pay a bribe.

In 1992, the State of Maharashtra adopted a Joint Forest Management Resolution. Under JFM, degraded forests could be handed over to villagers for regeneration activities, managed jointly by the villagers and the Forest Department. This directive was however, not applicable to Gadchiroli district with a majority of its forests classified as natural canopy forests. These could not be categorized as degraded and hence JFM was not applicable. Mendha, however, persistently demanded inclusion in the scheme only to be rejected. In 1996 the forest department finally conceded to the demand and an official forest protection committee was formed in Mendha. Mendha Lekha became the first village with standing forests in the state of Maharashtra to be brought under JFM.

5. Teamwork and Watershed Management

Once the Gram Sabha had established itself and the self-study circle had become active in 1987, the village took a series of different measures to maintain and sustainably use its resources. Extensive watershed management work was planned and executed inside the forest with over 1000 gully plugs made across the landscape. Forest streams and small ponds were cleaned up of debris and their maintenance began on a cyclical basis. Interestingly, the village approached the government and the National Bank for Agriculture and Rural Development (NABARD) to fund their watershed development activities. Both the agencies rejected their demands repeatedly. Mendha decided to go ahead nevertheless and completed the work using voluntary labour.

In the year 1993, facing a shortage of water in the dry months, the people decided to construct a large pond on the outskirts of the forest in an area with suitable drainage and geography. The forest department opposed the construction saying it was technically forest land and hence a pond could not be constructed on it. The villagers fought for the construction and to cope with the lack of funds used the Employment Guarantee Fund (EGS) money to make the pond. In order to pacify the forest department, the villagers contended that this pond was a *'van taalab'* (forest pond) being constructed for the animals. The EGS money was however, only sufficient for the construction of half of the pond and construction stalled after the funds ran out. The following year, more funds were not forthcoming.

Several self-study group meetings later the village decided not to take any help from the government and came up with a unique solution. Following the monsoon in 1994, the half finished pond was filled with water. The village introduced fish into it. Now, anyone from the village could come and help in digging the other half of the pond and in return could catch fish from the completed half. If a person or a household dug around a third of a metre deep and $3m^2$, he/they could catch one kilogram of fish for their use. This unique payment system ensured the completion of the pond the same year. The effort led to increased percolation and the fields around the pond benefitted immensely. Nanja Tofa, a 26-year-old resident of the village commented that this pond secured at least one crop for the surrounding fields even if the rains were poor. Even now, the pond is used for fishing but the fish are sold only to the villagers. Those who are unable to pay for the fish can simply undertake a proportionate amount of labour in cleaning and upkeep of the pond. The labour is decided on by the Gram Sabha.

Following the success of this effort of making a pond, the village decided in 1997-98 to further reduce its dependence on forest streams by planning to make *baodi* or small irrigation ponds/wells next to the agricultural fields themselves. Once again, the village approached NABARD for funding. NABARD was funding similar schemes in different parts of the country at the time. Citing a lack of technical expertise, the bank refused funding once again. Devaji Tofa, the village head, continued his efforts to persuade the bank and even approached the bank executives in Mumbai. The bank finally relented and gave the money to the village for the construction of 17 *baodis*. Today, almost all the fields in Mendha are irrigated using these baodis. Those fields that lie close to streams and village ponds use their water.

6. Minding their Business

Preservation and judicious use of resources was not restricted to the forest. Activities spread to the institutional, financial and personal level. Mendha's village committees - the forest committee, its grain bank, the self-study circle, etc. have had to fight for their existence. The village is a part of Lekha Panchayat, a council of several villages in the Lekha region. The Panchayat is a strong 'official' institution that looks after all affairs of the village. It was natural for it to not recognize these village institutions that it considered as threats to its power. Lekha has from time to time tried to arrest control of Mendha's resources and management but the tribals' hold is strong and cohesive.

The Mendha forest is one of the sources of bamboo for the Ballarpur paper factory located 120 km from the village. The forest department leased out the right to collect bamboo every second year to contractors. These people cut all the bamboo shoots in the forest to maximize profits leaving nothing for the domestic use of the villagers. Mendha fought to stop the practice and after its JFM committee was formed in 1996, the village took total charge of bamboo collection. The Gram Sabha decided to cut only mature bamboo from the forest, collect in the village and allow the people to take whatever they needed. The remaining bamboo shoots were sold to the mill at Rs 600 per metric ton, the price fixed by the Forest Department. The earnings in this case however were taken by the Forest Department. Under the JFM agreement the village was to get its share of 50% earnings but is still awaiting the money. The contractors treated the bamboo resource as a **stock** to be depleted while the villagers saw the bamboo stands as a permanent **fund** that could provide a flow of regular sustainable resources.

The village moved on to take complete control of all commercial activities on its land and formed self-help groups (SHG) to manage these. Mendha had several granite stone mines. The stone was used for construction and the mining was leased to contractors by the forest department and the district administration. The Gram Sabha passed a resolution to mine responsibly and not to allow outsiders to manage the mines. The village approached the district administration to not renew the mining permit for the contractors and persuaded them to lease the mines to two women SHGs from Mendha. The Development of Women and Children In Rural Areas scheme (DWACRA) allowed for the SHGs to apply and get the mining permits. It was also decided that only two big mines would be allowed to operate in the village and the rest of the small mines would be closed as they caused severe degradation. The SHGs took control of the mines and allowed only two truckloads of stone to be mined a day. The profits went to the Gram Sabha and into the SHG account. The SHG earned enough money to buy its own tractors which are now used to transport the stone to the market, cutting out the contractors completely and increasing profits. Members of the SHG can now borrow money from the group for any activity at a minimal interest rate of 2 % per annum.

With increased prosperity in agriculture, the village decided to further reduce its dependence on the forest for fuelwood and brought the gobar manure gas plants (bio-gas plants) to the village. The initiative began in the year of 2000-2001 and today there are 80 bio-gas plants installed in the village. This leaves out only two poor households, but the village plans to help these two acquire their bio-gas plants in the near future. The money for the installation of these plants came from the bio-gas plant scheme of the district administration and some from the forest department. It takes about Rs. 7000 to make a single unit. The Gram Sabha decided to fund Rs. 500 from its account, each family put in labour worth Rs. 1500 and the rest of the money was funded by the government. The structure for the bio-gas plants was modified by the villagers to suit their needs and each household is responsible for its plant's maintenance. Technical guidance was sought from the government and local NGOs that work on the construction of these plants.

Another activity that the Gram Sabha fought to control is tendu patta (tobacco leaf) collection. The collection of tobacco leaf was controlled by the forest department and leased to the contractors. These contractors hired cheap labour from outside the village and ravaged trees by stripping them naked in the collection season. Other trees also suffered damage due to the labourers' indiscriminate cutting of all vegetation to get to the tobacco plants. Mendha formed a cooperative and fought to get it registered in 2002. It went on to stake a claim on the collection of tendu leaves through the cooperative so that the people get employment within the village and do not have to venture out. The Forest Department however sold the rights to collection to the highest bidder (invariably a contractor). In response the village put its foot down and forced the contractor to hire only labour from Mendha. The practice still continues.

Apart from tendu, the villagers also collect mahua (a flower used to brew local liquor), Amla (Indian gooseberry), chironji (Cudapah almond - a seed used to garnish sweets), gum and bamboo shoots, teak leaves, etc. The Gram Sabha decided that none of these would be sold in the market. Consequently, people only collect what they use at home, taking the commercial exploitation of forests out of the equation. One important product from the forest- honey is exempt from this rule. The Gonds have a special method to extract honey without killing the bees or harming the beehive. They cut out the middle portion of the beehive on moonless and first moon nights when the bees are believed to be relatively calm. Collection of honey provides livelihoods to the few landless families in the village. Of late, the Gram Sabha has decided to fund the training of one of the landless youths in Nagpur. The training entailed methods of processing honey with mahua and neem to enhance its medicinal properties. A honey-processing unit is being set up in the village and the product will be sold locally to cover the costs and generate an income for the landless family.

6.1 Ecology and Economy

The impacts of the initiatives undertaken in Mendha cut across ecological, economic and social spheres. Given the non-monetary nature of tribal economy, it is hard to define the economic gains in figures. The people of Mendha see the economy and well-being in social-environmental terms. The dependence of the people on forest resources gives these resources a cultural rather than a commercial context. In other words, the people save the forest because they depend on it, not for economic gain. Also, the definition of rich is linked to how much land one owns. Well-being is defined as a state wherein one has enough to meet ones' **needs** and some saving to tide over the hard times. Everything is seen in terms of accessibility to natural resources as most of the daily requirements come from these.

Figure 4: Controlled grazing in Mendha Lekha
(Source: Supriya Singh)

Economic conditions in the village are poor by monetary standards, with many people living below the poverty line. However, the village does not recognize poverty as income poverty. One question that comes to mind is why does the village not change even after so much influence and exposure to other cultures over time? Devaji has a simple answer: people make no relationship between jungle and money, because if people do then they will destroy the jungle. The village never kept track of increases in groundwater levels and crop production and milk production in numbers. The watershed development work led to an increase in the groundwater table in that wells did not run dry during the lean season even after the water was used for irrigation.

6.2 Sustainability

The story of Mendha is unique for many reasons. Firstly, the decision-making process is an informed one. In this, the study circles or the Abhyas Gats formed in the village play a crucial role. The villagers welcome all kinds of information from the outside world, yet they retain the right to decide for themselves, and this helps in making the right kind of choices. Then comes the fact that no decision is taken merely by majority. Almost always, it is taken by a unanimous vote. Be it getting bio-gas for every family, making women equal representatives and even monitoring the effects of television - the consensus process prevails. It hasn't been easy. ``Mendha also has its share of good and bad. People haven't always agreed to our plans, but through discussion they have been made to see the pros and cons like in the case of banning liquor shops in the village,'' says Tofa.

Finally the transparency that is strictly adhered to makes the entire effort of self-rule successful. There is a bit of discontent among the higher officials who feel threatened by the power enjoyed by the villagers because in a way it makes their position redundant. However, inherent traits of the community like its close-knittedness and cohesion have contributed to the successfulness of their efforts. And while this transition of Mendha from a helpless, uninformed and fear-ridden community into an informed and empowered community is remarkable, the struggle is by no means complete. Neither is the conservation process completely foolproof. Replication of the same process elsewhere may not always be possible.

7. The Lessons of Mendha: Is ‘Scaling-up’ Possible?

When site-specific and decentralised management of natural resources is the need of the hour, the process of self-determination, natural resource conservation, and environmental investments undertaken in Mendha can show the way to other villages in India. Comprehensive land and water management for livelihood security however will require planning and implementation at the settlement level. Village-level planning will require good technical inputs into land and water conservation but these inputs in turn require new (and old) knowledge.

Does the National Rural Employment Guarantee Act (NREGA) allow for this capacity building and what kind of knowledge systems are needed? Village planning will need institutional capacity at the settlement level. There is a weakness in the current NREGA where the involvement of the Gram Sabha is recommended but not guaranteed. For instance, the priorities are set by the Gram Sabha but then when the plan is made by the sarpanch and the junior engineer or block development officer, this plan is not cleared with the Gram Sabha. Similarly, when the budget is made by the junior engineer and then sanctioned by the district collector, it is not discussed in the village.

The village plan will require integration of land and water, with the need for legal and institutional reform. The village implementation and its continued success and scaling-up requires data collection and building confidence in its impact. Climate coping strategies will call for risk management systems, which will need inputs from villagers and their strategies. In dryland areas, cropping systems are more risky and so traditionally people have depended on animal care systems, which maximize the value of each raindrop. Additional risk management strategies include a return to traditional cropping patterns, which are built on less water-intensive systems and which provide for fodder and other multi-purpose crops as well as water management which optimizes on the little rain that is available by harvesting where it falls.

7.1 Present Scenario

Mendha has a self-sufficient economy- negligible dependence on the market, extensive use of forest products in everyday life, organic farming, gobar (bio) gas plants, controlled grazing (See **Figure 4**), only necessary trading with ‘bazaar people’ (market people in the Gond terminology). As far as leadership is concerned, Devaji Tofa has led for the last 30 years by consensus and everyone has equal powers and rights. Institutional mechanisms have created a space of support for poor families, technical education for youth funded by the village, employment for all, and the revival of traditional institutions.

7.2 Replication Potential

Following Mendha, two more villages have treaded the path to self- rule. Markegaon, a village three kilometers from Mendha, is inhabited by 175 Gond tribals. Their fight started against the forest department when the department sent a notice of fine to the villagers regarding illegal cutting of the forests. “We replied that we have taken wood from god’s forest. We will pay the fine to him only”, says Chatruji Halami, President of the Markegaon Gram Sabha. Disillusioned with the five-village Gram Panchayat of Tukum under which Markegaon is a part, Halami participated in Mendha’s Gram Sabha way back in 1990. “It showed us the way. I talked to the people in my village”, he says. After a series of discussions the people of Markegaon decided to have their own Gram Sabha along the lines of Mendha’s. “Our objective is very clear. We want to see Delhi’s money trickling down to the village Gulli”, says Halami. One can’t call this replication as each situation is different but there are new beginnings everywhere, learning from each other, people have started their own initiatives.

It is a majority vs. consensus situation in Mendha and all have to agree, not the majority if a decision is to be implemented. Today, the Gram Sabha’s permission is mandatory before any development work begins in the village. All grants are treated as loans to be repaid from the village’s contributory fund, to which each resident is required to pay 10% of his or her total annual earnings. All community work here is also the individual’s work, to which each person has to contribute personal time and resources. “This makes the village a true republic and an effective **participatory democracy**,” says Mendha resident Mohanbhai Hiralal.

7.3 Forest Rights Act

In August 2009, Mendha joined the elite few communities in India that have managed to get community rights under the new Forest Rights Act. Managing forest resources came easily to the people of Mendha Lekha. The village has been managing 2 km^2 of forest for more than ten years. They applied for community rights over the entire village forest area of 18 km^2 under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. “The rights would help villagers bargain the price of important minor forest products (MFPs) like bamboo and tendu patta,” contends Devaji Tofa, the head of the village. He adds, “In an absence of rights regime previously a lot of these resources were harvested unsustainably by private contractors under license from the forest department”.

Under the present arrangement, the Forest Department does not give the village their share of the profits from the sale of bamboo and tendu leaves. The people of Mendha believe that with community control these funds will come directly to the people. “Given our dependence on the forest for leaves, grazing animals, fruits, firewood, and medicinal herbs, rights over 2 km^2 of forests were not enough to sustain the village”, explains Tofa. Mohan Hirabai Hiralal, social activist and head of Vrikshamitra, an NGO working in the area, agrees. “The village depends largely on MFPs. So community rights hold more value for them”. Hiralal feels that management of resources is more important than ownership. Taking a cue from Gandhi’s philosophy he states “decision making power should lie with the people, only then will they benefit in the true sense and the process will become democratic and de-centralised”.

8. Lessons

Rainfed agriculture in India extends over an area of 97 million ha and constitutes nearly 67% of the net cultivated area. Most backward districts lie in these areas and account for 60% of the poor population in the country. These areas are also characterized by single crop agriculture but account for 42% of the total food grain production in India. They suffer from a degraded natural resource base, low soil fertility, soil erosion and have an unutilized irrigation potential of 65%. In the wake of this it becomes important to manage resources well and create more natural wealth. Villages like Mendha Lekha provide a view of the ecological opportunities that each village in India has. Every village has the resources to self-sustain and Mendha shows the way it can be done. Water conservation emerges as the core of these models and community governance is the key to sustainability. What is required is to build strong institutions based on a rights-based approach in order to lay down the key principles of sustainable development.

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Chapter 6: FORESTRY AND COMMUNITIES IN CAMEROON

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Harvesting the Bubinga Tree in Cameroon
(Source: CED-FoEI)

Abstract
This paper provides an overview of Cameroon's logging situation – especially power issues, impacts on local populations, and the problem of illegality. The objective is to provide a new look at industrial logging in the region by using concepts taken from ecological economics and political ecology in order to stimulate a reflection that may foster a change. The article also focuses on legal devices supposedly aimed at mitigating negative impacts of logging activities such as the 1994 forestry law and the new Forest Law Enforcement, Government and Trade (FLEGT) process launched by the European Union. A positive point of the FLEGT is that it offers an opportunity for civil society to try to improve the legal framework – and its enforcement – regulating the logging sector operating in Cameroon. However, its economic rationale remains that which prevailed during the colonization period and continues today, namely to extract timber from peripheral poor regions and to export it to Europe. The concept of an ecologically unequal exchange is implicit everywhere in the present article, highlighting the crucial role of improving the balance of power relations.

Keywords: Industrial Logging, Property Rights, Community Forests, Commodity Chains, Ecologically Unequal Exchange, Cost Shifting, Corporate Accountability, Corruption, Wood Certification, Fair Trade, Consumer Blindness, Languages of Valuation, FLEGT-VPA.

1. Introduction

This article aims at providing a new reading of logging in Southern Cameroon by using concepts taken from ecological economics and political ecology in order to stimulate a reflection that may foster a change. In particular, it focuses on the “Forest Law Enforcement, Government and Trade” (FLEGT) process aiming at developing a “Voluntary

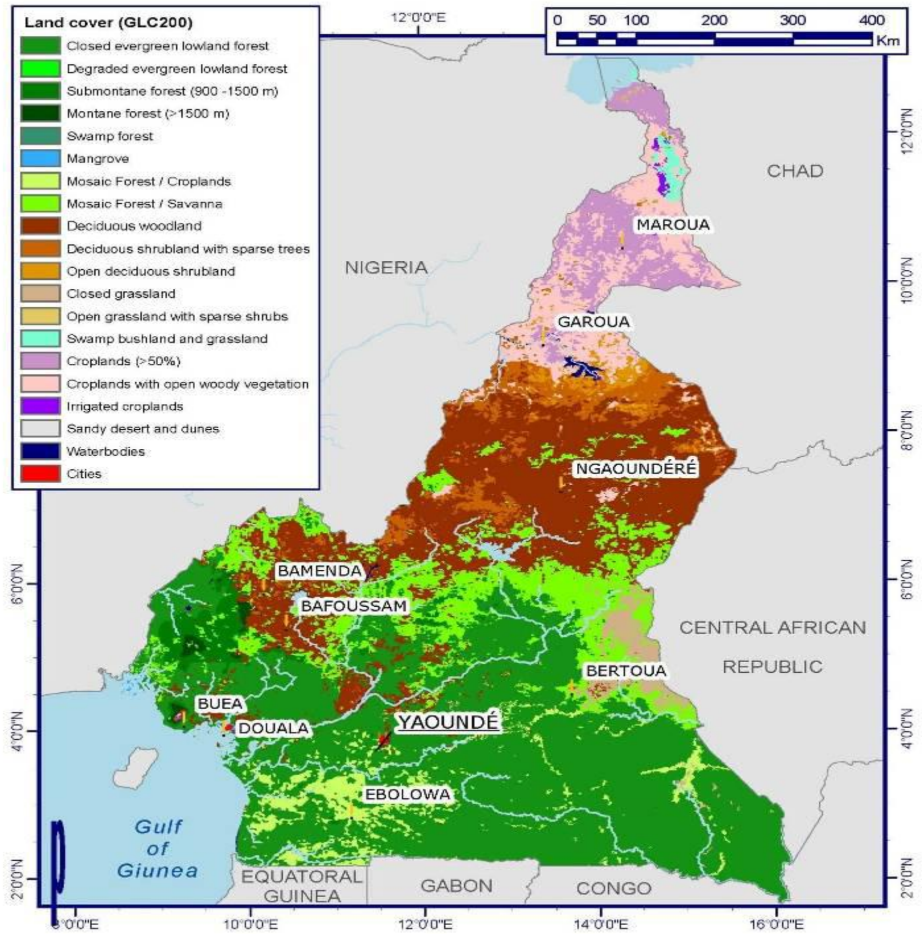

Figure 1: Vegetation in Cameroon
(Source: Ministry of Forestry and **1 :**
Wildlife and World Resources Institute, Interactive Forestry Atlas of Cameroon, version 2, Yaounde, 2007)

Partnership Agreement” (VPA) between the government of Cameroon and the European Union on the matter of legal timber trade. However, because this kind of process tends to restrict the discussion to a limited number of aspects, we find it crucial not to forget the bigger picture if our aim is to better understand what is at stake and what kind of strategies or public policies should be promoted. Accordingly, the paper provides a contextual overview of Cameroon’s logging situation – especially power and local impact issues.

1.1 The role of the forest

The Cameroonian forest covers an area of about 20 million hectares, which represents about 40% of the national territory (**Figure 1**). The importance of the forest is related to its multiple and sometimes conflicting uses and functions at local, national and global levels. From a conservation perspective, the forest constitutes a crucial reservoir of biodiversity, including many endemic species, and its contribution to climate regulation and other environmental services has now been established.

Cameroonian forests are the home to nearly four million persons belonging to Bantu ethnic groups as well as to the last indigenous populations of the African rainforest, the so-called "Pygmies". Forest Bantu societies practice shifting or rotational agriculture, each family producing what is necessary by cultivating itself the different crops. A family field typically has a surface of 0.3 to 1.5 hectares and is exploited during two consecutive years before lying fallow during 3 to 10 years, sometimes much more. Trapping, fishing, and gathering still bring a large part of the food domestically consumed. While most Bantu are engaged in the production of cash crops, they often still lack health and education facilities, or basic infrastructure. There are also in Cameroon three large ethnic groups of indigenous "Pygmy" peoples: the Baka, the Bakola/Bagyeli and the Bedzan. All of them traditionally live from hunting and gathering in territorial and remarkably egalitarian nomadic bands. However they are increasingly adopting a sedentary lifestyle (agriculture) under the influence of multiple factors, such as massive deforestation leading to the loss of resources essential for their biological and cultural survival.

All of these peoples, to varying degrees, depend on forest resources for their livelihood. The forest represents a kind of huge free "supermarket" providing food, medicines, construction and equipment materials, as well as ceremonial elements. Their standard of living therefore closely depends on the quality of the forest. This access to natural resources and **ecosystem services** outside the market has been described sometimes with the words "the **GDP of the poor**". Today, all these populations generally experience conditions of deep poverty, both in money terms and also in terms of direct access to resources. This phenomenon started with the arrival of the Europeans: first tradesmen looking for slaves, then colonists imposing labour obligations, taxes, and extracting natural resources in favour of the metropolis (timber, plantations, oil and mining). Before that happened, it can be argued that local populations were not "poor" as they adapted to their surrounding natural wealth, usually without undermining it.

1.2 The origins of timber exploitation

From a macroeconomic viewpoint, the exploitation of timber started during German colonization; took off after Second World War II, and intensified at the beginning of the 1990s. Timber thus became the second most important source of export income, after oil. The conflictive potential of the forest arises from the high profitability of its timber resources in a context of weak state control. This tends to drive loggers to act in contravention of their obligations, using corruption and other illegal practices, against the interests of the other forest users who complain accordingly. The resulting degradation of the forest tends to impoverish local populations. This is why the concept of **ecologically unequal exchange** will be implicit in the discussion throughout the article. The notion refers to a typical feature of the Cameroonian wood *filière*, or **commodity chain**, namely an extractive and export process characterized by the shift of negative environmental and social impacts onto forest communities and by the appropriation of wealth by Northern industries. A central question of the paper is to what extent the FLEGT process is really able to change this situation or it is simply going to legalize it further.

In order to better understand the situation, we start by briefly outlining the historical roots of the marginalization of forest communities. We then provide a discussion of power issues within the forest sector as well as an inventory of its impacts on local populations. After a brief analysis of the shortcomings of the measures that have been taken, especially the 1994 forest law, we focus on the most recent one – the new FLEGT process – before ending with some concluding remarks and recommendations.

2. Mise en Valeur and Impacts

2.1 The colonial legacy of power imbalance in extractive processes

According to customary institutions, local communities – whether Bantu or "Pygmy" – have ownership rights over the land and the natural resources on which they depend for their daily survival. These **customary rights** have been under threat since the beginning of the colonial period, when, in 1896, the German administration introduced written norms using the questionable concept of "vacant and ownerless lands". In this way, the colonial state was able to appropriate all land and resources through the transformation of **common pool resources** into state and private property. This process happened through a double movement: (1) the creation of rights for new actors: the colonial state and for private persons (physical or moral); and (2) the considerable restriction of the populations' **access rights** to land and resources.

In fact, a given plot of customary land could only be claimed as property when its owner was able to prove its *mise en valeur* (economic profitability) through cultivated fields or constructions. However, as many anthropological studies have revealed, the customary land of Bantu forest societies goes beyond the cultivated or inhabited areas and encompasses large portions of forest that are collectively managed (Diaw, 1997; 1998; Oyono, 2002; Bigombé Logo, 2004). The problem was still more difficult for the indigenous "Pygmy" communities whose hunter-gatherer lifestyle has little impact on the forest cover and their presence on a given area was therefore difficult to establish (Abega, 1998). The large areas they covered in search of food and other resources were consequently declared vacant by the colonial administrations and taken under its control – a practice that would be reinforced after independence (Nguiffo *et al*., 2008).

From 1960 onwards, independence was not at all characterised by a rupture in the philosophy of colonial law. This can be explained by the fact that the genuine independence movement was largely suppressed by the French army. Between 100,000 and 400,000 civilians sympathetic to the UPC (the "Union des Populations du Cameroun -

the main nationalist movement) were killed and their socialist leader Ruben Um Nyobé was assassinated by the French in 1958 (Survie, 2006). The only two Cameroonian presidents since then have behaved as "straw men" of France, to take up the expression of the famous Cameroonian writer Mongo Beti. The secret – and sometimes bloody – political-economic connections that continue today between France and Africa have been referred to as the "Françafrique", and have been traced to 1960 under De Gaulle. The term was coined in 1994 by French journalist François-Xavier Verschave who was a specialist on the phenomenon. These kinds of geopolitical relations are of importance for understanding institutional and economic change in French-speaking Africa but they are rarely mentioned by researchers (Agir Ici and Survie 2000; Survie 2006).

Despite the resistance against the first post-colonial legislations, Cameroon's "land tenure nationalism" (Diaw, 2005) culminated with the 1974 law, still the basis of today's land regime. The colonial notion of "vacant and ownerless land" was taken up again to the benefit of the state andambiguously recognized a limited space for customary institutions. In this process, forests were a major target, as securing bureaucratic control over forested land and timber constituted a critical ingredient in the mix of political-economic forces which historically shaped territorial nation-states across the globe (Neumann, 1997).

2.2 Today's macroeconomic actors in forest management

It can be argued that Cameroon – along with other countries in Equatorial Africa – is still subject to a system of neo-colonialism, perpetuated by the former colonial powers, by foreign capital and by the ruling classes at the national level. Germany, France and the United Kingdom all played a significant part in the colonial history of the country and remain influential "partners" on trade and macroeconomic policies. They are joined in their enterprise by other Northern governments, as well as by multilateral agencies, notably the World Bank and the International Monetary Fund (IMF) – in which they occupy strategic positions. For the most part, the former colonial countries and their home-based transnational corporations remain in a key position for dictating the terms of development and conservation in the region.

Foreign creditors and donors have always been very active in the forest sector and their assistance programs are generally conceived with the (naïve) intention of promoting both economic growth as well as ecological and social sustainability of forest activities. Despite numerous improvements in forest sector brought by the reform process that started at the end of the 1980s, the impact of their "goodwill" has, however, been limited. For instance, the World Bank and the IMF have persisted in supporting the development of the logging industry on the pretext of increasing state incomes but remaining apparently blind to the weakness of the same state – Cameroon was rated by Transparency International as "perceived to be the most corrupt country" in its international survey of 1998 and 1999.

Since independence, the State's main aim in the line of development policies has been to foster the industrial extraction of timber. Official discourse stresses the important contribution of the timber industry to national economic growth. Indeed, the state is a strategic actor in the management of Cameroonian forests, as it owns the forest and defines forestry policies and regulations. However, at the same time, it has an ambiguous power position for three main reasons. Firstly, as the government wants to attract direct foreign investments, it hesitates to be strict when companies commit even the most serious offences. Secondly, its capacity to monitor and enforce legislation is in any case minimal and limited both by corruption and structural adjustment policies, which have reduced the number of civil servants and their salaries. Thirdly, there is often a mutually beneficial relationship between political elites and foreign economic operators, involving the appropriation of wealth for both parties through bribery, corruption and transfer pricing at the expense of public benefit through lost revenues and royalty payments as well as at the expense of forest-dependent communities.

The economic operators involved in timber production are obviously key stakeholders in Cameroon's forest sector. Their objective is to maximize their financial benefits, which is easy to achieve in a corrupt country such as Cameroon. Since colonization until now, almost all timber extracted in Cameroon has been exported to Europe and, since 2005, also to Asia. French entrepreneurs launched the three first important companies in Cameroon in 1949 and French companies continue to be key operators in Cameroon – in logging activities as well as in plantations (Etoga Eily, 1971; Obam, 1992). The logging and timber processing industry is highly concentrated, with more than 80% of national timber extraction being generated by fewer than 20 large, predominantly European, companies (Cerutti and Fomété, 2007). Recently, Chinese operators have established themselves, either through the acquisition of European interests, or through acting as contractors for national interests (Karsenty and Debroux, 1997).

2.3 Accumulation by dispossession

The transition to capitalism has often been preceded by land appropriation by large private landowners and/or by the state, through different kinds of "**enclosure movements**", physical as well as legal. The English version of this process was defined by Polanyi (1944) as a "revolution of the rich". In Cameroon, Western law allowed the colonial administration to secure its access to natural resources by transforming customary common pool resources into state property. This phenomenon has led to an unequal repartition of **property rights** allowing capitalist accumulation through the dispossession of local communities (Harvey, 2003). A Western-type property regime is indeed central in the functioning of capitalism itself by standardizing the economic system, by fixing the economic potential of resources in order to allow credit and selling contracts, and by protecting (by armed force if needed) property and transactions (Heinsohn and Steiger, 2003).

Today, the approach of standard economics still emphasizes the necessity to extend a Western-type property system to all kind of goods and services in order to ensure growth and even "sustainability". Surprisingly, such policies still frequently refer to Hardin's (1968) "**tragedy of the commons**", which confuses regimes of open access with those of common property. According to Hardin, private/state property would supposedly allow the conservation of natural resources due to the clear definition of rights and duties. However, this theory has been criticized (Ostrom, 1990). The important point is to achieve a correct match between **institutions**, and the cultural and biophysical environments. Indeed, anthropological studies have shown that societies have often developed institutions regulating access rights to natural resources and duties between the different community members in order to ensure the social functioning of the group and the management of natural resources (Berkes, 1999). Thus, the transformation of common pool resources into state and private property – such as in Cameroon – has often been socially unequal and ecologically unsustainable.

Ecological historian Alf Hornborg (1998: 133) has defined three factors entering into any process of industrial accumulation: (1) the social institutions which regulate exchange; (2) the direction of net flows of energy and materials; and (3) the symbolic systems which ultimately define exchange values and exchange rates. So far, we have discussed the first two factors: first, how a Western-style property regime has become the official set of institutions legitimating and providing the colonial state – and then the independent state – the legal capacity to make claims over other people's resources; and secondly, how today's control over the flows of timber is carried out by a limited number of economic actors. Later, we shall tackle *inter alia* the symbolic system – the dominant "language of valuation" – that imposes unjust monetary exchange values to the detriment of other value systems.

3. Socio-ecological costs

3.1 Impacts on local populations

Logging companies consider the forest only in its economic dimension and their single objective is to maximize financial benefit. Their "grab-it-and-run" logic – a good example of what early 20th-century European geographers called *Raubwirtschaft* – consists in extracting the maximum of rich timber species in very little time, without concern for sustainability. These practices are based on high **discount rates**, indicating an undervaluation of the future. Companies want to get profits to pay back debt to banks (that charge interest rates), to pay dividends to shareholders, and to make further investments. Profits are obtained by discounting future sustainability. Accordingly, companies perceive sustainable management as a constraint to overcome. The impacts of this extractive model will be discussed next.

Although selective logging causes less damage to the canopy than clear cut logging, it provokes direct and indirect negative environmental effects. In particular, the search for the best trees means that companies build roads into relatively large areas of forest to extract the few wanted trees. This practice destroys the peasants' fields and opens up the forest to human settlements, to the development of agriculture, and to commercial hunting. While bush meat is traditionally important for forest peoples, the development of large-scale commercial trade in bush meat is relatively recent and has been directly and indirectly facilitated by the development of timber industries. As a result, wildlife populations are being decimated, including rare and endangered animals such as elephants *(Loxodonta africana cyclotis)* and lowland gorillas *(Gorilla gorilla)*.

Although promoters of timber exploitation argue that selective logging on large concessions is required in order to reach sustainable management, none of this, in actual practice, is proven to be true (see Debroux, 1998). Present logging methods are very destructive since the extraction of each cubic meter of wood implies the destruction of larger volumes, resulting in a significant change of the initial ecosystem diversity. Harvested volumes can be as low as 5–6 m^3/ha out of a potential volume of 35 m^3/ha. This is because only a few high value timber species (8% of known species) are extracted from the forest for commercial purposes. Among these species, six represent almost 80% of Cameroon's timber production: Ayous *(Triplochition scleroxylon)*, Sapelli *(Entandrophragma cylindricum)*, Azobe *(Lophira alata)*, Frake *(Terminalia superba)*, Tali *(Erythrophleum ivorense)* and Iroko *(Chlorophora excelsa)* (Auzel et al., 2003). Other high value species which are harvested include Moabi *(Baillonella toxisperma)*, sacrificing their use by the local communities to extract oil, fruits, and for medical purposes (Betti, 1996), and Bubinga *(Guibourtia* sp*.)*, which has spiritual and medicinal values as well. In addition, it is important to note that there is much waste of the valuable wood – up to 25% of raw logs – at the logging sites in the forest as well as at the sawmill (Gartlan, 1992).

4. Further limitations of conventional approaches

Conventional economists and policymakers usually look to a country's GDP when measuring its "economic health". However, GDP measures only the monetary value of goods and services produced and does not account for the physical flows of materials and energy within the economy which says a lot about the environmental impacts. Indian ecological economist Pavan Sukhdev found that the most significant direct beneficiaries of forest biodiversity and ecosystem services are the poor, and the predominant impact of a loss of these inputs is on the **well-being** of the poor. The poverty of the beneficiaries makes these losses more acute as a proportion of their "livelihood incomes" than is the case for the people of India at large, hence the notion of the "GDP of the Poor".

Instead of focusing on monetary **cost-benefit analyses**, ecological economics argues for evaluating any given economic activities through their biophysical dimensions as a way of highlighting their (un)sustainability. This is for instance investigated through **material flow analyses** (MFA) that looks at what materials are extracted, imported and used in a given region or in a given economic sector and with what consequences. An MFA of industrial logging in Southern Cameroon would be interesting from an activist perspective because it would assess its unsustainability. In effect, it could be potentially quite subversive to look at:

How much energy – oil – is needed for the typical process of timber extraction and for its exportation? (i.e. oil for the chain saw, the truck, the sawmill, the boat). The whole extraction/export process would appear as a pure madness from an energy point of view when compared, for instance, to the consumption of local populations.

How much biomass (i.e. forest plants) is destroyed by extractive machines and roads in order to reach the wanted species? In other more technical words, what are the "**hidden flows" or "rucksacks**" of selective timber extraction (meaning the "extra-economic", "forgotten" damages of timber extraction)? This figure is probably quite impressive, in tons. Again, the whole extraction process would appear as deeply unwise in view of the amounts of wastes and damages caused (in terms of biomass destruction).

How important is timber, from a physical perspective, for the importing economies? Cameroonian timber is not an essential bulk commodity for the metabolism of the importing countries. It is different from imports of oil, gas, phosphates, iron ore or steel, wood and wood products for paper. It would be insignificant in tonnage. It would clearly appear as a luxury good for some sectors of the upper classes, thereby emphasizing its futility and the recklessness of timber extractors as well as European consumers (when compared to local impacts). The European consumers suffer from something that in the CEECEC project we have come to call "consumer blindness", a social ailment that the activists of fair trade would like to cure.

How important is waste? Also, within the sawmill the quantity of material wasted would be accounted for in a MFA analysis.

Part of the rationale for promoting industrial timber production is that the sector contributes to poverty alleviation. This "underlying principle" needs to be challenged. A 1991 Oxfam report concluded that opening up Africa's forests to exploitation would "cause an increase in poverty rather than its resolution" and a 1990 report for the European Community stated that "forestry development and deforestation generally go hand in hand with the redistribution of wealth from the poorest (…) to a national elite and foreign companies (and) widens the gap between the rich and the poor in tropical countries" (Witte, 1992). For instance, contrary to what promoters say, the direct benefits of logging in terms of infrastructure development (schools, clinics, churches, etc.) are poor. Evidence shows a complex and far from positive picture of the impact of such operations.

Some employment opportunities arise, but not necessarily for people living locally. The best jobs in the foreign companies are for foreigners. Jobs in the logging industry are often short-term and remuneration can be very low. Facilities for the workforce are sometimes provided but their conditions are often poor and restrictive. Diseases such as alcoholism, malaria, ulcers and tuberculosis are widespread in the workers' camps. Forestry operations act as a magnet, often attracting thousands of newcomers deep into the rainforest. These new settlements are totally dependent on forestry activities. Once the timber extraction finishes, the towns invariably collapse. Such boom-and-bust townships are not sustainable: they cause social tensions between newcomers and existing communities, increase pressure on natural resources including bush meat, and facilitate alcoholism, prostitution and illnesses.

In many cases, the degradation of forests implies a disruption of successful local economies. Traditional ways of life are being eroded, threatening food security and livelihoods. Non-timber forest products (NTFP) become scarce, resulting in a direct loss of income for many forest-dependent populations. Women and the elderly are particularly badly affected as they are often the ones to collect and trade NTFPs, providing valuable food and cash for their families. Timber trees such as Moabi and Sapelli, for instance, have been highly valued for their many uses. Their over-exploitation has seriously disrupted local livelihoods and has led to a net loss of cash income for many.

In addition, beyond Cameroon itself, there is a loss of the environmental services provided by forests. Forests are sinks for carbon dioxide, the main gas causing an increase in the greenhouse effect.

5. Conflicting languages of valuation

The forest is thus a site of conflicts between competing values and interests reflected by different **languages of valuation** used by different classes and groups. How are such conflicts to be understood? The approach of standard economics (even when labelled "environmental") is to use of a common unit – a monetary numeraire – for all the different values and then to look for a compromise (a trade-off) between all of them within a market context. By "values" we understand what is considered important: conservation of nature? sacredness? livelihood? aesthetics? money? national sovereignty? Typically, conventional economists apply monetary compensation to the injured party to solve conflicting claims, using for example cost benefit analysis and **contingent valuation** methods. In some cases, as when asking for redress in a court of law in a civil suit, this is what is done: asking for money as compensation for damages. This approach assumes therefore the existence of value commensurability, that is, all values can be translated into money.

Ecological economists, in contrast, accept **value incommensurability** (Martínez-Alier *et al*., 1998). If a territory is sacred, what is its value in money terms? If the livelihood of poor people is destroyed, can money really compensate for it? Nobody knows indeed how to convincingly estimate the monetary price of cultural, social or ecological impacts of, for instance, deforestation. Instead of appealing to a unique numeraire, other ways are available for resolving problems related to a plurality of values.

In Southern Cameroon, the languages of valuation used by local populations are diverse. Most of the time, it is not the language of Western conservation (e.g. "biodiversity protection") nor it is the one of standard economics (e.g. "monetary compensation"): local populations use the languages of defence of human rights, urgency of livelihood, defence of cultural identity and territorial rights, respect for sacredness. The following information is relevant. Because of logging, "Pygmy" Baka lose bush meat, territory, trees, and product collection spots. However, they often say that the main prejudice they suffer from is noise pollution from chainsaws and trucks. In the Baka cosmology, when God created the world (humans and Nature), his favourite activity was to listen to the bees. So, humans had to stay quiet in order not to disturb God. But one day, some Baka began to make noise in the forest and God punished them by transforming them into wild animals. Noise is thus considered by Baka as a severe impact of logging since it is directly related to their religion, creating a “spiritual prejudice”.

In view of this, it is misleading – as standard economists do – to try to reduce such a diversity of languages to a single monetary measure and to put a price on forest degradation. Conventional conflict resolution through cost/benefit analysis and monetary compensation is therefore inappropriate because it denies the legitimacy of other languages. It simplifies complex value systems related to the environment into monetary units. Moreover, if the only relevant value becomes money, then poor people are disadvantaged as their own livelihood is cheaply valued in the market. The compensation will be scarce. Therefore, market prices and monetary valuation are themselves tools of power through which some sectors impose their own symbolic system of environmental valuation upon others, thereby defining exchange values and allowing the trade-off of economic benefits and socio-environmental costs in their own favour. In fact, we realize that poor people are well advised to defend their interests in languages different from that of monetary compensation for damages, because in the capitalist sphere the principle that “the poor sell cheap” is operative (Hornborg *et al*., 2007).

Values are often incommensurable. This means that they cannot be measured in the same units. It then appears that only a truly democratic debate can solve valuation contests. **Social multi-criteria evaluation** is a tool from ecological economics that allows the comparability of plural values and sometimes helps to reach compromise solutions. It also shows which coalitions of actors are likely to be formed around different alternatives (Munda, 1995). In reality, however, it is usually the most powerful actor that imposes his own viewpoint and language of valuation. In this context, quite obviously, conflicts are sometimes the only way to change power relations favouring the dominant actors, and to advance towards equity and sustainability.

6. Unequal patterns of trade

The present structure of trade relations between different world regions is, to a large extent, a consequence of the international division of labour, which has developed since the beginning of colonization in the 16th century (Wallerstein, 1974; 1989). This process has structured Southern economies according to the interests of industrialized countries, transforming them into suppliers of bulk raw materials, precious commodities, and cheap labour in logging, plantations, mines, and ranches.

These imposed directions of material flows inevitably lead to an unequal distribution of environmental burdens related to extraction activities, i.e. to an ecologically unequal exchange, where negative environmental impacts are shifted to poor world regions and “clean” final products are exported to rich countries (Bunker, 1985; Altvater, 1994; Hornborg, 1998; Muradian and Martinez-Alier, 2001). International trade opens the possibility for industrialized countries to maintain – or even increase – the national environmental quality without changes in the resource intensity of the population’s increasing **consumption**. This is possible because world markets prices of raw materials or other exported goods do not take into account their depletion as well as local externalities (Cabeza-Gutés and Martinez-Alier, 2001; Hornborg et al., 2007). In this way, the negative environmental impacts are shifted to the extractive periphery while wealth is accumulated in the centres. The notion of an ecologically unequal exchange highlights the fact that the specialisation of Southern countries in primary exports tends to impoverish the environment upon which local populations depend for their livelihood. This applies also to regions within large countries (eg. Brazil and India).

Considering the limited power of Southern countries on world markets and the falling prices for primary commodities (as we see now again in the crisis of 2008–2009), revenues and debt service payments can often be maintained only through an increase of physical export volumes. According to Giljum and Eisenmenger (2004), these mechanisms allow "the maintenance of high levels of resource consumption in the North and lead to environmental destruction and the maintenance of unsustainable exploitation patterns in the South". The ecologically unequal exchange highlights power imbalance. The logging of Cameroonian forests is a prime example of this phenomenon.

Conventional economics looks at environmental impacts in term of **externalities** which should be internalized into the price system. One can see externalities not as market failure but as cost shifting success, however which can sometimes backfire for business companies because they might give rise to environmental movements (Martínez-Alier (2002: 257). One conclusion is that "the focus should not be on 'environmental conflict resolution' but rather (within Gandhian limits) on conflict exacerbation in order to advance towards an ecological economy" (ibid.).

During the early 1990s, the idea of the North's **ecological debt** to the South began gaining currency (especially in Latin America). Friends of the Earth International – to which the CED also belongs – gave support to this notion in some of their meetings and writings. Activists have been at the forefront of this discussion. Ecologically unequal exchange and the disproportionate use of natural resources and environmental space by industrialized countries are the main reasons for the claim of the ecological debt. Examples of unpaid costs that the North owes to the South with respect to industrial logging are *inter alia*: (1) unpaid costs of sustainable management of renewable resources – especially the trees that have been extracted/exported; (2) the costs of the future lack of availability of destroyed natural resources; and (3) the compensation or reparation for local damages produced by exports (such as the destruction of forests, fields or graves). Of course, these aspects of the ecological debt defy easy measurement. However, although it is obviously not possible to make an exact monetary valuation, it is certainly useful to establish the orders of magnitude in order to stimulate political debates and consciousness-raising. The social and ecological consequences of logging activities will be developed in the next section.

The moabi tree *(Baillonella toxisperma)* provides a good illustration of ecologically unequal exchange giving rise to environmental conflicts expressed in different languages of valuation. Various interests and cultural values crystallize around this species: this moabi is (1) endemic to the Congo basin forest and endangered, (2) particularly valued by loggers, as well as (3) essential for local populations and especially for women.

It is Africa's largest tree – some specimens can reach 70 meters of height, five meters in diameter and up to 2,000 years of age – and it is emblematic of the ecological damage caused by commercial logging. Its biological characteristics make it very sensitive to industrial exploitation because its reproduction is fragile due to a slow growth rate, a late sexual maturity (after about 70 years), a spaced fructification periodicity of about three years, and a high predation rate on seeds and young stems (Debroux, 1998). Moabi are today rare in the littoral region, where commercial logging started about one century ago, while it is still possible to find them in the south-eastern region of the country. The Canadian International Development Agency has classified it as an "endangered species" and Friends of the Earth International campaigns for its inclusion in the Red List of the Convention on International Trade in Endangered Species (CITES).

The moabi is the eighth most exported tree species in Cameroon (in volume of sawn logs), a fact that shows how sought after this species is by commercial loggers. Its price per cubic metre is very high, making of it more of a "preciosity" than a bulk commodity. It is a luxury consumption good, used for furniture, parquet, yachts and so on. The six main groups of moabi loggers own 40% of the forests affected by logging. In 2005, they produced 92% of the moabi national production. The French groups (Pallisco, Rougier) have produced 45.2% of the total moabi production from 2000 to 2005 and the Italian groups (Patrice Bois, Fipcam) 19.6%. Like all Cameroonian timber, moabi are integrally exported to industrialized countries. France has imported 71% of the production from 2000 to 2005 and Belgium 23.5%. Accordingly, moabi trade takes place in the continuity of the commercial relations that began under the colonization.

In parallel, the moabi is a central element of forest societies of Southern Cameroon who complain and resist its logging. The moabi fulfils four central functions: cultural, medicinal, food and, now, economic. First, deceased important persons were traditionally sat at the bottom of the tree or in a cavity of the trunk and left there to decompose; the moabi became thereafter a totem embodying the power of the ancestor. Second, more than fifty medicines can be prepared using moabi leaves, roots, sap or bark, such as those to cure vaginal infections and for healthcare related to childbirth. Third and fourth, fruits are consumed and the seeds produce oil used for self-consumption as well as for sale on a limited scale. The production of oil is controlled by women, from the collection to the commercialisation.

In the conflicts over the moabi, this tree is accordingly not only valued through the language of standard economics (that is, market prices). While forest societies refer mainly to the defence of livelihood (including health, food and income), cultural values (including sacredness and the defence of customary rights) and social justice (illegitimacy of logging practices), the logging companies typically use the idioms of economic growth and state law. Such conflict can be understood as a clash on valuation standards. The concept of an ecologically unequal exchange is also relevant as the price of the moabi timber does not take into account its depletion nor local externalities. Indeed, the majority of the benefits remain in Western countries – and particularly in France – while most environmental and social costs are imposed on the country and particularly on the populations of the extractive regions.

7. Attempted Mitigations

7.1 The 1994 Law and Involvement modalities of local communities

In order to solve the growing conflicts related to industrial logging, in 1994 the state adopted a new set of forestry laws that came into force under the auspices of international actors such as the World Bank (Bigombe Logo, 2004; Cerutti and Tacconi, 2008; Ekoko, 2000). A zoning plan was designed that divides the forest territory into a Non-Permanent Forest Domain (NPFD) and a Permanent Forest Domain (PFD), itself divided into about 100 Forest Management Units (FMU) from which the majority of the bulk of annual timber harvest is collected. Among the main changes, there is a declared will to associate communities to forest management and to the benefits generated by logging, through the creation of (1) "legal" community forest and (2) annual forestry fees.

Such "community forests" remain within the NPFD and correspond to a maximum area of 5,000 hectares, whose management is attributed by the state to given communities for a period of 25 years renewable. Local populations thought that the creation of "official" community forests would be a way of claiming their customary institutions and secure a peripheral area around their villages. However, in reality, the formalization process is a huge challenge for them as it is complicated, time-consuming, onerous, and the administration's free support mentioned by the 1994 law was never turned into practice (Nguiffo, 1998). Moreover, the treatment of community forest by the administration is more severe than that of industrial logging concessions with respect to forest management plans and sanctions.[42] Finally, the areas allocated for community forests are virtually always much more limited than the customary ones. These points highlight the fact that the zoning plan was designed without taking into account the customary institutions and forest management of local populations.

A new taxation system was also put in place as part of the legal requirement for exploiting state concessions: 10% of the new annual forestry fees are allocated to local communities, 40% to city councils, and 50% to the state. The 40% to councils is also supposed to be used for the development of communities. Although it is a good idea to tax natural resources that are exported (sometimes these are called "**natural capital depletion**

42 A management plan is required before any exploitation for community forest, while for logging concessions, a provisional agreement of three years allowing exploitation is conceded. In case of law offences, there is direct cancelling of the community forest permit against a gradual system planning financial sanctions for logging companies.

taxes”), in reality these taxes are often misappropriated by local bureaucracies and rarely get down to the people.

Thus, despite the social benefits of the 1994 law, in practice, populations experienced huge difficulties to accede to what they in principle had rights to. In February 2000, a workshop organized by the British government found that industrial timber production in Cameroon “tends to benefit a small minority (often foreign investors), and its contribution to poverty alleviation is minimal” (Hakizumanwani and Milol, 2000). The workshop made a series of recommendations which would need to be implemented before local development could be equitably achieved, including (a) greater transparency in the use of the income generated by forest resources; (b) equity in the redistribution of income as local communities see just a tiny fraction, if any, of the money generated by logging; (c) institutional decentralization; and (d) the creation of favourable conditions for local people to climb out of poverty through self-initiative.

7.2 Achieving sustainability: the illegality trap

Another objective of the 1994 forest law was to promote the sustainable exploitation of the forest through the creation and reinforcement of protected zones, through the implementation of a minimum standard in terms of forestry management practices, and through the eradication of illegality. It has fostered a revival of Cameroon’s interest in conservation.

The 1990s saw the beginning of many projects related to protected areas in the South of Cameroon: Korup, Mount Cameroun, Dja, Campo-Ma’an, Lobeke Lake, Boumba Bek and Nki. The scarcity of the state’s means and the low technicality of its personnel have attracted foreign aid agencies involved in the management of such areas: in all cases, their management is supervised by international conservation NGOs, particularly by the WWF. The problem with such projects is that the regime on protected areas imposes important restrictions on local communities regarding their access to land and forest resources. Indeed, the law often proscribes any human activity in protected areas. In this field also, the objectives of involving local communities with the management of protected areas are not being translated into facts, instead, transforming the protected areas into a field of fierce confrontation between local communities and conservation agencies or state administrations, sometimes culminating into exchanges of insults or shots (Nguiffo, 1998).

With respect to management practices, the FMU system has replaced the former system of concessions. FMU are allocated by auction to a company for 15 years renewable and force loggers to set up a management plan, respecting minimum standards of exploitation that has to be approved by the administration. However, reaching that minimum seems to be the exception rather than the rule. Forestry officials do not have the capacity to monitor the operations of companies nor to enforce legislation.

In that context, illegal logging and trade in timber has, since the beginning of the 1990s, continued to increase and today has reached worrying proportions. The 1994 forest law was the first attempt in reaching sustainability and equity, assuming that a “good” legal system would constitute *per se* an adequate and sufficient response. Later on, in view of the systematic violation of the law – including by those who were supposedly in charge of enforcing it – several “independent observers” were created and contracted, such as Global Witness, Resource Extraction Monitoring, Global Forest Watch, and Cameroonian private firms. They are mainly active at two stages: (1) in the commission allotting FMU and (2) in the legal monitoring of forestry operations. However, independent observation has quickly shown its limits: if it is true that these observers improved the understanding and exposure of illegal activities (tax evasion, timber quantities), they never had the power to guarantee sanctions. Indeed, very few companies have been sanctioned on the basis of the reports of independent observers.

7.2.1 Daily illegal practices

It is important to understand that logging companies are not the only actors involved in illegal practices. The administration also plays a key role – and this is why mitigation policies (such as the FLEGT process that will be discussed below) are likely to be ineffective. The state benefits from a presumption of legality. However, since the first years following the implementation of the 1994 law, it was not unusual that decisions taken by the administration were in flagrant violation of the legislative and regulative clauses in force. Several strategies aiming at circumventing the law have been used. The following can be mentioned:

Allocation of concessions outside the legal process

It is through Decree no. 96/076 of 1 March 1996, signed by the Prime Minister, that the government has allotted the first concessions, following the 1994 reform. It concerns five Forest Management Units (FMU) that were allocated exceptionally and in complete illegality to the companies Coron and CFC (*Compagnie Forestière du Cameroun*). The five FMU represent a total area of 334 158 hectares. The allocation resulted from a procedure based on mutual agreement against the law. Moreover, although the law imposes a maximal area of 200 000 hectares for such FMU, the CFC apparently received 215 680 hectares (Durrieu de Madron & Ngaha, 2000), instead of the 197 398 hectares announced in the notification letter prepared by the MINEF.[43] This inaugural allocation clearly indicated a line based on opacity, in spite of the clauses of the new law and the proclaimed objectives of the forestry reform in favour of more transparency.

Allocations of concessions in violation of the results of the auction system

In accordance with the 1994 law, the MINEF has published in January 1997 the very first invitation to tender for the granting of forestry concessions in Cameroon.[44] It concerned 23 FMU, representing a total of 1 685 000 hectares. In October 1997, the beneficiaries of the new FMU were notified, through the Forest Department, about the results of the deliberation of the Commission allocating concessions. After a closer look at the results, it became obvious that the final beneficiaries had not always been the highest financial and

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43 See Correspondence No. 045/L/Minef/DF/SDEIF of 13 August 1996 to the Management of the CFC.
44 See Auction No. 0158/AAO/Minef/DF/SDIAF of 13 January 1997.

technical bidders. In one third of the cases, the final beneficiaries had not been recommended by the Commission and among the 15 companies chosen by the Commission only five were the highest bidders with the best technical scores. Objectivity is therefore far from having ruled the first invitations to tender in Cameroon. And the World Bank admitted in a 1998 report: “Finally the Government has started to auction cutting rights, but […] in the October 1997 allocation of concessions, the specified allocation criteria have not been fully respected. Bidders are supposed to be preselected based on minimum technical qualifications, and the highest prequalified bidder. But concessions were awarded to the highest bidder in only 10 of 25 cases. In most of the cases (16 of 25), concessions were awarded to the most technically qualified bidder. In other cases, concessions were awarded to bidders with low technical ranking and low bids” (World Bank, 1998: 17). These opaque processes have had a significant cost for state finances: because of the non-allocation to the highest bidder of some of the FMU, it is estimated that the state loses about 4 million euros per year (GFW, 2000).

De facto **extensions of the duration of provisional conventions**

The 1994 law stipulates that beneficiaries of concession titles can only enjoy a provisory convention of a maximum length of three years, “during which the industrialist is obliged to complete a certain number of works, notably the installation of industrial unit(s) for wood transformation”.[45] Article 67(2) of the Decree of 23 August 1995, providing for the application modalities of the forest regime, specifies the nature of the works in question: an inventory of the management, the elaboration of a five-year management plan, an operation plan for the first year, the delimitation of the exploited areas, and the installation of a transformation unit. These works are executed under the responsibility of the logging company. Many provisional conventions have lasted for more than the three years provided for by the law and without carrying out the realization of these works. Although such breaches are sometimes the administration’s fault (but not always), it remains nevertheless true that they are violations of the law – and violations that the FLEGT process will have to deal with. Technically, the timber taken out from these concessions is illegal as the law does not provide for an extension of the provisional convention.

Delocalisation of *ventes de coupe*

Ventes de coupe (cutting permits) are part of the forestry devices provided for by the 1994 law. They consist of authorisations to exploit during a limited period of time a precise volume of wood on an area no larger than 2 500 hectares. If a *vente de coupe* is planned on a given forest zone, the project must first be presented to the neighbouring communities, who benefit from a preferential right if they want to ask for a community forest on the same area. If local communities have no interest in it, the MINFOF starts a public auction process for the *vente de coupe* in question. Following this, bidders are invited to visit the site in order to better prepare their offer. When offers have been sent to the MINFOF, they are opened by an Interdepartmental Commission allocating titles composed *inter alia* of an Independent Observer. At the end of the process, the best offer

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45 See Article 50(2) of the 1994 forestry law.

is chosen and the MINFOF signs an allocation decree of the *vente de coupe*. However, these requirements are not always respected by the administration and it is not rare that such *ventes de coupe* are allocated at places different than those indicated in the invitations to tender. This was for instance the case for 15 *ventes de coupe* that were visited by the Independent Observer in October 2007.[46] Called out by the latter, the Forest Department confirmed that the *ventes de coupe* concerned had been displaced and intended to justify such illegality by explaining that the beneficiaries, once they had already paid all the legal fees, discovered that the titles were localised on places without forest cover, notably on markets, schools and villages.

Abusive use of authorisations for recuperating wood

Such authorizations are generally given when roads, plantations or any development project are planned. These last few years, they were at the heart of serious governance problems within the MINFOF.[47] These titles – formerly considered "small" in view of their maximal area of 1 000 hectares, their limited validity periods, and their limited quantities of timber produced – became the second source of wood supply after the FMU because of systematic abuses. During 2006, they concerned an annual volume of more than 300 000 m^3 of wood. Following a series of missions, the Independent Observer reported that more than 80 per cent of them resulted from illegal procedures.[48] The most common cases are title delocalization, beyond-limit exploitation, fraudulent use of marks, and non-payments of taxes. According to the same report, a large part of these illegalities are endogenous to the MINFOF. The trafficking of waybills *(lettres de voiture)* around areas of authorisations for recuperating wood also apparently originates from the MINFOF itself, as well as the erroneous and partial entries in the computer-aided management system of forestry information (SIGIF), making this tool malfunctioning and useless. It turned out for instance that because the Direction of Forests did not reclaim and follow up the effective use of the waybills, many of them remain in the hands of loggers and are subsequently used in the laundering of illegal timber.

The problem of illegal logging and the trade in associated timber products led the European Union (EU) to propose a new type of legal device that will be analysed next: the Forest Law Enforcement, Government and Trade (FLEGT) process.

8. The FLEGT process: Origin and scope

FLEGT traces its roots as far back as 1998. It arose from the recognition that illegal logging results in serious environmental and social damage, as well as severe loss of income to governments. In a G8 Summit in 1998, where measures to tackle illegal logging were discussed and an "Action Programme on Forests" formally adopted, it was acknowledged that illegal logging costs governments an estimated $10 billion every year in lost revenues. In 2002 at the World Summit on Sustainable Development held in Johannesburg, the European Commission set out a strong commitment to combat illegal

46 See Quarterly Report No. 10 of 6 October 2007 (www.observation.cameroun.info.org).
47 See Annual Report of March 2007–March 2008 of the Independent Observer (www.observation. cameroun.info.org).
48 Idem.

logging and the associated trade in illegally-harvested timber. The EU published its first Proposal for a FLEGT Action Plan in May 2003. A number of other initiatives, arising from both national and international commitments, have developed in parallel. In particular, three regional FLEG (Forest Law Enforcement and Governance) processes have been established in South East Asia, Africa (AFLEG) and Europe and North Asia (ENAFLEG). These processes, co-ordinated by the World Bank, have resulted in ministerial commitments to identify and implement actions to combat illegal logging in each region.

The main objective of FLEGT is to combat illegal logging and the trade in associated timber products. This must be seen as part of an EU policy to secure imports of natural resources in a manner that causes less conflict. The EU is a very large net importer of natural resources. To achieve this aim, one of the strategies used is to provide support to timber-producing countries. This is done through the conclusion of Voluntary Partnership Agreements (VPA) with timber-producing countries that wish to eliminate illegal timber from their trade with the EU. These agreements will involve establishment of a licensing scheme to ensure that only legal timber from producing countries (so-called "Partner Countries") is allowed into the EU. Unlicensed consignments from Partner Countries would be denied access to the European market under the scheme. The agreements are voluntary, meaning that Partner Countries can decide whether or not to sign up, although once they do so the licensing scheme is obligatory. In May 2010, the Cameroonian government and the UE finally concluded a VPA, after Ghana (in 2008) and the Republic of the Congo (in 2009). Each VPA requires – according to the circumstances of each Partner Country – a definition of "legally-produced timber" and the means to verify that wood products destined for the EU have been produced in line with the requirements of this definition.

8.1 Critical analysis of the FLEGT-Cameroon

8.1.1 Stakes of the Process

The appropriate application of a VPA in Cameroon seems very tenuous as the parties involved have various expectations and interests (avowed or not) with respect to the FLEGT:

The main aim of the EU is to ensure that all wood and derived products that enter its territory come from legally logged and exported trees, on the basis of the national definition of legality of the producing country, integrating at best all aspects of sustainable forest management. Cameroon's government seems to perceive the FLEGT, on one hand, as an instrument able to promote and enforce the technical and fiscal aspects of forest management and, on the other hand, as a marketing tool able to promote and show a political will of forest "good governance" allowing to seduce donor partners and to attract foreign capital. The main goal of the private sector seems to be to make sure that the standards developed within the FLEGT process will be less restrictive and as credible as the ones prevailing in certification schemes such as the Foresty Stewardship Council (FSC). However, there might be private sector actors who see in FLEGT a chance to differentiate their "high quality" product and achieve higher prices. Civil society expects that the FLEGT process will integrate into the definition of legality the principles and criteria related to ecological, social and economic sustainability (such as the ones used in the certification) as well as participation (such as the rights of indigenous people). Civil society hopes thus that the process will lead to a compulsory standard of legality including sustainability and the recognition of human rights, including indigenous territorial rights.

8.1.2 Definition of legality

A questionable consensus was reached by the members of the technical committee in charge of negotiating the definition of legality within the framework of a VPA for Cameroon. It covers the following points:

— the exclusion – to the benefit of logging companies – of all the social and environmental obligations that are admitted within the certification framework but that are still not introduced in the law;

— the unification of the legal framework (without expressions such as the “main” or the “minor” laws and regulations) and the inclusion of all the national and international legal instruments that can be applied to the forestry sector;

— the guarantee that the reform of the relevant legislations will precede the implementation of the VPA

9. Discussion: Challenges Ahead

9.1 Defining and managing “legality”

This consensus surely represents progress, highlighting the fact that civil society has been successful in establishing a number of ideas. However, many challenges are still to be taken up before reaching a good definition of legality. Among them, there are at least: (1) the management of the “original illegality”; (2) the question of the illegal wood seized and sold by the administration; and (3) the integration of the legal requirements whose related legal framework does not provide for documents proving that they have been respected.

First, there is the management of the “original illegality”. The current version of the document dealing with the definition of legal wood suggests that only non-governmental actors can act illegally. There is a presumption of legality on behalf of the administration. However, such a presumption is misleading.

Second, there is the question of the wood seized and sold by auction by the administration. According to the 1994 law[49], such auctions only concern wood already logged and they are organized in order to ensure the commercialization of the wood seized by the administration because of abandonment or illegal exploitation. However, sales by auction have proliferated with the reinforcement of the donors’ vigilance with respect to the allocation process of the concessions. The practice consists in auctioning an important and

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49 See Article 144(1).

fictive volume of wood, the proof of the sales being then used as a justification for the exploitation of timber up to the limit of the same volume. Incidentally, the minister of the environment has himself recognized – and condemned – the existence of these fraudulent practices: “I have noticed that various economic operators of the forestry sector carry out, sometimes with the complicity of employees of the Minister of the Environment and the Forests [MINEF], fraudulent logging in the forest, and then come to my services in order to get authorizations for the removal of the wood supposedly abandoned in the forest or in order to seek for their profit the organisation of sales by auction of abandoned wood, [a practice] that is now forbidden”.[50] In spite of this, the sales by auction have continued and continue replacing legal ways of accessing the resource (GFW, 2002). Consequently, it would be desirable – in order to discourage such large-scale illegal and unsustainable logging practices – to exclude from the FLEGT and from exports in general all wood issued from sales by auction, and to reserve it for the internal market only.

9.2 Verification and credibility

As we have seen, illegal activities proliferate in the forestry sector as the 1994 law was not correctly enforced and the MINEF did not benefit from enough means to ensure the monitoring of forest exploitation. Indeed, in 1998–1999, official exports reached 2.9 millions of cubic meters, while the official production was only of 1.9 millions of cubic meters (Cuny et al., 2004).

This reality has pushed international donors and buyers to demand the application of forest laws and a more efficient verification process in Cameroon. Notably, they have put several Independent Observers in charge of monitoring the allocation of the forest exploitation titles, the logging activities, and the forest concessions through remote sensor techniques.

In parallel, the Ministry of Finance has been more involved in the application of the “good governance” principles. Within the framework of the structural adjustment program and due to the need for increasing the national income of the forestry sector, this ministry has been in charge of all the fiscal responsibilities devolved to the MINEF until then.[51] Moreover, the Securitization Program of the Forest Revenues (PSRF), created in 1999, is supposed to allow the Ministry of Finance and the MINEF to collaborate on a rigorous monitoring of the fiscal revenues of the forest sector. They are supposed to exchange information in order to allow for a better collection of the data and a more effective and harmonious detection of offences (Cerutti and Assembe, 2005). As we have seen, these control systems present some weaknesses due to the lack of capacity of Independent Observers to guarantee sanctions.

In spite of the important lessons concerning illegality, the FLEGT negotiations in Cameroon only put the MINEF in charge of the responsibility of the verification implementation. It is imperative to create a multipartite verifying structure in order to guarantee the process’ credibility. The MINEF seems to have understood this point well as it has asked the EU to

50 See Circular Letter No. 0399/LC/MINEF/CAB of 30 January 2001.
51 See Decree No. 08/009/PM of 23 January 1998.

associate European representatives to such a structure in charge of the verification. But the EU has declined the offer, arguing that Cameroon is a sovereign state that has to ensure legality verification on its own. The non-interference argument is inappropriate when the timber companies are European and when the history of exploitation and change in property rights dates back to European colonization.

Moreover, local communities – which have been long aware of problems – should be allowed to actively take part of the decision processes. Many crucial questions are today open and can only be addressed with local participation, such as:
Should industrial logging activities continue in the primary rainforest? If yes, on what area should logging activities take place?
Who should pay for reforestation?
Who judges sustainability? The company? The state? What about the workers, local peasants, or “Pygmy” communities?
Sustainability for whom? With what criteria?
What is the extent of illegal logging, what is the value of official statistics?

9.3 Participation

The FLEGT-VPA process formally creates space for dialogue in the producing country between the parties involved (government, industry and civil society) as well as inside of the different groups.[52] On the one hand, it seems justified to acknowledge the efforts of the administration in the dialogue with all the parties involved in the signature of a VPA. On the other hand, it is important to point out that a full and effective participation of civil society has not been achieved, despite the inclusion of mechanisms for participation. The following breaches can be mentioned:

Lack of full participation of civil society in all the activities led by the Cameroonian party.

Lack of an institutional framework related to the participation of civil society. A technical commission in charge of conducting the VPA negotiations has been created, under the decision of the Minister of Forests, and allows civil society to be associated to the process. However, the institutional conditions of its participation have not been provided.

Lack of a clear mode of decision-making within the technical commission.

Lack of access to information and documentation for all the parties involved. This is one of the main conditions for effective participation of civil society in the process.

Weak representation of civil society and limits on its contribution. Although civil society is represented by a group of organisations regrouped into a platform, it has only one seat in the commission and it is therefore impossible for civil society to deploy all the expertise existing within the platform.

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52 See p. 5 http://www.euflegt.efi.int/uploads/EFIPolicybrief3ENGnet.pdf

*Confusion in the representation of civil society. Civil society h*as suggested, without success, that open invitations should be made so that it would be able to choose the members entitled to represent it.

10. Conclusions

The pattern of extraction of forest resources, disguised as "selective logging" to the benefit of foreign companies and consumers, continues to be unsustainable in Cameroon. Moreover, the forest is still the scene of many illegal practices that were adapted to the new rules – they became more complex and sophisticated and can therefore give the impression to have decreased (Cerutti and Tacconi, 2008). However, this is not the case. The FLEGT might help to improve this situation under certain conditions. However, **corporate accountability** has still not been implemented and environmental and social liabilities remain outside the accounting books of companies, and outside the state's budget. Old colonial rules changing property rights to the land and forests did not change with independence. The benefits of conservation in terms of environmental values and the provision of products and services for the local population have been sacrificed to the pursuit of monetary gain by companies that enjoyed concessions. The state has not been able or has not been unwilling to implement legislation that provides for strict zoning of forest areas and for substantial taxation of wood exports. Attempts at community co-management have not been successfully implemented either.

There are now new attempts in the law and in international negotiations with the EU to reduce illegal timber exports and to secure the application of sustainability criteria in forest management and timber exports. A number of points arise:

First, the solution to the issue of sustainability involves much more than enforcement of the law, as what is considered legal is far from being in line with principles of sustainable forest management. In addition the FLEGT is flawed because (1) it is based on a presumption the state is acting legally, and (2) it entrusts the state with the monopoly of the verification process, despite the fact that there are numerous documented cases in which the administration has acted in total illegality.

Second, the FLEGT process offers an opportunity for civil society to influence the regulation of the logging sector operating in Cameroon, allowing different kinds of actors to discuss controversial issues together. In this sense FLEGT has created a space for improving participation in logging practices. However, the full and effective participation of civil society on this issue is far off. In fact, the FLEGT VPA in Cameroon could be seen to hold a systemic "tyrannical potential", insofar that it may well facilitate the illegitimate and / or unjust exercise of power (Cooke and Kothari, 2001) in the management of this country's forests. This is because in aiming to stop illegal logging through providing support to timber-producing countries, the support offered under FLEGT only extends to the establishment of a licensing scheme, stopping well short of assisting with the implementation of a multipartite verifying structure for guaranteeing the credibility of the

VPA process. In presuming that the government of Cameroon has the will and capacity to create open, democratic governance structures, the FLEGT VPA leaves Cameroonian forests vulnerable to processes that will likely result in the strengthening of elites and local power relationships that so many projects committed to **public participation** and empowerment fall prey to (Hilyard in Bryant 2002).

Third, the FLEGT does not challenge the legitimacy of Northern consumption patterns, nor does it question the legitimacy of private operators that originate from the North and that accumulate the lion's share of the produced wealth. FLEGT's economic rationale basically remains the same as that which prevailed during the colonization period and continues today, namely to extract timber from peripheral poor regions and to export it to Europe in a pattern of ecologically unequal exchange. This "environmental injustice" arguably arises from a kind of "environmental racism". Nevertheless, the FLEGT initiative can to an extent be interpreted as an attempt to move towards fairer trade, by providing instruments for verifying compliance with legal provisions, similar to the certification of wood in other international schemes.

To conclude, at this stage, it is not clear to what extent the FLEGT process will really be able to challenge unsustainable forestry in Cameroon. While one of the best ways to establish extractive processes that are more equitable is to foster democratic deliberation, or what is sometimes vaguely referred to as "participation", this can only take place within more balanced power relations – a fact that is clear from the idea of conflicting languages of valuation. A democratic process would undoubtedly result in improvements in the redistribution of revenues and legal recognition of customary tenure arrangements, as well as increased timber prices.

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Chapter 7: LET THEM EAT SUGAR: LIFE AND LIVELIHOOD IN KENYA'S TANA DELTA

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Gamba Village in the Tana Delta
(Source: Leah Temper)

Abstract
The Tana Delta in Kenya is one of Africa's most valuable wetlands. It is home to two dominant tribes, the Orma pastoralists and the Pokomo agriculturalists, both competing for control of water and land resources in the delta, sometimes in violent conflict. But the delta also holds much of Kenya's potential of irrigable land. A variety of projects have been proposed. Among them two sugar plantations, which will transform over 200,000 ha into a sugar monoculture, producing industrial and table sugar as well as ethanol. Another project would see the leasing of a large tract of land to the Qatari government, part of a trend of middle-eastern economies appropriation of land in Africa. This article examines the historical background of development projects in the delta and how ecological economic indicators such as virtual water, HANPP and EROI can be used to argue for sustainable development of the delta in line with existing livelihoods there.

Keywords: Wetlands, RAMSAR Convention, Land Grabbing, Irrigation, Pastoralists, Property Rights, Customary Rights, Bio-Fuels, HANPP (Human Appropriation of Net Primary Product), EROI (Energy Returned on Energy Input) Virtual Water, GDP of the Poor, Resilience

1. **Introduction**

The Tana Delta (**Figure 1**) is frontier land. Bordering Somalia on the edge of the Kenyan Coast, this marginal and isolated district has long been an axis of contraband, banditry and arms smuggling. While safety has improved in recent years, even today travellers to the area are told that they should be accompanied by an armed military officer. But the delta is also where over 50% of the potential of undeveloped irrigable land in Kenya lies. With food and land prices still high despite the financial crisis, with

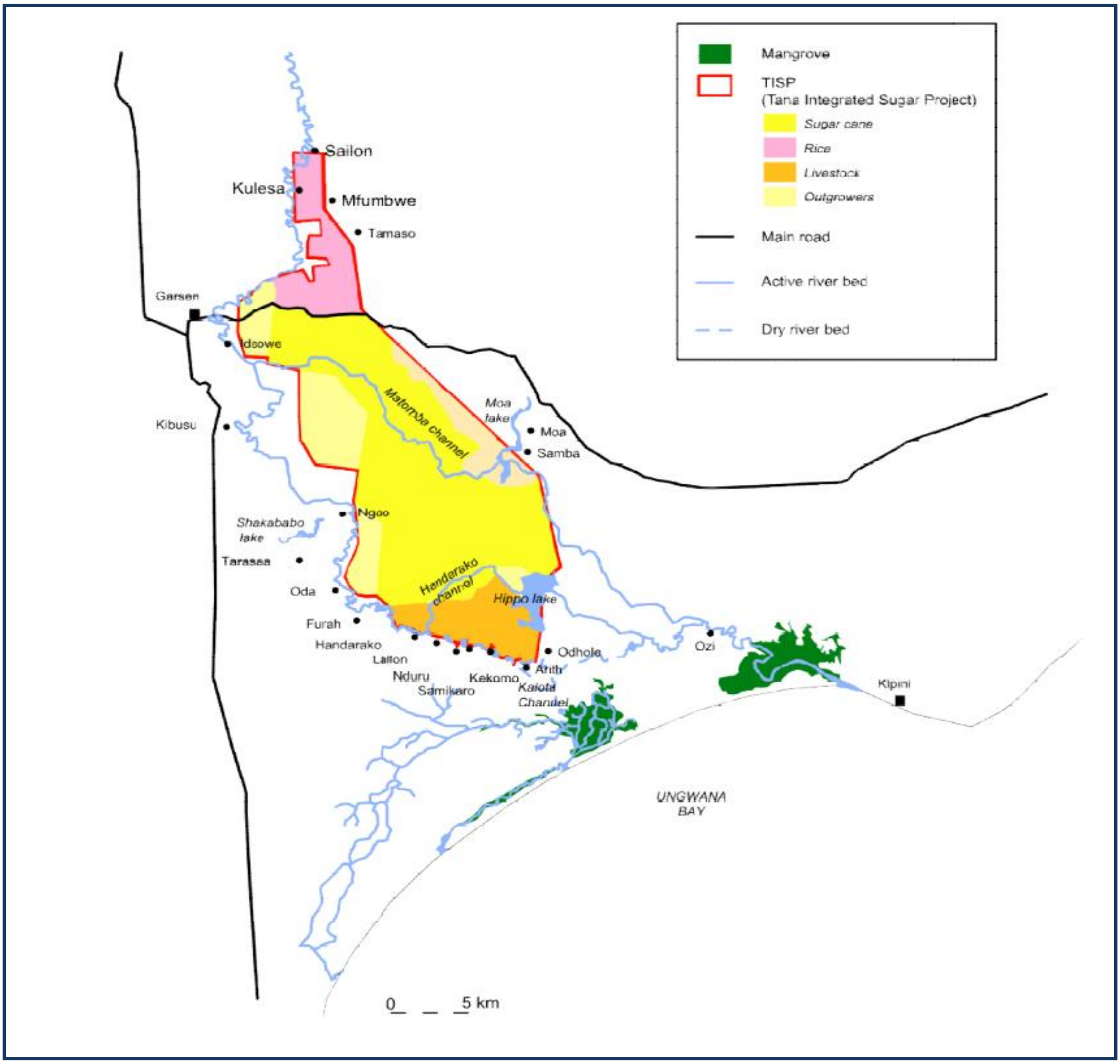

Figure 1: Map of Tana Delta
(Source: Olivier Hamerlynck & Stéphanie Duvail)

population growth, the question is not, when agricultural development will come to the delta, but what sort? There are already many players trying to get a piece of the pie: Kenyan sugar companies, international agro-fuel companies, and foreign governments **land grabbing** to ship food abroad. But the delta is inhabited by farmers, fishermen and pastoralists living an ages-old way of life, with their own “biomass and water conflicts” among themselves. Some of them, mainly the pastoralists, say they will fight to the death to defend their land and livelihood.

The question is how the wealth of the fertile delta should be distributed, for the well-being of the inhabitants and their livelihoods, for the economic development of the country, and finally, what will be left over in nature for the other species that cohabitate with humans. This paper will describe the ecology and peoples of the delta, briefly discuss some of the previous (failed) development plans for the delta, then focus on the current plans and offer an alternate vision for the delta’s development.

2. The Delta and its People

The Tana is Kenya’s mightiest river. It flows over 1000 km from the foothills of Mt. Kenya to empty into the Indian Ocean in Kenya´s remote east. At its base, lies the Tana Delta, one of the most important wetlands in Africa, covering 1,300 sq. km. The range of habitats within it, including riverine forests, grasslands, savannahs, bush land, lakes, mangroves, dunes, beaches, and estuaries, mean it is a hotspot for biodiversity, supporting uncounted plant and animal species including over 350 bird species. The Tana is also home to two endangered primates – the Tana River Red Colobus and the Crested Mangabey monkey. Other wildlife includes buffaloes, zebras, and hyenas, hippopotamus, and the Nile crocodile.

Figure 2: Nomadic pastoralists of the Tana Delta
(Source: Leah Temper)

There are two primary ethnic communities living in the delta, the Pokomo, Bantu-speaking Christian sedentary farmers and the Orma, Kushitic speaking Islamic nomadic pastoralists (**Figures 2 and 3**). The remaining inhabitants include the Wardei pastoralists, Luo fishermen and other tribes. The Pokomos practice flood recession agriculture along the banks of the river, growing maize and bananas and other vegetables for subsistence and mangoes and rice as cash crops.

The delta is an important dry season grazing area for the pastoralists and hosts about 60,000 heads of cattle during the dry season, while 20,000 head of cattle graze permanently in the area. In general, the pastoralists maintain a higher standard of living than the agriculturalists. They oppose any project which could threaten their livestock and reduce grazing areas. The Pokomo, in contrast, are more sympathetic towards agricultural development projects but are wary due to unfulfilled promises in the past.

Figure 3: Gamba Village
(Source: Leah Temper)

2.1 Property rights, resource distribution and conflict

Co-existence in the delta between the communities is uneasy, sometimes leading to violence. An examination of the causes behind a series of tribal conflicts in 2000-1 between the Pokomo and the Wardei-Orma allow us to understand the role of **property rights** and **access rights** to the resources underlying them. Property rights in the delta are often complex and overlapping, with concurrent systems of private, public, and common land and different rights to access, usufruct, leasehold and freehold. Much of the land in the delta is trust land, whereby it is held in trust and administered by the county council for the community. This trust land may be set aside for purposes deemed to benefit the

residents, or transferred to the government. Yet there are many instances where this "trust" is abused.
Apart from property rights over land, are access rights to water. For example, among the Orma wells are owned by the person who first dug it and their patrilineal descendents (Ensminger&Rutten, 1991). While the Pokomo lay claim to the land along the riverbanks to practice agriculture, the Orma stake their claim over the river waters. Violence erupts when the Orma try to gain access to the river for their cattle, often trampling and grazing in the Pokomo farms in the process.

Some property rights theorists (who perhaps have read **Coase** second-hand) hold that clearly defined property rights should reduce conflict by creating shared expectations and through the creation of markets for damages. However, in practice, property rights are not easy to "clearly define". Socio-environmental conflicts are often over the property rights, as we see at world level with the disputes on the rights to dump carbon dioxide in the oceans and atmosphere. It is naïve in the extreme to think that all that is needed for efficient allocation of natural resources and compensation of damages are "clearly defined" property rights and markets. In the context of property rights to water, "when a fixed expectation comes up against a fluctuating resource, that in itself can be a source of conflict" (Meinzen-Dick & Nkonya, 2005).This is why rights of access to water are often ambiguous and based on principles open to negotiation rather than clearly defined rules. The attempt to formalize rights that were previous **customary rights** thus can be a source of conflict in itself. sometimes described as a "**tragedy of enclosures**" as when mangroves are turned into shrimp farms.

Thus one of the triggers for the flare-up of inter-tribal violence in the Delta in 2000-01 was related to the acitivities of the Land Adjudication Commission which, began in 2000 to favour a liberal land policy based on individual ownership. This policy created a sharp split between the Pokomo and the Orma/Wardei. The Orma/Wardei accused the Government of fuelling ethnic conflict by imposing a liberal land tenure system on an area where land is communally owned without adequate consultation. The year was also dry one, adding fuel to the fire. After the clashes, over 100 people lay dead and many rendered homeless.

3. Past projects: Parks for Primates and World Bank White Elephants

The Tana Delta could house a museum featuring failed World Bank (WB) projects. From conservation parks constructed as zoos to keep the local population out, to shrimp farms that destroyed valuable mangroves, to misconceived irrigation projects, the delta is testament to the failure of the Bank's strategy of top-down projects that fail to take the local peoples and environment into account. Thus the Kenyan government's attempts to civilize and bring the Eastern frontier closer to the centre has met with little success, due to a combination of bad planning, resistance on the part of local people and environmentalist campaigns.

3.1 Dam construction

The Kiambere **dam**, completed in 1993, was a success in that it now provides 140 megawatts of electrical power to Kenya's growing urban population. However, the people of the delta paid heavily in the name of national interest. Over 6,000 were displaced without any compensation, with those families losing over 82% of their money-equivalent income (Kagwanja, 2003). As Hadley Becha, the director of the East African Wildlife Society points out, the waters of Tana River were supplying this country with electricity from before independence. And yet the communities of Tana only got electricity last year (interview, 2009).

3.2 Conservation and research

The Tana River Primate Reserve (TRPR) was another WB funded project abhorred by the local people. Based on the conservation logic of the incompatibility of human and animal co-existence, the local Pokomo were displaced from their ancestral territory to make way for a reserve for the Mangabey and Colobus monkeys. As the Lonely Planet guidebook shares in a quirky aside about the delta, things came to a head when 300 naked Pokomo women stormed the research centre is protest. Ironically, according to the Pokomo oral history, they themselves brought the Mangabey and Red Colobus to the banks of the Tana River when they migrated there from central Africa more than 600 years ago. This claim is substantiated by the fact that the primates are more numerous near villages than in abandoned forestlands (Horta, 1994).

The TRPR logic is based on the conception of Africa as a zoo for foreigners and scientists, a common complaint in a country where 7% of the land, an area the size of Denmark, is designated as National Parks and protected by armed guards from the Kenya Wildlife Service (KWS) who shoot poachers and encroachers on sight. The TRPR case also highlights the often opposing positions of conservationists and local communities in Kenya, with some saying that the plane crash which led then director of the KWS, Richard Leakey to lose both his legs was an act of sabotage by those opposed to the reserve. However, their interests can also sometimes align, as in the fight against the Mumias sugar company in the delta, where environmentalists and pastoralists have entered into a marriage of convenience. Here we see the combination of two streams of environmentalism joining together to mutual benefit: cult of wilderness with **environmentalism of the poor** (Guha and Martinez-Alier, 1997)

3.3 Irrigation

The next project hatched was the Bura Irrigation Scheme, with the original aim of settling around 5000 farmers in 23 villages to grow cotton and maize on 6700 ha of land. An additional 4500 ha of irrigated forestry were to provide for the fuel wood of the estimated 60 000 settlers. The Bura scheme was an utter failure, crippled by corruption and mismanagement. The wrong choice of the pumps was made whereby components and spare parts came from different continents. Siltation destroyed the pumps and the dredgers were rendered useless (BISS, year). According to Horta (1994), in a country where per capita income was only about $350 per year, the project spent an incredible $55

000 for every settler. Yet today, the settlers are poorer than before and the area is a wasteland, overrun by the invader bush mathenge (*Prosopis juriflora*).

The most recent “white elephant” project was the Tana Delta Irrigation Project (TDIP) rice scheme, managed by the Tana and Athi River Development Authority (TARDA). The TDIP represented a switch in policy from irrigation schemes with settlement and freeholders to new plans for “economically motivated” commercial estates with a few out growers. These new estate schemes, while unlikely to be a cure for unemployment and landlessness, were thought to be more likely to produce an economic return. This was not to be as the TDIP rice scheme collapsed due to flooding after the El Niño rains in 1997.

3.3.1 Land in dispute

The communities list a number of unfulfilled promises by TARDA, including not paying for crops in a timely fashion and not building promised schools and hospitals. Moreover, after the construction of an embankment, TARDA claimed the land as their property. The communities are still in court trying to claim back the expropriated land. Despite the fact that the case is still pending, the new Mumias sugar project is planned on the same disputed area.

4. Future projects: Outsourcing the Delta

Little has been learnt from the errors of the past. Future plans for developing the delta continue in the same line. None of them try to achieve food or livelihood security for the peoples of the delta but instead focus on bio-fuels development and food for export.
The Mumias Sugar Company, in a private joint venture with TARDA, plans to turn 20 000 ha of the delta over to sugar production. Outputs would include industrial sugar, the co-generation of 34 megawatts of electricity from the bagasse (the fibre left over after the juice has been squeezed out of sugarcane stalks), an ethanol bio fuel production plant and a livestock element. On 11th June 2008 Kenya’s National Environment Management Authority (NEMA) approved the project’s **Environmental Impact Assessment** (EIA). Environmental organisations have gone to court citing the impact of the project on the Tana Delta’s ecology, biodiversity and local people’s livelihoods and on 11th July 2008, they were granted a temporary injunction stopping the project. For the moment, the fate of this project and another proposed sugar project in the region by another company - MAT international - are unknown.

4.1 Livelihood risk

Despite the fact that Mumias, in its operations in Western Kenya near Lake Victoria, sources 90% of its sugar cane from smallholders, the plan envisaged for the delta is that of the 20 000 ha under cultivation, 16 000 would be under nucleus farming – a centralized operation controlled by the company with hired labour. The remaining 4000 ha of cane would be produced by out-growers from among the company´s employees. So, the 20 000 jobs on offer would almost certainly be work cutting cane. This is back-breaking work, for low pay, but it also seasonal. So the Pokomo farmers would be giving up their land for a risky labour situation.

4.2 Land grabbing and bio-diesel

A more recent proposal involves leasing an area of 30 000 ha to the government of Qatar in exchange for a loan to build a 3.4 billion dollar port in Lamu. The government of Qatar would provide the technical know-how and the technology for the agriculture project and all the produce, probably fruits and vegetables, would be shipped back to Qatar. This plan is part of a much wider phenomenon dubbed "land grabbing" (GRAIN, 2008). Stemming in part from the food crisis of 2008 which saw food prices rise enormously, it has caused food importers primarily in the Gulf countries and Asian countries, to feel they can no longer depend on the market to guarantee food supplies. Instead they are acquiring huge swathes of cheap farmland, much of it in Africa, and plan to outsource their food production there. However, as GRAIN outlines in their report, another motivation for this land grab is the financial crisis. Companies and private investors see land as a commodity that is undervalued and it is being touted as an investment vehicle for a financial return.
Another project in the pipes is the leasing of land at 1$ a hectare to a Canadian company, Bedford Fuels, hoping to plant jatropha for biodiesel in a $300 million project. Despite being praised as a plant that grows without water, jatropha needs water if it is to give a good crop. In South India it competes with food crops (Ariza and Lele, forthcoming).

5. Alternative analyses

Nature Kenya have conducted an alternative **cost benefit analysis** that argues that the wealth created in the delta is much greater than the potential returns from the Mumias sugar plantation (Mireri, 2008). They argue that the profitability foreseen in the EIA is predicated on the fact that the Tana Integrated Sugar Project (TISP) will not have to pay for the use of abstracted water from River Tana: some 28 m^3/sec or approximately 2 420 000 m^3/day. If they were to pay the Water Board, this would cost no less than KES 1 815 000 (16 000 €) per day or KES 662 475 000 (close to 6 million €) per year. They also consider the land to be undervalued. They are interested in undertaking a more complete valuation that will also take into account the foregone **environmental services** of the Delta's ecosystems.

There are other technical ecological economics arguments against these projects: the low **EROI** (energy return on energy input) of sugar cane ethanol when factoring into the accounts the energy value of the pastures produced naturally that would be destroyed; the "**virtual water**" expenditure for growing the sugar cane; the increased **HANPP** (Human Appropriation of Net Primary Production) at the expense of the biomass needs of other species.

5.1 An Ecological Economics Approach: EROI, Virtual Water and HANPP in the Delta

From an ecological economics perspective, an analysis of the flows of energy of different sources and flows of materials and water in the delta, both in the current situation and under the sugar plantation scenario can help underline the relative sustainability of different development schemes for the delta, the impact they will have on the local populations, the **resilience** of the ecosystem and the wildlife. The following section outlines the relevance of three eco-eco methodologies.

5.1.1 EROI

EROI stands for Energy Return on Energy Input. As availability of easily accessible fuels decreases, the concept of EROI becomes more relevant. Essentially, it asks – how much energy does one need to invest to get a certain amount of energy back? For example, when extracting oil, when you first strike a well the crude may come gushing out like a geyser, as the oil level goes down, one needs to invest increasing amounts of energy to pump the oil out of the ground, refine the oil, and so on. In fact it may reach a point where more energy would be needed to be invested in pumping, refining, and so on, that it makes more sense to leave the rest of the oil in the ground. This is the point when the EROI is below 1. If one energy unit is needed to get three or four (as it occurs in the best of cases with bio fuels), then the amount of energy available for other sectors of the economy is too little to maintain a high standard of living.

Bio fuels (or agro-fuels) require large energy inputs in the form of irrigation, fertilizers, pesticides and so on, and after that need to be processed and converted into biodiesel or ethanol. Also, they are grown in areas where some net energy was produced before in the form of pastures or other crops. This is now sacrificed. Many question whether the low EROI of bio fuels because of such intense use of inputs and water justifies their perceived low carbon footprint. Particularly because fertilizers are made with non-renewable fuels. The low EROI of bio fuels is a sign that they are really not reducing carbon dioxide emissions, and therefore an argument can be made against incentives that have been offered to Mumias – for example in 2009, Mumias signed a ten year agreement with the Japan Carbon Finance Company, which will allow the company to sell Certified Emission Reduction Credits (CERS) from the electricity Cogeneration Project from bagasse (Mumias website).

This falls under the Clean Development Mechanism (CDM), which allows Japan to “offset” emissions through funding initiatives in developing countries to achieve sustainable development through greenhouse gas-reducing projects. Another problem with this, apart from the low EROI, is that the soils of the delta hold vast stores of carbon which will be released into the atmosphere when the land is levelled and vegetation cleared to prepare it for the sugar project. Calculating the net carbon savings from such a project is thus a complex process, reliant on factors that CDM projects do not always take into account.

5.1.2 Virtual Water

Water availability in the delta is irregular, highly dependent on the twice yearly rainy periods. Even currently, there are conflicts over water in the delta between different groups. The EIA of the Mumias project already expresses concerns over the possibility of increased conflict for water under the sugar scenario. One way to express this would be to use the **social metabolic** concept of virtual water.

Virtual water allows us to quantify the water used in traded goods between countries or regions. Thus if water is being diverted for irrigation purposes to the sugar cane plantation, it may no longer reach downstream users. When the sugar is exported, it contains some water, but this water is only a small fraction of all the diverted water that was required to grow and process the sugar/or ethanol. All the water that has gone into the whole process is called the Virtual Water Content or the Water Footprint of the commodity. In the case of the Tana Delta, it would be interesting to look at the Virtual Water of the sugar plantation or of the Qatar plan. The virtual water would be water no longer available in the same form for the human inhabitants and to the biodiversity of the delta. Even if some of the water were to enter back into the system, it could be polluted with fertilizers and pesticides and no longer serve the same purpose for the peoples and the wildlife of the delta. The virtual water argument is an increasingly useful tool because we must keep in mind that one corollary to land grabbing is water grabbing – and those whose water is being appropriated are not being compensated for this additional loss of a scarce resource.

5.1.3 HANPP

The HANPP indicator is a measurement of the impact of human activity in a given territory. It indicates pressure on the biodiversity. It is calculated by seeing how much of the net primary productivity – biomass flows created through solar energy, are appropriated by human activity, and how much is left in the ecosystems for other species.

As humans passed from hunter gatherers to agricultural and then to industrial societies, they altered more and more the area around them. In this way, HANPP has been likened to a way to measuring the “scale” of human activities compared to natural processes (i.e. the “physical size of the economy relative to the containing ecosystem;” Daly, 2006). Global calculations have been undertaken for HANPP as well as some localized studies. In the case of the Tana Delta study one application would be to look at the distribution of the HANPP between the two competing groups (agriculturalists and pastoralists) sharing the same territory.

The distribution of the energy flows is of particular interest because the inhabitants of the delta rely almost entirely on the biomass production of the Delta for their biomass/energy needs. Thus, the HANPP and its distribution among the tribal groups give us insight into the conflict between them, as pastoralists and agriculturalists. The biomass can also be seen as a type of **GDP of the poor** (TEEB, http://www.teebweb.org/) – how does the ability to appropriate biomass outside the market relate to the well-being of the distinct groups.

HANPP also allows us to measure sustainability and sustainable resource use in a particular region. Since we are interested in the ecological resilience of the delta, a clearly demarcated area, this would allow us to see the pressure exerted upon the delta, showing the usefulness of the HANPP as a changing indicator of pressure on biodiversity probably increasing with time. It clarifies how among the various forms of appropriation of biomass (grazing, agriculture), which are more compatible with different types of biodiversity (birds, crocodiles). By resilience we mean the ability of an ecosystem to withstand changes, or the ability to recuperate after changes. If an ecosystem is deprived of the biomass energy and the water required, it might resist for a while but then it loses resilience and flips over to a different system.

We can also examine what the new HANPP will be under the sugar scenario. In the case of irrigated sugar plantation, human intervention would probably increase the net primary production over that which would be produced in the original eco-system. However, this biomass will be much simplified in its biological richness and moreover it will be appropriated and no longer available to either the inhabitants or the wildlife of the area. To the contrary, the export of HANPP (the direct and embodied HANPP) will substantially damage the livelihoods of the pastoralists of the area and impair their ability to appropriate biomass through grazing. Thus what we will have is a model of the competing claims for the HANPP among different groups (human and animal) within the delta and their relationships to each other.

These methods for the study of social metabolism provide alternative ways to appraise proposed projects in other ways besides pure monetary valuation that is undertaken for example in a cost-benefit analysis. We can examine the changes in bio-physical terms as a means to gauge the (un)sustainability of a given development plan. This can be complemented in campaign work by valuation of the ecosystem services of the delta and alternative management plans developed through extended peer networks of stakeholders with vast local knowledge.

6. Impacts: Let them eat sugar (and drink ethanol)

The impacts of these intensive agricultural projects are numerous and they raise both environmental and social issues. Even the Environmental Impact Assessment of Mumias questions whether the proposed abstraction of irrigation water from the Tana River can be maintained during dry months and drought periods (EIA, p. 136). Reduced flow could lead to damage of downstream ecosystems, reduced availability for livestock and wildlife and increased conflict, both inter-tribal and between humans and wildlife. Meanwhile pollution from fertilizers and pesticides may lead to the accumulation of nitrates in ground water and the use of phosphorous can cause eutrophication and algal blooms in the lakes and rivers.

Despite the recognized conservation value of the riverine forests, the plans contain no provisions for alternate energy sources for the 20,000 workers who will be hired for the sugar plantation. Assuming fuel consumption of 67kg per household on a weekly basis, this translates to 194,769 kg per week, which works out to 10,127,988 kg per year (EIA). The biomass available for cattle will also be squeezed and put under enormous pressure. This is the only dry season grazing area available to the pastoralists of the delta.

Ironically, as pastoralists settle, their grazing area becomes reduced and milk availability falls. One of the major substitutes for calories in the diet is heavily sugared tea. To make the tea involves boiling water, further increasing pressure on the forest resources. Thus at one time, their integration in the market increases, as does the pressures exerted on the environment. It is a chain reaction; the analysis of which is often lacking in development project planning. Johansson´s study of irrigation projects in the delta concludes that “irrigation schemes in arid and semi-arid areas lead to high population densities in areas with low carrying capacity” (Johansson, 1991).

7. Conclusion: The Key to Development – Saving the Swamp

Historically, wetlands have been seen as problems to be solved, drained, dredged and dried out. Only recently, have scientists and policy makers began to understand their value. Some wetlands are now protected through the international Ramsar convention. Even The Economist magazine, not noted for its environmentalist bent, questioned the Kenyan government’s wisdom of planting sugar in the delta, noting how in Florida the Governor was buying over a hundred miles of sugar plantations to allow them to convert back to wetlands in the Everglades (The Economist, 2008). The choice to develop a region is often irreversible and the water filtration and other environmental services that the delta provides are still poorly understood.

Despite the conflicts in the delta, it should be kept in mind that such wetlands have enriched, rather than impoverished by the diversity of land uses and livelihood strategies that occupy them. The mosaic of grazing, agriculture and forests contributes to the ecological balance and diversity that thrives in the delta. Thus in one sense, the conflicts between pastoralists and farmers and between humans and wildlife, contribute to the sustainability of life there. Environmentalist groups would like a section of the delta declared a Ramsar site as a protected wetland. But environmentalists, herders, farmers and monkeys can all co-exist peacefully, as long as conflict-resolution methods and improvement in the uses of the resource base are integrated. The inefficient local practice of burning down trees to create charcoal for example, can be curtailed through the introduction of more efficient stoves or LPG. Meanwhile, increased crop livestock integration such as the selling of crop residues from the farmers to the pastoralists would enrich both sides (Gefu&Kalowale, N.D.).

Based on interviews with the residents of the delta in July 2008, their demands to add value to their production are clear and easy to implement. According to a young Orma, “We want help with marketing and distribution and factories for skin production and beef production.” Local farmers already produce the apple mango for export, and other compatible cash crops could be developed. Currently, environmental groups are drawing up a Master plan for the delta based on surveys of the local communities´ shared vision. As Hadley Becha, the director of the East African Wildlife Society, says, “We need development that brings added value to the livelihoods already existing in the delta, not development that aims in a day to turn a pastoralist or a fisherman into a sugar cane cutter” (Interview July 2008).

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Chapter 8: LOCAL GOVERNANCE AND ENVIRONMENT INVESTMENTS IN HIWARE BAZAR, INDIA

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Carrying fodder in Hiware Bazar
(Source: Supriya Singh)

Abstract
Hiware Bazar is a village that has achieved success through investing in local ecology for economic good. The village followed an integrated model of development with water conservation as its core. It won the National Water Award for its efforts in water conservation and raising village productivity levels. The village is outstanding because it uses water as the core of village development, it is community driven, its village-level resource planning is impeccable, it uses government programmes but with the community in the driving seat, and it has thought out its future plans to make the initiative sustainable. This case study examines the keys to the success of Hiware Bazar with a view to identifying the potential for replication across region and country.

Keywords: Environmental Investments, Rural Poverty, Water Governance, Grazing Rights, Collective Decision-Making, Community Resource Management, Water Harvesting, NREGA (National Rural Employment Guarantee Act), Institutional Innovations, Property Rights, Virtual Water, Bio-gas, Livelihood Security.

1. Introduction: Water Scarcity in Ahmednagar, Maharashtra

In the Ahmednagar district of Maharashtra State, the village of Hiware Bazar is located around 17 km west of the town of Ahmednagar (see **Figure 1**). The district is the largest in the state and exhibits contrasting living conditions within it. The north of the district is prosperous with sugarcane cultivation and a large number of co-operative sugar factories. This part is canal irrigated and economically better off, while the southern half of the district features rain-fed farming and limited agricultural activity. This has lead to the out-migration of people in large numbers for work in other parts of the district as well as outside of it.

Figure 1 : Hiware Bazar, Ahmednagar, Maharashtra
(Source:CSE)

The district lies in the Maharashtra plateau, with a mix of flat agricultural land and undulating terrain. In most seasons, the hills are bare and dry. Farmers survive mainly on groundwater and levels are declining. Rainfall is variable and drought common. Even in years when rains have been bountiful water has been scarce. The average rainfall is around 400-500 mm, but its persistent failure is what breaks the district's back—there have been three consecutive years of drought from 2001 - 2003. Furthermore, the terrain in the district is undulating and there are pockets of hard impervious rock spread across the area making access to groundwater difficult.

The **property rights** regime in the area, as in much of the rest of the country promotes over-extraction of water. Groundwater as a resource belongs to anyone who owns the piece of land from where the water is drawn. Water as a resource is 'free' as this regime calls for no control over use of water. At the same time, the issue of groundwater recharge is left to nature and is not generally seen as necessary for people to manage. The countryside is therefore perforated with hand pumps, tube wells and bore wells to quench the thirst of people and agriculture. Statistics show that 80-90% of the irrigated area in the country still sources its supply from groundwater. In addition, 80% of drinking water supply in the country is also sourced from groundwater resources. This means that massive utilisation without ascertainment of the resource's recharge has led to water scarcity across the country.

State response to the shortage of water has been varied, with investment in recharge programmes like watershed development schemes and even employment generation schemes to fund rainwater harvesting across villages. The Employment Guarantee Scheme (EGS) of Maharashtra was one such scheme rolled out to provide relief during drought conditions in the early 1970s. The scheme offers each rural person 100 days of paid labour a year to work on rural development works. In 1972, when the state was hit with crippling drought and mass migration, it implemented this scheme by which professionals working in the cities would pay for employment in the villages. This

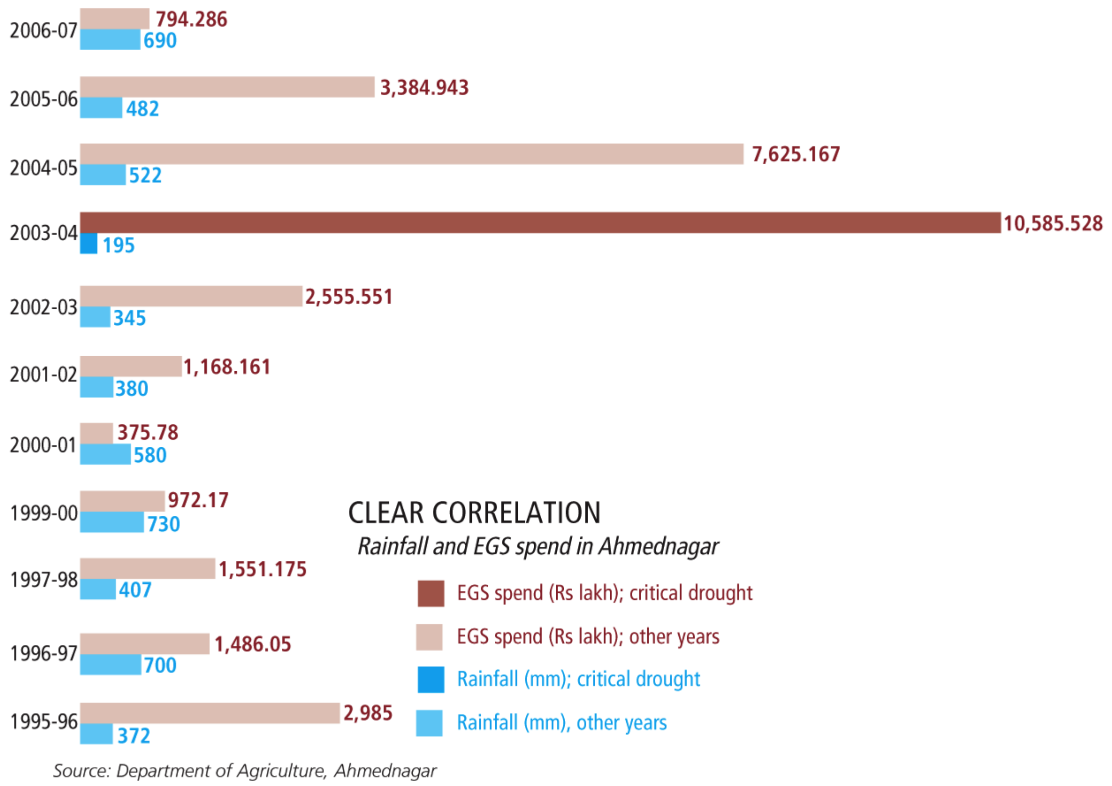


Figure 2: Water, Jobs and Soil

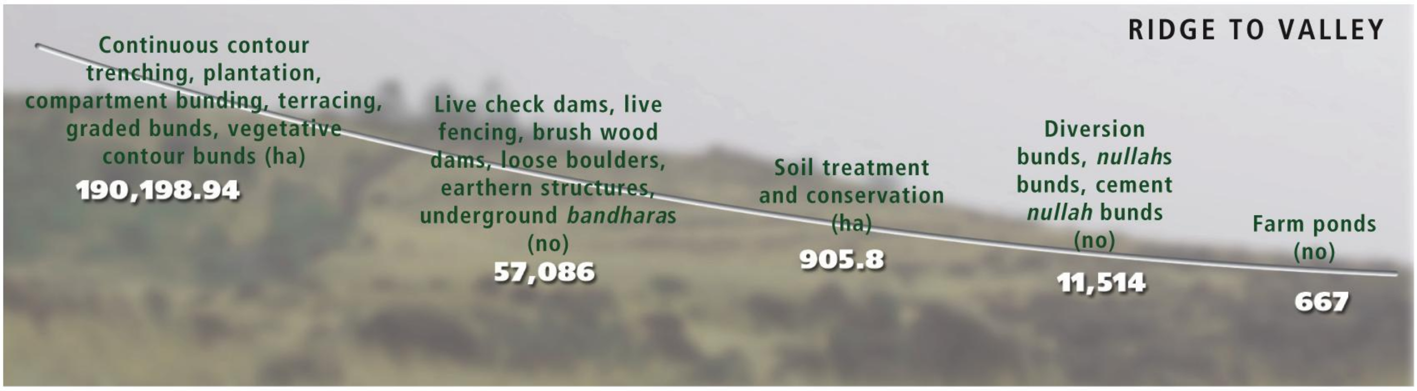
employment was guaranteed by law, which meant it provided an entitlement and put a floor to poverty. Since work was available locally, people did not have to flee to cities. It later formed the basis for the National Rural Employment Guarantee Scheme introduced across the country in 2006. This scheme focuses specifically on water harvesting. The idea again is to create jobs for people locally so as to reduce distress migration and also provide for their long-term future in the bargain.

In the Ahmednagar district there was a clear correlation between the intensity of drought and State spending under the EGS on watershed work and soil conservation (see **Figure 2**). In 2003-04, the critical drought year, spending shot up to almost 1060 million Rupees (Rs)[53], a big chunk of the total of Rs 3380 million spent between 1995-96 and 2006-07.

53 There exchange is approximately 60 rupees to the euro.

This Rs 1060 million went towards making 201 farm ponds, doing 20 000 ha of continuous contour trenching, another 3,400 ha of compartment bunding and building over 1000 check dam-like structures in different streams and drains to improve water harvesting. In this period the district built over 70 000 water-harvesting structures. In addition, it treated, through trenching and field bunding, another 190 000 ha. Of the district's area of just over 1.7 million ha, roughly 11 per cent was treated for soil conservation. "We have in these years of scarcity used funds to plan for relief against drought," says Vikas Patil, Director of the district's Department of Agriculture (see **Figure 3**).

Figure 3: Ridge to Valley



Source: Department of Agriculture, Ahmednagar

The impact has been tangible, say officials, citing three indicators. First, there has been a drastic decline in the demand for employment in the last few average and high rainfall years. In 2006, the district spent as little as Rs 7 crore[54] on building water structures. "No one is ready to work on our public employment programmes. This is because agriculture is booming and labour is short," says Uttam Rao Karpe, the Chief Executive Officer of the district's Zilla Parishad (District Rural Development Agency, DRDA). In that year, he says, nearly Rs 500 million of the funds for soil and water conservation lay unspent. A look at the employment demand statistics shows that from April-December, 2007, only 7000 households demanded work, as compared to the 30 000-odd who did so in 2006-07 under the National Rural Employment Guarantee Act (NREGA). With improved water availability, people prefer to work on their own fields. An added effect has been felt on the wages in the area. The average wages in the district have risen from Rs 40 to an average of more than Rs 70.[55] With the revival of agriculture, opportunities to work within the village have increased, as have other employment opportunities in small-scale industry.

Secondly, the area under cultivation has increased, farmers have moved to cash crops and yields have risen. "Agriculture has become productive and lucrative," says Karpe. The best indicator is the fact that previously, during drought there was a desperate shortage of

54 One Crore = 100 Lakhs
One lakh = 100000

55 government figures taken from the nrega.nic.in website

fodder and farmers preferred not to sell sugarcane but to use it as fodder, but now there is surplus of sugarcane in the district, according to officials.

Thirdly, and key, is the improvement in the water table of the district because of soil and water conservation. In the district, roughly 20% of the 1.2 million ha of cultivated land is irrigated. But the bulk of this—75%—is well irrigated. Farmers use dug wells, which tap the shallow aquifers, and increasingly deeper and deeper tube wells for cultivation. The district groundwater authorities monitor 200 wells to check water levels. Their data shows, on average, there has been a 5-metre rise in water levels between the peak drought period of 2003 and 2007. Analysis of individual wells across different watersheds confirms this trend. The groundwater department now declares that less than average rainfall is no longer a problem in the area. Even with less rainfall, the water harvesting structures are likely to hold water and therefore have a stabilising effect on the groundwater table.

One key challenge in the future will be to improve productivity, with use of techniques to minimize water use and change cropping patterns. "The district administration is promoting drip irrigation to counter the increasing use of borewells," says Patil. The drip irrigation techniques in use across the countryside are low energy systems that save up to 70% of the energy costs compared to flood irrigation systems. Another big challenge, say officials, is to protect watersheds—mostly lands under the forest department. "Till now we have mainly worked in the storage zone and recharge zone, not in the upper areas of the watershed," says Ajay Karve, Deputy Director of the district's Groundwater Department. "The next phase needs to focus on runoff or hill areas," suggests Karve. This will ensure the district is drought-proofed. The message from Ahmednagar is clear: if we can create productive assets then drought relief can become drought-proofing.

2. Hiware Bazar and its People

The village of Hiware Bazar is fairly representative of the uncertain conditions in the area but stands out as a paragon of successful community resource management. Spread over an area of 976 ha, 70 ha is forested, 860 ha is private, and 8.5 ha is Panchayat land. The community is more or less homogenous with most of the population belonging to upper caste Marathas and only two Scheduled Caste families in the village. Agriculture forms the mainstay of the local economy along with animal husbandry. Prior to the water conservation works in the village there was rampant poverty and small-scale industries like brick making and liquor shops dotted the landscape. The brick making industry uses the most fertile topsoil to make bricks leaving large stretches barren and useless. To add to the woes, brick making consumes a large quantity of water, adding to the already existing shortage.

Due to the vagaries of the monsoon season, agriculture was poor and there was large-scale outmigration leading to the **depopulation** of the area. The monsoon by its very nature is highly erratic, and with the village receiving a scant 400mm rainfall in good monsoon years, water was always scarce. Back in the 1970s the village, famous for its un-putdownable "*Hind-Kesari*" wrestlers, lost a crucial fight against ecological degradation.

The village slipped into an abyss of ecological degradation with deforestation in the surrounding hills, the catchment areas of the village. During the monsoons, the run-off water from the hills looked stark brown, says Chattar, a native of the village. “Naked hills shocked the elders in the village. The same hills were once home to mogra flowers and fruit trees,” remembers Arjun Pawar, the Sarpanch of the village from 1975 to 1980. It made drought chronic and acute as even a slight deviation in rainfall resulted in severe crop failure. The village faced acute water crisis and severe land degradation. The village’s traditional water storage systems were in ruins.

People migrated in hordes due to constant crop failures and drought. By the early 1980s as many as 50% of the village population had drifted out of the village. During 1989-90, less than 12% of the cultivable land was under cultivation. The village’s wells used to have water only during the rainy season. In 1972, when water scarcity hit the state, a percolation dam was built using EGS funds. The village took to making, drinking and selling country liquor. Those who were left behind further cleared the dwindling forest for survival. It worsened the village economy further. Families began to shift out, first seasonally, and then permanently to big cities like Pune and Mumbai. “Even government officials shifted out and soon Hiware Bazar became a punishment posting,” recalls Maruti Thange, a 56 year-old local farmer. Shankuntla Pandurang Sambole, a 50 year-old female resident, recalls the days when water was unavailable in the village. “I abandoned farming my seven acres of land in the early 1990s and became an agricultural labourer on a big landlord’s farm earning Rs 40 a day”.

Contrasting the past with the present is inspiring. Of the village’s 216 families, 25% are millionaires, earning more than a million rupees in profit per annum from agriculture and dairy farming alone. On average, every village resident earns twice the average of the top 10% of the earning population in rural areas. In the last 15 years the average income has been multiplied by 20. The forest here is well preserved; the fields are green and the residents happy. Shankuntla has bought an additional four acres of land and grows tomatoes and onions. Today she earns around Rs 100 a day from vegetable selling alone.

How did the village script such an economic miracle? It attained this feat by using EGS money for the regeneration of the village ecology: the land and water that sustains close to 90% of the residents. It turned its crisis into an opportunity by channeling government drought money into the creation of productive village assets like water conservation structures and reforestation to restore the village ecology. “Living in the rain shadow area with less than 400 mm of rainfall per annum has its blessings, only when you know how to manage the water”, says Popat Rao Pawar, Sarpanch of Hiware Bazar. The village’s message lies in the importance of the means as well as the ends. The village story is in contrast to the norm where villages that get money under EGS usually follow whatever they are told by the government or implementing agency. There is no organised effort on the part of the villagers to scope for the requirements and act accordingly. This is where Hiware scores.

3. The Beginning of the Success Story

In the 1980s, the youth of Hiware Bazar began to think about remedying the dejectable scenario confronting them. The elections to local Panchayats in 1989 provided the right occasion. In search of a candidate who would be acceptable to all factions, the village youth zeroed in on Pawar, who won unopposed. From here began the village's tryst with destiny. Inspired by social activist Anna Hazare, Pawar took up water conservation works year after year.

Anna Hazare is a Gandhian who scripted the success story for his village Ralegaon Siddi, 40 km from Hiware Bazar, in much the same way as Hiware. He too inspired his people to come together and treat the land so as to harness rainwater and put social rules in place to manage the natural resources. His model of development using water as the core and the consequent success of Ralegaon has been an inspiration, not only to Hiware Bazar but also to a large number of other villages across the country. Even government programmes have been inspired by the success to re-emphasize watershed development as a way of holistic natural resource management.

The district was brought under the **Joint Forest Management** (JFM) Programme in 1992. The JFM programme itself was born in 1988 after a law was passed by the central government to include communities in the conservation of forest resources, mainly village forests. By the year 1993, the district's Social Forestry Department reached Hiware and brought Pawar on board to regenerate the completely degraded 70 ha of village forest and the catchments of the village wells. With local labour donations, the Panchayat built 40,000 contour trenches around the hills to conserve rainwater and recharge groundwater. Residents took up massive plantation and forest regeneration activities. Immediately after the monsoon, many wells in the village collected enough water to increase the irrigation area from 20 ha to 70 ha in 1993. "The village was just beginning to get a bit of life back in its veins," remembers Pawar.

Hiware Bazar's achievement under the JFM programme is special as it counts among the few successful JFM cases in India. JFM as a programme failed to capture the imagination of the people mainly due to unclear property rights and weak institutional capacities. For any programme to be successful therefore one needs a clear property rights regime, whether defining communal or individual rights, strong institutional support as well as a strong and visionary leadership.

In 1994, the residents, along with the Gram Sabha (village council), approached 12 different agencies to implement watershed works under the state's EGS. The village prepared its own five-year plan for 1995-2000 that emphasized local ecological regeneration. Implementation of the five-year plan then became the objective of the EGS, which was otherwise a wage employment programme. This was to ensure that all departments implementing projects in the village would have a common and integrated work plan. Work began in 1995 building contour trenches across the village hillocks and planting trees to arrest runoff.

Simultaneously, in 1994 the Maharashtra government brought Hiware Bazar under the Adarsh Gaon Yojana (AGY), a scheme to replicate the success story of Ralegan Siddhi. The AGY programme was based on five principles: a ban on cutting trees, free grazing, and liquor; family planning; and contributing village labour for development works. The first work it took up was to plant trees on forestland and people were persuaded to stop grazing in these lands.

Grazing forms the second most important part of rural-pastoral life with every household owning cattle. Traditionally, common land in the village also doubles as grazing ground. For watershed development to be effective this activity had to be stopped to allow the pasture to regenerate. In Hiware Bazar, prior to the implementation of the AGY rules, many people owned more goats than cows. Goats eat plants by pulling them out causing the soil to loosen and leave less scope for the plants/grasses to grow back. Keeping this in mind, the village slowly sold off all its goats in favour of cows.

4. Investments in water conservation

The village invested all its development money of the five-year plan on water conservation — recharging groundwater as well as creating surface storage systems. It laid a tight trap to catch rainwater. The 70 ha of forest helped in treating the catchments for most of the wells, 414 ha of contour bunding stopped run-off and saved farms from silting, and around 660 water harvesting structures of various types captured rainwater. A total of Rs 42 Lakhs[56] was spent thought the State government on EGS in the village. Treating 1000 ha of land, the per ha cost of treatment of land was Rs 4000. But the benefits in term of raised incomes of village residents were phenomenal.

The village today stands on its own, reaping benefits from the investments it made in conserving water and in drought-proofing the village. “The little rainfall it receives is trapped and stored in the soil”, says Deepak Thange, who volunteered in the watershed works in the village. The economic harvests of water conservation have now translated into prosperity for the village. The number of wells has increased from 97 to 217. Land under irrigation has gone up from 120 ha in 1999 to 260 ha in 2006 (See **Table 1**).

Courtesy of the watershed works, grass production went up from 100 metric tonnes in 2000 to 6000 metric tonnes in 2004. Sakhubai Pandurang Thange, a 70-year-old resident who had been cutting grass for the last 25 years, recalled a time when grass scarcity had increased due to overgrazing. “The efforts put in by the people of the village for soil and water conservation have created surplus for us today,” says Sakhubai. Every morning from 7 am to 10 am for three months beginning in Dusshera (around the month of October), the grass-cutting season begins. Nearly 80 people from the village come to the forest area to collect the grass. A sum of Rs 100 per sickle has to be deposited with the Village

56 1 Lakh = 10 000 Rupees

Development Committee, says Sakhubai. Her son, Sambhaji Thange, a 28-year-old farmer, who accompanies her to collect the grass everyday, proudly states, "Residents of

Intense cropping

Hiware Bazar is getting more out of its land

Land use	1996-97	1998-99	2002-03
Gross cropped area (ha)	821	1,007	1,125
Net cropped area (ha)	723	730	748
Multi-cropped area (ha)	99	276	377
Cropping intensity	1.140	1.380	1.500

Source: Talathi (village accountant) records

Table 1: Intense Cropping in Hiware Bazar

the nearby Bhuvre Patar village come here to collect grass and aspire to be like Hiware Bazar." The people of the village understand the value of grass and hence stall-feeding is promoted in the entire village. In case of violations, the Village Development Committee levies fines.

The village makes an effort to share the increasing wealth equitably. The poor or landless who have been deprived of their **customary rights** to pasture land can buy grass-cutting rights from the Panchayat. An increase in the water table and the rules in place to protect the watershed have benefited everyone with higher availability of water and more employment opportunities for the landless in the village. There is no family in the village that feels excluded from the benefits incurred from the resource management regime in place. Furthermore, schemes for the landless and backward castes (though few in Hiware Bazar) are well implemented by the Panchayat. The village governing body also helps people monetarily if need be.

According to a household survey conducted in 1995, 168 families out of 180 were below the poverty line (BPL). The number of BPL families shrank to 53 in the survey conducted in 1998. There are now only three BPL families in Hiware Bazar out of 216. "There has been an unbelievable 73% reduction in poverty. This has been due to the profits earned through the dairy and cultivation of cash crops," says Popat Pawar.

4.1 Local affluence definition

Hiware Bazar has set a very high standard for itself in terms of defining **affluence**. The village has developed its own set of BPL indicators for the village, which includes access to two meals a day, school enrolment of minimum two children in a household and expenditure on health. According to Pawar, the village poverty line is set at Rs 10 000 per year, the necessary level of spending on all three items. This is around two and a half times that of the official Government of India rural poverty line that stands at Rs 4380 per year. Despite this high benchmark,the number of BPL families is negligible. Another indicator of the village's prosperity is that the village now has no demand for works under the NREGA since it has replaced the EGS.

5. Institutional setting

Hiware Bazar's strong institutions for **public participation** set up facilitated the initiatives. The Gram Sabha became the nodal institution, deciding everything from identifying the site for a water harvesting structure to sharing of water and types of crops to be taken up with consensus. The village voluntary organization became its implementing arm.

The village is not taking its turnaround lightly. The Gram Sabha continues to do judicious planning so that the ecological wealth generated doesn't go to waste. Its biggest innovation is the water budget that it does annually (see box). The village's second five-year plan (2000-2005) has focused on sustainable use of the regenerated wealth. As a part of it, every year the village takes stock of its water availability and dictates cropping patterns according to water availability. There are no violations. The village appoints two youths every year to take charge of vigilance activity and look into possible violations or any other problems and bring them to the notice of the Gram Sabha. The system has become efficient in managing itself as every member of the village is a potential watcher and the proceedings of the Gram Sabha are transparent. According to Habib, a resident of Hiware Bazar, "The essence of the experiment in watershed development comes from the strong Gram Sabha. It is here that decisions for the village are made. The greatest environmental planners are the village residents themselves and the institution of Gram Sabha empowers them to plan for themselves." Every adult member of the village is automatically a member of the Gram Sabha. The Gram Sabha convenes once every month and may be asked to convene as and when required.

6. Water Audit

Since 2002, Hiware Bazar has been doing an annual budgeting of water assisted by the Ahmednagar districts' groundwater department. Every year the village measures the total amount of water available in the village, estimates the uses and then prescribes the agricultural cropping to be taken up. All this is done through the instrument of Gram Sabha whose decisions are binding for the residents of the village. "It is through consensus that the village decides on the crops that are grown", says Shivaji Thange, who works with the village watershed committee. The cropping pattern is undergoing a change in favour of cash crops but with high productivity and availability of water food crops produced in the village also suffice. Many families now buy food grains from the market. Food security will not be an issue for the village for a long time to come.

Through the five years of water budgeting, the village has been able to identify its average water availability. It is estimated that with 400 mm of rainfall, a small amount, the village of Hiware Bazar will have sufficient water throughout the year. Because the the village has an average shortfall of 50 to 80 million litres, the Gram Sabha has banned drilling of borewells for irrigation. “The discipline on this decision is maintained”, says Thange.

“The audit process begins with the monitoring of the groundwater level of the six observation wells identified in the village, along with the amount of total rainfall received measured by the village’s 3 rain gauges. The cumulative sum of rainfall and groundwater is the total water available to the village after monsoons,” explains Ramesh O. Bagmar, Assistant Geologist, Groundwater Department.

The Gram Sabha thus budgets water for the village and decides from the total water available the amount of water that can be used and for what purpose. Here, water for drinking purposes (of humans and animals) and for other daily uses gets top priority. After budgeting for drinking water, 70% is set aside for irrigation. The remaining 30 per cent is kept for future use by allowing it to percolate and recharge groundwater. Taking this broad framework for water use, a yearly audit is carried out to assess water availability and adjust use accordingly.

In the year 2004- 05, Hiware Bazar found a deficit of 86.5 million litres of water after receiving an annual rainfall of 237 mm. This was followed by another deficit year in 2005-06 with 47.7 million litres after the village received only 271 mm of rainfall. “The village had changed its cropping pattern and priority was given to crops like *moong, bajra* and gram instead of wheat and rice. This sustained them through the shortfall and helped them handle the deficit experienced in 2004- 05. As a result the deficit of 2005- 06 did not have any major impact on the cropping pattern”, says Bagmar.

In 2006, (see **Table 2**) the village experienced 549 mm of rainfall and the village had a surplus of 1465 million litres of water available, which encouraged them to take up wheat on 100 hectares of land and *jwari* (a type of sorghum that needs moderate moisture to grow and is used as grain as well as fodder) on 210 hectares of land. However, in 2007-08, the village again received less rainfall, about 315 mm registering a deficit of 456.3 million litres. The Gram Sabha again decided to reduce the *jwari* grown to only 2 hectares and wheat to 70 hectares in the village, again emphasizing on growing *moong* and *bajra*. People understand the importance of the rules in the village and hence there are few deviations.

The water audit has been very useful in ensuring sustainability of both agriculture and water available for drinking purposes for humans and livestock in the village,” says Popat Rao Pawar, the present Sarpanch of the village. During 2003- 04, when the rainfall was only 60% of the norm, drinking water scarcity pervaded the district with a few exceptions. Hiware Bazar was the only village in the city block that did not have to rely on water tankers.

Table 2: Water Sources and Quantities 2006-2007

Source of water	Quantity of water in crore litres _2006	Quantity of water in crore litres 2007
Runoff from rainfall	549	315
Water lost as water vapour	536.29	107.70
Category-wise availability of water		
a. Water as runoff	54.59	8.87
b. Water lost as water vapour[57]	187.7	107.70
c. Stored surface water	26.81	15.39
d. Water that percolates into the earth	53.63	30.77
e. Sub-soil water as moisture or groundwater	160.89	92.31
f. Groundwater due to water harvesting structures	52.67	52.67
TOTAL water available (a+b+c+d+e+f)	**294**	**191.13**
Water demand in the village		
i. Drinking water (humans and animals)	3.39	3.39
ii. Water required for irrigation	133.38	229.55
iii. Water required for additional/peripheral farming activities	10.73	3.822
TOTAL	**147.5**	**236.76**
The difference between availability and requirement (deficiency or surplus)		
Water available – water required	**146.5**	**- 45.63**

6.1 Economic boom

Hiware Bazar is now reaping the economic harvests of water conservation. Increased grass production has resulted in increased milk production, from a mere 150 litres per day during the mid-1990s to 2,200 litres per day presently. In 2006 the income from agriculture was Rs 24 784 000. This means an average per capita agricultural income of Rs 1 652/month. This is almost double the Rs 890/month income level for India's top earning 10 % of the rural population in 2004-05. With only 3 families below the poverty line according to a household survey conducted in 1992, there has been an unbelievable reduction in poverty.

7. Message in the story

In many ways, Hiware Bazar symbolises the problem of water management in villages. It also emerges as an example of how to fix the problem. Many villages around Hiware have taken up similar measures and achieved success but none yet to the extent of Hiware. In India, where it rains for roughly 100 hours of the year, the management of water is critical to water sustainability. The current water crisis in India is not about scarcity. As the Hiware Bazar experience shows, it is about the management of water resources so that the infrastructure is capable of reaching out to poor people. It is about deepening democracy so that communities can be involved in the governance of the resource.

In the context of NREGA, Hiware Bazar shows a model of how to use this Act for village development because NREGA priorititises water conservation. Currently, all of the more than 610 districts in India are implementing the NREGA, a scaled-up version of the EGS that Ahmednagar implemented successfully to fight drought and rural economic distress.

57 Water vapour rises from the water stored in the harvesting structures and is hence taken as available.

Most of the districts in the country exhibit ecological and economic problems of varying degrees that can be fixed in a similar fashion. However, after two years of NREGA implementation, the programme awaits the realisation of its development potential. Like EGS in Ahmednagar, the NREGA has also unlimited development potential. Thus, Hiware Bazar, and for that matter the Ahmednagar district, offers some crucial tips to enable NREGA to replicate Hiware Bazar across the country.

Under NREGA, however despite a 'non negotiable' (the act is clear on this) focus on water and soil conservation, most of the money is being spent on building roads and buildings[58]. It is just a few states, already known for implementation of massive water conservation programmes, that are giving priority to water conservation. Except for five states, the 22 remaining states have negligible allocation for water conservation. Only three states account for 96% of total water conservation works under the NREGA.

There has also been a failure in understanding the real nature of employment in the country. Ecological assets, **natural capital** like land and forests are the key employment sources for rural people in India. Any attempt to create employment must focus on these sectors. But our policies for employment generation have restricted themselves to employment per se, and completely ignored the fact that the generated employment opportunities need to be sustainable and allow the employed to move above the poverty line. Exclusive focus on the purely quantitative approach to employment generation has resulted in low quality of employment. The result: we do generate employment, but they become unproductive very soon, leaving people either unemployed once again or grossly underemployed. A large part of the funds spent under these schemes is used in more capital-intensive activities such as building roads and government houses, rather than in labour-intensive activities. Productive assets are not the priority. A road remains what it was — a collection of holes in the ground — because it has not been built to last. It has been built to be washed away, each season, so that employment can be guaranteed.

The second lesson comes from 'how' the drought relief money has been spent on regenerating and increasing environmental productive assets. In Hiware Bazar, nature now produces more environmental services. This has implications for the future as well. What has been done for water availability might also be done for forests through investments in alternate energy sources to biomass such as solar and wind energy. Examples of large-scale movements such as the Green Belt movement in Kenya call for massive replication of successful models like Hiware. The green belt movement is a programme begun under the leadership of Wangari Maathai. It started out as a tree plantation movement against deforestation in 1977. Today, it has turned into a women's empowerment movement that spreads across Africa and other parts of the world. In Hiware Bazar, the village plan was a well thought out, integrated ecological plan. It first treated the forest, the catchments for the village wells. Then it took up water conservation. Soil conservation followed this. Changes in crop patterns were also collectively determined according to the water budget available

58 Government statistics for the year 2006-07 from nrega.nic.in

year to year. All along, the Panchayat made sure that EGS money was being spent according to this plan. Doing this the village made the EGS a long-term development programme. And EGS created more productive and sustainable employments. The zero demand for works under the new NREGS in the village is an indicator.

The third lesson is the role of coordination between the ‘where’ and ‘how’ factors. The Panchayat, made different independent government departments work in an integrated fashion by changing the most dubious character of bureaucracies in the country: their stand-alone mode of functioning. The Panchayat engineered reform in local governance by evolving a plan (in conjunction with the Gram Sabha) that government departments implemented and were accountable to the Panchayat for. This made the EGS a community-owned programme despite being a state-wide government scheme. Government however has not empowered the Panchayats sufficiently to enable village level planning in the (approximate) 60% of NREGA projects that they are responsible for implementing. This may make whatever productive assets are created redundant. One need only look back to the first few drought relief works in Hiware Bazar before the Panchayat took over leadership to appreciate the risk. This will be the biggest challenge for NREGA. Conceptually, decentralization is part of the scheme. The village has to make a development plan; the district has to make a perspective plan; the projects have to be cleared by the Gram Sabha and implemented by the panchayat. The question now is how this scheme can replicate the lessons of Hiware Bazar.

The Hiware Bazar example is meant to be exemplary for development planners and practitioners and for students of planning and policy research, but a precise compilation of such cases will help even local communities in assessing their case and taking away the vital lessons from model cases. The case of Hiware Bazar is representative of the conditions in the country and what can be done to change them, however the importance of de-centralisation of power structures also emerges as a key issue. On paper the Panchayats are empowered to take matters into their own hands. This augurs well for flexibility in the rural development schemes, and can go a long way to ensure proper and multi-dimensional development, but lack of funds and uncooperative government departments hamper the true exercise of power at the local level by these institutions.

8. Conclusion

As wealth increases in Hiware, the visitor to Hiware can observe changes in the lifestyles of the inhabitants. Hiware has adopted a policy of one child per family. Not only are births down, but the preference for male children has been almost entirely eliminated. Apart from rising literacy and health, there are also changes in **consumption** patterns. While almost all Hiware’s farmers carry their milk to the dairy by bicycle, a few now come by motorcycle. The first cars have entered the village, soon to be followed by more. This slow but steady transformation of the **metabolism** of this small village is representative of a change that will soon encompass large parts of rural India. How will India’s ecological base handle this socio-ecological transition? What kind of development and growth can we envision for a country with a population of over a billion and dwindling resources?

Firstly, India's economic growth will be fuelled primarily by local environmental resources. India will not have the luxury that Western economies had to import food from colonies for its billion plus population. Because India's population relies so immediately on their environment, CSE argues for a new conception of growth, one that emphasizes the concept of Gross Nature Product or the "**GDP of the poor**" in addition to standard economic indicators. When a dam is built or when forest clearance leads to loss of access to resources for poor people, they are forced to buy these inputs they depend on from the market. GDP goes up, but the **well-being** of the population suffers. By the same token, one can make environmental investments, such as Hiware has done, largely based on voluntary labour, and the economic returns are substantial. One could calculate the labour invested in terms of hours worked in contour trenching, bunding and other watershed work, as well as the return to such work in terms of increased production due to the increased water tables. Such a valuation exercise could be used as a powerful argument for replicating investments across rural India. This concept of investing in natural assets has important consequences for the future prosperity of the rural poor. Investment in creating renewable sources of energy and water will also be key.

Most energy in rural India comes from locally sourced biomass (fuelwood, crop residues, and animal dung). In many places, where the **institutions** are not in place to regulate sustainable extraction, this can lead to deforestation and consequent soil erosion. While LPG and kerosene fuels are highly subsidized by the government and used primarily by the middle and upper classes, an even better alternative is evident in some households in Hiware — the use of biogas plants for lighting and cooking. The government should subsidise the construction of biogas plants in rural areas – leading rural India up the energy ladder, but using renewable energy rather than developing a dependency on non-renewable energy sources. Biogas plants have the added bonus that the manure waste can still be used as fertilizer.

Another lesson from Hiware relates to India's future availability of water. In particular, Hiware's system of water auditing has important lessons regarding the concept of virtual water. **Virtual water** is a concept, first elaborated by Tony Allan from London, about the water needed to produce a commodity throughout its whole life cycle, be it a grain crop or a hamburger. Because agriculture is by far the activity that uses most water, the virtual water concept has been used to suggest that countries with water scarcity should adopt a policy of eliminating exports of water intensive crops, such as rice, or alternatively, should stop producing them and import them from other countries. However, there is a problem with this simplistic understanding of the concept. Firstly, because it does not differentiate between rain-fed crops and irrigated crops, nor crops irrigated with harvested "renewable" surface water, or those irrigated with tube wells fed from ground water. The virtual water argument can also have consequences politically, and regarding equity. If water is released from agriculture, and farmers grow lower-value crops with less water requirement, the released water could easily be sucked up by India's thirsty cities rather than distributed more equitably among the rural poor. Finally, the virtual water concept gives no indication whether water is being used within sustainable extraction limits, which change from year to year depending on rainfall. While Hiware's virtual water exports have multiplied within the last 20 years, it was always in the light of increased supply. The water audit process that they have instituted is a much better indicator of sustainable extraction and perhaps a better policy tool than the concept of virtual water, despite the fact that the water footprint as a concept has captured the imagination of CSOs and governments around the world. However, Hiware shows how the true distinction should be between living off the income of environmental investments rather than depleting limited environmental capital.

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Chapter 9: NAUTICAL TOURISM DEVELOPMENT IN THE LASTOVO ISLANDS NATURE PARK

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The Lastovo Islands
(Source: Igor Karasi)

Abstract
The Lastovo Islands Nature Park (Lastovo Islands NP) was one of the first protected areas to be designated in Croatia, established in 2006. The area has been able to preserve its natural and cultural heritage due to the fact that it is an isolated and distant archipelago that was a closed military zone until the 1990s. In the last two decades the Lastovo Islands have begun to develop their economy, which is primarily based on tourism, followed by fisheries and small-scale agriculture. The number of tourists visiting the archipelago is increasing each year, especially the number of nautical tourists, who are attracted by the well-preserved nature, numerous coves and bays and good fish restaurants. Infrastructure and tourist facilities are not well developed and more construction is expected in the future, bringing with it increased pressure on the environment in coves and bays where the installation of new mooring facilities is planned. The Nature Park is currently in the process of developing physical and park management plans to establish the basis of future tourism development and management. Here we explore how ecological economics could be used to support decision-making for the sustainable development of the Lastovo Islands.

Keywords: Nautical Tourism, Marine Biodiversity, Depopulation, Landscape Value, Physical Planning, Property Rights, Protected Area Management, Carrying Capacity, Resilience, Local Communities, Public Participation, Willingness To Pay, Economic Instruments For Tourism Management

1. Introduction: Geographic and Biophysical Setting of the Lastovo Islands Nature Park

In Croatia, the Lastovo Islands NP is situated in the southern part of the Adriatic Sea (**Figure 1**). The archipelago consists of the main island Lastovo (40 km^2) and more than 40 small surrounding islands, islets, rocks and reefs. Lastovo Island, with its surrounding waters and islands, was officially declared a Protected Area (PA) and named the Lastovo Archipelago Nature Park on 29th September 2006 under category V of the International Union for Conservation of Nature and Natural Resources (IUCN). The surface of the whole PA measures 195.83 km^2, out of which 52.71 km^2 is on land and the remainder at sea (143.12 km^2). It is the second biggest marine PA in Croatia and its borders extend to a minimum of 500 m from the Islands' shorelines. Lastovo Islands NP is also part of the Ecological Network and very likely to become part of the Natura 2000 Network.

Figure 1: Lastovo Islands NP
(Source: Z.Jakl)

The climate of the Lastovo Islands is typical of the Mediterranean, with predominantly mild moist winters and warm, long and dry summers (**Table 1**). They receive around 2700 hours of sunshine per year, ranking them one of the sunniest places in the Adriatic Sea. Annual rainfall is approximately 650 mm.

Table 1. Lastovo Islands NP climate
(Source: www.croatia-travel-guide.com)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum temperature	11	12	14	17	22	25	28	28	26	21	17	13
Minimum temperature	5	6	8	11	15	18	21	21	18	14	10	7
Number of sunny hours per day	4	5	6	7	9	10	11	10	9	7	4	3
Number of rainy days	11	10	9	8	7	4	3	3	6	9	11	13
Sea temperature	13	13	14	15	17	22	23	24	22	21	18	15

The landscape is formed of small forested hills and small valleys with high-quality soil which is used for small-scale agriculture (mainly grapes and olives). It is one of the most forested islands in the Adriatic, with roughly 60% of its surface covered by forest (**Figure 2**). A considerable part of the forest is old-growth Aleppo pine (411.83 ha) but there are also rare Holm oak forests (234.48 ha). More than half of the forest surface is local community property while the other half is State owned and managed by the Croatian Forest Authority.

Figure 2: NP Lastovo Islands
(Source: I. Carev)

Figure 3: Red coral (*Corallium rubrum*)
(Source: H. Čižmek)

The Lastovo Islands NP is important for marine and predatory birds, and is situated on an important migratory route to Africa. The Island has rich and unique flora and cave fauna, and the shallow waters of the coast and around the small islands are rich in marine life (**Figure 3**). Although they have experienced a decline in fish stocks, the waters are still one of the richest fishing grounds in the Adriatic Sea. There are no surface waters, but there are several freshwater ponds and seasonal submarine freshwater springs (“vrulje”) as the Island is part of a complex karst system of underground waters.

Rich Heritage of the area

Ecological

- One of the most preserved areas in the Adriatic Sea due to its geographical position and historical isolation
- Diverse landscape of a number of islets, rocks and reefs in the sea, as well as hills and fertile fields on the land
- Steep coastal cliffs up to 100 m high
- Zone of “upwelling” of deep sea water rich with nutrients
- One of the most forested Adriatic islands, covered with Holm oak and Aleppo pine
- Large number of endangered and rare species and habitats
- Rich and diverse marine and terrestrial biodiversity (around 700 plant species, 140 vertebrates, 248 underwater flora species, 330 underwater invertebrates and 150 fish species recorded until now)
- One of the most important fishing grounds in the Adriatic, especially for lobsters and pelagic fish

Cultural

- Traditional and sacral architecture
- Rich folklore
- Underwater and terrestrial archaeological findings

Besides its natural heritage, the Lastovo Islands also have a rich cultural heritage. The first human presence dates back to over 8000 years BC. The main island called Lastovo is 80 km away from the Croatian town of Split and 95 km from the Italian coast. This central southern position in the Adriatic Sea has given it special status since at least Roman times. Its strategic importance attracted a variety of foreign rulers (Greece, Roman Empire, Venice, Italy, France, England, Austro-Hungarian Empire,Yugoslavia). Between the two World Wars the area belonged to Italy. Holding a strong sense of individual identity and a need for independence, the archipelago holds many traditions that testify to the rich history

Figure 4: Old church
(Source: B. Berković)

Figure 5: Amphora
(Source: Z. Jakl)

of this area. The historic settlements of Lastovo and Lučica are considered monuments with a large number of churches, buildings and archaeological findings protected as cultural goods (under the Act of protection and conservation of cultural goods O.G. NN 69/99, 151/03, 157/03).

Around the Island there are also 18 underwater archaeological sites. Due to its unique and rich natural and cultural heritage (**Figures 4 and 5**) the WWF nominated the Island as a priority conservation area of the Mediterranean in 2002.

2. Administration and Demography

The Lastovo Islands NP falls under the administration of the Municipality of Lastovo, located on the main island of Lastovo, within Dubrovnik-Neretva County. On September 29th, 2006 the Croatian Parliament declared Lastovo and its surrounding islands a protected area, naming it the Lastovo Islands NP.

There are 835 inhabitants registered on the Island according to the 2001 population census, although in winter the population falls to less than 500. Many inhabitants, although registered there, spend winters in the cities of Split, Zagreb or Dubrovnik. The inhabitants occupy several small villages on the Island: Ubli (also a ferry port); Pasadur; Zaklopatica; Skrivena luka; Lučica; and Lastovo, the biggest settlement with 200 inhabitants (**Figure 6**).

The number of inhabitants is decreasing however, especially that of the younger working population. The ratio of active (employed) to supported (unemployed) people is 19:10 which means that 65.52% of the population works (**Tables 2 and 3**).

Table 2. Population of the Lastovo Islands NP in 1971-2001

Village/Year	1971	1981	1991	2001
Glavat	7	3	9	-
Lastovo	987	643	734	451
Pasadur	-	-	79	77
Skrivena luka	12	18	20	18
Sušac	6	8	7	-
Ubli	198	290	303	218
Zaklopatica	-	-	69	71

(Source: State Administration Office in Dubrovnik-Neretva County)

Note: Pasadur and Zaklopatica were registered as separate villages only in 1991.

Figure 6: Lastovo village
(Source: I. Carev)

Table 3. Lastovo Islands population structure compared to the national average and the second biggest city in Croatia
(Source: Croatia Central Bureau of Statistics)

	Total	**0-19 years**	**65 years and more**	**Average age**	**Aging index**	**Age coefficient**
Croatia	4437460	1053240	693540	39.3	90.7	21.6
%		23.74	15.63			
City of Split	188694	44913	26140	38.5	81.2	19.4
%		23.80	13.85			
Lastovo Islands NP	835	214	168	40.8	100.9	25.9
%		25.63	20.12			

On Lastovo Island there is one primary school with around 80 pupils and a kindergarten. After finishing primary school pupils must move to the town of Split or the island of Korčula to continue to higher education. Due to the lack of employment possibilities many remain on the mainland after finishing their education.

In 1945 the Island was declared a military base of Yugoslavia and the arrival of foreign citizens forbidden until 1988. Due to the military atmosphere Yugoslavian citizens also avoided Lastovo. After the 1988 political changes in Yugoslavia started. In 1991 Croatia

Figure 7: Pasadur
(Source: Petronije Tasić)

declared independence, war with Serbia began, and in 1992 the Yugoslav army left Lastovo Island. Normal life was established only after the end of war in 1995.

These facts, together with national policies that neglected the Islands, resulted in a long-lasting process of **depopulation**. Depopulation implies potential loss of human and social capital, but also potential biodiversity loss, as depopulated areas are more likely to be intruded upon by investors, tourists, or seasonal inhabitants who hold different values and knowledge. They are usually not concerned with sustainability of the local environment, since they do not depend on the environment as permanent inhabitants do. Without a young working population it is therefore very hard to bring new ideas and implement conservation measures. In this context, well-managed tourism has been perceived by locals and the government as the best prospect for economic development that could reverse the depopulation trend.

3. The Local Community

3.1 Livelihoods and Migration

As the limited natural resources of the Islands and their remote location have only offered a marginal existence, many residents migrated not only to the mainland, but even further to Australia and the Americas. The largest migration took place after the Second World War, but this trend is still very much alive. Those who have remained on Lastovo Island are engaged mainly in agriculture, cattle breeding and fishing. Currently, the main economic activities are agriculture, fishing and tourism-related services. Traditional small-scale fishing, wine-making and olive oil production form the basis of the local economy, based on a centuries-old way of life. Olive oil and wine are produced by individual households and in socialist times a cooperative was set up for the production of wine. Households still deliver their excess grapes to the cooperative that produces bulk wine. Apart from few small shops, cafés, restaurants, contractors, workshops and service providers, there are no enterprises or industries. Local government, with around 20 employees, is the biggest single employer.

3.2 Infrastructure

One of the limits to further development of Lastovo is the Island’s infrastructure. The public transportation system and ferry connection to the mainland are insufficient, as are the water supply system, wastewater treatment and waste management systems. The public utility company “Komunalac”, based in Lastovo, is in charge of the water supply and waste management. However, problems with water supply are frequent in summer. In the near future, there are plans for supplying water to the Island by a regional water supply system, connected by underwater pipes to the Neretva River (water source). There is a desalinization facility on Lastovo Island (in Prgovo) but it is often not functioning.

Waste and wastewater flows are significant problems in isolated areas of Croatia such as the Lastovo Islands. On the main island, solid waste is collected three times a week and transported to the roadside Sozanj dump, located between Lastovo and Ubli. The municipal authorities selected this location in 1997. Situated near the coast above one of the richest underwater locations on Lastovo, the dump is in the process of closure under a national plan to transport waste to the county waste management centres on the mainland. However, this system is not functioning yet and waste is still illegally dumped on numerous sites.

Litter from yachts and wastewater discharge from yachts and coastal settlements into enclosed bays pose serious threats. A small proportion of wastewater from the village of Lastovo is channelled to a communal septic pit which then discharges it directly into the sea near Lučica port. The majority is collected by private septic tanks (“black pits”) many of which are porous and discharge either into the ground or into the sea. Hotel Solitude and part of the village of Pasadur (**Figure 7**) discharge their wastewaters via an undersea pipe that releases its waste just off the coast into the nearby bay.

In addition to the above-mentioned problems, forest maintenance and forest fire-fighting is poorly organised and implemented. Major forest fires in 1971 (1600 ha), 1998 (221 ha) and 2003 (494 ha), destroyed a significant proportion of forest, leaving the southern part of the Island seriously damaged (**Figure 8**). At the same time that fires in Lastovo Islands NP were burning, fires also broke out on other Croatian islands. This area was not considered a priority and therefore did not receive the necessary help from the mainland.

The environment of the Lastovo Islands has so far managed to sustain itself in spite of these pressures, but with expected construction and tourism activities growth, infrastructure and nature conservation investments will be necessary to preserve the quality of the environment.

Figure 8: Southern side of Lastovo Island burned by forest fires
(Source: I. Karasi)

3.3 Local identity

The local culture tends to be conservative and individualistic. Community-based initiatives are rare. However, in times of imminent threats the islanders are able to organize themselves. Earlier national strategies proposed PA designation, but due to the local community objections and a lack of national funds, these proposals failed to materialise. The reasons for the local community's resistance to PA designation were fears that the Islands would again become an economically closed zone and overall distrust towards local and national government. In 2001 a local businessman planned to construct a stone quarry on Lastovo Island that would yield much profit, but with a great deal of destruction to the coastal zone. After intensive communication, lobbying activities and a "battle" with interest groups, the local NGO Spasimo Lastovo (Save Lastovo) and the Association Sunce managed to change the attitude of the community and the government, initiating the process of declaring the Islands a Protected Area and stopping the development of the stone quarry.

This event, in which local people united in opposition to the destruction of the environment is a clear illustration that islanders attribute high value to the local **landscape**. Yet it also shows how vulnerable the Islands are to initiatives that promise new investment at great environmental expense. PA status was declared largely in order to stop the stone quarry project, proving that residents of the Islands were in favour of conservation and wanted to develop its economy in a way that would allow a more equitable distribution of gains across the population. As national and local tourism had come to be perceived as the best opportunity for economic development, the majority of locals were in favour of the PA declaration at the public hearing in December 2004. However there is much doubt over the competence of the Lastovo Islands Nature Park Public Institution, the state institution responsible for the management of the area, which is very young (established in 2007) and still lacks the capacities (in terms of human capital, funds, and political support) to carry out its work properly.

4. Patterns of Resource Use

As mentioned before, the local economy is based on agriculture, fisheries and tourism, with tourism taking the leading role. Pressures from tourism-related construction are mounting. Furthermore, there are many unresolved land ownership disputes so that assertions about the land categories and property rights must be dealt with carefully (**Table 4**).

Table 4. Lastovo Islands NP land type and ownership (Source: Nature Park Lastovo Islands, baseline study for the declaration of protected area

(Source: State Institute for Nature Protection, 2005)

LAND CATEGORY	PRIVATE PROPERTY (ha)	STATE PROPERTY (ha)	TOTAL (ha)	%
Plough land and gardens	210	7	217	4.09
Orchard	110	7	117	2.21
Vineyard	65	4	69	1.30
Pastures	304	1070	1374	25.91
Agricultural land (total)	689	1088	1777	33.51
Forest land	1792	1349	3141	59.24
House gardens	3	1	4	0.08
Roads and paths	23	2	25	0.47
Constructed land	8	6	14	0.26
Other	26	314	341	6.43
Built up area (total)	60	323	384	7.24
TOTAL	2541	2761	5302	100

4.1 Agriculture and livestock

Agricultural land on Lastovo Island is divided into small plots, precluding modernised and larger-scale agriculture. Furthermore, a shift from the state-controlled to the open-market economy, unresolved property rights and a lack of young working population today mean that only a small proportion of arable land is under cultivation (**Figure 9**). On the Island there are only 29 people directly employed in agriculture. However, local families usually grow crops on small plots, either for their own consumption or for restaurants catering tourists. According to the available data, there are around 14 000 olive trees on Lastovo. The second most important crop is grapes, used for wine production. Almonds, figs and vegetables (potato, onion, garlic, tomato) are also grown. Agriculture has little negative impact on the environment.

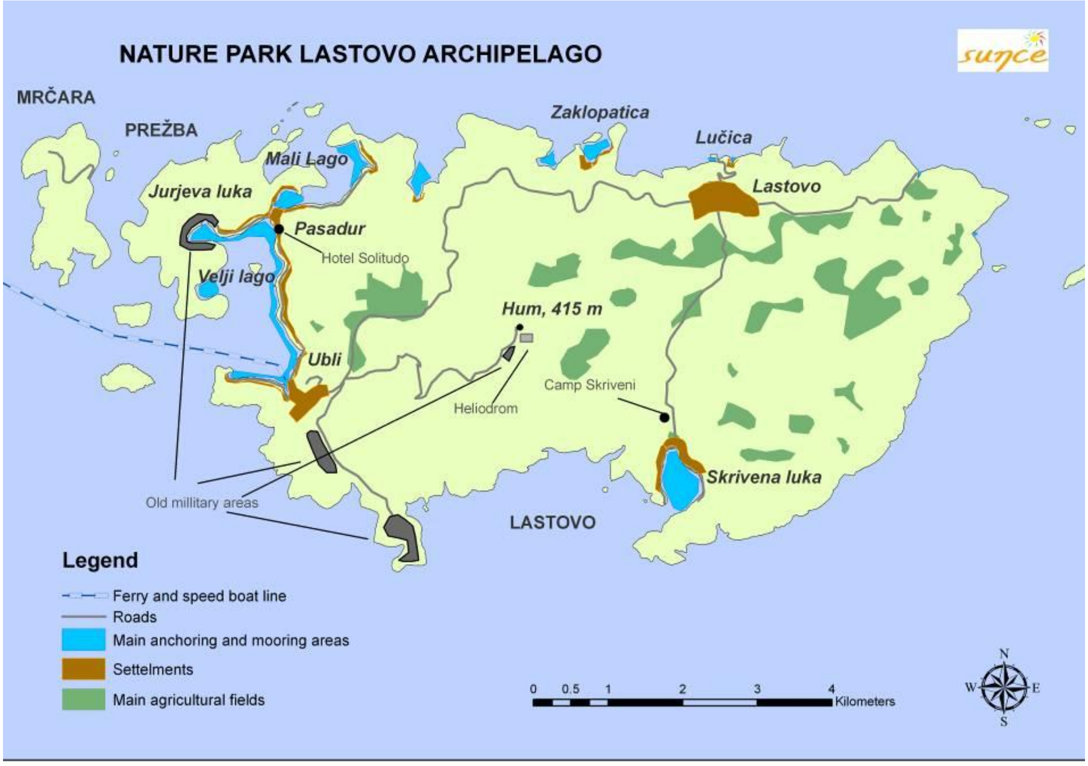


Figure 9: Lastovo Island land use overview
(Source: Z.Jakl)

People from the Lastovo Islands have not been very much involved in stockbreeding in the past and this activity is today even less relevant. In total there are about 400 sheep and goats on the Island, most of which are unfenced and unsupervised. As a result, the animals' presence is sometimes unappreciated due to their tendency to graze on native vegetation, and roam into the path of cyclists and hikers. Local breeders similarly do not like to have tourists walking in areas where livestock is feeding.

4.2 Fishing

Fishing has always been an important source of income as the waters surrounding the Lastovo Islands are rich in marine life. A fish processing factory existed in the period 1933-1969, but was closed down when production became unfeasible after subsidies from the central government ceased, along with most of the fish processing factories in the Croatian part of the Adriatic Sea. Today most fishing is at the service of tourism. Residents are engaged in small-scale fishing, while recreational fishing is practiced mainly by visitors. In 2004, 484 licences for sport recreational fishing, 101 licences for small fisheries and 40 economic fishery licenses were purchased.

Figure 10: Spiny lobster (*Palinurus elephas*)
(Source: Z. Jakl)

Figure 11: Zaklopatica bay
(Source: P.Tasić)

Lastovo Islands NP waters are important fishing grounds for the spiny lobster (*Palinurus elephas*) (**Figure 10**) but also for other species of fish and crabs. There is one purchasing station for fish in Zaklopatica (**Figure 11**) that deals mainly with local fishing vessels. Fish is then sold to restaurants visited mainly by tourists from yachts during the high season. In other periods it is sold to the cities on the mainland.

In the Lastovo Islands, as in the whole of Croatia, fishery statistics are poorly collected so it is difficult to develop a well-informed report on the state of fish stocks. But the opinion of those engaged in fishing is that fish stocks are declining. This is attributed to the poor control of illegal fishing by locals and people from other islands. There are increasing numbers of Italian fishing vessels buying fish directly from Croatian fishermen and illegally fishing in the Croatian maritime zone. One objective of the establishment of the PA is to improve fisheries management. Fishing in PAs is subject to regulations that delimit the fishing area, control the use of fishing gear and the amount of fish caught. However, a very small percentage of PAs include no-take areas. Over-fishing and illegal fishing, including that of red coral, still pose a high level of threat to marine resources, both in PAs and non-PAs.

4.3 Hunting

Hunting is practiced in the forests and pastures of Lastovo Island but on a small scale. The main hunting targets are the brown hare (*Lepus europaeus*), rock partridge (*Alectoris graeca*), common pheasant (*Phasianus colchicus*) and other birds.

4.4 Tourism and Nautical Tourism

Tourism is one of the main drivers of the Croatian economy and it is likely to remain so in the future (**Table 5**). Nautical tourism (tourism that involves travel by sailing or boating and related activities such as fishing or diving) is the most important sector of tourism in the Lastovo Islands.

Table 5. Tourism statistics in Croatia in the period 1980-2008

	1980	1985	1990	1995	2000	2005	2006	2007	2008
Number of tourists (in 000)	7.929	10.125	8.498	2.438	7.136	9.995	10.384	11.162	11.260
Number of overnights (in 000)	53.600	67.665	52.523	12.885	39.183	51.421	53.006	56.005	57.103
Income in billion Euro						6	6	6.7	7.4
Income in billion USD				1.3	2.7				
Percentage of national GDP				7.2%	15%	19.4%	19.4%	18%	15.7%

(Source: Ministry of Tourism www.mint.hr)

In 2007 in Croatia there were 811 000 registered nautical tourist arrivals (7.26% of the total number of tourist arrivals) out of which 91.9% were foreign tourists (Germans 25.3%, Italians 22.5%, Slovenians 15.6% and Austrians 14.6%). In total they realized 1 378 000 overnight stays, 98% of them in the period from April through September (Central Bureau of Statistics of the Republic of Croatia, 2008). The total number of licenses issued to foreign vessels for sailing in Croatian coastal waters in 2007 (excluding vessels hired in Croatia) was 54 864, and the average length of time spent in Croatia was 16 days. It has been estimated that nautical tourists spend 48% more on average per day than other types of tourists (tourist on rented boats spend 139 euro/day, on private boats 55 euro/day, other tourists 49 euro/day).

There are issues with statistical data collection, however. Every tourist arriving to a nautical tourism harbour is registered as one new tourist arrival to Croatia, but since nautical tourists usually visit more than one harbour, the official number of such tourists is likely to be higher than their real number. On the other hand, anchoring in Croatia is allowed in almost every bay and cove without any monitoring, so tourist overnight stays that take place outside of nautical tourism harbours are not registered. In this light, the real number of overnights is likely to be higher than the official one. In any case, the trend is clear. Nautical tourist arrivals and overnight stays have increased. The annual growth rate for the period 1996 – 2004 was around 15%, which was 4.1% more than for other types of tourism. Nautical tourism is expected to continue growing in the future. The Croatian Nautical Tourism Development Strategy projects that in 2018 Croatia will generate 2 billion € from nautical tourism.

Croatian nautical tourism is recognised as possessing many assets: a clean sea, a beautiful landscape rich in biodiversity, the geographical position, traditions and the perception of safety in the country. But serious shortcomings lie in the low number of moorings, lack of moorings for bigger yachts, quality of services for tourists, “value for money”, poor waste and waste-water management, and a poorly defined legal framework. Croatia has 12.2% of the Mediterranean coastline and 33% of the coastal length of all Mediterranean islands, and therefore much potential for nautical tourism development. In

2007 Croatia had 70 nautical tourism harbours and 15 areas with anchoring and buoys distributed across only two counties (Primorsko-Goranska and Zadarska County). In total there were around 21 020 moorings in Croatia (15 834 at sea and 5186 on land). Based on the current county physical plans the number of new moorings planned by 2015 is 33 655 (25 755 at sea, 7 900 on land), which means an increase of 160%. So, in 2015 Croatia could have 54 675 moorings in total (41 589 in sea, 13 086 on land). This will require much heavy building, especially in Istria County and in Dubrovnik-Neretva County, where 43% and 22% of new moorings are planned, respectively.

Since the greatest attraction for nautical tourists is the well preserved natural environment, it is to be expected that conflicts might arise as capacity expands. County physical plans anticipate the construction of new ports and moorings in PAs, including the Ecological Network and future Natura 2000 Network areas. As projects get underway and investors begin work to define the total number of moorings and their distribution per location, they will have to develop strategic environmental impact assessments that include feasibility assessments of physical plan derogations, impacts on the natural and historical heritage, and hopefully, the input of local communities.

Croatia has several new laws and regulations defining procedures for strategic environmental and nature impact assessments (Regulation on Strategic Assessment of the Impact of Plans and Programmes on the Environment O.G. 64/2008, Regulation on Informing Public and Interested Public in the Environmental Protection Issues O.G./2008, Regulation on the Environmental Impact Assessment O.G. 64/2008, Rulebook on the Nature Impact Assessment O.G. 89/07, Environmental Protection Act O.G. 110/07, Nature Protection Act O.G. 139/08). However, these regulatory tools have unclear and overlapping competences and are still not properly functioning in practice. In addition, they are often modified by the Croatian Government. For example, the Regulation on the Environmental Impact Assessment entered into force in June 2008, but by April 2009 its strength in terms of environmental protection and public participation had been diminished, allowing investors to be less concerned with the environment.

The greatest threat to long-term nautical tourism development is the potential for uncontrolled usage of natural landscapes and resources. Tourism, including the nautical tourism sector, generates direct economic benefits and contributes significantly to the country's foreign exchange earnings. Nautical tourists visit Croatia because of its attractive coast, the large number of islands as well as preserved coves and bays free of urbanization. More than 90% of the current nautical tourists in Croatia have already visited Croatia at least once before. The Islands currently have approximately 2.6 moorings per coastal kilometre. If sustainable nautical tourism development is to be adopted, any construction of new mooring facilities has to respect **carrying capacities** (the amount of use an area can sustain while maintaining its productivity, adaptability, and capability for renewal) of coves, bays and ecosystems in general in order to avoid destroying the main assets that are attracting tourists.

5. Tourism and Lastovo Nature Park

5.1 The local tourism framework

Almost all economic sectors (e.g. agriculture, fishing) on the archipelago are related to tourism, reflecting national level designs for its economic development. This affects social life since the Islands are almost deserted during the year and only come to life in the summer period. Tourism has actually only been developing in the last 15 years, since the war, and the Lastovo Islands are mostly visited by families in search of quietness and unspoiled nature. The number of tourists has increased significantly, although still not as rapidly as in other coastal parts of Croatia.

This is due to several reasons: the distance of the islands from the mainland and poor ferry connections, with the only regular access from Split by ferry (5 hours) or by catamaran (3 hours); limited marketing of the island, a lack of sporting and cultural events; the existence of only a few sand and pebble beaches; and poor infrastructure.

In 2005 there were more than 70 registered owners renting apartments to tourists. Currently on the island there are 511 registered beds in private accommodation, 30 registered (legal) moorings, 30 camp units (for up to 100 people) and 72 hotel rooms (hotel "Solitudo", "A" category, 150 beds). Two lighthouses, one on Lastovo and one on Sušac, are also being rented.

The "sun and beach" tourist season is limited to July and August, while nautical tourist season usually runs from June to early October. In 2007 the total number of overnight stays was around 50 000 (**Table 6**), out of which most were Croatian, Italian and Slovenian tourists. Fewer than 30 000 overnight stays were in private accommodation, while the rest were in campsites and hotels, with an additional 10 000 or so mooring fee payments (fees are paid by boat per night, but the price also depends on the boat length). However, many tourists are not registered at the Tourist Board by their hosts who wish to avoid paying sojourn and income taxes. Likewise, many nautical tourists who anchor do not pay mooring fees and are therefore not registered, although in recent years statistical coverage has improved.

5.2 Increasing pressures

An increasing number of visitors arrive to the Lastovo Islands by yacht, using a number of very small private marinas and moorings, most of which lack legal concessions. However, these moorings provide a safe place for yachts and actually lower the incidence of "free" anchoring, so they are tolerated by the local government. Unregulated anchoring is practiced in almost all bays and coves, with damaging effects on the seabed, habitats and species. It also contributes to the spreading of invasive marine species (**Figure 12**). Oil and wastewater discharge and littering from boats and yachts significantly contribute to sea pollution, which often happens in bays that are already under stress from the sewage waters from surrounding houses. Water quality for swimming is measured several times

Main threats to the environment from:

Tourism:

- Illegal fishing and over-fishing including over-harvesting of endangered species such as red coral
- Inadequate wastewater and waste management
- Coastal construction and the consequent visual pollution

Nautical tourism:

- sea bed damage by anchoring (especially coral and seagrass meadows)
- noise pollution
- littering
- wastewater pollution
- pollution from boat paints
- increased hazard from oil pollution
- spreading of invasive species (e.g. algae *Caulerpa racemosa*, **Fig. 12**)
- increasing pressure for coastal construction (new fixed moorings, marinas, apartments)
- high seasonal demand for seafood (fish, crabs)
- Forest fires (**Fig.8**)
- Depopulation and land abandonment

per year by the Ministry of Environment in places such as Sv. Mihovil, Rt Zaglav, Skrivena luka, and Kupalište Pasadur, and these results still show high sea quality, though in the summer months the measurements also show a decline in suitability for bathing (**Figure 13**).

Although the Islands have very transparent seawater, rich marine life, and some of the best diving locations in the Adriatic Sea, scuba-diving is not well developed. This is due to the Island's distance from the mainland and a lack of promotion within diving tourism groups. Until 2009 there was only one diving centre on Lastovo Island. Now there are two and it is expected that more of them will be opened. Most restaurants, apartments and hotels furthermore, are located along the coastline in small villages that have been constructed in the recent years. Some of them are constructed illegally or with high

Table 6. Number of overnights in Lastovo Islands NP in 2002-2007
(Source: Lastovo Tourist Board office statistics)

			Overnights by tourists from			Overnights per accommodation type			
Year	**Number of tourists**	**Total number of overnights**	**Slovenia**	**Italy**	**Croatia**	**Private accommodation**	**Camp**	**Hotel**	**Moorings**
2002	/	24026	4668	4536	2706	All private accommodation	/	/	/
2003	/	24216	6930	8061	3229	19064	685		4467
2004	/	34918	7116	11687	4497	20979	1356	4667	7916
2005	/	36247	8163	10430	6611	20699	1771	6467	7310
2006	/	47424	11071	11516	10299	26461	2000	9429	9471
2007	13013	51989	10041	12207	12811	27759	2192	11574	10464

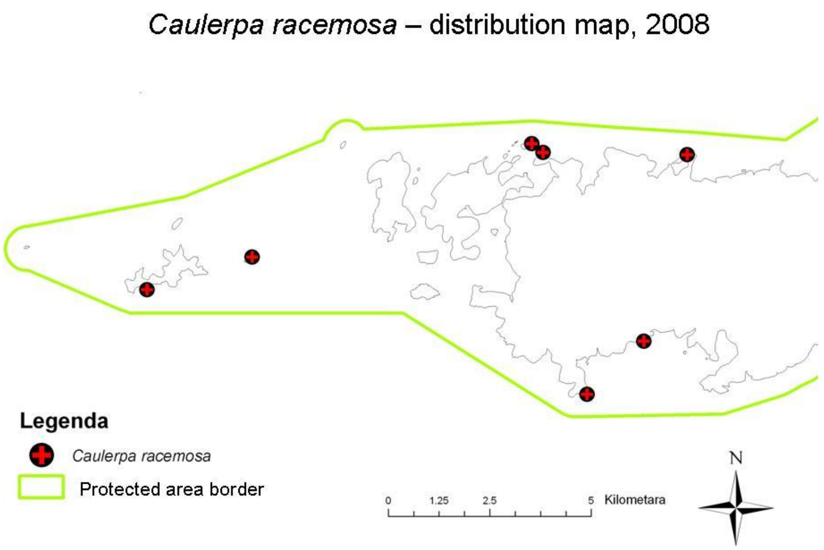
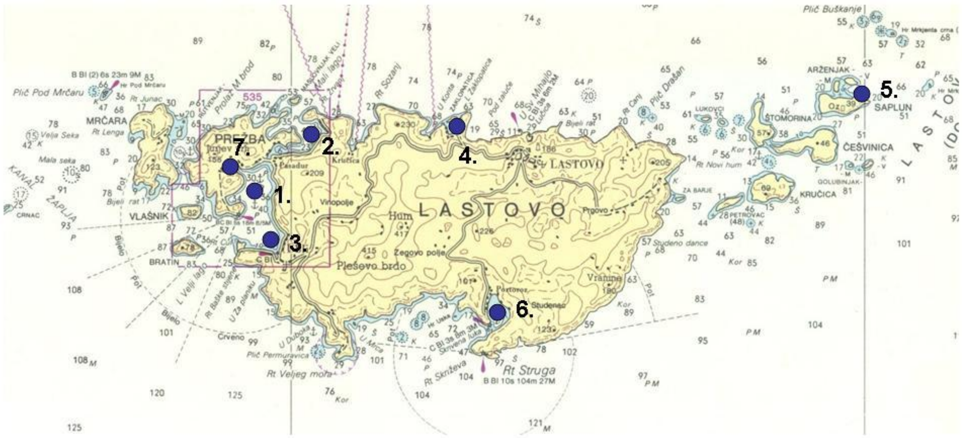


Figure 12: Invasive marine green algae *Caulerpa racemosa* – distribution map
(Source: Z.Jakl)

Island of Lastovo – areas under highest nautical tourism pressure



1. Veliki Lago
2. Mali Lago
3. Ubli
4. Zaklopatica
5. Saplun
6. Skrivena luka
7. Jurjeva luka

Figure 13: Lastovo Islands NP – areas under highest nautical tourism pressure
(Source: Z. Jakl)

impacts on the landscape because of their proximity to the sea or their height which is often incompatible with the local landscape. Rows of houses are frequently built parallel to the narrow stretches of coast, separated by the main road and constructed in an unorganised manner. Such coastal development of apartments, moorings and hotels can be expected to continue in the future. The ancient main village, Lastovo, based in the centre of the main island offers interesting architecture but very little accommodation facilities. Here properties can belong up to ten or fifteen owners, many of which now live in America or Australia or are dead with legally unresolved succession issues.

Where these problems have been resolved, people have begun to rebuild and rent many of these properties. However, as of February 2009, foreigners were permitted to buy Croatian property without restrictions, so an increasing number of properties are being sold to outsiders. These are usually old people, who live in the Lastovo Islands only during the summer and therefore do not contribute to the development of the local economy, social life or maintenance of traditions.

6. The Protected Area (PA) Management System

The Nature Protection Act (Official gazette 70/05) regulates the system of protection and integrated conservation of nature and its assets. In Croatia there are nine categories of PA: Strict Nature Reserve, National Park, Special Nature Reserve, Nature Park, Regional Park, Nature Monument, Important Landscape, Forest Park, and Park Architecture Monument. PAs cover 5.85% of the national territory: equalling 9.01% of terrestrial surface but only

0.07% of territorial waters. National Parks and Nature Parks are managed at the national level by specific institutions based in or near PAs, while all other categories are managed at county or local levels.

The most important document for the management of PAs is the management plan, which defines the organization, usage and protection of space in national and nature parks for a period of 10 years, and legally provides opportunities for **public participation**. Management plans are developed by the PA management institutions and adopted by PA management boards after their evaluation by the State Institute for Nature Protection (SINP) and approval by the Ministry of Culture (MoC). Each park also has a Rule Book of Internal Regulations defining more detailed protection measures for each PA.

Since PA physical plans are approved by Croatian Parliament, these documents have the highest rank in the planning process hierarchy. However, while PA management is under the competence of the Ministry of Culture (MoC), physical and spatial planning are under the competence of the Ministry of Environmental Protection, Physical Planning and Construction (MoEPPPC). Physical and spatial planning in Croatia are furthermore very complex, usually entailing high levels of political influence. Moreover, Croatian laws are in a process of changing to fall in line with EU accession requirements. These combined situations often open legal gaps that allow the implementation of projects with high environmental impacts.

In general in Croatia processes of involving stakeholders in planning, decision making and management are still on the whole, undeveloped. Neither government nor citizens have had much experience in communicating on such levels due to the country’s communist history, throughout which all decisions were taken by the central government. However, public participation has recently begun to improve, mainly under the influence of EU accession processes.

6.1 Management of the Lastovo Islands NP and the Role of Stakeholders: Plans and Regulations

The establishment of the Lastovo Islands NP was based on the assessment of scientific data (species richness, habitats, cultural heritage, expected impacts on the local economy) and in consultation with local communities. It is managed by the Lastovo Islands Nature Park Public Institution, set up only in 2007 as previously mentioned. Operating from Lastovo Island and funded by the central government, it has only five employees (a Director, a Conservation Manager and three Rangers) equipped with only one boat. Furthermore, the regulations and physical plans of the Lastovo Islands Nature Park PA are still under development. The Spatial Plan for the NP, the responsibility of the MoEPPPC and the most important document in the planning hierarchy is still not ready, while the Dubrovnik-Neretva County Spatial Plan has been in place since 2003. The Lastovo Municipality Spatial Plan meanwhile is in the final stages of approval and expected to be in place by the end of 2009.

In addition, the Rulebook on Internal Regulations for the Lastovo Islands NP is still being drafted. The Rulebook will limit the quantity and type of fishing gear in the NP, the number of annual licences issued, and will define criteria for determining who can obtain licences. It will also divide the Islands into four fishing zones and every three years two zones will be closed for fishing. Spear fishing will be restricted to several particular areas of the park, and anchoring will be limited as well. Clearly, the entire planning process is complex in Lastovo and has suffered delays for over 4 years due to politics and slow bureaucracy. In the absence of effective regulation a great deal of illegal construction (including that of nautical moorings) has therefore been tolerated.

7. Stakeholder Participation

In response, the Lastovo Islands Nature Park Public Institution has initiated the development of a management plan under the MedPAN South framework. This is an international pilot project that aims at supporting 5 Croatian marine PAs (including Lastovo Islands) in developing management plans, networking and exchanging experiences. In Croatia this project is being implemented by the authors of this chapter, Association Sunce and coordinated by the WWF, the Ministry of Culture and the State Institute for Nature Protection. The PA status of the NP only allows economic activities which do not pose significant threats to the values due to which the area is protected. This means that in practice protection has to be negotiated amongst stakeholders, of which there are many.

The main actors in the Lastovo Islands NP are the Ministry of Culture (responsible for nature protection), the State Institute for Nature Protection, the Ministry of Environmental Protection, Physical Planning and Construction, Public Institution Nature Park Lastovo Islands, the Lastovo Municipality, professional, small-scale and recreational fishermen, tourism sector representatives (nautical tourists, restaurant owners, accommodation facilities owners, mooring owners, tourists, etc.) and national/international NGOs (Sunce, WWF). Another important actor is the Croatian Ministry of Defence which holds the property rights of many of the old military facilities on Lastovo Island, some of which are based in very attractive areas for tourism development.

Association Sunce and **WWF** have been active in campaigning for the protection of the Lastovo archipelago since 2002. The establishment of the park made obvious that further support was needed in order to ensure that management of the area would contribute to nature conservation and the sustainable development of the local economy. In 2005-2008 Sunce collected a substantial amount of marine biodiversity data and established good relationships with local community representatives and park authorities. In January 2009 a four year project to assist managers in developing management plans was initiated in collaboration with WWF, Sunce, and the Ministry of Culture.

Communication, participation and co-management are seen as the way to manage PAs in Croatia since most of these areas have communities living within their borders in possession of private property. Local people cannot simply be forced to obey rules; they need to have a sense of ownership over the PA and believe that these regulations can bring good to them and the environment they live in. In engaging with stakeholders, different values and interests come into play. **Social multi-criteria evaluation** (see below) could be very useful in facilitating participatory decision making on the future management of the Lastovo Islands NP.

7.1 Participatory Tools for Sustainable Tourism Development

The Lastovo Islands NP is an archipelago undergoing economic development that needs to define a strategy for reaching its development objectives. The Island's physical and spatial plans define the general framework for development but which projects will be implemented and how they will be carried out depends on the local community and available investments. If Islanders want to be creators of their own future, they need to know what kind of future they want. Visioning, scenario building and social multi-criteria evaluation (also called multi criteria analysis) are tools that could help decision making on development options. These evaluations could also be used as part of the consultation process for the development of PA management plans. Local civil society could play a role in applying these tools by:

- Identifying the main stakeholder groups from, or connected to the island, at different scales.

- Organising group meetings with representatives of these groups to present the objectives of the work

- Developing a set of workshops or focus groups with stakeholders in order to:

- Holding a visioning exercise, to identify fundamental options for the development of different scenarios (usually two contrasting axis are established for the development of four scenarios). Scenarios would describe possible images of the future of the Island, for instance, 20 years down the road. One could contemplate two scenarios for example, one with more tourists and one with less tourists, see their implications in terms of economy and environment, as an aid to taking public policy decisions.

- Identifying the main indicators/criteria (called social multi-criteria analysis) that translate stakeholders' viewpoints and objectives in relation to the economy, society and the environment (e.g. number of jobs, number and diversity of businesses, how many jobs for locals, seasonality of income, way of life - everyday stress, "fast way of life", traffic problems, perception of safety, preservation of traditions, air and water quality, risk of forest fires, preservation of fisheries).

- Discussing and evaluate the scenarios in a multi-criteria framework, in order to discuss the pros and cons of each scenario to develop a commonly shared vision.

- Drafting an action plan identifying the main actions that are needed in order to turn that vision into a possibility for the future. Policy instruments could be discussed at this stage.

- Using conclusions and recommendations from the workshops to propose future management actions

8. The Future of Nautical tourism development

Coastal areas in Croatia are suffering devastation from illegal and poorly planned construction and development in general. The development of nautical tourism generates additional pressure on coastal resources, especially in PAs which are the most attractive areas for nautical tourists. The Kornati National Park and its surrounding area, for example, are considered one of nautical tourism's "paradises", visited by around 20 000 boats per year, which implies the throwing of as many anchors and much damage to the sea bed. The Kornati National Park Public Institution tried to install buoys to stop anchoring and allow safer mooring for nautical tourists but was forced by the Ministry of Culture to remove them as they were not in line with the current physical plan. Developed independently of the Institution, MoC planning foresees that in the next 10-15 years all individual visits to the park will be stopped, eliminating the need for a system of buoys. Meanwhile, the number of nautical tourists in the park is increasing each year and destruction of the sea bed continues.

In 2008 the Lastovo Islands NP Public Institution started charging entrance fees of 2.70€ per person per day. In 2008, 20 570 entrance tickets were sold. This fee is currently charged only to nautical tourists but will likely soon apply to all visitors. This practice is already implemented in almost all Croatian PAs and is largely driven by the Ministry of Culture and the central government. The objectives are to lower the costs for financing protection from the State budget, to ensure the self-sustainability of the park and the local economy, to obtain information about the number of visitors, and to increase awareness about the fact they are in a PA. Unfortunately, although the money stays in the Public Institution, often the priority for using this money is to promote further tourism while the implementation of conservation measures comes last. In the case of The Lastovo Islands NP, the large number of islands and islets has meant that money collected from entrance fees has mainly been spent by the Public Institution on funding boat maintenance and petrol costs for monitoring. The salient point to be made here, however, is that because PAs are mainly protected through entrance fees, managers are keen to increase the number of visitors (rather than simply raise entrance fees, which are already seen as relatively high) regardless of the pressures on habitats.

It is not surprising then that a large proportion of the local community of the Lastovo Islands NP does not welcome the use of entrance fees since the Park is currently not offering any services in return or contributing to systematic forms of protection (buoys systems, facilities for collecting waste and waste-waters from yachts). They believe that the Public Institution should invest money in conservation and more importantly, provide clear information and include locals, who are very sceptical about what the fees will be spent on, in management planning. The owners of restaurants earning a living from nautical tourists are also apprehensive about entrance fees, fearing their implementation will lead to a decrease in the number of visitors without contributing to environmental protection and a positive experience for visitors.

Meanwhile, plans are being developed to forbid anchoring on all of Lastovo Island and to restrict mooring to specific locations. In these specified areas the total maximum number of boats per bay was set by the Municipal Physical Plan, but without the necessary prerequisite studies. Studies of mooring capacities of each bay and cove are needed before project implementation, as are detailed plans for implementation of the mooring system, i.e. whether it will involve fixed moorings, marinas, buoys, and/or pontoons (**Table 7**). The situation is similar for new construction projects, particularly those of the new tourist zones foreseen in the Island's Municipal Physical Plan. The physical plan sets up construction zones and the maximum possible construction capacity while interested investors and environmental and nature impact assessment studies define this in more detail.

Table 7: Moorings and harbour capacities (Source: (Draft) Lastovo Municipality Physical Plan, 2007)

Moorings					
Area	Maximum planned moorings	Existing moorings	Surface (approx)	Already constructed area	Maximum depth (approx)
Lučica*	10	yes	0.17 ha	yes	5 m
Pasadur*	70	yes	6 ha	yes	6 m
Sv. Mihovil*	10	yes	0.47 ha	yes, some	5 m
Ubli*	50	yes	n/a	yes, ferry port	10 m
Zaklopatica*	40	yes	8 ha	yes	12 m
Skrivena luka**	80	yes	20 ha	yes	17 m
Mrčara	10	yes	n/a	yes, some	7 m
Kremena**	60	0	6,5 ha	no	34 m
Saplun	30 (anchoring buoys)	no	13 ha	no	30 m
Jurjeva luka	200 (support for planned tourist facilities)	no	6 ha	yes, old military area	10 m
Nautical tourism harbours (marinas)					
Kremena	400	no	6.5 ha	no	34 m
Skrivena luka	200	yes	20 ha	yes	17 m
*Harbours of local importance (for local community) **After development of the nautical tourism harbour, moorings will become part of marina					

Therefore, a mix of policy measures may be of interest. There are a variety of economic **instruments for sustainable tourism** that could be effective, including regulatory or "command and control" instruments (such as the prohibition of anchoring, urban zoning, or fishing quotas), institutional instruments (introducing nautical tourism eco-labels, or changes in property rights like privatization of military facilities which could be reformed for tourism purposes) and market based instruments (like levying an environmental tax or a user fee for raising funds for conservation of the NP, or creating financial incentives for sustainable tourism practices). A higher entrance fee, if locals could be persuaded in its favour, could for instance reduce the number of visitors and consequent impacts (depending on the response, or "elasticity" of demand to changes in price – see below), if the receipts are not spent on tourism marketing.

8.1 Economic Valuation for Lastovo NP

Economic valuation methods could be applied in order to support decisions which involve choosing between the degree of environmental preservation versus economic development or assessing the costs and benefits of a development project. Economic valuation should be seen as a complement to other approaches and it should be integrated into a broader multi-criteria evaluation context.

For each of the values to be estimated, it is important to select the most appropriate economic valuation technique/tool. For example, the **contingent valuation** approach, using field work based on the completion of surveys could help determine the demand curve (a ratio of the appropriate entrance fee / number of tourists) for the Lastovo Islands NP. Such a survey could also explore opinions among locals and tourists on what the maximum number of tourists should be on the Island and per bay. A questionnaire could also gauge the perceptions of nautical tourists of what the maximum number of boats per specific bay should be, for although a bay may be able to hold a certain number of boats, from the perception of tourists wanting peace and quietness this number could be too much.

If a contingent valuation technique were selected to estimate (some of) the economic values, the main steps to implement the tool would include:

- Explaining to potential questionnaire respondents the reasons for levying an entrance fee, (insufficient public funding for example) and outlining how the money would be used for conservation purposes

- Developing a questionnaire on issues such as: the maximum amount that one would be **willing to pay** as an entrance fee to the NP; what one should get in exchange for this price; which specific purpose the money should be used for in their opinion; whether respondents believe that this money will be spent on conservation; what the optimum number of boats in the bay would be; and finally, the socio-economic characteristics (gender, age, education, income) of respondents.

- Defining the number of interviews to be implemented

- Conducting interviews, analysing obtained data and presenting results to the relevant authorities[59].

The **travel-cost method** is another economic valuation tool that could be applied to identify tourists' willingness to pay for entrance fee to the NP. This method is based on the assumption that travel costs and time spent travelling to a site represent the price of access to this site. This method can also determine the demand curve and the total **economic use value** of a tourist site. Unlike the contingent valuation method, which is based on hypothetically stated behaviour, the travel cost method uses information on revealed behaviour of visitors. In this method, the willingness to pay is estimated based on the number of trips that tourists make to a specific site at different travel costs. In applying this method, information would also be collected through surveys, in which respondents are asked how many trips per year they make to the Lastovo Islands NP and how much time it took them to get there.

The travel cost method might also be combined with contingent valuation to estimate an economic value of a change (either enhancement or deterioration) in environmental quality of the NP by asking the same tourists how many trips they would make in the case of a certain quality change. This information could help in estimating the effects that a particular policy causing an environmental quality change would have on the number of visitors and on the economic use value of the NP.

The scale of construction that will ultimately be implemented will depend on local communities' vision of the future, potential investors, and the strength of Croatian laws. It is important that the Lastovo Islands NP keeps both small-scale and high-quality tourism in order not to deteriorate its offer of environmental services that is currently attracting tourists and which distinguishes it from the other parts of Croatia. There can be an alternative to mass and high-impact tourism, and this can be achieved in practice with the NGO community as a watch-dog to ensure laws are implemented and nature is respected.

Learning from the Kornati National Park experience, the Lastovo municipality and Public Institution of the Nature Park are working to ensure via the Rule Book on Internal Regulations that the management authority can control anchoring by limiting anchoring and mooring to specific locations, while the Municipal Physical Plan sets a limited maximum number of boats per location (in line with the County Physical Plan). Moorings can be organised directly by the Public Institution or by other parties through a system of concessions granted by the Dubrovnik-Neretva County, which contain very general requirements regarding environmental protection.

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59 See the study carried out by Ivana Logar for a doctoral thesis at ICTA UAB, 2009, on willingness to pay for access to some mass tourism beaches in Croatia.

All interested parties agree that anchoring and mooring should be limited and the majority agrees on the chosen locations. The issues of the maximum number of boats per location, the method of mooring (marina, buoys, and pontoons) and charging of entrance fees have, on the other hand, aroused controversy and remain to be decided. Some of the conflicts are arising between restaurant and mooring facility owners, who would like more nautical tourists and who think that entrance fees are discouraging tourists to visit the Islands, and the people who rent apartments and think that boats are polluting the sea and disturbing swimmers. It is the method of mooring organisation however that will play an essential role in determining the level of new construction and of the permanent impact of tourism on the landscape and the environment.

9. Conclusions: A CSO vision

Tourism development can create considerable benefits for the local economy in the long run. The Sunce vision for maximising these benefits with minimal environmental impact is one in which boats visiting the Islands would be predominantly moored to fixed buoys distributed across selected coves and bays. The number and distribution of buoys would be based on a carrying capacity estimation (See below), and a system discouraging anchoring would be in place and supported by the local community (e.g. those that are anchored would pay much higher entrance fees). The system of buoys would also be designed to have a low impact on the surrounding environment and landscape. The notion of carrying capacity combined with an assessment of the area's **resilience** (the ability of the system to recover when disturbed) could contribute significantly toward reaching agreement on the appropriate number of nautical tourists for Lastovo NP.

9.1 Carrying Capacity in Lastovo NP

The Lastovo Islands, with their sensitive environment, have limited development capacities. These capacities are most obvious in relation to tourism, especially nautical tourism. In order to ensure sustainable development, Lastovo Islands NP will have to define the archipelago's carrying capacity with respect to fisheries and tourism, in particular to nautical tourism. Definition of the nautical tourism carrying capacity of this area would involve:

- Determination of the maximum number of boats per bay based on the optimum surface needed per boat
- Assessment of facilities and methods for anchoring, mooring, buoys, marinas
- Identification of the most likely sources of pressure: pollution and physical damage from boats, pollution from houses and restaurants
- Selection of possible indicators: heavy metals, posidonia beds, water quality, physical damages, eutrophication, currents, perception of tourists, etc.
- Quantification of:
- Quality/state of the system
- Pressures on the system
- Indicators

- Relations between units of pressure - units of state of the system

Resilience is an approach for ascertaining which parts of the ecosystem will give way to pressures first, as it measures the ability of an ecosystem to absorb shocks while maintaining its functionality. When change occurs, resilience provides the components for renewal and reorganisation. Vulnerability is the flip side of resilience: when a social or an ecological system loses resilience it becomes vulnerable to change that previously could have been absorbed. In a resilient system, change has the potential to create opportunity for development, novelty and innovation. This can happen after forest fires in the Mediterranean (although perhaps not on southern Lastovo where Aleppo Pine is thriving at the expense of Holm Oak, acidifying the soil, negatively impacting biodiversity and increasing the risk of future forest fires), but in vulnerable systems even small changes may be devastating, as is often the case with fisheries and coral extraction. With assessments of the carrying capacity and resilience of the area, it would then be possible to study nautical tourists' willingness to pay to use moorings. This could be translated into higher entrance fees, which ideally would be recycled into environmental investments.

A number of new high-quality tourist accommodation facilities would be constructed in areas previously devastated by military bases. Several new fixed coastal mooring areas would be developed, but limited in number according to carrying capacity. New moorings and new accommodation facilities providing additional beds would be constructed respecting the local environment, culture and architecture. The construction of these facilities would significantly contribute to local infrastructure development, especially waste and waste-water management. Money collected from entrance fees would be transparently reinvested into furthering the conservation system. A trust fund to subsidize green technologies would be implemented, partially funded through entrance fees. The Public Institution of the Lastovo Islands Nature Park would have enough financing and capacity to run the management of the area properly, a task which would be much easier with the involvement of locals in decision making.

No-take zones supporting fish stock restoration would be set in place in consultation with local stakeholders. These areas would not only revive depleted populations of fish through spill-over effects (increases of fish populations outside no-take zones) but also attract a substantial number of divers eager to see untouched nature and a diversity of fish species in their natural environment. Professional fishing would be limited by restricting the number and type of tools, issuing fewer licences which would be offered mainly to locals, and sport/recreational fishing would be restricted to a few specific zones. Illegal fishing would cease to be a problem as the attitudes of local communities changed and law enforcement improved. Tourists would have the opportunity to enjoy the Islands' beauty, not only along the coastline, but also inland, discovering fields, architecture, and folklore. Good local food, natural and cultural excursions and events would attract yachts and younger generations would have opportunities to run businesses, reversing trends of depopulation.

This is the vision of the CSO Sunce, one of the stakeholders of the Islands. A shared vision of all stakeholders will have to be defined through a participatory process. In order to move toward the vision described above, in which the economic benefits of tourism are increased and equitably distributed with minimal environmental impact, it will essential to develop and implement a strategy focused on forms of tourism that will create economic added value while preserving the environment on which these activities depend.

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Chapter 10 : LOCAL COMMUNITIES AND MANAGEMENT OF PROTECTED AREAS IN SERBIA

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Danube River passing through Djerdap Gorge
(Source: Ivana Jelic, Ecological Society Endemit)

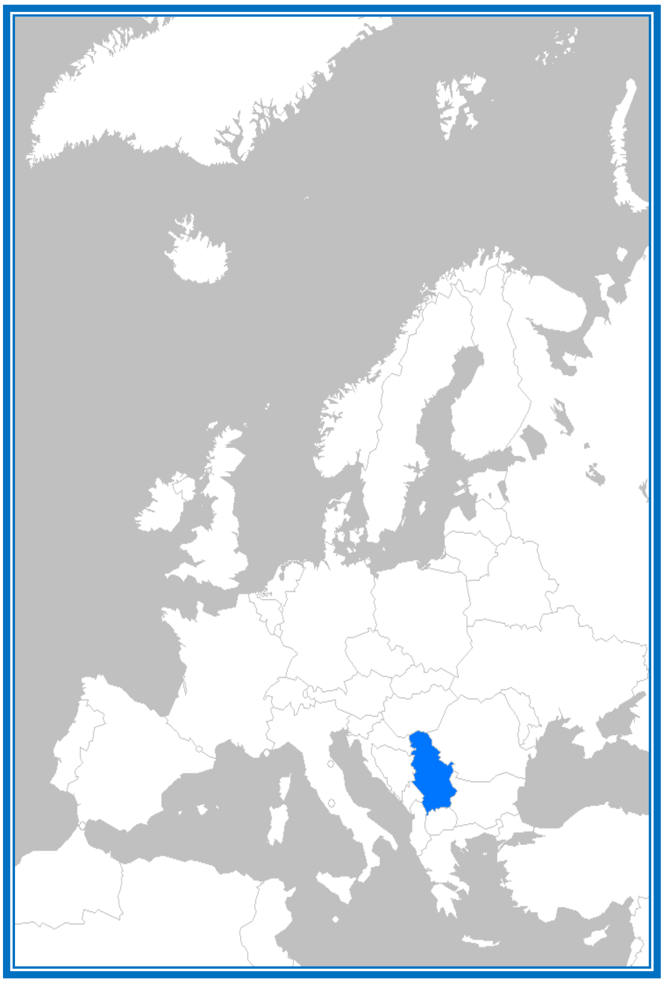
Abstract
In Serbia's eastern Carpathian region, Djerdap National Park is the country's largest. It is an important refugial habitat extremely rich in biodiversity and cultural heritage, but one with considerable social and economic problems that can be traced back to the construction of a dam and the largest hydropower plant system on the Danube River. In fact, a complex combination of factors, including river damming and subsequent National Park designation, have affected the local cultural heritage and ecosystems, and contributed to the depopulation and impoverishment of the now aging local community. In addition, further devastation was visited upon the locality by the economic crises in Serbia in the 1990s. Sustainable national park management practices are needed. However, their design must incorporate active community participation in decision-making and planning for the sustainable use of ecosystem services and development of ethno-tourism, if trends in rural emigration and depopulation are to be reversed and the national park is to be protected in line with sustainability principles.

Keywords: National Parks, Dams and Hydroelectricity, Depopulation, Co-Management, Eco-Tourism, Forest Economics, Local Livelihood Opportunities, Ecosystem Services, Krutilla's Rule, Cost Benefit Analysis, Cultural Heritage, Trans-boundary Cooperation

1. Introduction

In 1972 the Iron Gate Dam, 1278 m long and 60 m high (AQUAPROIECT 2003) was built on the border of Serbia (**Figure 1**) and Romania, flooding 12 settlements over an area of 14 500 ha and transforming the local way of life forever. This area in the Carpathian region of north-east Serbia has a rich cultural heritage. Many important riverside archeological sites from various historical periods were impacted by this flooding, such as Roman fortresses on Ada-Kaleh island, considerable parts of the Roman road, and memorial plaques to Tiberius and Domitian (Stanojlovic, 2005). Other sites were relocated to an upper shoreline zone, including the Trajan Table and the archeological site of Lepenski Vir (Stanojlovic, 2005). As it interrupted the flow of the Danube River the dam also resulted in the creation of Djerdap Lake, altering the local river ecosystem (Brezeanu *et al*, 2006, ICPDR, 2009).

Figure 1: Map of Serbia
(Adapted from
http://upload.wikimedia.org/wikipedia/en/e/e9/Europe_map_serbia.png)



Two years later the area upstream of HPP Djerdap 1 was designated a Protected Area (PA), and named Djerdap National Park (NP) The largest in Serbia, it occupies a surface area of 63 608 hectares (ha), within a wider protected area of 93 968 ha. Intended as a measure for environmental protection, the founding of the NP and the dam construction have contributed to the deterioration of the inhabitants' standard of living and an ongoing process of **depopulation**.

1.1 The Rich Heritage of Djerdap: Geography, Geology, Hydrology and Biodiversity

Home to a number of important ecosystems (**Table 1**), the park's borders stretch from town of Golubac up to the Iron Gate dam near the village of Sip. The terrestrial part of the park is about 6 km wide and 100 km long. Upon entering park territory the Danube River passes through the longest European composite valley (about 150km long), comprised of 3 smaller gorges (Golubacka, Gospodjin vir and Sipska), 2 canyons (Veliki Kazan and Mali Kazan) and 3 valleys (Ljupkovska, Donjomilanovacka and Orsavska). The last and narrowest gorge of the system on the Danube River is called "Iron Gate" (in Romanian Porţile de Fier or in Serbian Gvozdena Vrata). The name originates from the Roman period, since the part of Djerdap Gorge near Sip, made river traffic almost impossible due to the presence of underwater rocks and fluctuations in water levels (Serbia Travel Club, 2008). The gorge divides the Carpathian and the Balkan Mountains and forms part of the border between Serbia and Romania. It is about 3 km long and 162 m wide, with towering rock cliffs that make it one of the most dramatic natural landscapes of Europe (Britannica, 2009). The name Iron Gate however is commonly applied to the whole 150 kilometer gorge system (Britannica, 2009) as well as to the dam. This area has the oldest geological history in Europe, with complex structures resulting from the impacts of climate and tectonic phenomena adding to its morphological diversity and richness. There are also numerous notable hydrological formations, including springs (for example, the spring of the Porecka River) and other small rivers and streams.

Table 1: **Ecosystems diversity and surface**
(Source: Medarevic, 2001)

Ecosystem type	Area (ha)
Forests	44 851
Meadows and pastures	6337
Acres and orchard	4559
Aquatic areas	5882

With regard to biodiversity, the territory of the NP is situated on the border of two different floristic regions: the middle-European region of temperate forests and the ponto-southsiberian or steppe-forests floristic region (Stevanovic, 1996). The park is one of the largest and most northerly European refugia for flora and vegetation of the Arctic-Tertiary period, with more than 50 different types of forest and bush formations, out of which 35 are relict (Medarevic, 2001). More than 900 species and subspecies of vascular plants inhabit the territory of the NP (Stevanovic, 1996), however a detailed database on the total number of species has not been completed yet.

The fauna of this area is also rich and various. So far 170 bird species have been noted, but it is thought that at least 200 bird species visit this area throughout the year. Numerous species of mammals are also present, including: the wildcat (*Lynx lynx carpathicus*), bear (*Ursus arctos*), wolf (*Canis lupus*), jackal (*Canis aureus*), chamois (*Rupicapra rupicapra*), deer (*Cervus elaphus*), otter (*Lutra lutra*) and others. A great number of species of insects, amphibians and reptiles also inhabit the territory of Djerdap NP. Before the construction of the Djerdap dam, the fish population was composed of species common to the Danube River, as well as semi-migratory species such as eel and other migrant species (sturgeons, stellate sturgeon, etc.).

1.2 Cultural Heritage

Due to its specific geographical position, the presence of the river, the mild climate, and diverse and rare natural resources, the Djerdap region has been home to numerous human civilizations throughout history. There are archaeological sites all across the park territory dating from pre-neolithic times, through the Bronze and Iron Ages as well as Roman, Byzantine and Turkish epochs. Lepenski Vir for example, is an 8000 year-old archeological site of global importance holding the oldest known European human settlement (Misic, 1980). Historically, the strategic value of the area is evident in the number of military fortifications (as in Golubac) from different periods (Roman, Medieval, etc). Different cultures and civilizations have over time shaped and affected patterns of cultural development in the region. This cultural heritage has an important, non-monetary value, yet many of these priceless assets were forsaken due to dam construction and subsequent flooding.

2. National Park Management

Djerdap National Park is managed by the Djerdap National Park Public Enterprise (NPPE) based in the city of Donji Milanovac. The territory of the park is divided into three different zones of protection (**Figure 2**). The first zone (dark green) is dedicated to the strict protection of natural and cultural heritage. The second one (medium green) covers the area surrounding the first zone and applies to special nature values (specific ecosystems, landscapes etc.), and natural areas around cultural monuments. The third zone (light green) applies to NP territory outside the borders of the first and second zones of protection, and permits activities such as: tourism, sports, recreation, forestry, water use, potential exploitation of mineral resources, urban construction and development etc.

The main source of funding for Djerdap NP management comes from the timber trade, with some income from the state budget allocated for the management of private forests and cultivation activities in state forests. There is also a small amount of income from taxes on non-timber forest product collection and from hunting and fishing (licenses) (Nestorovic *et al*, n.d.). The fact remains however that Serbian NP enterprise revenue to a great extent depends on returns from logging, illustrating that the line between over-exploitation and sustainable use of resources in any protected area can easily be crossed. In light of the impacts of dam construction and NP designation, this case study aims to explore how the economic prospects of local communities might be improved through reliance on local resources given the vast potential of this area. It is the belief of the authors of this study that the development of a long-term sustainable, social-ecological system could enhance the management of local cultural and natural wealth and empower the local community.

Figure 2: The 3 Zones of Protection in Djerdap National Park
(Source: www.npdjerdap.org)

3. The Djerdap Dams and the Hydro Power Plant System

The biggest construction project ever undertaken on the Danube River is the Djerdap Hydro Power Plant System, designed for energy production and regulation of river transport (**Figure 3**). The dams also contributed to the establishment of road connections between Romania and Serbia.

Figure 3: The Danube River Basin with HPP Djerdap 1 and 2
(Source: Todoru et al. 2005)

The Djerdap Hydropower Plant System (Djerdap HPP) is 100% state owned. While its main activity is electricity production, the company also provides services related to river and lake transport, namely navigation of boats through the dam canal system.

The Djerdap 1 hydropower plant (**Figure 4**) was built between 1964 and 1972, 943 km from the confluence of the Danube into the Black Sea. This is the largest hydro-technical construction on the Danube River with a total length of 1278 m (AQUAPROIECT 2003). It is symmetrically and equally shared between Serbia and Romania, as is the total quantity of energy produced. The dam and its facilities are situated on the border of Djerdap NP and electricity production systems are constructed so they can supply energy to both territories equally, in response to local demand or shortages in either State. The basic parameters of the hydro-power-plant (HPP Djerdap, 2008) are as follows:

- Total power – 1026 MW
- The maximum flow – 4800 m^3/s
- Total volume of the accumulation - 2800 x 10^6 m^3
- Average production per year - 5.65 billion kWh

Figure 4: Djerdap 1
(Source: www.dejerdap.co.rs)

Figure 5: Djerdap 2
(Source: http://staklenozvono.rs/wp-content/gallery/elektroprivreda-srbije/he-djerdap-ii.jpg)

Since becoming operational, Djerdap 1 has produced 204.35 billion kWh of electricity and more than 50 000 ships have passed through the dam canal. The Serbian segment of the canal can carry ships of up to 5000 t directly to Belgrade, Serbia's capital city. After 35 years of operation, work on the modernization of Djerdap 1 commenced in 2008. Djerdap 2 (**Figure 5**) is the second largest hydro-power-plant on the Danube River between Serbia and Romania. Its construction lasted from 1978 - 2000, and it is located 863 km from the Danube Black Sea delta (Kusjak-Ostrovul Mare). It has a total accumulation volume of 716.5 x 10^6 m^3 and total power of 270 MW. In addition to these two sites, another project has been proposed: a reversible hydro-power-plant, "Djerdap 3", is planned near the Lepenski Vir archaeological site – 162 km downstream from Belgrade.

4. Impacts of the Dam and National Park Status

4.1 Impacts on Ecosystem Services

Djerdap NP plays a significant role in supporting and enhancing **ecosystem services** (ES), defined as the benefits natural ecosystems provide to mankind (MA, 2003, 2005). All four types of ecosystem services (ES) classified by the Millennium Ecosystem Assessment are provided by Djerdap NP. Besides playing an important role locally, they are also important on regional and global scales. Unfortunately, all types of ES provided by Djerdap NP have come under threat as a direct consequence of dam construction and inadequate NP management (**Table 2**).

4.1.1 Supporting Services

Natural ecosystems play an important role in waste treatment. The ability to absorb, or process waste varies among systems, and if some materials are released too rapidly, can modify ecosystem functioning (MEA, 2005). This is often the case with metals that cannot be converted to harmless materials, but are released in accidental spills in the Danube, accumulating in the dam.

Healthy ecosystems play an important role in moderating the severity of extreme events, the frequency of which is expected to increase with climate change. Also, the functioning of climate and natural ecosystems are intertwined, so the stability of one depends on that of the other, providing an important ecosystem service (Daily et al., 1997). Water is required for life on Earth and in that way supports all other ecosystem processes. Forests, furthermore, regulate the water cycle, in particular, mitigating floods, droughts, the erosive forces of wind and rain, and silting of dams and irrigation canals. As the forest in the Djerdap NP is an important carbon sink, sustainable forest management in the NP is of great importance.

Table 2: Threats to Ecosystem Services in Djerdap NP

Ecosystem service type	Threats from unsustainable forestry to Djerdap NP
Supporting (necessary for the production of all other ecosystem services, include soil, photosynthesis, primary production, nutrient cycling and water cycling)	the role of forests as an important carbon sink, forests' role in nutrient and water cycling.
Provisioning (products obtained from ecosystems, including food, fiber, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources and fresh water)	inefficient use of forest products pollution of drinking water from waste water and noise pollution from increased river transport as well as increases in invasive species
Regulating services *(*including regulation of air, climate, erosion, water purification, disease, pest, pollination, and natural hazards.	increased coastal erosion increased flooding on a regional level degradation of water quality and dependent ecosystems
Cultural *services (*non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences)	displacement of entire communities loss and relocation of important cultural artifacts loss of recreation areas and aesthetic beauty

4.1.2 Provisioning Services

The gathering of forest products is generally under strict control, nevertheless a more efficient use of ecosystem products would be beneficial. Drinking water in particular faces real threats from inappropriate waste management practices, an important issue not only in Djerdap NP, but in the whole country. While improvements in waste management systems are underway, increased pressure on the Danube River's inland waters is anticipated with increased river transport. Environmental problems associated with inland waterway traffic include: water pollution from engines and illegal waste dumping, mechanical and noise disturbance of aquatic biota and surrounding ecosystems, and increased risk of introducing exotic species via ballast waters.

Negative impacts on the quality of Djerdap dam water are already visible. The creation of the lake changed the natural water flow and its capacity for self-purification. Furthermore, a variety of industrial accidents in the upper Danube and its tributaries have led over the years to an accumulation of heavy metals. Sediments are rising faster than initially predicted, and have taken only 20 years to reach the acceptable maximum level, instead of the predicted 50 years. According to International Commission for the Protection of Danube River (ICPDR), in the backwater zone of the Djerdap Dam, 325 million tons of sediment accumulated between 1972 and 1994, using up 10 % of the entire reservoir capacity (ICPDR, 2005). According to total measurements of suspended solids, "long-term storage loss of 0.6% per year has reduced the storage capacity of the reservoir by 20% after 30 years of usage" (Teodoru *et al*., 2005). Locals estimate that sediment levels have already exceeded the permitted limit by 1 meter (Endemit, 2009), but the cleaning of the dam will be an extremely expensive task, and problematic due to the issue of disposing of the huge amounts of sediment. Furthermore it is not clear when and by whom it will be accomplished.

4.1.3 Regulating Services

Downstream coastal erosion has intensified as a result of the dam, as has incision of the river bed (ICPDR, 2005) The most controversial effect however is the fact that today, instead of preventing flooding, the dam has become a catalyst for floods, by raising the level of the Danube and its underground tributaries all the way to Hungarian border in the north. Combined with other impacts of climate change, this contributes to a dramatically higher risk of flooding nation-wide.

Other potentially irreversible negative changes are occurring in the water regimes of the area. These are, visible for example in changes in composition and degradation of the shallow waters and coastal ecosystems. With the slowdown of the river flow in artificial accumulations and related build-up of organic substances, sediments and other pollutants (heavy metals, pesticides, row materials etc.), water quality has been severely affected, increasing the risk of destruction of specific life forms and entire ecosystems, with coastal ecosystems particularly vulnerable.

4.1.4 Cultural Services

The non-material benefits that people obtain from Djerdap NP are numerous. Djerdap NP is home to a wide range of historical remains of great importance which add to the area's **landscape value**, and form part of the national cultural heritage. Construction of the dam for example destroyed a large part of the Lepenski Vir site, and while some monuments and artifacts were transferred to the upper zones of the riverbank, most of the original findings such as graves, foundations of shelters etc. were destroyed forever.

The park’s purpose is to conserve and enhance the natural beauty, wildlife and cultural heritage of the area, as well as to promote opportunities for the public to learn about and enjoy the special qualities it offers. Critical for life-sustaining processes, ecosystem services are usually perceived to be free of charge (WWF, 2007). This perception ultimately has a negative impact on local communities, as not only are they often poor, but they are also directly dependent on the exploitation of local ecosystems. Although a PES scheme could probably be designed for Djerdap NP, it is unlikely in the near future due to outstanding **property rights** issues (see 2.3 **Other Social Impacts**).

4.2 Impacts on Local Economy and Livelihoods

Numerous negative impacts from the dam and NP-related restrictions on resource use have created a situation in which more rather than fewer unauthorized activities such as fishing, logging and hunting are taking place in local communities.

4.2.1 Forestry and Forest Management

In Djerdap NP, 43 537 ha out of 63 680 ha is forested, amounting to nearly 70% of the area. Upon designation as a national park, approximately 36 518 ha of the forested area was registered as state and 7018.3 ha as privately owned. Although private forests are managed by their owners (Law on Forests,1991), private forest owners must have a management plan; assigning trees before cutting; paying the toll on cutting wood; sealing cut wood and issuing waybills for transport. These procedures and tolls are designed to ensure better protection of private forests and to decrease their exploitation. The NPPE gives technical support and carries out its obligations through issuing the licenses for cutting, assigning trees for cutting, giving licenses for the transport of wood and organizing activities for forest protection (Fornet et al., 2009). The entire territory of Djerdap NP is also divided across the jurisdiction of three municipalities (**Table 3**).

Forested areas within the park are divided into categories with specific functions, including strict nature reserves; scientific-research reserves; forests around cultural and historical monuments; erosion protective forest cover; and recreational forests (Medarevic, 2001). Of this total area, only 5.88 % lies in the first zone of protection, with the rest falling under the second and the third zones (see **Table 4**) in which use of forest resources (including timber) are allowed. Forests in NP territory as mentioned previously are managed by the NPPE, and this authority is in charge of labeling timber from protected areas. Gathering of the medical plants and other forest products, the use of stone, shingle, humus and other non-timber products, and bee farming are also allowed with permits issued by the NPPE. Significant natural resources for immediate use are provided by non-wood forest products, such as forest fruits, medicinal herbs, mushrooms, stone, gravel and others. Data shows the expected yield of mushrooms over a two-year period is 15 t. According to unofficial sources, with an average price of 5€ / kg, this amounts to just over 76 000 €.

Municipality	State owned		Private owned		Total	
	ha	%	ha	%	ha	%
Golubac	12 269	28	1340	3	13 609	31
Kladovo	8752	20	1673	4	10425	24
Majdanpek	15 496	36	4006	9	19 502	45
Total	36 518		7018		43 537	100

Table 3: Forest ownership by municipality
(Adapted from General Framework for Forest Management of the Djerdap National Park, 2002)

Forests in Djerdap NP are managed in line with principles of classical **forest economics** (see Faustamann and Hartman Rules below), and the municipality of Majdanpek provides a typical example of forest use in the region. In this municipality, 36% of forests are under state ownership and managed by the NPPE. The main forest products in this vicinity are technical wood (up to 25%) and firewood (75%) extracted to meet the fuel needs of the local population and for trade. Fire wood and wood of lower quality from local forests is also used for charcoal production (Fornet et al., 2009).**Table 5** shows the entire amount of wood produced privately as well as on state owned park land, illustrating the economic role of forestry in the municipality of Majdanpek.

Protected Zone	Surface	
	ha	%
1st	2564.26	5.88
2nd	12420.88	28.53
3rd	28551.92	65.59
Total	43537.06	100

Table 4: Forest surface by protected zone
(Source: General framework for forest management of the Djerdap National Park, 2002)

The Faustamann Rule, a model of classical forest economics, is used to calculate the ideal rotation period with an infinite time horizon when the "cyclical dynamics of forest management are constrained to clear-cutting". It computes the age at which an even-aged forest stand (plantation) should be harvested in order to maximize the return to forestry (Touza-Montero & Termansen, 2001). It focuses on the age-class structure of forest stands assuming all rotations of land are identical (Touza-Montero & Termansen, 2001). According to this rule, the optimal time to harvest the standing forest is when the marginal benefits of delaying the harvest equal the opportunity costs of waiting. The price of product is the key input for this principle (Raunikar & Buongiorno, 2007) that considers only timber products. In addition, the Hartman Rule (1976) takes into account "the additional flow of amenity outputs if the harvest is delayed and the 'site value' includes both timber and non-timber benefits" (Touza-Montero & Termansen, 2001). Forest protection should be of the highest priority in the Djerdap NP due to its role in climate regulation and global threats of deforestation. Nevertheless, there are obstacles to practicing sustainable forestry in this area.

Table 5: Wood production in the Municipality of Majdanpek in 2008
(Source: Fornet et al., 2009)

ASSORTMENTS	Technical wood (m^3)	Fire wood (m^3)	Residuals (m^3)	Total (m^3)
FSE Majdanpek	5.214	10.951	2.632	**18.797**
FSE Donji Milanovac	2.901	12.792	2.949	**18.642**
NP Đerdap – MU DM	4.700	14.160	4.900	**24.000**
EC Debeli Lug	1.012	2.596	792	**4.400**
State forest	**13.827**	**40.499**	**11.273**	**65.839**
Majdanpek	449	3.803	505	**4.757**
Donji Milanovac	17	3.744	430	**4.191**
NP Đerdap	450	1475	575	**2.500**
Private forests	**916**	**9.022**	**1510**	**11.448**
Total	**14.743**	**49.521**	**12.783**	**77.287**

SOURCE: Internal data of PE Srbijašume, PE NP Đerdap and Forest Faculty

4.2.1.1 The definition of "forest"

According to UNEP/CBD, 2001 a forest is a "land area of more than 0.5 ha, with a tree canopy cover of more than 10 percent, which is not primarily under agriculture or other specific non-forest land use…"(FAO, 2007). This definition, based on physical properties of vegetation rather than by land use (Verchot et al. 2005 in FAO, 2006) can also apply to tree plantations that are primarily used for forestry and protection purposes, as in the case of Djerdap. The core argument against this categorization of course is that a forest is an ecosystem rich in biodiversity while a plantation, recognized as "forest/other wooded land of introduced species and in some cases native species, established through planting or seeding" (FAO, 2006) is not. Djerdap NP features mainly rich natural forests composed of indigenous trees. Consequently, they should be managed in line with principles of sustainable forest management, which call for "the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems" (The Ministerial Conference on the Protection of Forests, 1993).

4.2.1.2 Finding a balance

The appropriate balance between classical forestry management practices which aim to maximize profit in order to meet the increasing demands of society for forest products, and protection of forest health and diversity has not so far been attained. Management policies have been poorly implemented due to unfavorable political conditions and difficulties related to the transition from communism to a market based economy. Current management plans furthermore have been dictated by market demand for wood instead of the pursuit of sustainable management objectives.

4.2.1.3 Exclusion of community

The local population in Djerdap NP is not allowed to use forests without special consultations with and authorization from park officials, even if privately owned. Locals also need to pay to take fallen wood from the forest. Forests products are traded by the NPPE in national and international markets but revenues from neither timber nor non-timber products are directed to the budgets of municipalities or local communities.

Furthermore, community members complain that in light of restricted access to forests, posts in the NP forestry sector (including management, maintenance and protection) are limited, and not reserved for local residents (Endemit, 2009). In 2002 for example, direct employment of the local population in the forestry sector was as follows (NPPE 2002):

- 6 out of 11 forestry engineers,
- 20 out of 28 forestry technicians
- 6 out of 6 assistants

Apart from employment matters, local communities also complain about the quality of infrastructure. Municipal governments are responsible for road maintenance, but village roads are heavily and continuously damaged by the trucks that transport wood cut in the NP without compensation for logging related damage to roads.

4.2.2 Hunting

The hunting grounds of Djerdap NP have been managed by the NPPE since 1990. Covering a surface of 63 608.45 ha, they are 100 km long, and range from 2-10 km in width. Of the total zone, 23 483 ha or 36.92 % is private property and 40 125 or 63.08% is state owned. Hunted species include deer, roe deer, wild boar, chamois, hare, partridge, and pheasant, but protection and breeding are also approved user activities.

Two hunting societies with 300 members in total operate within the borders of the hunting area. Hunters must sign annual contracts with the NPPE, and in exchange pay a fraction of market prices for the game they take. They pay 20% for small game, 30% for large game and 50% of the market value of large game meat. Although these prices can be seen as fair relative to market prices, interviews with local hunters revealed dissatisfaction as they are just one set of fees that local hunters must pay, for the use of hunting grounds reduced by flooding, and in competition with relatively better-off hunting tourists (Endemit 2009).

Table 6: Incomes from Hunting 1993-2003

(Adapted from: Framework for Hunting in Djerdap 01/04/2003 - 31/03/2013)

Incomes from Hunting 1993-2003	**% of Total**
Shooting fee incomes for large game species	44. 9
Shooting fee incomes for small game species	4.7
Hunting services incomes	5.2
Game meat and leader incomes	19.2
Live game trade incomes	12.7
Incomes from hunter societies	13.3
Total	100%

The Framework for Hunting in Djerdap shows that in a period of ten years (1993 - 2003), income was mainly derived from shooting and game meat fees (see **Table 6**). Although precise up-to-date data on earnings from hunting is not available for comparison with total park revenues, we can conclude that a perverse situation exists in the country's "protected" areas and national parks, whereby income is generated mainly from shooting animals, rather than from breeding them, or running nurseries or veterinary services.

4.2.3 Fishing

Generally, trends show a decrease in the amount of fish caught in the Djerdap region, with populations of autochthonous (indigenous) species on the decline. Between 1990 and 1999 the catch shrank drastically from 138 t to 23 t (Jankovic et al, 2000). In the same period however there was a ten-time increase in the total catch of herbivore fish species. This is mainly because these species are adapted to thrive in the lake ecosystems and slow waters of Djerdap Lake. Meanwhile, alien species like carp (*Hypophthalamichthys molixtris* and *Aristichthys nobilis*) and topmouth gudgeon (Pseudorasbora parva) have appeared and their numbers are growing.

The negative impacts of the dam on fishing are most visible within the native sturgeon population that has disappeared from the upper flow of the Danube. Hydro-morphological alterations and the creation of two accumulation ponds for the dam meant that the watercourse was slowed down, affecting changes in the entire aquatic ecosystem. The dam itself furthermore obstructed the passage and migration of sturgeon, one of the most important commercial species for local fishermen, not just for the fish itself but also for its high quality caviar. Besides sturgeon, numbers of many other native species, like the common carp C*yprinus carpio*), common barbell (*Barbus barbus*), zander (S*tizostedion* *lucioperca*) and wels catfish (*Silurus glanis*), have been decreasing since the appearance of the dam.

Fishing permits are expensive for residents according to interviews conducted with members of the local community (Endemit, 2009). An annual professional fishing license costs approximately 1000 €, and as in the case of hunting, local people have to compete with better-off fishing tourists to make a living from increasingly scarce fish stocks. Although the figures for park revenue from licenses are not available, we do know that the average annual commercial fish catch was 22 336 kg from 1995-2000, while the average sport fishing catch in the same period was nearly half of that, 10 500 kg, with 453 sport-fishing licenses issued.

Ancient Angling in Djerdap Lake

The "Golden Fish bait" (Zlatna bucka) is an angling contest that has taken place on the Djerdap lake, near the town of Tekija every summer since 1984. The contest is based on an ancient local way of fishing. The *bucka* is a wooden stick 50 cm long, used to make a noise on the water's surface to attract catfish from the bottom. This traditional way of fishing is possible when the water surface is calm, which makes Djerdap Lake, 14 km upstream from the hydropower plant, a perfect location. The aim of the competition is to catch the biggest fish, although the amount of the fish caught counts as well. Catfish in this part of the Danube River can weight more than 50kg. The competition lasts for three days, with around 120 participants – 60 competing couples.

An Action Plan for sturgeon species management was developed in 2005 (Lenhardt et al., 2005) comprising sets of measures and recommendations for protection of these endangered species. It includes the roles of many stakeholders from relevant ministries, the scientific community, and fishermen's associations to local communities. One measure proposed for sturgeon protection in the Action Plan was the further development of aquaculture, which potentially could provide a good source of income for the local community. However, the Action Plan has not been consistently implemented due to changes in national government.

4.2.4 Agriculture

As already mentioned, the majority of agriculturally productive land in the area was submerged when the dam was built. Villages were removed from the rich livelihood-providing shores of the river and relocated to less fertile hilly land in compensation. This was a major contributing factor to the diminished role of the agriculture sector in the local economy.

According to interviews with locals, the few gardens and little livestock still kept are under constant threat of damage by protected wild animals, mainly boar. Locals complain that financial support for the installation of fencing is not available, and that while compensation for this damage was once paid for out of timber revenues, today such compensation is insufficient.

The government has developed an initiative to support the agricultural sector financially, but eligibility for the scheme requires the registration of agricultural land in the official cadastre (Republic of Serbia, 2005). This measure is intended to improve government data on agricultural trends in Serbia. Unfortunately however, many small farm owners are

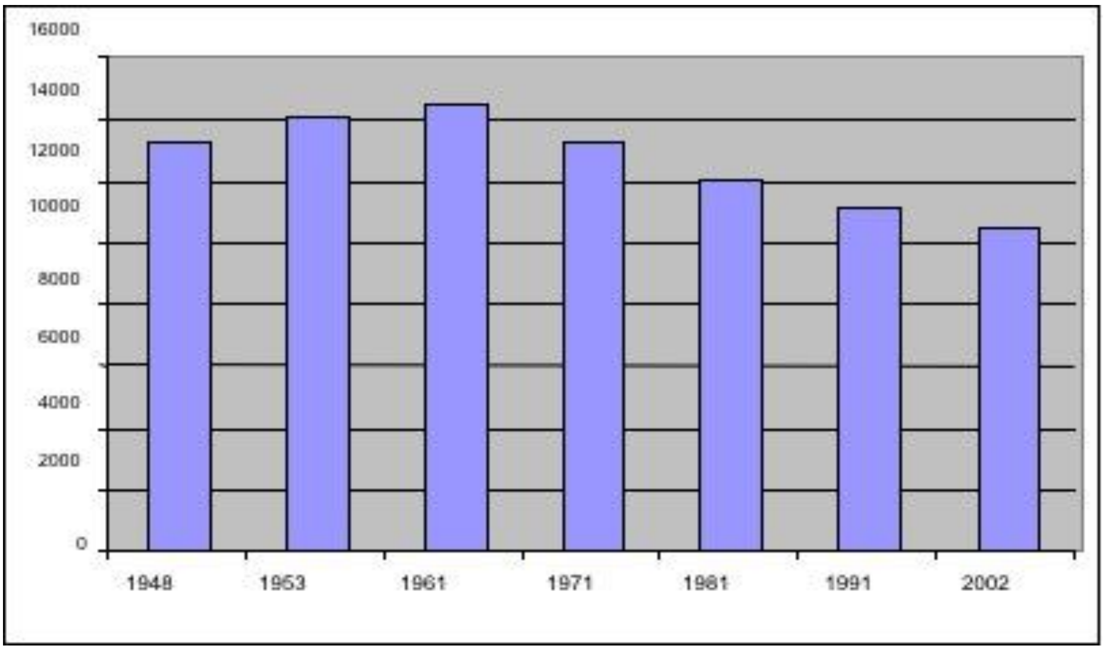
unaware of these measures, and do not make use of them. There is a clear need for workshops with agricultural specialists and representatives from the Ministry of Agriculture, Forestry and Water to help the local people to understand their rights and develop a strategy for the further agricultural improvement.

4.2.5 Livestock

In Djerdap there is a tradition of livestock rearing, although past, implementation of high taxes on grazing led to people giving up animal husbandry. Relocation due to flooding also affected traditional livestock rearing. The local community sees potential for livestock production, especially for sheep and goats on the more recently occupied hillier ground. However, the absence of any organized milk or meat markets makes this unfeasible for the time being. An economic study of the amount of meat and milk that could be sold in this region is therefore a precondition for any animal husbandry development strategy. Should market conditions develop sufficiently, the transport of milk and meat will also be an important consideration in the NPs strategy for sustainable transport. Organic farming, which is not being practiced at the moment, represents another potential area of development that could contribute to the development of eco-tourism in Djerdap NP.

4.3 Other Social Impacts

Figure 6: Population decline in the Djerdap region in the period 1948- 2002
(Data source: Statistical office of Republic of Serbia)



4.3.1 Emigration

The completion of the dam in 1971 and creation of the 1278 m long Djerdap Lake involved the flooding of 12 settlements, with many thousands inhabitants (EPS, 2009). (according to various sources from 10000 to 23000). Among these were three small towns - Donji Milanovac and Tekija in the Republic of Serbia and Orsava in Romania - whose inhabitants were resettled on higher ground above the flooded areas. The total area submerged was estimated at 14 500ha (EPS, 2009).

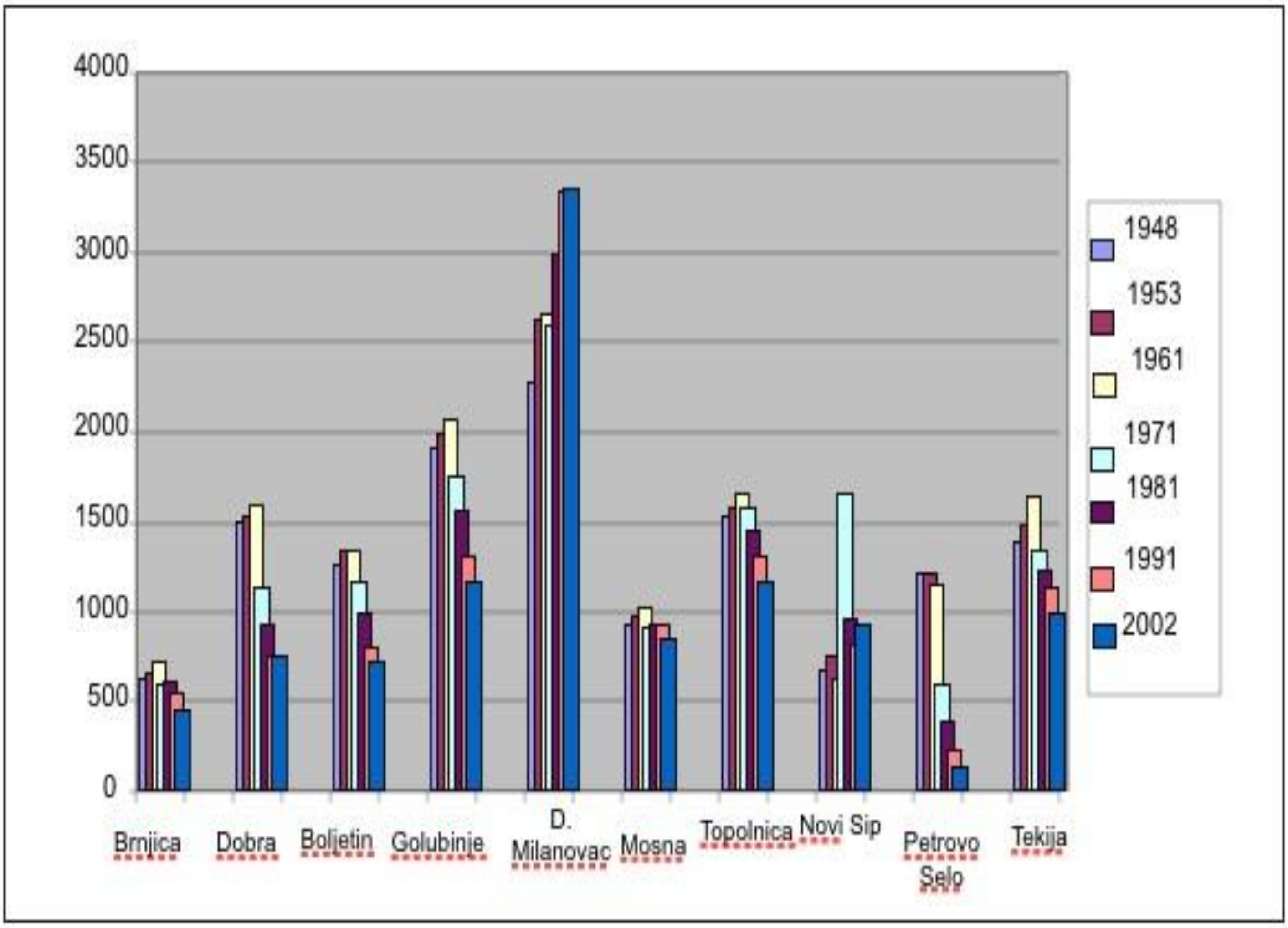


Figure 7: Change in the number of inhabitants per settlement, in the period 1948 – 2002
(Data source: Statistical office of Republic of Serbia)

This flooding had a "domino effect", triggering many negative social consequences, all of them contributing to emigration from the area and an unsustainable trend of depopulation (see **Figures 6 and 7**). First, as settlements lost their municipal status, health care and administration centres were relocated to surrounding cities which were in some cases as far as 80 km away, detracting further from local living conditions. Once flooding had submerged the majority of arable land, the population was forced to change its way of life.

People were offered limited opportunities to work for the Djerdap Hydro Power Plant system (HPP) and for newly built industries, but many at this point decided to leave their homes instead.

Emigration and Depopulation in Djerdap NP

The majority of the Djerdap population is between 45 and 64 years old and the population is aging. There is also a low birth rate and a relatively small proportion of females in the region. For the past 8000 years, the natural characteristics of Djerdap NP determined the position of human settlements within the area, until the construction of the HPP and the creation of Djerdap Lake when settlements were shifted 1-2 km uphill from their previous positions.

Today one city (Donji Milanovac) and nine villages are spread across three municipalities: Kladovo (Tekija, Novi Sip and Petrovo Selo), Majdanpek (Mosna, Golubinje, Topolnica, Donji Milanovac and Boljetin) and Golubac (Dobra and Brnjica). In addition there are 10 other towns/villages that partially lie in the NP area. In total, 10 499 inhabitants live on Djerdap NP territory (Statistical office of Republic of Serbia, 2002).

Population Dynamics and growth

There was a positive trend in the population growth of the whole country from 1948-2002 (**Figures 6 and 7**). Nevertheless, the growth rate has been declining since the 1980s. Djerdap NP had the highest number of inhabitants in 1961, with over 13,000, and the lowest in 2002, with just over 10,000 people (**Figure 6**). This decline is reflected in the rapid aging of the rural population, the abandonment of rural settlements, a shortage in the agricultural labor force, and a consequent decrease in agricultural production (LEAP 2005).

Population growth until the 1980s can be attributed to economic expansion in northern part of Eastern Serbia, which resulted from the development of the mining and metallurgy and the chemical industries in Prahovo, and hydro power plant construction. These causes led to an influx of immigrants from surrounding areas until the economic crisis in Serbia in the 1990s. In the same period however, peoples of the southern area of the NP (in Kladovo and Negotin) had begun to emigrate to more developed countries.

Emigration: three waves

The first wave of emigration from Djerdap and Serbia as a whole began in the early 1960s, initiated by the opening of the country's borders and the migration of the poor and uneducated, mainly toward Western Europe. As a result, several large companies in Donji Milanovac closed down as well as some of the mines in the region. This trend was halted only slightly by the opening of the first phase of operations of the Majdanpek copper mine in 1961.

The second wave took place from 1966 to 1975, caused by the flooding of agricultural land and settlements on the territory of Donji Milanovac, Mosna and Golubinje. Delays in the construction of new wood processing facilities also negatively impacted the availability of employment opportunities, although some relief came from the opening of the second phase of copper mining activities in Majdanpek in 1966. This contributed to growth in the population there from 2,244 inhabitants in 1953, to 11,760 in 1991.

Due to the impacts of the dam and protective measures which left the local population with few remaining livelihood alternatives, the third and current wave of emigration began in the 1990s. Causes can be traced to the collapse of the Federation of the Yugoslav Republic, the impacts of civil wars in Croatia and Bosnia and Herzegovina, economic sanctions imposed on Serbia, hyperinflation and finally the devastation of the NATO bombing of 1999. With the beginning of economic privatization and reconstruction in Serbia, many people lost their jobs, which intensified emigration to the more developed parts of Serbia and abroad. It didn't help either that an HPP compensation scheme that began in the nineties to compensate for flooding damage was halted in 2006, depriving local communities of badly needed assets to support local economic development.

4.3.2 Unemployment

The HPP did not exclusively employ local people, who had to compete for jobs with other Serbians from elsewhere. An industrial zone was established after completion of the HPP to provide employment opportunities for people affected by the dam, but these enterprises are now for the most part either closed, or operating below original capacity. There remains a lack of available employment: jobs are mostly seasonal, and people have to rely on family or agricultural pensions, which are less than the average state pension. For a great many people the social security system is their only source of income, which is a burden on both municipalities and the country.

4.3.3 Property Rights

The displacement due to flooding also created property rights issues that remain unresolved. As land was taken over by the HPP, existing settlements were not registered in the land cadastre. This complicated procedures for construction or property selling by locals, which have become longer and costlier, creating a situation that now needs to be addressed on a national level.

4.3.4 Local Conflict

The dam and its reservoirs have lead to a loss of natural resources, the destruction on habitats, the displacement of people and destruction of cultural heritage, all without passing on any benefits of increased electricity supply to local rural communities. The principal beneficiaries of dam-building have without a doubt been the urban-industrial sectors, for which the expansion of electricity generation in the early 1970s opened the way for large heavy industry, and factories making shoes, textiles, and other products which undercut artisan and local-domestic production.

The poor economic situation in the country, inadequate management and restrictions on the use of resources have all contributed to the encouragement of illegal logging, fishing and hunting activities. Furthermore, there is evidence of unauthorized collection of forest products and illegal construction of tourist facilities. This situation has resulted in conflict between park management and local communities. Although the conditions for the development of different economic activities that comply with principles of sustainability are present, the local population remains poor and vulnerable to a rapid process of unsustainable depopulation, as the majority of young people from this region now work far from home, having abandoned traditional ways of life in a search of better life opportunities.

5 Reappraising the Costs and Benefits of Hydropower: Moving Toward Inclusion

Cost benefit analysis (CBA) is a neo-classical economic tool that aims to identify the project plan or policy that has the greatest net present benefit, and will therefore maximize economic efficiency. In short, it compares benefits with costs of projects, both translated into **net present value**. When the Djerdap dam was built no CBA was carried out, however even if one had been, it would not have taken into account cultural costs and the costs of destroying a pristine natural environment in exchange for the economic benefits of hydroelectricity.

If a CBA had been carried out however, modified in line with the **John Krutilla's rule** (Krutilla, 1967), it would have taken into account the non-use option value of keeping an irreplaceable natural area with a rich cultural heritage intact. Krutilla and Fisher argue that technological change tends to reduce the benefits of developments such as hydroelectricity because superior electricity generating technologies will evolve over time. Cultural and environmental assets, along with a positive rate of technological change would have been counted as part of the **opportunity cost** of building the Djerdap hydropower plant. In future, hydropower could be substituted with new technologies and thus electricity produced from hydropower plants could become cheaper and more abundant. The possibility of the emergence of new technology would lower the present value of the hydroelectricity, raising its **discount rate**.

On the other hand, beautiful landscapes are irreplaceable, their supply is inelastic (fixed) and they will be a scarce asset in the future. The same stands for cultural heritage. Consequently, the value of the pristine nature and rich cultural heritage would increase and the applied discount rate in a CBA would be lower than that of hydroelectricity. This approach to a CBA would ultimately provide an argument against the construction of hydropower plants.There is also an ongoing debate about whether hydropower should be considered a renewable energy resource due to its many negative environmental impacts. Generally, small hydropower plants, up to 10 MW, are included in renewable energy production, unlike big power plants that usually involve significant negative environmental impacts. According to the new Law on Environmental Protection (adopted in 2004) and the Law on Integral pollution prevention control, the Hydro-Power-System is obliged to undertake all measures possible in order to prevent negative environmental impacts and to compensate for any harm done (**Polluter Pays principle**). The new Law on Waters (under preparation) also means the HPP must consider the effects of river flow disturbances, because the management of waters will be based on river basin management principles, which is currently not the case.

6 Opportunities and Threats for Economic Development in Djerdap NP

6.1 Transport

Djerdap NP has a significant position with respect to transport and traffic. However, the roads are of low quality and river transport is underdeveloped. The Djerdap Road connects Belgrade, Pozarevac, Veliko Gradiste, Golubac, and Donji Milanovac with the cities of Kladovo and Negotin. About 100km of this road passes through park territory, and is important because it connects all of the settlements and historical sites along the river bank. A major precondition for shifting toward sustainable transport in Djerdap NP is the implementation of traffic calming measures, which could be achieved without excessive effort through speed limit enforcement and gateway signs.

The Danube River is the main inland waterway in Serbia carrying nearly 90% of total inland water traffic. The section that flows through Djerdap NP is also about 100 km long and stretches from the city of Golubac to the city of Kladovo. An international river course, it holds significant potential for the development of river transport in the region. However, pre-existing issues such as the deterioration of water quality, drops of water levels and negative changes in water regimes due to the numerous dams constructed upstream should be addressed beforehand.

At present the Djerdap NP is seriously threatened by unsustainable road and river transport, and its resultant noise, pollution, threats to biodiversity, and negative visual impacts. All of these diminish the ability of the park to protect the area's biodiversity, landscapes, natural ecosystems, and cultural heritage. One opportunity for sustainable transport under development is a European initiative to create a cycle corridor along the Danube River. In 2003 cycling experts with financial support from the German Technical Cooperation have began working on establishing a bicycle route along the Danube from Budapest to the Black Sea. This led to the first detailed bicycle map of the area, signposting of parts of the route and the launch of an informative web-page with information, recommendations and travel reports. The Danube cycling route has been accepted as a part of the Euro Velo Route No. 6, stretching from the Atlantic Ocean to the Black Sea. Nevertheless, limited signposting has been put up, and no proper cycling infrastructure has been developed. Improvement of the cycling infrastructure and its promotion could be important initial steps towards the development of sustainable transport development as a source of income in Djerdap NP.

6.2 Tourism

The cultural heritage of Djerdap NP offers many opportunities for tourism, with hotspots like Lepenski Vir, the Tabula Triana (a stone tablet set by the Roman Emperor Traian in 104 AD), and the Golubac Fortress, In addition the park's rich biodiversity, and the magnificent Danube gorge have much to offer visitors. The development of appropriate **policy instruments for sustainable tourism**, to optimize the use of environmental resources, maintain essential ecological processes and conserve the local cultural heritage and traditional values (USAID, 2005), has the potential to improve the economic situation of this region.

The Ministry of Economic and Regional Development has proposed The Serbia Tourism Strategy, and within it the Master Plan of the Lower Danube Region (2007). The strategy aims to provide economic improvements and employment opportunities, to develop the Serbian image internationally, and to protect natural and cultural resources through sustainable tourism development. The Master Plan is rather general, but the NP and its inhabitants could design activities in line with the proposed strategy. To this end, cooperation between the local community and the Djerdap Tourism Organization must be improved, and the local population more involved in tourism development. Focusing on rural eco-tourism for example, could provide opportunities in recreation and leisure, and to experience local food and customs.

Improvement of the area's capacity for tourism however necessitates infrastructure development and improved quality of accommodation facilities. However, building permits are difficult to obtain and highly taxed (by both the state and the NP), and procedures for company registration are onerous, so investment in development of tourist facilities has not been easy to attract, contributing to a great deal of illegal construction. Engagement with local communities for the development of the next NP management plan it is hoped will lead to the removal of some of these obstacles, through for example tax exemptions and more flexible construction procedures for residents. However, new construction and tourism facilities should be limited to traditional ethno-housing in a natural environment, within sustainable tourism practices, instead of facilitating large-scale tourism, which would drive environmental degradation.

Of course, the promotion of tourism in Eastern Serbia brings with it the risk of an increased number of private vehicles in the NP, so the success of sustainable tourism in part depends on the implementation of sustainable transport measures and infrastructure. Djerdap NP could be marketed to both visitors and commuters as an opportunity for guests to contribute to the development of an internationally renowned sustainable tourism site. The promotion of the park as such could be linked to the development of a coordinated sustainable transport network of buses, bicycle trails, boats and footpaths linking all of the major villages and attractions in the NP. Such a network could be based on existing services with improvements made to timetable co-ordination, shared ticketing systems, marketing, and facilities for bicycle carriage and storage.

7 Conclusion: Future Steps Toward Trans-Border Cooperation

The local community has not been properly included in park management and has therefore been unable to articulate its problems and needs. These circumstances have weakened the management of the NP and ultimately led to opposition to the present top-down system of environmental protection. Community based conservation would bring benefits to both the environment and the community, with the potential to abate the emigration rate. If communities were to receive benefits, they would develop positive attitudes and have an interest in protecting local wildlife and ecosystems. Nevertheless, the integration of social concerns with ecosystem-based management requires a stable local population. While "business as usual" will lead to continued depopulation, emigration, loss of jobs and poverty, local communities do see opportunities for a better life and living standard in tourism (ethno and eco), animal husbandry, sustainable water transport on the Danube, and in participatory decision making for NP management (Endemit, 2009).

Endemit's future actions and long term plans for Djerdap NP aim to put theoretical knowledge of **participative democracy** into practice. One of the first steps would be to foster local community participation in decision making. Priceless natural assets important for both biodiversity and eco-tourism lie along both the Serbian, and Romanian (Nature Park Portile de Fiera) banks of the Danube River. Accordingly, Endemit has initiated planning with Romanian CSOs for projects for biodiversity protection and economic development on both sides of the Danube. The first meeting was held in the Romanian city of Turnu Severin where representatives of Endemit, the Djerdap NPPE, the Romanian NGO Pro-Mehedinti as well as the Museum of Iron Gate assembled. This cooperative effort of cross-border cooperation is driven by the need to achieve the balanced, sustainable, socio-economic development of the Romanian-Serbian border area by increasing the economic vitality of the region and improving communities' quality of life.

The case of Djerdap NP provides a clear illustration that "At the heart of the dams debate are issues of equity, governance, justice and power – issues that underlie the many intractable problems faced by humanity" (The World Commission on Dams, 2000). Proponents of dams stress that they are necessary for meeting societal needs: for more electricity, flood control, and for boat transport. But what of their devastating environmental and social impacts? These were completely neglected in the monetary calculations that estimated the benefits of the Djerdap dam, inflicting damages that 30 years later are still being felt in this region.

7.1 Recommendations for NP co-management

Serbian law has recognized local communities as legitimate legal actors in NP management for some time (National Parks Law, Official Gazettes of Republic of Serbia No. 39/93, 44/93, 53/93, 67/93, 48/94, 101/05 and the recently adopted Law on Nature Protection, Official Gazettes of Republic of Serbia No. 36/09). Still, in reality, the involvement of local people in Djerdap NP management is far below a satisfactory level, and this involvement is characterized by a lack of two-way communication between park officials and local people. Local communities in fact, view the NP as the main source (apart from the dam) of the underdevelopment of the area, rather than seeing any benefits from living there (Endemit, 2009).

Therefore, any future Djerdap NP management plan must focus on improving the efficient use of resources through a participatory approach that empowers the local community, and builds its capacity to work with partners and manage partnerships for the enhancement of cultural and natural assets, habitats and wildlife. Although common practice in other parts of Europe, concepts of **co-management** as a process of sharing responsibilities between government and local resource users and community based conservation remain confined within the Serbian scientific community, even though “many resources are too complex to be managed only by one agency” (Berkes, 2008), especially bearing in mind the importance and value of local knowledge and skills. Issues of equity, justice, empowerment as well as managing relationships (Berkes, 2008) are clearly at stake here.

In the course of preparing this case study, proposals for co-management were discussed with the local population (Endemit, 2009), to address the issues described herein. The further development of processes along these lines would be very useful for managing not only resources but relationships and communication between local communities and NP administration. Furthermore, as knowledge for dealing with ecosystem dynamics, resource abundance at various scales, trends and uncertainties, is dispersed among local, regional, and national agencies and groups" (Berkes, 2008) this type of collaborative management benefit all parties involved.

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PAYMENTS FOR ECOSYTEM SERVICES

Chapter 11: PAYMENTS FOR ECOSYSTEM SERVICES (PES) IN INDIA FROM THE BOTTOM-UP

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(Source : Down To Earth November, 2008)

Abstract

In the Himalayas, in order to preserve a small dam, a downstream village decides to pay an upstream village to cease the grazing that causes soil erosion and the accumulation of silt. In economics, this is an example of “payment for environmental services” (PES). When payment compensates for the opportunity cost of lost income, PES is seen as a useful instrument for the preservation of nature. However, this chapter also illustrates that this method of valuing nature can also have its pitfalls.

Keywords : Willingness to Pay, Opportunity Cost, Coasian Bargaining, PES (Payment For Environmental Services), Transaction Costs, Community Property Rights, CDM, REDD, Forests

1. The Dam of Kuhan

The dejected eyes of Kartar Chand Rana, 52, panned the breached checkdam in his village, Kuhan. As head of the *Gram Vikas Samiti* (a local committee) he had had to order the breaking of the embankment of the very dam that fed his four hectares until last year. It was the best thing to do under the circumstances. The dam had silted over and the only way to clear the reservoir was to break the wall and let the water wash all the mud. Down. The immediate cause of the blockage: the dumping of debris from the construction of a Public Works Department (PWD) road that connected Kuhan to the highway. Kuhan had petitioned the PWD to pay for the reservoir's clean-up, but to no avail. After many somber discussions in the village square the farmers took the tough decision to breach the dam wall in the pre-monsoon of 2007. Now they are collecting funds to install iron gates to plug the breach and prevent similar problems in the future.

Figure 1: The nullah that runs through Kartar Chand Rana village, Kuhan
(Source : Down To Earth, November 2008)

Kuhan is tucked far away in the hills of Himachal Pradesh's Kangra district. It is typical of this region that receives high rainfall and yet faces water shortages due to lack of storage facilities. In 2003 the village pooled resources and with some help from a watershed development project and constructed a checkdam on Gulana Khad, a nullah (creek) that ran across the village. Its fortune changed overnight. With irrigation now available crop production was able to increase by six times; it became possible to grow vegetables and fruits for cash.

The honeymoon lasted only a year. By 2005 the reservoir had collected silt and its capacity halved. The worried villagers looked for a lasting solution. There was no quick formula they could apply here. With help from Winrock International, a non-profit organization, the villagers diagnosed the problem and came up with a unique prescription. Most of the silt came from the grazing land of Ooch village, high up the nullah, something had to be done about it. How? Why should villagers of Ooch work or sacrifice anything to solve Kuhan's problems?

No sacrifice was needed. Both villages discussed matters related to saving the dam and reached a formal agreement. This is a case of **Coasian bargaining.** Ooch banned grazing for eight years on its four-hectare common land and planted saplings of fruit, fodder bearing trees as well as bamboo and elephant grass. In exchange, Kuhan paid for the saplings and even worked out an arrangement to sell irrigation water to Ooch as and when required. The silt load in the nullah reduced and the villagers rejoiced again.

Figure 2: Negotiation meeting between Kuhan and Ooch villages
(Source : Down To Earth, November 2008)

That was before the PWD entered the scene and destroyed all that the villagers of Kuhan and Ooch had done to save the checkdam. "We entered into an eight-year agreement with Ooch to save our checkdam only to break the dam ourselves," lamented Rana, who won, lost, won and lost again the battle to secure irrigation and therefore prosperity for his people. "The dam opened our eyes to the problem of erosion in our area," said Purshottam Singh, 66-year-old farmer who participated in the project in Ooch. Singh felt the joint project was as beneficial for Ooch as it was for Kuhan, if not more. It stemmed erosion and gave the village more fodder and beneficial trees in the bargain.

2. Ecosystem services

The agreement between Kuhan and Ooch still stands. It is an example of how relations between two villages can be reworked to mutual benefit, centred on natural resources. The written agreement as negotiated between the two villages is what is called **"payments for ecosystem services"** (PES) in contemporary natural resource management parlance. The idea behind PES is to first identify environmental services or **ecosystem services**. These can be anything, from clean water, clean air, flood control, creation of soil, food production, fisheries, timber production, carbon sequestration to countless other benefits that underpin human **well-being**.

Figure 3 : Kuhan
(Source : Down To Earth, November 2008)

Identification of an ecosystem service implies that people understand its importance and want to preserve it or use it over a long period of time. For this they are willing to pay. As there will always be providers of such services, there will be willing sellers. Thus, under PES we are finding markets for ecosystem services where users directly pay the providers making the system voluntary and flexible. This concept is gaining ground around the world. In India the concept is relatively new. For instance, in the Kuhan case, water is seen as an ecosystem service. Ooch is provider of the service due to its role in maintaining the health of the nullah. We have a buyer-seller arrangement that can be brokered. Since Ooch had to compromise on grazing to save the water from siltation, Kuhan, being the beneficiary, compensated for it. This paid for the **opportunity cost** – the income sacrificed by Ooch for not grazing. Kuhan generated its own funds to pay Ooch when it delivered an environmental service. Winrock International, the NGO, through facilitating the agreement, helped reduce the **transaction costs**. To extend the logic of the Kuhan-Ooch joint venture to forests, people will want to conserve them if they are paid to do so. Kuhan is an important example, albeit on a small scale, not only of a successful PES model, but also what it implies for the future of resource management. There are lessons here for policymakers.

3. Valuation of services

Figure 4 : Kartar Chand Rana
(Source : Down To Earth, Novermber, 2008)

The idea of PES gained momentum worldwide with the release of the Millennium Ecosystem Assessment (MEA) in 2005. The MEA recognized that benefits accrued from natural ecosystems were widely recognized but poorly valued. "Increasingly it is becoming clear that traditional economic concepts like **GDP** only reflect economic values leaving out the state of natural resources. One might know the rate of growth of a country's economy, but still have little idea about whether this growth is sustainable", agrees Rajeev Semwal, ecologist, consultant with a non-profit organisation, and proponent of PES.

The design of payment for ecosystem services schemes by ecologists and economists can be conducted using a variety of methods. One way is **Net Present Value** (NPV) calculator. NPV assigns value to the forests in India. It is calculated by counting timber and non-timber products and the forests other services, calculating the value today and applying a discount rate. This value must be taken into account when destroying forests due to the construction of a dam or a forest. It is an additional cost to be paid for the diversion of forest land.

An important tool for making users pay for natural resources is mandatory compensation for projects converting forestland as per the Forest Conservation Act. All of this money is collected in a central fund called Compensatory Afforestation Management and Planning Authority (CAMPA) There is at present over Rs 6000 crore (crore is 10 million rupees) lying unused in this fund. The problem is that it is tricky to value most environmental services. For instance it is relatively easy to calculate the value of trees by looking at their timber value, fruit value, etc. but if one is to think of ecosystem services provided by a forest, like water retention, aesthetic value, home for other animals and plants, putting a value becomes complex and difficult. Then again, as Vikram Dayal, Research Faculty, Institute of Economic Growth, highlights, "collection of NPV or CAMPA funds is one thing but there is no clarity on what is to be done with the money". These payment systems, he believes, have highlighted a lack in policy direction in the country. This is likely to have serious implications if PES was to become a tool for conservation.

Dayal was part of another study commissioned by WWF India that looked at examining the scope of and opportunities for introducing suitable **economic instruments**, including PES. The study was carried out in three sites - Gangtok, Shimla and Munnar. It calculated **costs and benefits** of two specific services, urban water services and landscape beauty. The results will be used to assess and identify opportunities for broader application of PES. "In Himachal, PES is already working in the Great Himalayan National Park where communities are paid Rs 5000 annually if no fires occur in the area they patrol; but there is no formal regulatory mechanism to say that you paid for this service", said T R Manoharan, Senior Coordinator of Forest Policy and Economics, WWF and co-leader on the economic instruments project. Clearly, Dayal and Manoharan find the government unprepared to adopt the PES model or the buyer-seller arrangement for resource management.

Sejal Vora, Programme Director of WWF India was optimistic. She spoke from her experiences in the WWF study: the private sector was quite happy to pay for these services as it made their access to resources easier but the public sector still seemed reluctant. "The good thing is that nobody rejected outright the idea of paying for using an environmental service", she stated.

Economic valuation of ecosystem services forms the basis for informed decision-making. "One needs to examine both the way numbers are made and how effectively they help shape policy decisions that can be widely accepted," Dayal summarized. On a note of caution he added that some market-based methods were best thought of as coming up with minimum prices of services, as they often did not consider the harder-to-value components of an ecosystem's worth like clean air. Even Semwal felt monetary estimates were easy to comprehend, but hid assumptions, approximations, and simplifications. They measured only certain kinds of value, but they also integrated information about supply and demand, of what is important to people, however imperfectly.

4. Rethinking Policy Based on PES

In 2006 a study by the Indian Institute of Forest Management (IIFM), Bhopal pinned the numbers on Himachal Pradesh and Madhya Pradesh's forest wealth. It puts the money value of Himachal's forests at 1 323 000 crore including the value of services they provide. "Our watershed services alone are valued at 106 000 crore annually, so why should the state not earn money from its resources?" asks Dr. Pankaj Khullar, PCCF, Himachal Pradesh. He added that it is difficult for the central government to allocate such funds to states and therefore the PES model adopted at the state level would really be beneficial if the funds generated are kept by the State.

The 12th Finance Commission (2005-10) for the first time recognized the need to invest in resources and earmarked Rs 1000 crores for 5 years to be given to states for preserving forests. Himachal Pradesh's annual share was Rs 20 crores, a pittance compared to the standing value of its forests. Given the money they can earn by selling forest resources, this is obviously not enough incentive to preserve forests. This is one of the ways valuation of resources can be counter-productive. If those who provide ecosystem services are not paid, they can argue they have no incentive to continue providing a service that in the past they provided without even thinking about. The State government therefore took steps towards realizing the value of these services by trading them through the World Bank as carbon credits. Himachal Pradesh Chief Minister, Dr. Prem Kumar Dhumal, is upbeat about the development. "We aim to preserve our forests and the over 20 year-old green felling ban in Himachal is a testimony to that", he stated. "With increasing demands for resources and to provide people with livelihoods, it became important for us to look for alternatives to government funds and the World Bank provides one" he added. The project, Mid Himalayan Watershed Development, awaits validation. The Bank will invest in the preservation of 20,000 ha of land as forests.

4.1. PES over CDM

Himachal intends to use the Clean development Mechanism (CDM) as another vehicle for PES. This discussion however, highlights a very important fact. CDM does not consider standing forests and excludes the community by entering into an agreement with formal institutions like the government. "Untouched natural forests store three times more carbon dioxide than previously estimated and 60 % more than plantation forests," states Chetan Agarwal, Head, Natural Resource Management, Winrock International, and the facilitator behind the Kuhan – Ooch agreement. Given all this, PES models like the Kuhan –Ooch agreement, might just prove to be a good means to save old forests and their services. The post-Kyoto Reduced Emissions from Deforestation and Degradation (REDD) scheme aims to provide payment for reducing deforestation. As Agarwal also pointed out, "even if one were to engage in CDM projects, fluctuation in the rate of carbon credits would mean uncertainly for the people who invest in these".

Figure 6 : Construction of a brushwood checkdam in progress
(Source : Down to Earth, November, 2008)

5. A Word of Caution

PES is clearly a positive development but one that requires clear community rights over resources to succeed. Agarwal adds the example of central India where the government never really engaged with tribals to settle their rights resulting in large tracts of land being classified as forests. The result is conflicts that prevail in the region ever more today. He further cautions that while valuation strengthens his case, it also works the other way in defining what to let go. In the process of preserving certain services, what we don't preserve also deserves attention as it might serve some different purpose in the future. Agarwal adds, "One needs "sweat equity" - what the community puts in or invests in conservation to be also computed in the cost of resources". Vora concludes by pointing out that with the governance structure and policies not conducive to PES, value as well as payments for ecosystem services is still contentious. Therefore, small scale application of PES is possible but large scale adoption is still too complicated right now.

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Chapter 12: THE POTENTIAL OF REDD AND LEGAL RESERVE COMPENSATION IN MATO GROSSO, BRAZIL

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Cattle Grazing on Deforested Land
(Source: Rebraf)

Abstract

Under REDD (Reduced Emissions from Deforestation and Forest Degradation) and related initiatives, the possibility has opened up for creating a system of payments as an incentive to landowners to retire land that would be otherwise deforested. Until not so long ago, deforestation for the cultivation of fields or creation of pastures was seen as progress, and was subsidized in Brazil and elsewhere. Now in contrast, with the aim of undoing the damage, subsidies are being sought in the opposite direction, to recognize the benefits of nature's services, This study seeks to describe how potential benefits for social and environmental conditions in the humid Amazon tropics might be captured from a combination of policy instruments under development aimed at compensating for conservation of remaining forests through payments for environmental services (PES). Under such a scheme, payments for REDD would be channelled toward the expansion and structuring of a state system of protected areas in Mato Grosso, Brazil. Specifically, the objective of this case study is to evaluate the potential for deforestation reduction and compensation of legal reserves in new protected areas under proposed state ecological-economic zoning.

Keywords : Biodiversity Valuation, Ecological Economic Zoning, Avoided Deforestation, Carbon Trade, PES (Payment For Environmental Services), Opportunity Cost, Institutional Innovations, Stakeholder Participation, Public Policy Formulation

1. Introduction - Characterization of the State and relevance of agricultural expansion

Figure 1: Mato Grosso in the Brazilian Amazon
(Source: GoogleEarth)

The State of Mato Grosso (**MT**), located in the central-west region of Brazil (**Figure 1**), occupies an area of 903,357.91 km² (IBGE, 2001). It is the third largest state in the Brazilian federation, greater in surface area than Spain and Germany combined. As it lies in the geographic centre of the South American continent, equidistant from the Pacific and Atlantic coastlines and beyond the routes of European colonization (save for some minor gold and diamond mining), it is a state of relatively recent frontier occupation. This isolation enabled it to retain untouched indigenous territories, savannas and forests up until the mid-20th century.

Beginning in the 1970s, through national integration policies promoted by the then military regime, the State of Mato Grosso received a substantial flow of financial resources for infrastructure development. Numerous colonists arrived from traditional agricultural lands in southern Brazil, a diversified mass of small, medium and large landowners enticed by a package of fiscal policies and credit that stimulated intensive use of agricultural inputs along Green Revolution lines. The region offered comparative natural resource advantages over others in Brazil in terms of agriculture, since it possesses a tropical climate, smooth terrain and regular rainfall patterns favorable to large-scale production. It can be concluded that the public stimulus policies and natural characteristics of the region were responsible for Mato Grosso's receipt of significant public and later private investments that permitted it to become a major pole of agricultural commodity expansion. As **Table 1** shows, the agricultural area of Mato Grosso now covers nearly 88,000 km^2, close to 27% of the total area deforested for agricultural and livestock production, while ranching occupies about 233,000 km^2, corresponding to 73% of the remaining opened area.

Table 1 - Agricultural and livestock land use in areas of forest and *cerrado (a tropical savanna ecoregion)* of Mato Grosso, 2006/07

Biome	Agricultural area		Ranchlands		Total	
	km^2	%	km^2	%	km^2	%
Amazon Forest	31,350	18	140,525	82	171,876	53
Cerrados	56,594	38	92,839	62	149,433	47
Total	87,944	27	233,365	73	321,309	100

Sources: Map of agricultural area of Mato Grosso / Geosat, ceded by the Government of the State of Mato Grosso; SEMA-MT (deforestation up to 2004-05); Prodes/ INPE (delimitation of forest area, deforestation in forest areas in 2005-06); analysis by ICV.

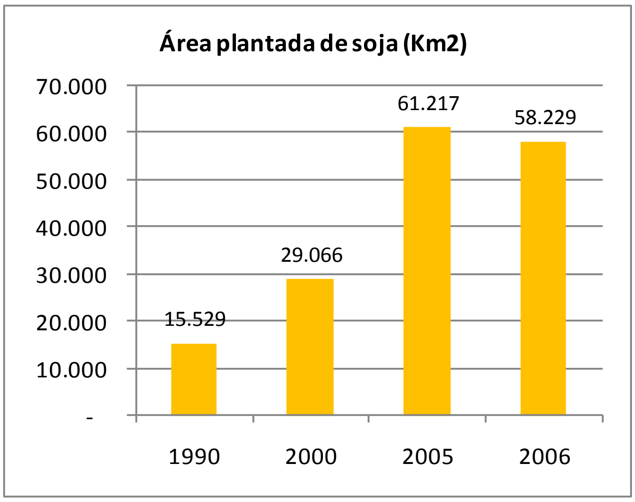
Mato Grosso's principal crop is soybeans, occupying nearly two-thirds of the total agricultural area of the State, followed by maize, cotton, rice and sugarcane (**Figure 2**). The area planted to soy grew from 15 000 to 29 000 km^2 in the 10 years from 1990-2000, an average annual increase of 6.5%.Favourable market conditions, allied with private sector investment and propitious credit policies toward the sector led to a further dramatic increase, an additional 61,000 km^2 in the period from 2000-2005, a 16% annual growth rate.

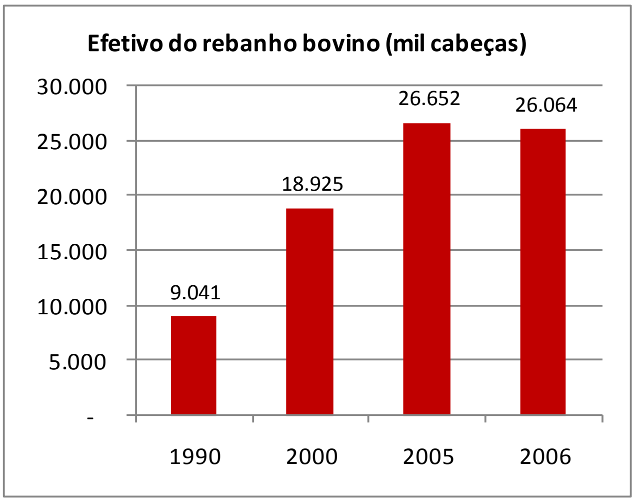
At the same time, the cattle herd expanded from 9 to nearly 27 million head between 1990 and 2005, maintaining an annual growth rate averaging approximately 7.5% over the entire period, as shown in Figure 2. To calculate the area involved in this expansion, we rely on an average stocking rate of 1 head/hectare, which would account for 260,000 km^2 (livestock are recorded in number and not in area occupied by pastures in Brazil). In 2006 there was a small reduction to 26 million head and as well as a decline in the soybean area, but in subsequent years as favourable market conditions returned these values renewed their growth trajectory.

Agriculture is the primary economic activity in the State, responsible for all resources mobilized in the service sector; around 70% of the gross state product is related directly or indirectly to the primary sector. Agribusiness is important not only to the regional economy, but also at the national level, where it is responsible for 8.5% of net trade, generating a surplus in 2007 of US$ 3.1 billion in the National Accounts (SEPLAN, 2008).

The agricultural model adopted by the State is strongly weighted toward agribusiness, but at the same time involves a large number of family farmers, most of whom were settled through agrarian reform projects. These producers confront difficulties in production and marketing of their products, and are far from exhibiting growth rates approaching those of the agribusiness segment. Most of their difficulties in this regard are related to the absence of a broad network of specialised technical assistance and support.

Figures 2 and 3 - Area planted to soybean and cattle herd in Mato Grosso, 1990-2006





Sources: Municipal Agricultural Survey (IBGE, 2007) and Municipal Livestock Survey (IBGE, 2007)

2. Agricultural expansion and deforestation in Mato Grosso

Deforestation in the Amazon is the principal problem that assails the world's largest tropical forest remnant. Of the nine states in Brazil's Amazon basin, only three (Mato Grosso, Pará and Rondônia) are responsible for nearly all of the deforestation of the remaining 18% of original forest area. All three of these states show similar patterns of occupation as the agricultural frontier advances from south to north. Should this pattern continue, it is anticipated that more protected areas will begin to exhibit similar rates of deforestation.

Over the past 10 years, the State of Mato Grosso has been responsible for around 40% of all deforestation in the Brazilian Amazon through expansion of agricultural activity. The occupation of forest is initially based on extraction of timber species of commercial value, accompanied by burning of species that are of lesser economic interest. Fire is the quickest and cheapest way to open up new agricultural areas. This logic of occupation is rooted in the cultural and economic logic of farmers who seek to extract maximum profit from the land as quickly as possible.

The deforestation dynamic is strongly dependent on the potential returns from agricultural land use (Margulis 2003). Annual deforestation rates have fluctuated in strong correlation with prices of principal agricultural and livestock commodities (beef and soybeans) (Barreto, 2007). The peak prices of soybeans in the period 2001-2004 for example, were accompanied by an increase in the planted area from 31 000 to 52 000 km^2, a 69% rise in three years (IBGE, 2006). During the same period, direct conversion of forests into agricultural fields represented 16% of deforestation in forest areas of the State, peaking at 23% in 2003 This figure is based on a consideration of only deforested areas over 25 hectares (ha) in size, which represented 85% of the total during this period.(Morton et al 2006). Besides this direct conversion of forests and *cerrados*, the conversion of pasture areas into agricultural fields in the north-central part of the State was also accompanied by the dislocation of ranching to new frontiers in the extreme north and northwest, contributing to the expansion of open areas in these regions (FBOMS 2005).

The fluctuating rates of deforestation in the Amazon can be explained by macroeconomic factors such as international commodity prices, the land market, inflation and financial markets, etc. (Cattaneo 2002, Anderson 1996, Barreto 2007). It is therefore necessary to bring mechanisms to bear to counter these tendencies, mechanisms that reflect the forces of the market and the value of environmental services provided by standing forests so that economic actors whose decisions affect conservation perceive their importance.

3. Forests and Environmental Services

Ecosystem or environmental services are defined by Dailey (1997) as services provided by natural environments and species of which they are composed, to sustain and nurture conditions for the permanence of life on Earth. This concept innovates in stressing the importance of these services that effectively sustain life, over and above the products derived from nature and natural resources, because ecosystems are so difficult and costly to repair or substitute with material infrastructure.

The identification of the importance of environmental services and growing recognition of their continual deterioration is very recent, having been exemplified through the *Millenium Ecosystem Assessment* (MEA, 2005). The MEA concluded that more than 60% of the global ecosystems have been used in an unsustainable fashion. The MEA classifies the services derived from natural ecosystems into four principal groups: provisioning, regulation, support and cultural, which assure well-being of human societies.

For millennia, humanity has received these services for free, never having to pay anything for them, and without considering them in the accounting of their economic activities. HEAL (2000) holds that if we exceed the capacity of support of terrestrial ecosystems, the era of free services will come to an end. It is now necessary to comprehend that there are increasing costs of maintaining these basic services so that they may remain intact and functioning.

One reason for maintaining forests and biodiversity lies in the fact that they provide a bountiful array of environmental services (**Table 2**). Forests subsidize the functioning of agro-ecosystems through their provision of environmental services such as climate regulation, supply and regulation of water resources and erosion control (Table 2) that directly benefit humans' quality of life. When these services are lost through biological simplification, economic and environmental costs can be significant (Altieri & Nicholls 2000).

Table 2 - Services and environmental functions provided by forests

Service and environmental function of the forest	Examples
Climate regulation through storage and sequestration of Carbon	Ameliorate the factors that increase surface temperature caused by the greenhouse effect
Water resource regulation through flow control	Reduces peak flows in flood and drought periods
Water supply through storage and retention of water during the dry season	Reduces the risk of lack of water during the long dry season
Control of erosion and sedimentation of rivers through soil retention	Avoids filling of rivers and loss of soil nutrients carried by rainfall
Research and exploitation of genetic resources assured by maintenance of genetic diversity	Medicinal products, genetic material for use in agriculture
Contribute to growth of an extractivist economy based on production of wood and non-timber forest products	Madeira, borracha natural, sementes para fabricação de adornos, frutos, castanhas, etc.
Opportunities for recreational and leisure use	Ecotourism, adventure sports, observation of fauna and flora, etc.

(Source: ICV, adapted from Costanza et al, 1997)

Agro-pastoral expansion leads to a loss in environmental services furnished by native vegetative cover; pastures and crops planted after forest clearing respire less water back to the atmosphere and absorb less solar energy, jointly effecting a reduction in rainfall and an increase in temperature in the Amazon region. Philip Fearnside of the National Institute of Amazon Research (Fearnside, 2008) posits that this logic of land occupation associated with deforestation accelerates the process of conversion of the Amazon rainforest into savannas, and besides altering continental rainforest patterns, results in a perpetuation of natural burning, which continues to suppress forest rejuvenation. Forest fires, besides provoking an increase in greenhouse gas emissions, generate a large volume of particulate matter and export nutrients from agro-ecosystems. That is, besides the loss of forest related environmental services, this interconnected series of processes can provoke an increase in forest fires, aggravating the risks of greenhouse warming, and resulting in more rapid soil degradation.

3.1 Protected Areas for Maintenance of Environmental Services

The Brazilian government is a signatory of the UN Convention on Biological Diversity (CDB) which has as its target at least 30% of the Amazon and 10% of other biomes effectively conserved in protected areas within the National System of Conservation Units (SNUC). It also committed itself to guarantee the protection of biodiversity in at least two-thirds of Priority Areas for Diversity through a combination of areas protected within the SNUC, as well as those lying within Indigenous Lands and Territories of Former Slave Communities ("*Quilombolas*") (MMA, 2007).

As part of this commitment the national Project for Conservation and Sustainable Use of Biodiversity (Probio) mapped (during 1997-2000,and revised in 2005), the Priority Areas for Biodiversity in Brazil following criteria of biological richness, vulnerability and importance for traditional communities and indigenous peoples.

These determinations were reinforced by the creation of new protected areas in Brazil during the Lula administration, which increased the area within Amazonia's integrally protected areas from 7.6 to 10%. Protected non-use areas (parks, biological reserves and ecological stations) covered a total of nearly 10% of the Legal Amazon by the end of 2007 (nearly 50 million ha), of which over one-third has been protected by the Lula administration since 2002. The conservation of such areas represents an indication of the priority of establishing limits to growth of the scale of human occupation in natural biomes, a source of environmental services of global importance.

Paradoxically, the only significant source of funding for protected area planning, land acquisition and facilities investment is precisely the implementation of major public and private development projects, whose location near protected areas is likely to undermine the potential for biodiversity conservation. Article 36 of the SNUC provides for compensation by developers of the unmitigated impacts of such projects on biodiversity, with a priority for investment in indirect use areas. This provision establishes a perverse incentive to attract development projects in the hope that by so doing, protected areas may be better preserved.

One of the most important arguments of the State for avoiding the creation of new protected areas is the high cost. These costs are high primarily when one considers the perennially scarce public financing available in environmental budgets at whatever scale: municipal, state or federal (Young & Roncisvale, 2002).

Within the Amazon region, the State of Mato Grosso has the smallest proportion of its total area protected. While Pará, Rondônia and Acre hold from 26 to 33% of their territory in protected areas, Mato Grosso counts only 4%. These protected areas (including both conservation units and Indian Lands) cover a total area of 170 000 km^2 in Mato Grosso. Besides their biological and cultural relevance these areas have effectively contained the advance of deforestation in the State. As can be observed in **Table 3**, the conservation units (5%) and Indian lands (4%) were deforested at a much lower rate than were private properties (44%). It is also worth noting that Environmental Protection Areas (APAs), one of the types of protected areas defined by the SNUC, offer little legal restriction to deforestation (and what little is afforded is poorly observed) outside of integrally protected areas. Of the 16% of total area deforested in conservation units in Mato Grosso, 11% occurred within APAs.

Table 3 – Total deforestation and natural remnants by tenure type in MT, 2007

Tenure type	Deforested Area		Remnant Area		Total Area	
	Km^2	%	Km^2	%	Km^2	%
Indigenous Territories	5,193	4	129,852	96	135,045	15
Conservation Units (not including APAs)	1,869	5	33,861	95	35,730	4
Other areas (settlements, properties and squatters)	322,014	44	410,795	56	732,809	81
Total	329,076	36	574,508	64	905,584	100

(Source: SEMA-MT (UCs, TIs, SISLAM), 2007; analysis by ICV)

The deforestation that still occurs within protected areas is owed to the fact that properties or squatters' rights are not wholly expropriated or indemnified by the State. Thus these properties are a source of ongoing conflicting claims within these areas. According to information made available by the State's Secretariat of the Environment (SEMA-MT), the total area of State protected area units that have been created but not yet indemnified is approximately 9000 km^2. To reduce deforestation within these areas, tenure regularization is therefore fundamental.

The 35 000 km^2 of protected areas already in existence in MT do not fully represent the diversity of fauna and flora present within the State, nor do they hold sufficient potential for reducing deforestation-related carbon emissions. The justification for creation of new protected areas arises therefore from strong arguments regarding the need to protect additional areas rich in biodiversity and to reduce carbon emissions in the State.

3.2 Payment for Environmental Services (PES)

Environmental policy in the Amazon has been principally based on use of Command and Control instruments including technical norms as to the proportion of private land that can be occupied by productive activities However, these instruments when applied on their own have not been sufficient to contain illegal deforestation.

Payment for environmental services (PES) is an economic instrument that has been increasingly applied as an **environmental policy mechanism**, one able to act directly on the costs of production and consumption of economic agents whose activities are the object of such policy. By incorporating the costs of negative effects generated by those activities (**externalities**), it has the potential to "internalize" them.

For Pagiola *et al* (2005), PES consists of the sale of services provided by forests, be they public or private. PES has as its fundamental principal compensation of the provider of an environmental service for the benefit furnished to a third party or a collectivity. It is the "provider-receiver" principal; that is, he who offers an environmental service, generating benefits to society has the right to be compensated for not using the land for a purpose other than for maintaining or restoring the forest. The idea is to motivate the proprietor of land, (be it public or private) to include environmental services in their decision making regarding land use, making conservation a financially more attractive option. The objective of PES is not to substitute for productive activities, but to motivate conservationist practices concomitantly with other land uses. It is related to a development plan based on conservation, on income generation and on furnishing environmental services.

The PES concept innovates with the idea that beneficiaries of environmental services should make direct payments, under contract, conditioned by services being effectively delivered, by rural producers or other holders of the means of provision of environmental services (rural communities, municipal governments, conservation units, etc.), for which they adopt practices that guarantee the conservation and/or restoration of the ecosystems in question (WUNDER, 2005). This perspective assumes that there exists a trade-off between different land uses and seeks to balance conflicting interests through compensatory schemes. Those who receive payment should be those who are proven service providers.

There is in reality a much broader spectrum of PES arrangements on trial throughout the world today (Landell-Mills & Porras, 2002). In a number of cases (see the CEECEC case study on PES in India), schemes are implemented based on shared belief that the proposed land use (for example, a forested watershed) would be more appropriate than another (e.g., a degraded pasture) to best respond to society's interests.

The voluntary nature of participation, characteristic of this economic instrument, is another feature that contrasts PES to mandatory Command and Control measures. It presupposes that the potential service provider has other options for using her land, besides conservation. It is necessary that there also be a clear definition of the environmental service that is being provided. The lower the certainty in relation to the services delivered, the greater the possibility of questioning the advantages of paying for them. It also is clear that we are handling the transfer of resources from a buyer to a seller; resources that would only be paid for so long as the services are delivered and as long as the payments last (or in accordance with the contractual terms).

An important contribution of ecological economics to the conceptualisation of environmental services is associated with the degradation of **stocks** of natural capital. The importance of a reduction in the capacity to furnish services historically essential to society is embodied in the concept of critical **natural capital**, which recognises the necessity to maintain ecosystems whose services are essential to life. The perception and posterior definition of the minimum tolerable limits to human occupation of natural ecosystems is frequently only possible through processes of political negotiation associated with the **precautionary principle**.

Economic instruments based on PES will not substitute for Command and Control instruments since application of PES requires a legal framework to delimit the economic activities involved. On the contrary, complementarity should be sought between the two types of instruments, seeking to reach the objectives of public policy at least cost to society. The operationalisation of any PES instrument requires bargaining between public and private institutions to establish a market for environmental service compensation in close articulation with pre-existing Command and Control instruments.

For example, in Brazil, the Forest Code defines the limits to the expansion of deforestation on private lands – in the Amazon this limit is 20% of a given property. Without such a legal limitation, proposals to restrict illegal deforestation through compensatory measures lack "teeth". Hence, one of the most widely discussed environmental policy proposals for the Amazon is that of combining environmental service payments with Command and Control mechanisms.

3.3 Reduction of Emissions from Deforestation and Forest Degradation (REDD)

Payment for storage of carbon in tropical forests, denominated "avoided deforestation", has come to be discussed as a means to make possible a rapid reduction in deforestation-related emissions (Santilli et al. 2005, Chomitz et al. 2007). This proposed mechanism to assure financial compensation for reducing deforestation in developing countries has been given the acronym **REDD** (Reduced Emissions from Deforestation and Forest Degradation).

At a global level, deforestation is considered to represent as much as 20% of greenhouse gas emissions. Deforestation and land use change-related emissions in Brazil (the latter also known as LULUCF: Land Use, Land Use Change and Forests, but as most such emissions are associated with deforestation, they tend to be conflated) have been estimated most recently as 54% of total greenhouse gas emissions in CO_2 equivalent measures. The greater relative importance of such emissions compared to most other nations (**Table 4**) implies that for Brazil to respond to its role as a signatory of the Climate Change Convention it must find some way to reduce these emissions. A proposal for "zero deforestation" arose from leading NGOs, who made a pact in that direction with land users and regional governments in the Amazon in 2008. Although the Federal government had not previously articulated a deforestation target, under the National Climate Change Plan promulgated in 2009 it resolved to reduce its emissions associated with deforestation in the Amazon by 80% by 2020.

There is already a de facto **market for carbon** as an "environmental commodity", as an offshoot of the so-called flexibility mechanisms of the Climate Change Convention. The market value of carbon arising from these mechanisms has fluctuated and varies between that negotiated among actors associated with the European Emissions Trading Scheme and informal markets that have emerged to capture a range of different values associated with emissions reduction, including avoidance of deforestation. For a number of reasons, maintenance of forest carbon stocks was not afforded formal status in the Kyoto Protocol mechanisms. Only forest restoration or afforestation (conversion of bare or cultivated land into forest) is eligible for crediting via the Clean Development Mechanism (CDM). Following debates at the Conference of the Parties to the Climate Convention in Bali, Indonesia in 2007 (COP 13) that resulted in definition of global policies for combating greenhouse warming post-Kyoto, the perspective that parties might receive compensation for their good faith efforts to reduce deforestation became more tangible. If this were to be the case, it would be necessary to integrate REDD with sectoral policies toward land use and regional development and not solely actions at the level of properties or “projects” as foreseen in the CDM.

Growing concern with the effects of carbon emissions on global warming has necessitated the creation of instruments that can revert deforestation and offer economic opportunities for those who maintain forests intact. Effective systems of property registry, tenure regularization, and implementation of land use monitoring as well as the restoration of environmental liabilities (areas cleared beyond legal limits), are therefore all prerequisites to enabling REDD projects. A REDD mechanism could encourage the intensification of agricultural production systems while making the State’s monitoring of illegal deforestation more efficient. There are already policies and mechanisms in existence in Mato Grosso that could have REDD as an important complementary mechanism for greater control over illegal deforestation in the Amazon (Micol, Andrade e Bonner, 2008).

Table 4. GHG emissions, 10 highest emitting countries; LULUCF emissions and adjusted total emissions, by rank.

	Total GHG Emissions in 2005 (excluding LULUCF) (1)		LULUCF Annual Average 2000-2005 (2)	Total Estimated Emissions (including LULUCF)		Share LULUCF
	$MtCO_2e$	Rank	$MtCO_2$	$MtCO_2e$	Rank	%
USA	7,219.2	1	-36.7	7,182.5	1	-1%
China	6,963.8	2	-461.2	6,502.6	2	-7%
Brazil	1,014.1	6	1,171.7	2,185.8	3	54%
Russian Federation	1,960.0	3	14.1	1,974.1	4	1%
India	1,852.9	4	-3.7	1,849.2	5	0%
Japan	1,342.7	5	0.6	1,343.3	6	0%
Indonesia	594.4	11	459.6	1,054.0	7	44%
Germany	977.4	7	0	977.4	8	0%
Mexico*	629.9	10	120.1	750.0	9	16%
Canada	731.6	8	0	731.6	10	0%
United Kingdom	639.8	9	-1.4	638.4	11	0%

(1) Source: WRI/CAIT. http://cait.wri.org/cait.php. Accessed April 2009.

GHG include: CO_2, CH_4, N_2O, PFCs, HFCs, SF6 but are estimated in CO_2 equivalent amounts, therefore "CO_2e" in the table.

(2) Source: FAO, State of the World's Forests 2009. CO_2 only, estimate based on change in forest cover and on the average carbon stocks/hectare.

1 t CO_2 = 3,666 t C

* Estimated using value of carbon/ha based on that of Guatemala.

4. Public Policy Mechanisms: institutional innovations to strengthen conservation and control over deforestation in Mato Grosso

The 1988 Brazilian Constitution foresees a relative transfer of power from the federation to the states and municipalities and to civil society. Decentralization of environmental policy is also part of this process and although with some delay, powers to legislate and manage environmental functions have been devolved to the state and local level to better reflect regional diversity. The State of Mato Grosso was the first in the Amazon region to make the first steps toward environmental decentralization. In 1995, the State government approved its environmental policy, and initiated a series of public policy innovations that began to take shape from the year 2000.

This does not signify that the environmental question has been resolved, as far as deforestation is concerned. Far from it: despite innovations that make it possible to say that the State is in the vanguard, the annual rates of deforestation continue to fluctuate significantly and it is still too early to be able to say that there is a correlation between stronger efforts at Command and Control and reduced deforestation. In many cases good legislation has been enacted, but with a lack of complementary resources, be they technological, financial or human, are not yet fully effective. In this sense, the role of organized civil society, acting through independent socio-environmental organizations, is of fundamental importance to monitoring and thinking through solutions that can help to make decentralized environmental legislation more effective.

In this section, we present current state-level environmental policies adopted in the process of decentralization of powers to states and municipal governments, highlighting the fundamental role that organized civil society might play in effective policy implementation. This is important to show how the REDD proposal fits within this existing State policy framework.

4.1 Plan of Action for Prevention and Control of Deforestation in the Legal Amazon (PPCDAM)

In 2003, the Federal government, at the level of the Presidency, formulated the PPCDAM, which consists of a package of actions to reduce deforestation and to construct a federative pact to achieve its purposes throughout Amazonia. Each state in the Legal Amazon region has the responsibility to prepare its own State Plan. Since 2007, the Mato Grosso State government, with the support of the Ministry of the Environment has been in discussion and working with various societal segments to prepare its Plan. The State version will have four principal axes: Territorial Organization, Monitoring/Control, Promotion of Sustainable Activities and Environmental Governance. The goal is for the Plan to be concluded by September 2009, containing all the inter-secretarial actions of the State and Federal government within a single mechanism. The greatest challenge faced by the Plan is to attain applicability. For this to happen, a wide range of complementary laws and regulations will need to be created and approved to make the Plan’s implementation viable.

4.2 State Plan for Combating Climate Change [60]

4.3 Licensing of Rural Properties

In response to the Federal requirement that rural properties be environmentally licensed, the State government of Mato Grosso instituted a Combined Environmental License (*Licenciamento Ambiental Único-LAU*) in 2000. This mechanism was linked to a technological package for monitoring based on satellite imagery that was instituted simultaneously as a means to resolve the illegal deforestation problem in the region as a whole. The Environmental Licensing System for Rural Properties (SLAPR, implemented on the basis of the LAU), entails integrated monitoring of deforestation using images provided by landowners at the time of licensing showing their properties and their protected areas (Legal Reserves, of which at least 80% are located in the Amazon biome and Permanent Protection Areas, areas near streambanks, hillsides and hilltops, and lands sloping over 12%). Such information was then used for forest control and environmental licensing as a requisite to obtaining authorization for additional deforestation.

The SLAPR permits periodic monitoring of the status of forest fragments within private properties by comparing annually produced state-wide satellite imagery on the advance of deforestation with the digitized images of properties provided by landowners. If deforestation has exceeded authorized limits or made incursions into protected areas on the property, grounds for disciplinary action exist. Not only does the State have access to these data, but all of this imagery is available on-line for public scrutiny. Properties adhere voluntarily to the system, but it is mandatory for anyone seeking authorization to deforest. SLAPR was initially targeted to properties over 1000 ha in size to reduce transactions costs and reach a large share of total deforestation in the State.

With nine years in operation to date, adherence to the system is still very low. In December, 2008, 9700 properties were registered in the SLAPR, covering an area of 19.7 million ha. This area represented only 26% of the total area subject to licensing in the State (73.2 million ha). The remaining areas of rural properties (74%) are still largely irregular, or not in compliance with permitted limits to clearing. The properties that entered into the system in 2008, totalling 1.24 million ha, represent only 1.7% of the total area subject to the law. At this rate, it would take about 30 years to achieve 80% of properties being registered. Furthermore, it is fundamental to actively promote licensing and environmental regularity of rural properties through credit restrictions as well as to stimulate property regularization (ICV, 2009).

To stimulate regularization, a Program for Environmental and Agrarian Regularization was created in the local governments of the State of Mato Grosso, entitled MT LEGAL. This program, to be implemented in the second half of 2009, seeks to motivate private property

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60 The state climate change plan was still under review at the date of presentation of this draft. Details will be added later.

owners to enter into the SLAPR, creating a market based on forest assets and liabilities, and offering the potential for establishment of a trading scheme for environmental services.

4.4 State Ecological-Economic Zoning (ZSEE)

Zoning has been required since 1990 by the Federal government in the nine states that compose the Legal Amazon. State Ecological-Economic Zoning (ZSEE) is an instrument of territorial planning with the objective of influencing decisions of public and private actors regarding the use of natural resources, and balancing maintenance of natural capital and ecosystem services with economic activities.

The spatial distribution of economic activities under ZSEE takes into account the limitations and fragilities of ecosystems, establishing restrictions and alternatives to territorial expansion of their exploitation. Implementation of REDD demands a new set of instruments and coordinated measures that necessarily involve society and government, and due consideration for the ecological and economic specificity of each region of the State. Spatial differentiation is of fundamental importance for the REDD instrument under discussion here, as it will greatly augment the efficiency of payment mechanisms to areas where the most critical ecosystem functions are under greatest threat.

In Mato Grosso, the document was presented by the executive to the legislature in the first half of 2008, giving vent to a series of 16 regional public hearings. A sizeable social mobilization occurred, marked by heated debates that expressed diverse political and ideological positions. This mobilization was an exercise of **popular participation** marked by a test of forces between social and environmental movements – usually the minority in these hearings – and those mobilized by agribusiness interests.

In the final stage of public consultation, the State Assembly worked behind closed doors with a technical commission responsible for devising the proposed bill for State zoning for the second half of 2009. The greatest challenge now is to make this process, marked by ample debate among civil society participants, a valued reference for this final stage. The greatest concern is that sectors such as agri-business that hold greater representation in the Assembly will look out for their own interests over other sectors' positions presented and debated in the public consultations.

4.5 Principal actors and interest groups engaged in the process

The framework of plans, programs and policies presented above illustrates the instruments and legal bases available for the Command and Control of deforestation in Mato Grosso. These mechanisms are ambitious and represent a position that is considered stricter than that of the Ministry of the Environment. Upon transferring responsibility to states with decentralization, the Ministry took on a monitoring role to ensure no relaxation of restrictions attending to regional arrangements.

In counterpoint to this movement, there exists a diverse range of interests from environmental conservation to agribusiness, the latter of which is closely articulated with regional political power and offered considerable resistance toward what was presented by ZSEE technicians. The reactive movement of agribusiness included preparation of technical reports with the objective of disqualifying the original proposal, and posturings of animosity and intimidation in public hearings.

The role of socio-environmental **institutions** is fundamental to bringing society documented information regarding the relevance of implementing these mechanisms. The proposal developed in the next section of this case study shows how this issue may be brought to a head within the scope of the ZSEE, whereby new protected areas may be proposed as providers of environmental services. Implementation will also depend on the State's agility in environmental licensing and title regularization of private properties and on the incremental capacity of the State government to engender efficacy in the monitoring and control of deforestation through expansion of its private lands registry.

5. The Potential of a REDD Mechanism

The objective of this study is to discuss the potential of a REDD mechanism in the context of the ZSEE, while supporting the creation of new protected areas in Mato Grosso. In doing so we will demonstrate that the programs and public policies of reduced deforestation in the State, if coordinated with the ZSEE proposal, would open up the possibility to undertake a series of effective initiatives for reduction and control of deforestation, simultaneously augmenting the representativeness of protected biodiversity, permitting resources to be attracted through REDD, and increasing the number of properties registered in the SLAPR.

5.1 The Creation of New Areas and Effective Protection of those Already Created

The proposal for ZSEE-MT was prepared by the State Executive branch, passed through the public consultation phase and is currently under discussion in the Assembly. It includes new areas identified for protected status, in all, 15 proposed such areas of biodiversity protection covering 63 700 km^2, or an additional 7% of the surface area of the State, of which 34 000 km^2 lies in the Amazon biome and 29 000 km^2 in the *cerrado*.

These areas indicated by the ZSEE are included in the Probio 2005 listing, showing that their importance for biodiversity conservation is recognized nationally and that their conservation would be part of a Brazilian strategy for compliance with its commitment to reduce additional biodiversity loss, as expressed in the Millennium Development Goals. Each of these proposed protected areas has specific importance, since they protect ecosystems threatened by human pressure, areas of important aquifers, endemic species of fauna and flora threatened with extinction and physiognomic patterns exclusive to these environments.

All this biodiversity is at risk, subject to human pressures due to its location in private areas that have registered deforestations from the moment they were proposed for protection. The accumulated deforestation in these new protected areas represents 24% of their original total surface area. In six of the 15 areas, this proportion was between 15 and 25%, while in four areas it exceeded 25% and in a final five areas represented less than 15%. Of the total area, 24,000 km^2 (38%) is found within properties registered in the SLAPR. This relatively high rate of registered properties relative to the rest of the State clearly reflects the interest of landowners in assuring their **property rights** in the face of fear of expropriation.

In light of the concerns already cited (biological relevance, pressure for deforestation and landowners' property rights interests), the new protected areas proposed by the ZSEE-MT have generated heated and polarized discussions among those with links to rural landowners and socio-environmental entities throughout the entire process, principally in the public hearings. On a number of occasions landowners with ties to the agricultural sector have suggested the reduction or even elimination of the protected areas proposed by the zoning bill.

5.2 Estimate of Private Areas That Can Be Regularized By Compensation in Protected Areas

As described previously, many rural properties in Mato Grosso have been deforested beyond limits permitted by the environmental (Forest Code) legislation. As a result, there is a large proportion of agricultural properties with irregular status and legal reserve liabilities. Working within the context of the new institutional and regulatory framework we assert that the creation of new protected areas would create a stock of lands fundamental to making possible the environmental regularization of already deforested areas in the State.

Based on an estimate of the total surface area cleared for production, and from available data on deforestation and property maps, it is possible to estimate the amount of deforestation beyond permitted limits for closed forest and *cerrado* in Mato Grosso The original extent of forest cover in Mato Grosso was 525 000 km^2. Of this total, the area cleared up to 2007 was 163 000 km^2 (43%). We calculate that this area includes about 61 000 km^2 of potentially regular areas, and 102 000 km^2 of areas cleared beyond the 20% allowed on each property, deemed irregular. In relation to the *cerrado* areas of the State, their original extent was 377 000 km^2. Of this total, the area cleared up to 2007 was 136 000 km^2 (49%). We calculate that this area includes about 118 000 km^2 of potentially regular cleared areas, and 18 000 km^2 of irregular areas, cleared beyond the 65% permitted on each property.

5.3 Options for Regularization of Legal Reserve Liabilities

State environmental legislation, consistent with the national Forest Code, offers three alternatives for regularizing legal reserve liabilities: restoration on the property, compensation in another private area that holds a surplus of legal reserve, or compensation in a protected area.

The option for restoration of legal reserves on the property could be appropriate in small and/or degraded areas, although generally implies a high cost. Considering existing planting techniques in degraded sites practiced in Mato Grosso, the cost of recuperation varies between R$ 2500 and 4000 (US$ 1390 to 2220) per hectare (ISA, 2009). Besides this, there is the **opportunity cost** for the landowner of desisting from use of productive areas so as to restore his reserve, which – when added to the cost of recuperation – makes this option even more onerous, especially in areas with high productive potential.

The option for compensation in another private area, through easement or outright purchase of surplus legal reserve area is of great interest, but also has significant limitations. We calculate that the surplus legal reserve area in private properties in Mato Grosso add up to about 24 000 km^2 in forested areas and 19 000 km^2 in *cerrado* areas. The first limitation of this option is that the surplus legal reserve area in forests is far from being sufficient to that necessary to regularize the liabilities. Besides this, this option is available only for deforestation that occurred prior to 1998, and is therefore non-applicable to the majority of liabilities, whether in the forest or in the cerrado. Besides this, this option implies an elevated **transaction cost**, from searching for an area with surplus reserve area available for compensation, through negotiation and effective acquisition of an area.

Compensation in existing protected areas is an option that may appeal more to landowners, as they would not have to face the opportunity cost of reducing productive areas nor the cost of maintaining or restoring the legal reserve. It is also an option of interest to the State, as it would provide opportunities for the regularizing of tenure of already existing protected areas.

According to SEMA-MT, the total area in State protected areas requiring tenure regularization represents nearly 8000 km^2 in forest areas and 5000 km^2 in the *cerrado*. That is, the potential for compensation for irregular land use in existing protected areas is relevant but insufficient when compared to the scale of existing liabilities. Even when all the areas offering the possibility of regularization among compensation options above are added up, there remains a deficit of 29,000 km^2. The potential for regularization considering all natural remnants in proposed protected areas in the bill to establish the ZSEE would be 26,000 km^2. Therefore, the creation of new protected areas is fundamental to enabling the regularization of already deforested areas, and to implementing the MT LEGAL compensation program.

The compensation of legal reserves with State protected areas would make it possible for rural landowners to obtain the environmental license (LAU) and for the State to integrate private lands within protected areas that have not been indemnified, at a lower cost. To have an idea of the order of magnitude of this cost, we consider the market value of the land with native vegetation (FTP, 2007). For all of the proposed areas, the total potential cost of acquisition would be in the order of R$ 3.3 billion (about US$ 1.7 billion). If we divide this value by the total area of 64.725 million ha, this value comes to just under R$ 5100 per hectare (about US$ 2,830). This is a significant amount of resources that SEMA would have to surrender from its budget if there were no lower cost alternative.

Among the options for environmental regularization offered by the environmental legislation, the options are shown in **Table 5** below:

Table 5: **Costs of environmental regularization by property transaction option, Mato Grosso - Brazil**

Item	Hectares with deficit	Cost per hectare	Total Cost
Proprietor restores deficit in legal reserve area	6 100 000	R$ 2500 to R$ 4000 (a)	R$ 1 525 000 000 to R$ 24 400 000 000
State expropriates and indemnifies protected area	(To be added)	(To be added)	(To be added)
Proprietor compensates liability in other private area	2 400 000	R$ 5100 (b)	R$12 235 200 000
Private liability compensated in protected area	3 400 000	R$ 800 (c)	R$ 2 720 000 000

Sources: (a) ISA (2009); (b) ICV (2008); (c) MT Legal; FTP (2007).

Thus, of the 61 000 km^2 that require recuperation in potentially regularized properties located in the Amazon biome, 48 000 km^2 could be compensated or exonerated within existing and future proposed protected areas, as well as in private properties that have not been deforested and that are expected to remain in that state to the extent that the agricultural frontier is consolidated in areas already defined as such by the zoning plan. The cost of these two actions in combination would require a level of resources considerably lower than the high range restoration costs of over R$ 24 billion estimated above, as can be seen in the details provided in **Table 5**.

It may be concluded that the option of compensation of private liabilities in protected areas would imply an effective savings both for the proprietor and the State in attaining the ZSEE goals, creating a context for net gain from negotiation. The transaction costs of these exchanges would be assumed by proprietors whose lands would require regularization under the rural licensing law.

Until today, few cases of legal reserve compensation within protected areas have actually taken place. In Mato Grosso, the number of cases is no more than a dozen, while an additional number have been stalled from going ahead since 2005. This possibility should be better studied to identify the principal limitations, as it opens up an important opportunity for rural landowners to resolve their environmental responsibilities through compensation at a relatively lower cost than other options presented. Besides this, it would allow for new protected areas to be created, guarding these areas against further deforestation. This form of environmental compensation is an instrument that can overcome the high costs associated with restoration, and bring properties into line with environmental licensing requirements.

5.4 Estimate of carbon stored and resources that might be obtained through avoided deforestation in areas indicated for creation of protected areas

Over the past decade, the State of Mato Grosso emitted through clearing and burning nearly 1 billion tons of carbon stored in biomass, or an average of 366 million t CO_2/yr. This volume may account for as much as 10% of global deforestation related greenhouse gas emissions.

Based on one of the most cited publications regarding carbon storage in forest vegetation in Brazil (Saacthi, 2007) we produced a map (Figure 4) representing the quantity of carbon stored in forest formations found in the new protected areas proposed by the ZSEE. The areas demarcated on the map contain carbon ranging from 40 t C/ha in more open *cerrado* formations up to 130 t C/ha in forest areas, considering only the carbon stored above the soil surface (not including forest litter or root biomass). Field studies carried out in the Northwest region of the State show that this value can attain as much as 195.6 t C/ha when other stocks of carbon besides living aboveground biomass are considered (ICV, in press).

Following this, we projected (**Figure 4**) based on deforestation rates over the past decade, an average deforestation of 1000 km^2 per year, in all new areas proposed for creation of protected areas. Considering the deforestation rates of the past 10 years and the per hectare carbon stock in each proposed protected area, we then estimated the historial emissions associated with deforestation in these areas. The resulting calculation suggests that emissions could have reached nearly 72 million tons of carbon (265 million tons of CO_2) between 1997 and 2007, an average of 7.2 million tons of carbon per year (26 million tons of CO_2) (**Figure 5**). With the conservative hypothesis of an average value of US$ 5.00 per ton CO_2, the reduced deforestatjon in these areas could imply financial compensation on the order of US$ 130 million per year.This value can be considered conservative due to the necessity of countries with greater emissions reduction requirements finding other means to reduce their emissions. Of course all of these suppositions depend on the formulation of the post-Kyoto accords.

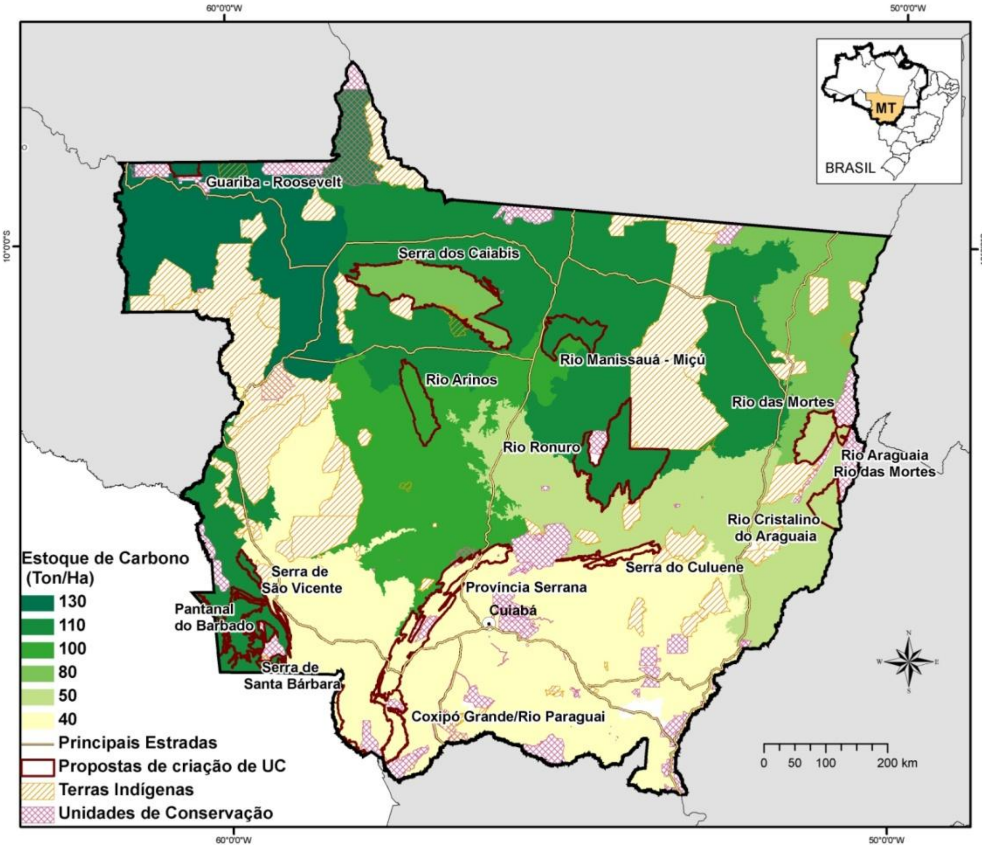

Figure 4: Estimate of carbon stock in protected areas
(Source: ICV, 2008)

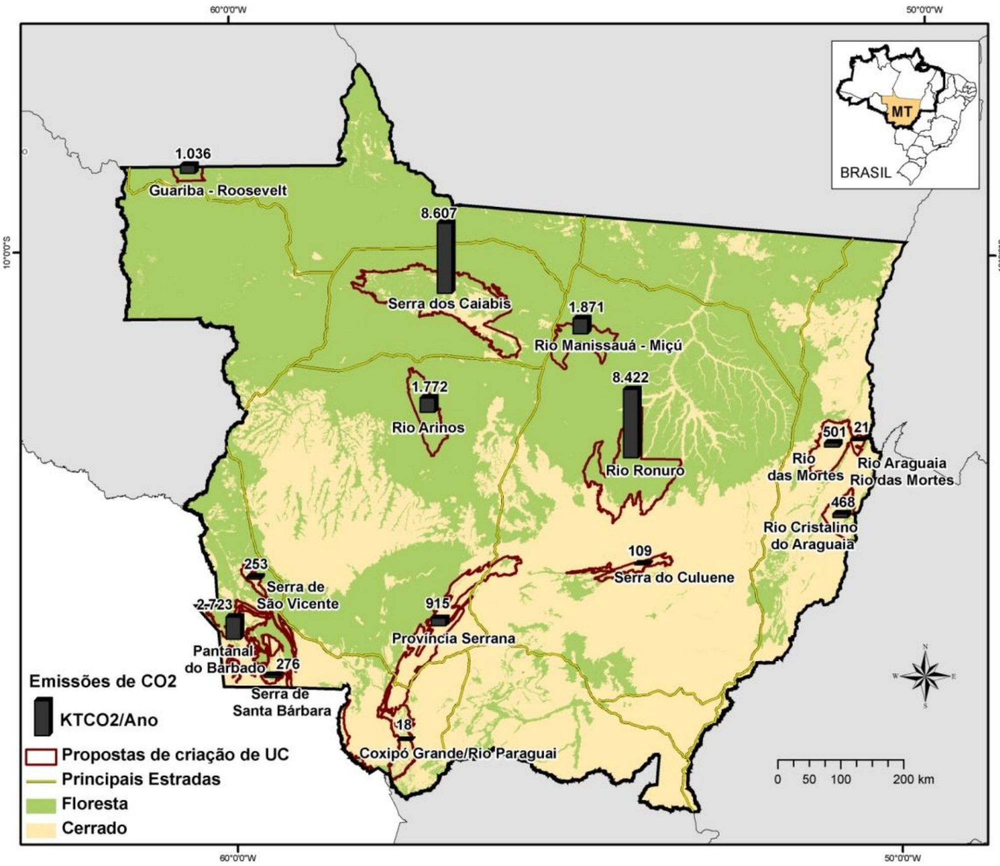

Figure 5: Annual CO_2 Emissions from Areas Proposed for Creation of Protected Areas
(Source: ICV, 2008)

6. Considerations and Conclusions

The creation of protected areas requires specific in-depth studies to determine their group (Integral Protection or Sustainable Use), management category (Park, Biological Reserve, Forest, Extractive Reserve, etc.), and their demarcation. These studies would locally analyze and map the areas of greater importance for conservation, the eventual existence of natural limits, as well as the types of potential uses of areas to be created and the possible socio-economic impacts of their creation.

The process of creating protected areas must also involve local society through public consultations where studies are presented and proposals discussed in order to make them appropriate to local realities. Based on the experience of the ZSEE consultations, it is in the general societal interest of all regions of the State to find adequate pathways toward socio-environmental conciliation. However there are clearly oppositional views on the assumption of costs on the part of economic agents, some that would eliminate the creation of new protected areas as an option. However, a negotiation of solutions of lesser cost would be, at least conceptually, of interest to all actors.

The protected areas proposals outlined in the law for the establishment of the ZSEE-MT are fundamental components in the strategy of environmental and territorial management for Mato Grosso. These are necessary to enable the State to effectively execute its commitments to national roles in the Convention on Biological Diversity. On the other hand, they will also be necessary to ensure the environmental regularization of rural properties in the realm of MT Legal. Therefore, all considerations of the elimination of protected areas proposals from the ZSEE should be discarded.

Besides the richness of biodiversity existent in these areas, they also offer the potential to generate financial resources for the State within the global carbon market. The new protected areas would represent a direct and concrete basis for implementation of REDD mechanisms.

The carbon market is still in process of definition, as well as a modality in which the forests could be treated as a part of this instrument. There are a series of uncertainties that affect the development of solutions in an unregulated environment. There exist voluntary funds, programs of “REDD-readiness”, etc. that indicate this proposal can be part of the equation of emissions reductions associated with deforestation. There is recognizably a long road forward toward this definition, but the analysis and mobilization of society around initiatives of this kind is the first step in this direction.

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WASTE

Chapter 13: THE WASTE CRISIS IN CAMPANIA, ITALY

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"Ecoballe" storage in Campania
(Source: Ansa)

Abstract

From 1994 to early 2008, the region of Campania in south-west Italy was subject to a formal State of Emergency, declared due to the saturation of regional waste treatment facilities. There is growing evidence, including a World Health Organisation (WHO) study of the region, that the accumulation of waste, illegal and legal, urban and industrial, has contaminated soil, water, and the air with a range of toxic pollutants including dioxins. The Government has been unable to resolve this crisis, adopting measures that have only increased public unrest, exacerbating the conflict. Local communities continue to organise and protest, risking arrest in order to be heard by a Government that has so far excluded them from decision-making processes. Meanwhile the management of waste has worsened: from the failure to separate dry from wet waste and the resultant inability to produce compost (necessary for the regeneration of contaminated land) to the continued production of the inaccurately named "ecoballe" that have continued to accumulate due to delays in the construction of incinerators.

Keywords: Hazardous Waste, Ecomafia, Externalities as Cost Shifting Successes, Post-Normal Science, "Zero Waste", Incinerators, Lawrence Summers' Principle, DPSIR (Driving Forces, Pressures, States, Impacts, Responses), Corruption, Democracy Crisis, EROI (Energy Returned on Energy Input)

1. Introduction

The region of Campania in south-west Italy (**Figure 1**) is divided into 5 provinces: Naples, Avellino, Benevento, Caserta, and Salerno. About 25% of all of protected areas in Italy are found within this region, the capital city of which is also Naples. There are currently 4 State Natural Reserves, 8 Regional National Parks, 4 Regional Natural Reserves, 106 Sites of Community Interest and 28 Special Protection Zones. Campania is notable as the most densely populated region of Italy, and also one of the nation's poorest regions.

Figure 1 : The region of Campania in Italy
(Source: http://www2.minambiente.it)

Campania´s waste crisis was first revealed to the world through the images in the news of the city of Naples invaded by waste. This emergency was publicized as a waste disposal problem while the real problem remained hidden to the public. Indeed, if international media coverage is to serve as an indicator, the waste conflict in Campania was fully resolved as of July 18, 2008, as a direct result of waste management measures implemented under Berlusconi (The Economist, Feb 26th 2009). However, closer examination of the waste crisis reveals a much more complex picture. For more than two decades the illegal and/or inappropriate treatment and disposal of urban and industrial waste has contaminated of the region's soil, superficial and underground waters, and atmosphere, threatening every single living thing and being.

There are various forces responsible for Campania´s waste crisis: damaging cultural behaviours, illegal activities of the Camorra (the name of a dominant Naples mafia clan), and criminal behaviour on the part of politicians and public administrators, company managers and freemasons. Campania´s waste management cycle has been infiltrated by an Ecomafia (a network of criminal organizations that commit crimes causing environmental damage) that have developed an alternative illegal and polluting waste management market for "treating" both local and other region´s urban and industrial waste.

This case study presents Campania´s waste crisis, showing both the legal and illegal aspects of the story. We show what has happened in the past and what still continues, indicate where responsibility lies and outline the social, environmental and economic externalities produced by the current waste management in Campania. Finally, through the lenses of ecological economics, this paper will analyse the main issues underlying the case with a view to better understanding this complex conflictive situation.

2. A Brief History of the Campania Waste Crisis

The "emergency" we are currently witnessing, presented by the media as a urban waste management issue, is much more complex than it seems. The contamination affecting the region is the result of corrupt waste management practices enabled by the use of subcontracts to private consortiums, lack of power to enforce the law and by the persistence of an illegal waste management market that started decades ago with the treatment of harmful toxic waste produced by northern Italian industries.

It all began in 1989, when Italian politicians of the Liberal party, members of the Freemasonry, and heads of the Casalesi clan met in Villaricca, in the province of Caserta. The purpose of the meeting was to define the different roles and compensations for waste management. The Freemasonry were in contact with northern Italian industrialists interested in getting rid of hazardous waste at below-market rates, and the Camorrist clan offered to provide these services through its own transport company, authorised by the Regional Councillor of Ecology from the Liberal party, Raffaele Perrone Capano.

Initially, waste – both urban and hazardous – was simply transported to and abandoned in illegal landfills. Then, as the market grew, the system became more complex and extensive, resembling the current system in which waste is sent to Campania from where it transits to several storage and treatment sites until it is buried or dumped on land or in watercourses. Only on paper does this waste receive "treatment".

No-one has been able to stop the mafia traffic. Public **institutions** tried to develop new legal frameworks for monitoring waste management, but these efforts failed to lead to any real improvement of the situation. In February 1993 the first Regional Waste Management Plan was approved in order to reduce the use of landfills in Campania by 50%. However, this measure was not effective and when landfills were saturated in February 1994, the State of Emergency was announced.

2.1 The First Regional Waste Emergency Plan

With a view to resolving the crisis, the Italian government appointed Naples Prefect, Umberto Improta as the first "Extraordinary Commissary for the Waste Emergency" while the regional administration was asked to prepare a waste management plan. The Prefect was unable to handle the emergency and in March 1996, the task of resolving the crisis was handed over to the President of the region, Rastrelli. This Prefect maintained responsibilities for daily waste management only, creating 6 ATOS, (areas for locating waste treatment facilities) and preparing a sorted waste collection plan for the collection of up to 35% of solid urban waste. The plan failed.

In February 1997, three years after the beginning of the State of Emergency, the Ronchi Decree (nº.22) was approved, incorporating the main European waste management regulations into Italian law. The Decree first prioritised the implementation of waste production prevention policies, followed by waste collection, recycling, re-use or combustion measures. Then the Decree made provisions for the limitation of waste disposal to prevent health and environmental contamination risks. It also established obligations for waste producers and managers to identify and register transport, and to provide environmental declarations. Unfortunately, the Decree had no impact in practice. Because waste treatment was dysfunctional the need for new waste disposal sites kept growing to the point where new landfills were created and some old ones were reopened (**Figure 2**). Increasing pressure to dispose of waste lead to an unleashing of local community protest.

Figure 2: Landfills in Campania in 2008
(Source: Ecoalfabeta 2008**)**

2.2 The Second Regional Waste Management Plan: FIBE and Ecoballe

On March 31st, 1998, the Italian Minister of Internal Affairs, Giorgio Napolitano (now the President of the Italian Republic), fostered a plan to modernize the Region´s waste management practices. Selective waste collection was to be introduced in order to reach a 35% reduction of solid urban waste (SUW). Commissary Rastrelli was given four months to write a tender for a 10-year urban waste management plan for Campania.

The tender included the construction of seven RDF (Refuse Derived Fuel, also referred to as “ecoballe”, formed of packed waste of high calorific value to be burned for energy production) infrastructures, and two thermovalorizers, which are incinerators that use 50 year-old technology to produce energy by burning waste of high calorific value (particularly ecoballe). The main criteria used by the Commissariat to select the winning bid was the speed of construction and the minimization of costs, as a quick solution was desired for dealing with waste.

With Decree nº 16 on April 22nd 1999, FIBE was provisionally awarded the tender for waste management for the province of Naples. FIBE was an A.T.I. (a temporary company association) composed of the following companies: Fisia Italimpianti S.p.A., Babcock Kommunal Gmbh, Deutsche Babcock Anlagen Gmbh, Evo Oberhausen AG, and Impregilo S.p.A. Competing bids offered better infrastructures, superior technologies, and lower pollution/environmental impacts, but proposed a treatment cost of 0.06 € /kg with a 365-day construction period. FIBE in comparison offered a 0.04 € /kg treatment cost, and a construction period of 300 days. On the 20th of March 2000, with Decree no. 54, the Commissar officially awarded the contract for urban waste management for the entire region to FIBE.

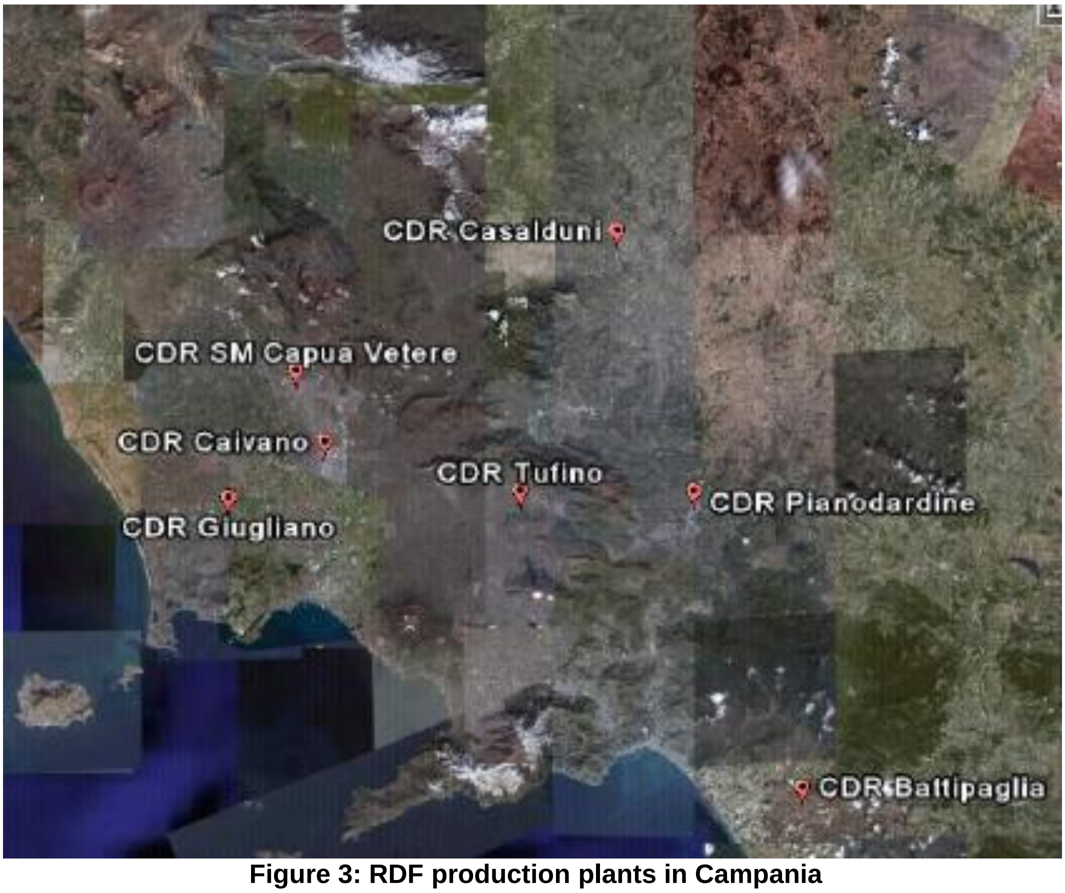


Figure 3: RDF production plants in Campania
(Source: Coreri, International Waste Conference February 17, 2009**)**

FIBE built seven RDF production facilities (see **Figure 3**), at a cost of over 270 million €, with one of the two planned incinerators financed by EU funds. The Acerra incinerator has been in operation since March 2009, while the second facility, located in Santa Maria della Fossa (**Figure 4**) is still on stand-by. According to the tender, all solid urban waste collected was to have been treated in RDF plants to become ecoballe (32%), compost (33%), and ferrous waste (3%) with only 14% disposed of in landfills. The ecoballe produced and stored during the construction of incinerators, as specified in Napolitano's decision, were to eventually have been burned in thermovalorizors for the generation of energy from combustion.

Figure 4: Landfill at Santa Maria della Fossa
(Source: A Sud)

A highly controversial aspect of the agreement made with FIBE was that the consortium was given sole authority to select the construction sites of the infrastructures, completely independently of public administrative bodies. This led to speculative activities in the rental of land by the Camorra, as well as numerous environmental and health impacts, as legal requirements for **Environmental Impact Assessments** (EIA) prior to infrastructure construction were derogated by the Commissary through the use of his extraordinary powers granted under the State of Emergency. EIAs were replaced by "Environmental Aspect Valuations", and then, by "Environmental Compatibility Valuations" which had very little bearing on decision-making processes.

The extraordinary powers granted to the Commissary enabled rapid decision-making but also created a lack of transparency which enabled the taking of many illegal decisions. This was certainly the case in the choice of waste transport companies and the control of ecoball stocking and landfill sites, which were (not coincidentally) based in mafia territory.

Another significant decision of the Commissary was to exclude municipalities and other local entities from waste management plans (Commissariat Decree 319 of 30-09-2002).

Since 2001 there have been perennial “emergencies within the emergency”. With RDF storage sites filling to capacity and the construction of the incinerators proceeding very slowly the Commissary has had to help FIBE find new storage sites for the inert and humid parts of treated waste. The region has been obstructed by waste on numerous occasions, and is still blocked frequently today with streets full of garbage. Each time one of the seven RDF sites is closed, for reasons ranging from regular controls, mafia interference and magistrates’ enquiries and sequestrations, the collection of waste slows down, waste fills the streets, and old and new dumpsites are opened once again to store the large quantity of ecoballe waiting to be burned in incinerators under construction.

2.3 The FIBE – Impregilo Affair

A critical issue of the waste treatment process as it has been conceived in Campania is the poor quality of RDF, or ecoballe derived from waste (see **Figure 5**). The chemical laboratory controlling the RDF plants was the property of Fisia, a member of the FIBE consortium. Judicial sequestrations have shown that infrastructures were not able to separate the various types of waste and the RDF produced was practically impossible to burn. In the ecoballe, percentages of arsenic over the legal limits were found, together with whole objects (e.g. entire wheels with tire and structure intact). The humid fraction was furthermore too wet for incineration in thermovalorizors. RDF was supposed to contain a

Figure 5: Ecoballe storage
(Source: Ansa)

maximum humidity of 15%, but it was found to contain more than 30% and could not be burned under European regulations or Italian laws firstly because of the highly toxic emissions it would produce, and secondly, because of the negative **EROI** (Energy Return On Investment), as the amount of energy produced by its combustion would have been lower than the amount needed to actually burn the waste.

Numerous police investigations looked into the quality of ecoballe piled in stocking areas and production facilities. A major judicial enquiry known as "Operazione Rompiballe" (Operation Break-ball) was led by Magistrates Giuseppe Noviello and Paolo Sirleo in 2002, after public condemnation by Senator Tommaso Sodano of the Communist Refoundation Party. RDF sites were put under preventive sequestration by a decision of the Naples court on the 12th of May 2004, but the management of these sites was handed back to FiBE - Impregilo on the condition that it abided by the law and its contract. FIBE however violated these conditions repeatedly. The contract for example reinforced FIBE's obligation to guarantee the incineration of RDF in existing plants for energy production while waiting for the completion of the Acerra plant, but FIBE failed to even treat ecoballe for RDF production as required by law.

On January 26th, 2006 a law recognised the responsibility of FIBE - Impregilo for the waste management crisis, stating that the company should continue to manage the waste treatment facilities and stocking sites until a new consortium was selected. Two European tenders were launched but to this day, none have been awarded. In June 2007, the European Commission initiated an infraction procedure for Campania's waste management. The procedure is still in process and it is anticipated that it will lead to monetary sanctions against Italy. Also at the end of June 2007, Naples' magistrates sequestered a total of 750 million € worth of Impregilo assets, imposing a one year interdiction on dealing with any public administrative bodies on waste management.

The "Rompiballe" inquiry concluded at the end of July 2007 with a request to bring about 30 persons including public administrators and entrepreneurs to trial. Three magistrates affirmed that owing to the inadequacy or lack of waste transformation facilities, the waste cycle as it had been conceived in the contract signed with the Impregilo could never have worked. Both Impregilo and Bassolino, who was the Commissary for the waste emergency between 2000 and 2004, hid the situation even though they had been informed of irregularities: the RDF plants were built on waste management sites different from those projected, the ecoball was irregular and the quality analyses were falsified.

On August 8th 2007, the courts ordered the confiscation of nine sites where three million tonnes (t) of Campanian low-quality ecoballe was being stored. Judge Rosanna Saraceno, in charge of the preliminary enquiries, deemed the stocking sites located between the provinces of Naples and Caserta illegal controlled landfills. According to judges, RDF should have been kept in prepared dumpsites instead of stockpiled, as they violated the chemical composition required by law. FIBE, in charge of the stocking facilities, was ordered by the Courts to treat the ecoballe so that they could be burned under existing norms. It was estimated that this process would cost FIBE about 600 million €.

This trial is still ongoing and scheduled sessions are frequently cancelled. So far, judges have prosecuted personalities such as the President of Campania, Commissary Antonio Bassolino (2006-2007) Guido Bartolaso, the Head of Civil Protection since 2001, the Sub-Commissary of the period, Claudio De Biasio, the ex-manager of Impregilo and administrators of companies of the consortium Armando Cattaneo, Enrico Pellegrino (FIBE) and Pier Giorgio Romiti (Impregilo), as well as other important public administrators.

2.4 The answer to the emergency: Decree 90

In 2008, with waste treatment capacity beyond saturation, the streets of the provinces of Naples and Caserta became re-filled with waste and another State of Emergency was declared. In May 2008, in order to deal with the crisis, the national government implemented Decree 90, the most recent and most powerful ruling approved in Campania for waste management. Unfortunately it is also the least respectful of environmental and human rights. This law centralised decision-making power in one person: the Head of Civil Protection, Guido Bertolaso, who was prosecuted under the FIBE - Impregilo affair. As Emergency Commissary he was able to derogate any law he judged necessary for implementation of the Decree. Waste treatment facilities (built and in construction) were thus designated "areas of strategic national interest" and militarised.

The Decree planned the construction of 9 new landfills in the region and 4 incinerators; two in the province of Naples (one in Acerra and the other in the city of Naples[61]), one in the province of Salerno, and one in Caserta (Santa Maria la Fossa). No tender was ever released for the construction of these plants. Instead the company was personally selected by Bertolaso, favouring the interests of the same lobbyists that created the waste emergency in the first place, illustrating that no real measures were taken under this Decree to stop corruption and crime in waste management.

The incinerator of Acerra for example (**Figure 6**), which opened in March 2009 was built by Impregilo under Decree 90, despite the ongoing trial against the company and without the preparation of an environmental impact assessment as required by law. This incinerator was authorised to burn several types of waste, including very low quality ecoballe produced from 2005 by FIBE. Moreover, the Environmental Observatory established to control the incinerator is composed of the same entities that were involved in its design and implementation: the Ministry of Environment, the Campania Region, the province of Naples, the Acerra, San Felice and Cancello City Councils, Campania's Regional Environment Protection Agency (ARPAC), "Napoli 4", a local health agency, and one epidemiologist.

Once Acerra's incinerator reaches its full functioning capacity, its management will be handed over to the Asian – A2A consortium. This consortium has also been given responsibility by Bertolaso for the construction and management of the Naples incinerator. At the moment, the Santa Maria della Fossa incinerator has not been built as the sites

Figure 6: The incinerator at Acerra under construction
(Source: http://wildgretapolitics.wordpress.com)

designated for its construction have been sequestered from FIBE.

3. Corruption and the Camorra

The measures and management plans have so far been implemented by authorities with disregard for environmental and health protection. Despite decades of investment and construction of a huge infrastructure complex, the management of waste treatment in Campania is still ineffective. In other European countries this would seem inconceivable but unfortunately in Italy this is quite common, and as the many enquiries and trials have shown there are two main reasons for this: corruption and mafia.

Since the beginning of the waste problem in Campania, an illegal waste market has evolved as mafia have infiltrated local and regional waste management. This explains, for instance, the presence of toxic waste within the ecoballe produced by the RDF plants. Campania is one of the poorest regions in Italy and many municipalities do not have sufficient resources to develop their own public waste management service companies, so clans easily enter into these businesses, “creating” companies and working under their auspices. Favouritism towards mafia-related companies is a common practice in Campania and, judicial investigations have revealed evidence of close links between the mafia and authorities at all levels, from the Emergency Commissariat to individual municipalities.

The Anti-Mafia Control Office declared that between 2001 to 2003, only 3 of 21 companies in charge of waste collection in the province of Naples were “clean“ of any mafia links. However, the identification of such links by Judicial investigations is not enough to stop the phenomenon, as companies branded as having mafia ties often change their names, administrators, and legal representation while keeping the same office, the same telephone and fax, and even the same trucks and drivers.

In addition to mafia infiltration of legal waste management operations, there also exists a parallel illegal hazardous waste market, which handles waste coming from all over the country, especially from northern industries. Campania is propitious for these activities as the highest-ranking region in Italy for environmental crime, where 14.7% takes place. Moreover, illegal waste treatment is a very lucrative business, with an estimated national value of 7 billion € in 2008. Italy holds the record for waste “disappearance” (after its record for production) with about 31 million ts of hazardous waste vanishing without legal treatment (Legambiente 2008, 2009).

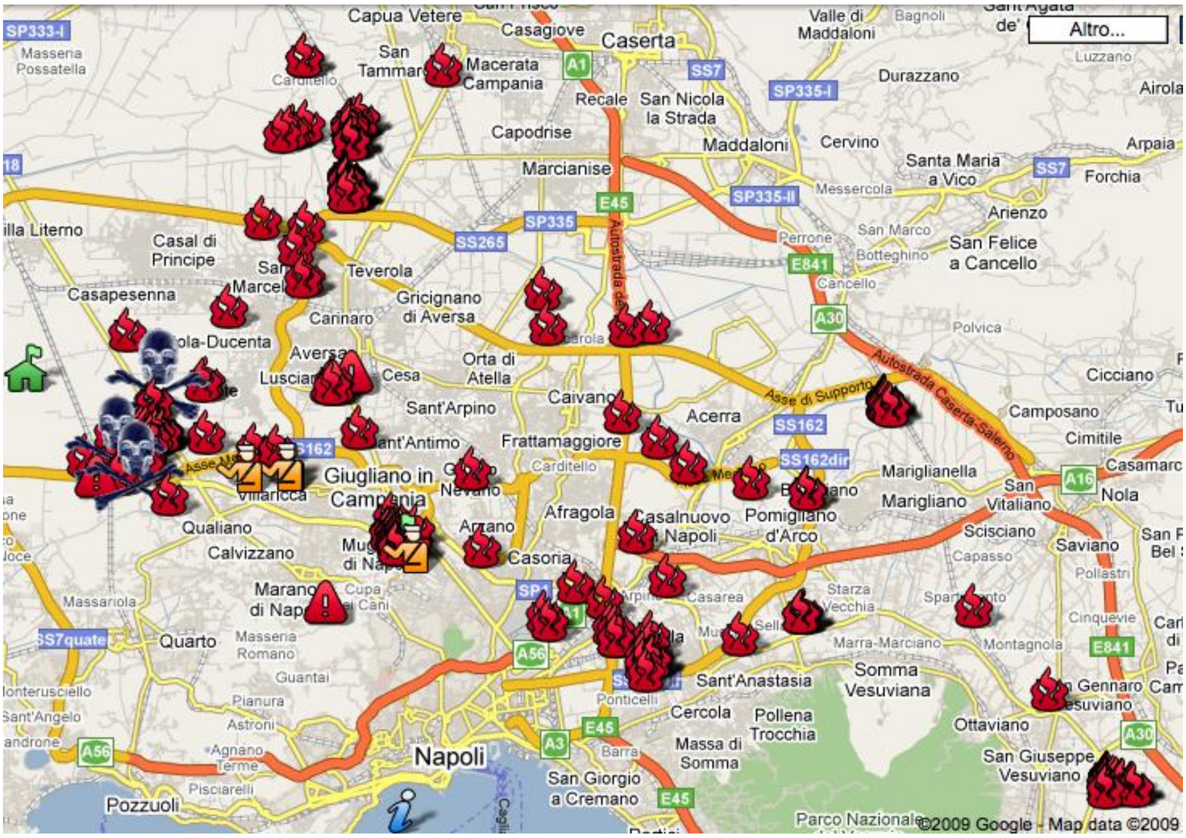


Figure 7: Illegal fires in the Provinces of Naples and Caserta
(Source: www.laterradeifuochi.it)

As a result of this process, the territory of Campania has been invaded and poisoned by waste for about 20 years. The province of Caserta is the most affected area because its geography of vast plains and numerous natural caves is particularly well-suited to hiding and containing waste. The province is also under the control of the powerful Casalesi clan, pioneers of the trade. The hinterland of the province of Naples is another important area of waste criminality. The Land of Fires, or “Terra dei Fuochi”, an area between Giugliano, Qualiano and Villaricca is sadly notorious for its ever-rising columns of smoke from illegal waste burning. This is a frequent phenomenon in Campania where there are about 17 illegal fires every day (see **Figure 7**). The province of Salerno also registers an increasing number of officially recognised illegal landfills. (Legambiente 2001, 2005, 2008)

3.1 Market Mechanisms of the Illegal Waste Industry

The business of illegal waste management is based on the transport and ”treatment” of hazardous waste as well as on the infiltration of the local urban waste management cycle. It is a major sector of organised criminal activity, especially the industrial waste market with its smaller infrastructure needs and higher profits. The illegal waste market is attractive and gains new clients every day (OAL, 2008, OAL, 2007).

One of the main characteristics of the illegal market consists of the creation by mafia of “clean” companies for waste management at all level of the cycle. These are funded and promoted in the legal market and used for illegal traffic (OAL, 2008, OAL, 2007). Infiltration at all levels of the waste cycle allows mafia to control every detail. For example, waste received from producers can be re-categorised, changing its official toxic status. Sometimes producers do not even declare their waste generation figures so mafia-related companies make the declarations themselves. The mafia also manage transit to storage areas or to treatment facilities, and is therefore able to falsify documents of waste classification, intermediary “treatment” and final “treatment”.

Tips for illegal waste management

Illegal waste treatment methods are very inventive. From “traditional” large open air dumps characteristic at the birth of the illegal waste market at the end of the 80’s, to other numerous methods:

- burying waste in cultivable areas, roads, construction yards, etc. and in natural caves;

- sending industrial hazardous waste to non-hazardous urban waste treatment facilities or other non adapted treatment sites ;

- abandoning hazardous waste derived from shredded urban waste on land undergoing decontamination, in the countryside and in natural areas such as the Vesuvius crater;

- spreading of false fertilizers and composts containing toxic substances;

- adding waste to the production of cement, metals and asphalt;

- diluting waste and disposing of it in sewage systems, rivers and the sea.

The waste “treated” on the illegal market is unbelievably diverse. It can be basic urban waste but also street sweepings or old bills from the Bank of Italy. All sorts of hazardous waste of varying toxicity is also treated: toxic powders and mud, soil mixed with highly toxic substances such as arsenic, mercury, and all sorts of metal toxic components, hospital waste, sewage waste, industrial mud and oils from hydrocarbons mixed with ground urban waste, used automobiles, inert materials, soils from graveyards and even special paper tissues for cleaning bovine calves. What matters to dealers is not the waste itself but the opportunity for profit it represents. (Legambiente 2005)

The illegal waste management market is a “real market” with profits and prices still in Italian lire for every kind of waste and service. Industrial waste treatment prices (0.52€/Kg) are very low, equalling roughly half of legal market prices. In contrast, prices for urban waste management (0.08€/Kg) are higher than those of the legal market, but there is no shortage of clients thanks to the waste emergency. Prices vary across the various categories of waste, also taking into account the composition of materials (one price for the “clean” part and another price for the toxic part), potential operative difficulties and clients’ needs.

3.1.1 The Re Mida case: a Micro analysis of illegal waste market

The Re Mida case allows a closer insight into Campania´s illegal waste market. In 2003 a police operation revealed this as one of the biggest waste traffic operations in the region, controlled by the Casalesi clan. During a period of 6 months, 40,000 t of waste were transported from the north of Italy to the south, mainly to the Giuglianese area, and to the northern area of the province of Naples. This was mostly hazardous industrial waste, although there was also urban waste present. The waste had come from Lombardia, Toscana, Piemonte, Veneto and also Sicily, and was being buried in caves in the Garganese area, for ”treatment” to produce compost for cultivable land in the north of Naples.

The Re Mida case (**Figure 8**) involved actors from all sectors: civil engineering, transport, chemistry, infrastructure management, intermediate’ services, etc.. Through mafia intermediaries the waste was “exchanged” at an average cost of 0.06 €/Kg. Then it was transported as random material from its origin to Campania through falsified documents on the materials’ transport and origins, at a cost of about 1 lire or 0.0005 €/Kg (15 000€/Month). Once the waste arrived in Campania, it was declassified with the complicity of analysis laboratories, at a price of 10 lire or 0.005€/Kg to bring it in line with the normative requirements of the storage and “treatment” structures it was to be sent to. Then the waste was “transformed” and “treated” in a couple of infrastructures before being sent to its final destination. In exchange for “treatment” (or in this case “transformation” into compost or soil for decontamination), the company charged 20 lire or 0.01€/Kg. The final burial of waste was made possible with authorization from complicit local public administrators, or by corrupt land owners at a price of 0.009 €/Kg, or 0.008 €/Kg if the person involved was connected to the main “business” dealer. The total business was estimated at 3.3 million €, plus tax evasion worth 500.000 € (in 6 months) for 40 000 t of waste which if treated legally would have cost 6.2 million €. The last part of the police operation resulted in the sequestration of two caves, in Quarto, Naples and in Viterbo, Lazio, where 2000 t of hazardous waste were buried, for a profit of 100 000 €. (Legambiente 2005, 2007, 2008)

Figure 8: Re Mida illegal waste market flows
(Source: A Sud)

4. The Externalities of Campania's Waste Crisis

It is difficult to completely and comprehensively assess the **externalities** of contamination from urban and hazardous waste in Campania, as some regions are well documented but others are incompletely, or have not at all been studied. One of the major factors affecting the quality of soil and other environmental components like watercourses and underground water reservoirs is the contamination of specific locations of waste storage facilities, especially in Naples and Caserta, the most affected provinces. In general, though, urban areas are more monitored than rural and industrial ones.

4.1 Environmental impacts

In Campania, the Commissariat initiated the contaminated sites census in 1996 and by 2008 it was estimated that there were as many as 2551 sites contaminated in the region (**Figure 9**). The province of Naples registers the greatest number, 1186, of which 1011 are private and 175 public areas. One of the most affected areas of the province is the so-called “Lands of Fire“, comprising the 3 Napolitano municipalities of Qualiano, Giugliano and Villaricca. For ten years, inhabitants have witnessed and paid for the consequences of daily illegal waste burning. Of the 39 landfills in the area, 27 are believed to host toxic waste. In the last 5 years, illegal landfills have increased by 30% (Legambiente, 2008).

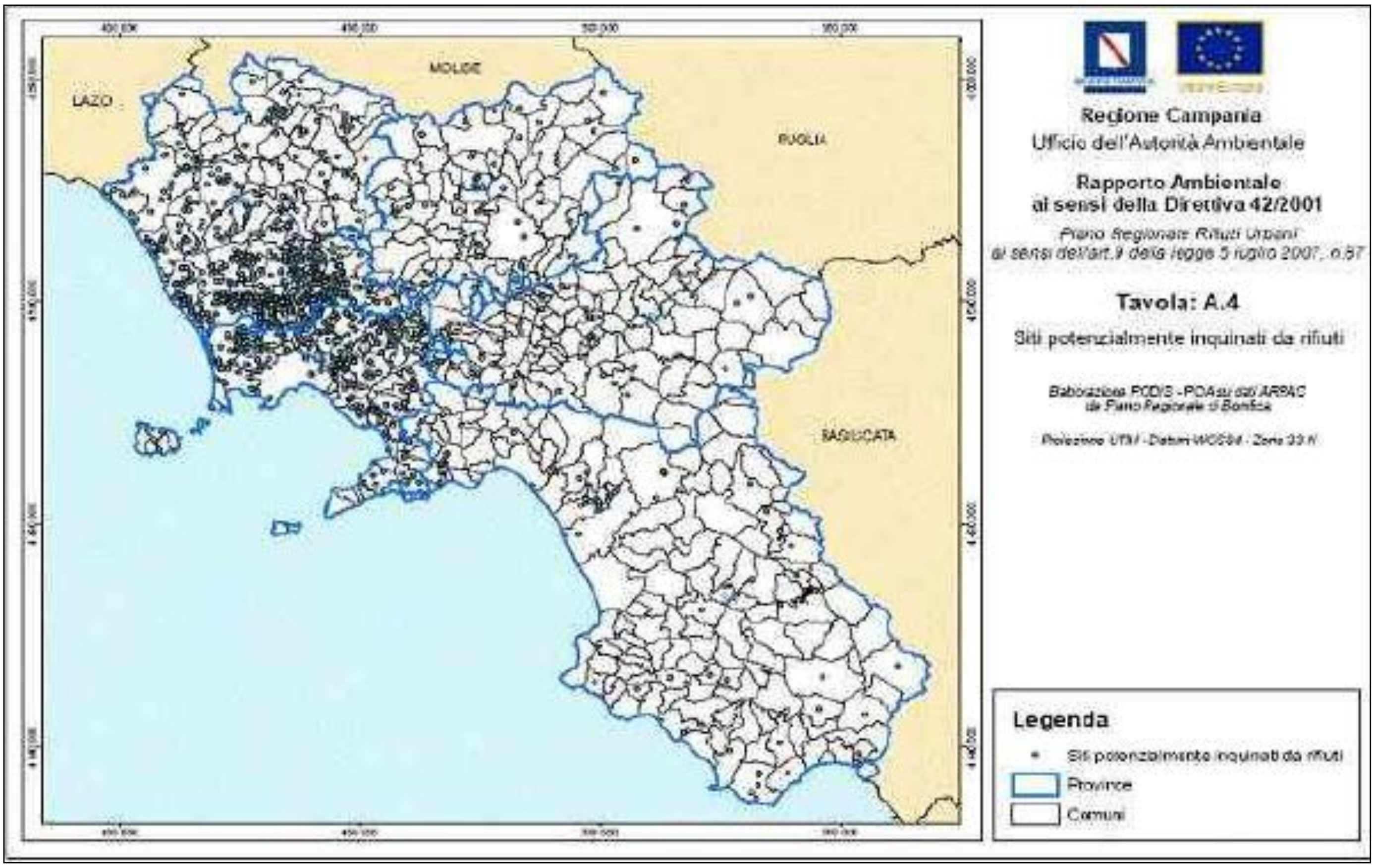


Figure 9: Contaminated sites in Campania
(Source: ARPAC 2008)

In Italy there are 55 national protected areas, six of which are in Campania and contaminated: the Domitio-Flegreo and Agro Aversano Littoral, Bagnoli-Coroglio, the Vesuvius Littoral and the Sarno and Regi Lagni Rivers. The management of national protected areas is directly controlled by the Environmental and Territory Guardianship Ministry. The typology of contaminated sites is classified as follows: 13% are caves used as illegal landfills (leading to soil and water contamination), 12% are water reserves and 75% are landfills (ARPAC, Legambiente 2008). Biodiversity research in these areas has been limited to specific systematic groups; nevertheless, the risk of extinction of some species of flora and fauna is certain due to soil and water contamination from illegal dumpsites. It is relevant here to emphasize the threat of the re-opening of dumpsites planned in the Vesuvius national park.

4.2 Campania's ecological footprint

Current levels of human pressure exceed the biological capacities of the territory, which also has the highest levels of soil consumption in Italy. Soil use in urban areas quadrupled between 1960 and 2000, and was accompanied by a population increase of 21%. Other environmental pressures come from the ageing of the agricultural workforce and the low level of uptake of this work by younger generations.

The **ecological footprint** of an area is a measurement of how resource use exceeds environmental limits. The area required to meet the production and **consumption** needs of the population of Campania, and for the assimilation of waste produced in there has been estimated at 15 times greater than the region's resource base can actually support (G. Messina, Mia Terra, 2009).

4.3 Health impacts

The Campania Mortality Atlas (2007) published by the Regional Epidemiological Observatory showed that from 1998-2001 the first cause of illness was cardiovascular related (40% of men, 50% of women), and the second one related to tumours (30% of men, 21% of women). The first cause of mortality for young people was tumours, data that can be interpreted as being directly linked to exposure to contamination from waste. Respiratory illnesses like bronchitis and asthma are also increasing.

The presence of waste has frequently been recognised as an important health risk. In 2004, the Department of Civil Protection implemented a study on waste impacts in Campania. The project was coordinated by the World Health Organisation's European Environmental and Health Centre with the participation of the National Research Council (Clinic Physiology Institute – Epidemiology department, Pisa), the High Institute of Health (Department Environment and Prevention), the Regional Epidemiological Observatory, ARPAC, the Campania Tumour Record, the Campania Congenital Malformation Record and the Local Health Agencies of the territories involved.

In the first phase of the project, data from the Mortality Epidemiological Observatory for the years 1994-2001 and from the Campania Congenital Malformation Record for 1996-2002 were gathered for the 196 municipalities of the provinces of Naples and Caserta (**Figure 10**), where the highest concentrations of illegal dumpsites and landfills are found. Twenty types of tumours and 11 typologies of congenital malformation described in the scientific literature were found and linked to the presence of dumpsites and incinerators. In the second phase of the study, the landfills and dumps of the two provinces were mapped and studied, with 226 sites, most of them illegal, identified and classified according to the level of risk present.

Figure 10: Illegal landfill in the province of Caserta
(Source: A Sud)

In the last phase of the research, the health and environmental data were analysed to specify the links between contamination from waste and the increase of some health issues. It showed statistically relevant correlations between health and waste, confirming the hypothesis that the high rates of mortality and malformation are concentrated in areas contaminated by waste. Increases of 9% in deaths of men and 12% in women as well as an increase of 84% of lymphoma and sarcoma tumours of the stomach and lungs, and genital malformations were measured. Still, as the data is considered incomplete and inaccurate, the cause/effect relation has not been certified.

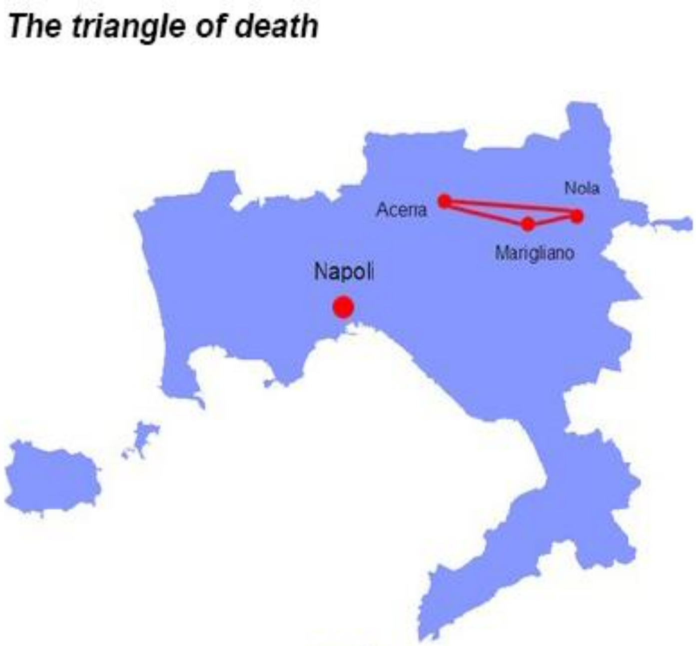


Figure 11: The Triangle of Death in Naples
(Source : Wikipedia adapted from Senior and Mazza 2004)

Some areas are more affected by waste than others. The Napolitan area between the municipalities of Acerra, Nola and Marigliano has become known as The “Triangle of Death”, due to increases in cancer and mortality in recent years (Senior and Mazza, 2004). In the Land of Fires area (**Figure 11**), cancerous tumours have also increased by 30% in the last five years, proportionate to the number of illegal landfills.

Not only is the population in direct contact with waste and its airborne emissions, contamination has also affected local sources of water and food production, creating health problems as well as economic issues for the farmers of the region (Legambiente 2008).

4.3.1 The Provinces of Caserta and Naples

The most affected zones are the areas of north-east Naples’ and south-west Caserta which mark the border between the two provinces. In their 2004 study the Department of Civil Protection created municipal-level synthetic vulnerability indicators (**Figure 12**), dividing the 196 municipalities of the two provinces into 5 groups of risk. Combined with another “socio-economic deprivation” indicator the analysis revealed that the most affected populations by contamination were also shown to be the most economically disadvantaged.

If we compare the maps below (in which increased colour intensity corresponds to the strength of indicators) with the map of possibly contaminated sites in Campania (**Figure 9**) we can see a clear correlation between the geographical distribution of illegal waste treatment activities, poverty and disease. High population density means more intense anthropogenic pressure on the environment, and these areas are also particularly affected by a lack of basic education and poverty. These socio-economic conditions reflect weak social economic and environmental policies that have lead to environmental destruction and deteriorating health conditions.

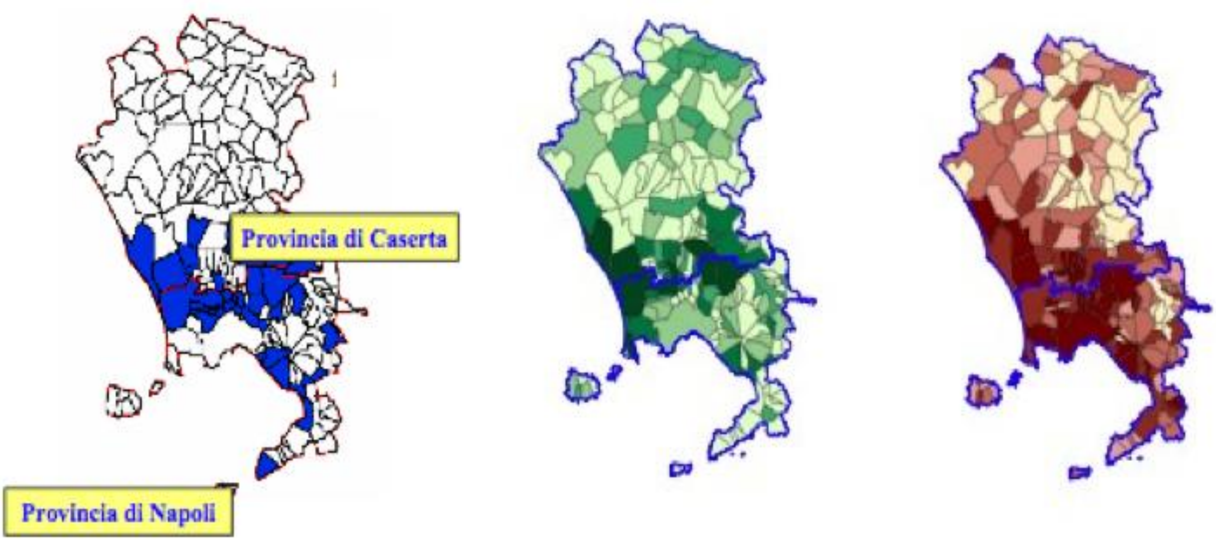


Figure 12: Rates of mortality and deformities, risk of exposure and socio-economic deprivation in Caserta and Naples provinces
(Source: Department of Civil Protection, 2007)

4.4 Local Economic Impacts

Campania is an agricultural region, very productive and highly specialised, and generally based on a model of extensive cultivation. Fruit and vegetables are mainly produced, but buffalo breeding for mozzarella production is also important. In 2006 Campania produced 34.000 t of mozzarella, about 80% of national production. Campania also produces about 324 traditional products and 28 certified products of Protected Designation of Origin or Protected Geographical Indication. In 2007, there were 120.000 persons employed in agriculture and 41000 in the agricultural industry in Campania. Nearly 80% of farm work is done on family farms so agricultural production units are very small (3.6 hectares of average). Campania's total agriculture production contributes an added value of 2.4% (compared to the national average of 1.8%) to national GDP. Its rate of productivity at 4000€/ha is almost double the national average, and is ranked second highest in the nation. This is a figure that has doubled in the last decade (Messina, 2009).

Land degradation and desertification is increasingly affecting hilly and mountainous areas, coastal dunes, and established traditions of farming. Levels of organic matter in Campanian soil are alarmingly low, requiring the urgent establishment of a strategic programme for its remediation.

The food production system in Italy is very vulnerable because of waste contamination: the presence of dioxins has suppressed cattle rearing and globally the sale of food products has decreased. The waste policies of Campania are seen as creating a Culture of Death that is leading to the disappearance of rural cultural and traditional food production, involving not only important economic externalities but also inflicting a cultural loss.

4.5 Social impacts: civil society mobilisation

In response to the growing presence of waste and its externalities, civil society has mobilised in local grassroots committees and associations. While committees and associations worked in isolation initially, in more recent years efforts have become more co-operative and network- based.

The Campania 0 Waste Movement, composed of two main networks, the Health and Environment Campania Network (Rete Campania Salute Ambiente) and the Regional Campania Waste Coordination (Coordinamento Regionale Rifiuti della Campania) is now struggling for a new, and drastically different Waste Management Plan, one that is participatory, agreed by consensus, controlled by communities concerned with public health, and opposes incinerators and mega-landfills. These networks meet in assemblies and have scientific committees and thematic groups addressing issues and formulating alternative proposals for waste management. They also coordinate activities such as international, national and regional meetings and conferences, marches, and other events to raise public awareness.

Dioxins in Campania

Spring 2002 saw the implementation of the so-called "dioxin alarm", with the discovery of above-normal concentrations of dioxin in bovine and ewe milk during analyses carried out by a national Ministry of Health programme of food and environment monitoring.

At the beginning of 2008, the Campania Region commissioned the Sebiorec Study, to be carried out by the Superior Institute for Health, the Clinical Physical Institute of the National Research Council, the Epidemiological Observatory, the Naples Tumours Register, and 5 Campania local health offices) which saw the analysis of blood (780 persons) and maternal milk (50 women) samples for presence of dioxin and heavy metals. Samples were taken from 13 municipalities with various grades of environmental risk in the provinces of Naples and Caserta.

In most countries dioxin contamination is linked to industry, but in Campania it is mainly linked to the incineration of waste, legal and illegal. Human exposure to dioxins occurs through inhalation, skin absorption and food consumption, especially meat and dairy products. Airborne transport of dioxins and deposits in soil contaminate grass and plants that are ingested by livestock. Through the consumption of contaminated meat or other animal products, humans absorb dioxins through the gastrointestinal tract, which are diffused through the body, accumulating particularly in the liver and in body fat.

Dioxin contamination in Campania affects especially rural areas where a significant amount of food is produced, not only for local but also for national and international consumption.

In the last 15 years, many protests and clashes with authorities have taken place. Below follows a brief overview of some of the key events occurring in Campania surrounding the management of waste management facilities and decision-making processes.

4.5.1 Salient moments of mobilization

The struggle against the construction of the Acerra thermovalorizor

Local committees evolved in opposition to the construction of the incinerator and in favour of more sustainable waste management, aiming to preserve an area already heavily impacted by waste and industrialisation. On the 29th of August 2004 a popular protest against the project was met with violent repression by both the police and army, profoundly affecting the local and regional movements and creating an atmosphere of fear among the local population. It became a symbolic moment illuminating the government's institutional rigidity and willingness to resort to violence toward civil society demands for participation in waste management. It was also a key event in uniting local committees and organisations at a regional level. After years of struggle, the thermovalorizor was inaugurated on March 26th 2009 and authorised to burn any type or quality of waste, whether it adhered to norms or not, from ecoballe to unpacked waste.

The Pianura battle

The Pisani landfill in Pianura (in the province of Naples) was in use for over 50 years and closed in 1996 due to its saturation, suspected violation of norms, and the dangers it posed to the environment and human health. The sanitation of the area was planned, but never implemented. During the last “waste emergency” in January 2008, the authorities reopened the landfill to receive waste for stocking until the completion of the Acerra thermovalorizor, where it was to be burnt. In reaction to the re-opening, the local population mobilised only to be violently repressed by police. Local committees, associations and activists involved magistrates however, and the landfill was sequestered on the 21st of January 2008. Enquiries into health issues and groundwater contamination led to the closure of the site as the impacts on illnesses were investigated. The landfill never did reopen and the so-called “Pianura Battle” became a symbol of victory for civil society mobilisation.

The Acerra-Napoli March “The March of 1000 Yeses”

The adoption of Decree 90 in May **2008** announced planned infrastructural works and waste management measures that would threaten the entire region. In response, a march was organised for the 21st of June 2008 from Acerra to Naples for “Environment, Justice and Democracy”. The point of the demonstration was to draw attention to civil society demands for inclusion in consultations for the management of their territory. It also helped unify all of the committees and associations struggling for civil society participation and more sustainable plans for waste management.

Uttaro

Uttaro in the province of Caserta has one of the most dense concentrations of landfills in the region. It is a small area with a population of about 200 000, and has been severely impacted by irresponsible waste management (**Figure 13**). Until the 1990s there was just one landfill (Migliore Carolina) with a capacity of 2 000 000 m^3, and by the end of the decade two other smaller landfills were operating in the area. With the most recent waste emergencies two further sites were opened, another landfill was created overnight in 2005 and a new transit storage site designated, until it was later sequestered. A cave in the area of the Uttaro site found to contain illegal waste was scheduled for sanitation under regional plans in 2005, but in November 2006

Authorities decided to use the site as a landfill and planned for its extension, leading to civil society mobilisation and the creation of the Waste Emergency Committee. For 3 days in April 2007, this Committee occupied the land and blocked the transit of trucks until they were forcibly removed by police. The land was then militarised to “guarantee the function of the plants”. The Committee continued its action however through a penal accusation and a legal appeal on the grounds of severe mismanagement of the site. On August 3rd Judge Como ordered the closure of the site due to its high concentration of toxic substances. This was another victory for civil society mobilisation, but 8 million t of waste are still concentrated in the area.

Figure 13: Buried landfill from the Uttaro dumpsite, showing obvious non-conformity (leachate and a broken chimney for gas expulsion) to safety requirements
(Source : A Sud)

5. Discussion and analysis

5.1 The conflict as a Post Normal Science problem

Campanian committees and associations have over the years developed robust alternative waste management proposals. However, despite their efforts to engage authorities and other official sectors in these processes, authorities have resisted debating alternative approaches to waste management, instead marginalising the participation and knowledge of organised civil society.

The Campania Movement critique of the existing waste cycle and its goal of energy recuperation, and its alternative proposals is based on two key principles of the 0 (zero) Waste concept: first, the reduction of waste production and implementation of door-to- door sorted waste collection; and second, the transformation of existing waste treatment plants, both compost and RDF facilities, into recycling centres using new technologies. This approach would reduce the need for incineration and would increase the recycling of materials (Movimento Campano rifiuti zero, 2009; Coreri, 2009).

In this sense the Campania waste conflict is an example of a **Post Normal Science** problem (D'Alisa et al, in press), where "facts are uncertain, values in dispute and decisions urgent". In such contexts, a technocratic approach alone cannot address the complexities involved. **Landscape values**, traditional land uses, **environmental justice** claims, local values and interests and community rights to participate in local decisions on a range of issues at stake, point to the need for a different approach. Moreover, local knowledge and competences have much to contribute to the understanding of the conflict, and need to be considered. During the conflict the Campania Zero Waste Movement has shown the capacity of civil society to assimilate expertise and produce knowledge. By applying their **activist knowledge** and engaging in the practice of **popular epidemiology** in their struggle, Campania's citizens have become specialists on issues such as health, land contamination, and waste treatment technologies, accumulating and assimilating specific knowledge, for example in relation to dioxins, environmental contamination, incineration, and waste collection and treatment, in order to formulate and construct alternatives.

The movement also denounces the way in which the Government has used the "emergency" to favour financial and private interests with public money, and exposes complex interrelations between political figures, and economic and mafia powers. Efforts to communicate these interrelations have been stifled in mainstream media, which works to misinform and manipulate public opinion. In the last emergency, the movement was criminalised by measures such as the militarisation of waste sites and protests, and the implementation of new laws condemning resistance organisers and demonstrators.

5.2 Emergency management and abuse of power

The above mentioned measures represent a clear attempt to undermine civil rights, and part of a wider process of legal reform directly linked to the waste emergency. Waste management has in fact been characterised by the abuse of power in at least two ways: through derogations of the law leading to the violation of numerous basic environmental and civil rights, and through continued application of the financial model used by general contractors.

5.2.1 Legal framework

The emergency has provided justification for the redesign of the legal framework related to waste management at the regional level. But other national legal provisions have been responsible for encouraging unsustainable waste management. The Italian CIP 6 Law adopted in 1992 for example favours the production of electricity through renewable and "assimilated" energy with public money. This latter category refers to any energy production method based on energy recuperation, like incineration. Producers can sell the electricity at a higher rate than that of non-renewable sources and the difference in price is paid by a tax that every citizen pays on their electricity bill.

The objective of this law was to encourage energy companies to orientate their production towards renewable energies, such as wind and solar, and at first glance, it seems quite "green". Upon closer inspection however, in practice CIP 6 has enabled increased production of mainly "assimilated" energy, specifically, from incineration, favouring the construction of RDF plants and incinerators in the country. Paolo Rabitti in his book *Ecoballe* estimates that in 8 years, 453 million € was invested in ecoball production in Campania owing to CIP 6. Moreover, CIP 6 was recently extended to apply to the construction of 3 incinerators in Campania (Acerra, Santa Maria la Fossa e della provincia di Salerno) because funds could not be raised from private investors.

5.2.2 European infringement procedures

The European Union began infringement procedures against Italy for the implementation of CIP6 and against the Region of Campania for its waste management procedures. Regarding CIP6, there have been two separate procedures against Italy: Procedure *n. 2004/5061* for the poor implementation of the European directive on renewable energy and for failing to introduce specific norms; and Procedure *n. 2004/4336* for the misinterpretation of European norms through which Italy has implemented non- renewable sources of energy (incineration) as renewable ones. The procedure against Campania for its procedure for waste management is expected to lead to economic sanctions only.

5.3 The financial model of general contractors

Currently in Italy, major public works are carried out under the General Contractor and Concessionaire Model, a practice that was established under the fascist regime of earlier times. The so-called “Legge Obiettivo” law, passed in December 2001, set out procedures and modalities for funding large strategic infrastructure projects in Italy from 2002-2013. The official objective of the law is to ensure the most economical and rapid construction possible for public infrastructures, and to define the terms and conditions of private Entrepreneurs' and their central role in all phases of public works organisation.

The “Legge Obiettivo” through various decrees and derogations favours a financial and management system based on unlimited sub-contracting, which translates in practice into the award of tenders as quickly as possible to the lowest bid, regardless of controls (even though these are usually laid out by project managers, as in the case of incinerators in Campania), security, public domain competencies and duties. This ultimately results in increased criminal infiltration and behaviours and the denial of basic rights.

This normative context is largely the product of the employment of substitutive powers, such as those applied by the Extraordinary Commissariat in times of emergency and crisis. The State of Emergency became an excuse for new development plans, which were ultimately defined by the private sphere, the sphere that stood to gain the most from these plans, to the disadvantage of the general public and public administration bodies. The result has been the complete disempowerment of the public domain: social development is now ruled by the private sphere that is able to pursue its own interests by using extraordinary powers that infringe laws. In this way local institutions are able to avoid real development questions and civil society resistance can be repressed with legal (and physical) threats.

On December 17th, 2009, the Council of Ministries voted on a new decree which effectively ended two states of emergency; the Aquilla earthquake and the waste crisis in Campania, and marked the return to normal practices from January 2010. For waste in Campania this has meant continued work on waste infrastructure development (including the Acerra incinerator) is back in the hands of local authorities still under investigation by the courts.

The decree also transformed the public body of Civil Protection into a private company, deeming it a”private subject, in its institutional profile and in the procedure for tenders and acquisition of goods and services": 'Protezione Civile Spa'. Board members of the company will be nominated by the Council of Ministries giving the President of the Council all decisional power both in private and public sectors for emergency management. This decree was voted on without any parliamentarian or public debate and with no media attention (Vegni, 2009).

5.4 Corporate Influence and Interrelations: The Role of Impregilo

Based on facts emerging thus far in the current trial, it would seem obvious that the Impregilo company, leader of the FIBE-Impregilo consortium that has run Campania's waste management for the last decade, bears significant responsibility for the waste crisis. The national context helps to illustrate the issue at stake: the Cavert consortium, of which Impreglio controls 75%, was in charge of construction of the High Speed Train Line (TAV) between Milan and Florence. In March 2009 Alberto Rubegni, President of the consortium was fined about 150 million € and given a 5 year prison sentence for illegal waste dumping beneath the TAV rails. It cannot really be seen as a coincidence that the President of a consortium dominated by a company active in illegal waste management activities should be so implicated.

It is no less than bizarre however that the same man, Rubegni, despite having been convicted, is currently serving as administrator of Impregilo for the construction of the Messina bridge. This project that will connect Sicily with the continent has become the source of a new environmental conflict in southern Italy, and is furthermore seen to be at high risk of mafia infiltration. Critics maintain that the construction of this bridge does not correspond to any real transport need, and that the project will generate much debt for future generations. Rubegni announced in September 2009 that work on the bridge would begin in January 2010.

Not only in Italy is Impregilo active. Besides building seemingly unnecessary bridges, toxic train lines and managing waste well enough to create "emergencies", the company is also very active abroad. Among its many projects, Impregilo has built hydro-electric facilities in Nigeria, Lesotho, Kurdistan, Turkey, Argentina, Guatemala and Nepal. In July 2009, Rubegni announced that Impreglio, leading the "Grupo Unido por el Canal" consortium, was awarded a significant tender for construction on Panama Canal (Lonardi, 2009).

5.5 Corruption and Ecomafia Infiltration of Urban and Industrial Waste Management

The gravity of the Campania waste issue is the result of a combination of shortcomings in systems of control, in public policies and their implementation. For Legambiente, (the Italian environmentalist NGO), Campania's waste management system was developed on the basis of the four "I"s: illegality, inefficiency, irresponsibility and indecision. The role of the Camorra and widespread corruption in creating this situation cannot be underestimated.

5.5.1 Ecomafia

Directly linked to corruption, the ecomafia as previously mentioned, are criminal organizations that commit crimes causing environmental damage. These are the most problematic actors in Italian environmental criminality, and the region of Campania is where they are most active, particularly in waste management. Legambiente estimates that the national illegal waste market from 1995 to 2005 was worth 26.6 billion €. In the year 2007 alone, the illegal hazardous waste market generated 4.432 billion € and investment by mafia in urban waste management was estimated at 963 million €. Between 1998 and 2007, there were almost 3000 waste related-crimes, corresponding to an incidence of 0.2 per km^2 (Legambiente 2007, Legambiente 2008).

5.5.2 Illegal waste flows

The main north-south axis of waste flows is divided into an Adriatic route going to Puglia, Abruzzo and Romagna and a Tyrrhenian route going to Campania, Lazio and Calabria. However, the dynamics of waste traffic are continually changing, and from Campania, the trade has spread to “clean” zones like Basilicata and Umbria. Another recently developed dynamic is the flow of waste from Campania to the north, across the regions of Emilia Romagna and Lombardia and through the Milano Como axis, to arrive in Piemonte.

It is estimated that in the last 5 years, 3 million t of all types of waste have been illegally treated on the Tyrrhenian route, 1 million t of which was treated in the province of Caserta alone. Increased police control (ironically) and the exhaustion of landfills have contributed to the emergence of these new routes. Ecomafia waste activities are not only regionally and nationally based. They also have an increasingly international dimension: investigations focused on 2008 revealed traffic in thirteen countries including Austria, France, Germany, Norway, China, India, Russia, Syria, Liberia and Nigeria (Legambiente, 2005, 2007, 2008).

5.6 Waste production and treatment

The paradox of the situation in Campania is that the region actually produces **l**ess waste urban and hazardous waste than the rest of the nation on average, although it would not seem so in the light of repeated crises. This is due to the fact that the illegal waste trade attracts waste from outside the region, although it also makes some “disappear”.

A lack of data on treated waste makes the accurate assessment of waste production and treatment in the region difficult, but available data (see **Table 1**) on the amount of waste produced per capita, the amounts of sorted urban waste (SUW) and the price of treatment in Campania compared to the rest of Italy illustrates clearly that waste management practices do not score well in terms of their environmental friendliness.

Table 1: Waste production and treatment in Campania and Italy

	Campania	Italy
Kg waste / Per capita	485	539
% SUW	10.6 %	24%
Price of treatment / kg	0.03-0.04€ *including* transport	0.04€ *excluding* transport

Moreover, in 2004 Campania produced 4.3 million t of hazardous waste (below the national average) of which only 2.6 million t was treated in the region. This can be explained by two factors: first, the absence of binding norms for the treatment of hazardous waste in its region of origin; and second, the national phenomenon of "ghost waste" (source: Eurostat, Apat). Ghost waste refers to waste produced but not treated legally. It is one of the only indicators of illegal waste treatment as it is difficult to quantify the real amount of such traffic. While there are no reliable regional indicators of ghost waste due to lack of data, it has been estimated that in 2008 31 million t of hazardous waste vanished, the equivalent of a mass 3 hectares wide and 3100 meters high.

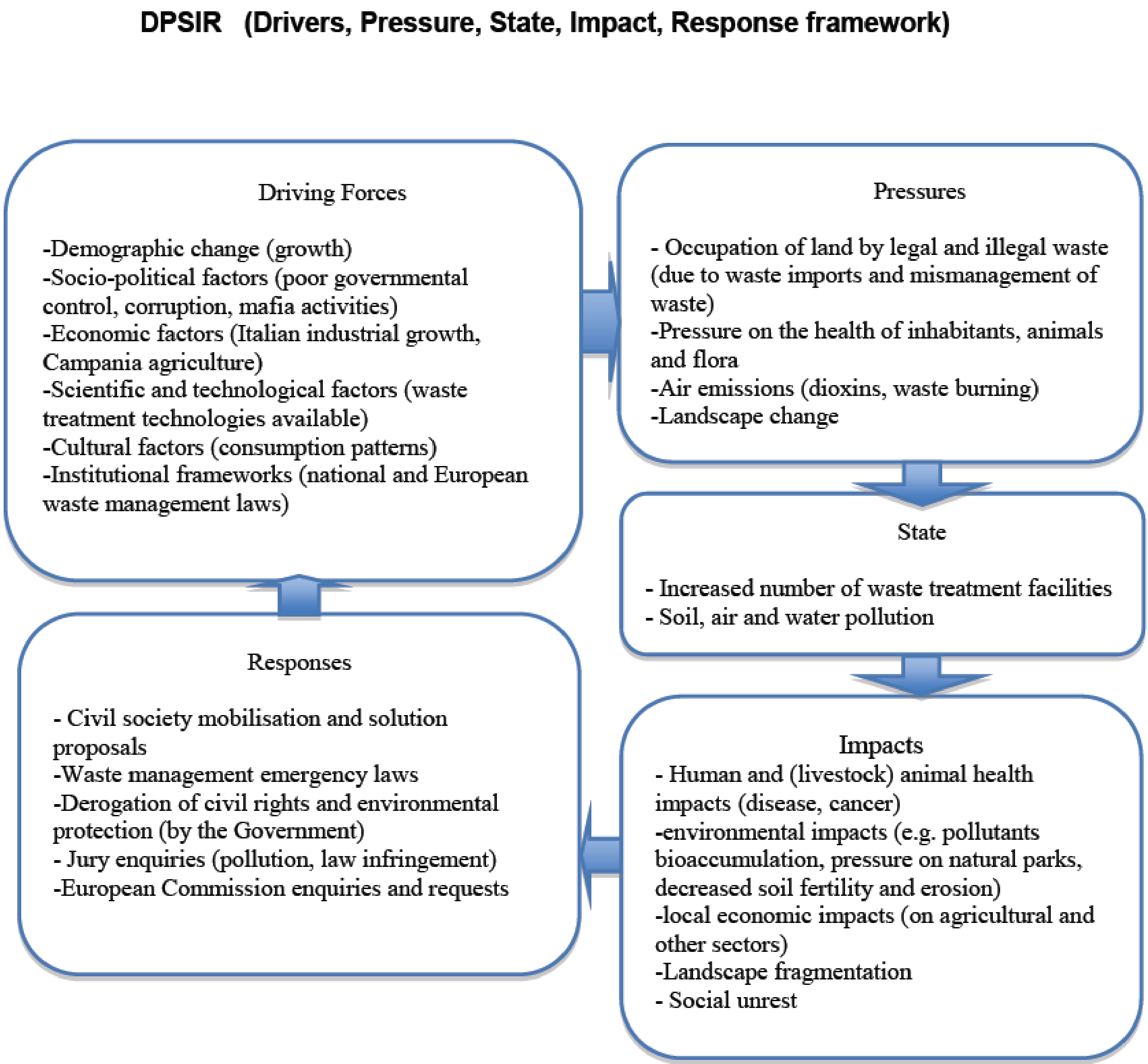
5.7 Causality, consequences and responses

DPSIR (Drivers, Pressure, State, Impact, Response) is a classificatory device that enables the study of environmental indicators in order to explore causality (drivers, pressure), consequences (state, impact).

and responses to a given environmental issue. When the Campania waste conflict is structured according to the DPSIR model, it highlights the underlying causes and current consequences of the waste management policy adopted there. This model is based on the assumption that there are causal relationships between the different elements of the socio-environmental system.

In the case of Campania (**Figure 14**) , the Drivers, i.e. the social, economic and institutional systems, directly and indirectly trigger Pressures on the environment and society and as a consequence their States change, through the accumulation of waste without proper control and treatment. The Drivers have been the production of waste by the economic system, together with the existence of defective socio-political institutions. The production and displacement of waste puts Pressure on the local environment in Campania. Its State changes. These changes have Impacts on humans and the environment, for instance water pollution, the occupation of land, health deterioration. These in turn lead to social and policy Responses. The Responses themselves can

Figure 14: DPSIR of Waste in Campania
(Source: ICTA UAB)



become further causes of Pressures on the environment (e.g. incineration is a response that might lead to production of dioxins).

The DPSIR framework in this way offers the potential to clarify and organise the elements of the waste conflict in Campania, shedding light on its complexities and enabling a more thorough assessment of the full range of issues at stake.

5.8 Campania as a case of Environmental Injustice

The waste crisis in Campania is an example of extreme mismanagement of a basic public service, but another striking dimension of this case is that it also clearly represents a situation of severe environmental injustice. In Campania, the burdens of waste and contamination and the presence of environmental criminality are unequally borne by the residents of this region. These citizens, many of whom live in poverty are the most affected, as this paper has demonstrated. The persistent exclusion and repression of Committees and civil society very clearly represents a denial of rights of self-determination's and **popular participation** processes. Moreover, the links to economic benefits enjoyed by the Camorra, policies and regulations such as the decrees and plans implemented in the course of the waste emergency, and communities' lack of power are obvious.

Lawrence Summers' principle on waste and poverty in Campania

Lawrence Summers, current Director of the White House's National Economic Council for President Barack Obama, applies to waste and polluting activities the principle of comparative advantage. In 1992, Summers was Chief Economist of the World Bank and wrote an internal memo arguing that pollution should be sent to places where there are no people, or where the people are poor. In his own words:

"the measurements of the costs of health impairing pollution depends on the foregone earnings from increased morbidity and mortality. From this point of view a given amount of health impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that" (mek1966.googlepages.com/summers.doc).

From a strict economic analysis these conclusions are correct, however, this is to the exclusion of any non-monetary considerations such as impacts on health and environmental externalities. The Campania waste crisis illustrates the **Lawrence Summers' principle** on both regional and national levels. Regionally, direct links between poverty and contamination are apparent, particularly for the provinces of Caserta and Naples, where as we have shown there are direct links between sites of contamination and economic disadvantage. From a national perspective, Campania is one of the poorest regions in Italy, where 21% of families live below the poverty line. In 2003, the regional average wage per capita per year was around 11.000 €, approximately half the national average. Campania also has a low education level, with only 15% of the region's population between 15 and 52 years having completed compulsory education in 2001. In Campania life expectancy is also below the national average especially in the provinces of Caserta and Naples (**Table 2**).

Table 2 : Life expectancy in Italy and Campania,
(Source: Istat 2006)

	Campania	Italy
Men	76.91	78.44
Women	83.5	83.97

The answer to the ethical question of whether it is acceptable to subject poor people to health and environmental contamination for economic gain should be obvious, but it seems that in practice, adherence to the Lawrence Summers' principle is behind much environmental crime and injustices.

5.8.1 Addressing environmental crime and injustice

Legambiente estimates that 15.6% of Italian criminality is environmental. In most cases, like in Campania, such crimes are not isolated but part of a broader context of systemic environmental injustice. One of the main battles of defenders of environmental justice is the effective punishment of environmental crimes through the implementation of an effective preventive and regulatory framework that goes beyond the occasional enforcement of monetary fines.

Monetary compensation and fines are high-stakes, highly contested issues when applied to contamination of the environment and human health. Recently, the extreme right party (*La Destra*) submitted a request to the European Court for Human Rights for compensation for citizens affected by waste emergency procedures of 2008. The Italian state has been ordered to pay an average of 1.500 € to citizens suffering economic, biological and living quality damages. The details have still to be published and the Court will meet with the Italian government to decide on how to implement compensatory measures in practice, but in the context of broad impunity and social injustice, it is absurd to believe that monetary compensation of 1.500 € per person can possibly compensate for the destruction of an entire agrarian economy, the lives of the dead, the health of future generations and for the devastating of contamination that is sure to have an impact for decades to come. The limits of monetary compensation for environmental contamination without justice or any real political effort to protect **ecosystem services** are blindingly obvious in the context of the Campania waste crisis.

The European Union is pursuing an infringement procedure against Italy for the waste crisis in Campania, which will lead to the payment of a fine by the State but will not see the condemnation (legal or even symbolic) or prosecution of the individuals, public bodies and companies responsible for the crisis. There is hope however that with national level implementation of the EU's Nassauer Directive on penal sanctions for environmental crimes adopted by the European Parliament and the Council of the European Union in November 2008 (Directive 2008/99/EC), this situation could change.

6. Conclusion

Environmental crimes in Italy should be prioritized as national and European concerns. There are 71 “eco-crimes” every day in the country, or 3 every hour, half of them in Calabria, Campania, Sicilia and Puglia, the four main regions of mafia activity. The Campania waste crisis, has so far cost an estimated 1.8 billion € (Legambiente, 2009) and the current panorama gives little hope for concrete improvement.

The waste treatment strategy adopted by government has only addressed the symptoms of the crisis (the accumulation of ecoballe), rather than the roots of the crisis. These are to be found in: a lack of participative democracy, an absence of research, the need for behavioral change, necessary improvements to the judiciary and control efforts, and implementation of effective dissuasive and penal sanctions. Moreover, the “extraordinary” handling of the crisis has raised some extraordinary questions: How have companies and public administrations been able to under-declare quantities of produced and treated waste without any consequences? How can the damages suffered in Campania have gone unnoticed? How could the collusion of controlling public bodies not have been suspected with so much evidence of corruption, mafia infiltration, easy money and vested interests? Perhaps contamination of the territory is the necessary price that local inhabitants have to pay for their proximity to a lucrative and attractive industry.

Civil society committees and organisations have so far been excluded from waste management and decision making processes through the use of repressive measures and military interventions. As an act of goodwill government authorities need to recognize their obligation to create space for true civil society participation, rather than continuing to make disappointing, sporadic and instrumental promises that only create the illusion of participation.

Uneven availability of scientific data makes it difficult to prove that toxic substances in the air, soil and water of Campania due to waste contamination are causing serious health impacts. While such a conclusion may seem like common sense to most, the mafia are able to maintain that contamination is the result of industrial activity. Further scientific research is needed for the production of accurate figures of waste production and treatment, and for the construction of a clear analytic framework to assess the current level of contamination and related risks. This fundamental step is necessary if the issue is to permeate the consciousness of the general public.

The media and the government have had a major role in convincing public opinion that things are now back to normal, justifying abuses of power by government through emergency measures and concealing the continued use of improper waste management practices. Remarkably, instead of learning from past errors and looking for improved and alternative models of waste management, the government is continuing its promotion of outdated technologies such as RDF and thermovalorization in the southern regions of Sicily, Calabria and Lazio.

With regard to waste management then, Italy is positioning itself to repeat its mistakes. If, as we believe, the problem is rooted in mafia activity, corruption and profit interests, diversion from the current path will require major efforts to be put into improving judicial investigations, police control of the territory, and penal prosecution. If the citizens of Campania are to succeed with their demands for environmental injustice, these fundamental steps must be taken. Furthermore, the co-operative efforts of civil society, the research and legal communities and policy-makers will also be required to create the necessary conditions for the development an appropriate legal framework to prevent future violations of environmental justice.

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CORPORATE ACCOUNTABILITY

Chapter 14: Environmental Justice and Ecological Debt in Belgium: The UMICORE case

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UMICORE in Hoboken:
(Source: Nick Meynen)

Abstract

Antwerp in Belgium has a long history of expanding industrialisation with impacts on the environment and inhabitants' health. Life expectancy in Antwerp is two years shorter than the average in Flanders, a highly industrialised region in itself. In the suburb of Hoboken, where UPMR runs the world's largest precious metals recycling unit, the link between pollution and health is intriguing. Although the plant has implemented substantial ecological modernisation since the 1970s, the legacy of 122 years of historic pollution is still present: lead, arsenic and cadmium levels in the soil increase with proximity to the factory, as does the level of lead in the blood of toddlers and infants. Cancers are significantly more frequent in Hoboken than in Flanders or Antwerp, particularly lung cancers, the type most likely to result from the plant's activities. UPMR has drastically reduced emissions and is now recognised as one of the most sustainable companies in Belgium. This paper sets the clean-up operation of the company within a framework of ecological debt, calculating the amount that UPMR owes to the environment and nearby residents, with a focus on health damages and loss of capabilities, the major collateral damages inflicted by UMPR's direct and recognised environmental impacts.

Keywords: Ecological Debt, Lead Pollution, Manufacturing of Uncertainty, Environmental Justice, Popular Epidemiology, Historic Liability, Environmental Externalities, Corporate Accountability/Liability, Value of Human Life, Ecological Modernisation, Discount Rate, Greenwash

1. Introduction – A Brief History

Flanders is not only the most populous and industrialised region in Belgium, it also ranks at the top for Europe. Antwerp is the second largest port in Europe, the fourth largest in the world and the engine of Belgium's GDP. The city has gradually swallowed smaller villages surrounding the old city, Hoboken included. Industries have also surrounded neighbourhoods.

Just outside of Antwerp, the small rural village of Hoboken became a major industrial hub. What began as a lead de-silvering operation in 1887 grew to a large industrial plant extracting heavy metals from waste [62] The factory became gradually surrounded by a working class neighbourhood, mainly built on the initiative of the factory owners. It did not take long before the people who lived nearby nick-named the de-silvering plant "the sweet death". In the early 1920s, workers started to ask for the recognition of lead poisoning as an occupational disease.

By 1930, Hoboken had grown from a few thousand to 30 000 inhabitants. The whole area slowly merged with the city of Antwerp. Many local people thought their health problems were somehow related to pollution from the factory, but they could not prove it. While two World Wars were fought with a major economic depression in between, people were happy to just have a job and ask no questions, "seeing all but saying nothing''.

This humble attitude changed after World War II. The economy was booming, prosperity was growing fast and workers wanted better jobs. The solution from the factory owners was to look for other, less demanding workers. During the golden 1960s, the de-silvering plant attracted a large amount of Moroccan and Turkish workers to fill this gap. By the early 1970s some 700-800 immigrants worked there, mainly in the dirtiest jobs. By that time, the ecosystem surrounding the factory had already started to send emergency signals. Bees are to an ecological system what the canary birds were to the mineworkers: if they die, something is deeply wrong. In the sixties, several mass extinctions with great losses of the honey harvest occurred in municipalities downwind from the factory. According to Professor Debackere from the University of Ghent, the cause of death was an increased arsenic dose (Gijsels, (1979). However, the polluter remained unknown.

By 1973, many people from Hoboken began to notice that their laundry, drying in the garden, was becoming eroded with holes when the wind blew from the factory. When dozens of cows and horses began to die after grazing near the plant, Professor Debackere measured the lead concentrations in the soil. They were sixty times above normal and more than twenty times above the legal limit. In places, the legal limit for arsenic was exceeded 225 times (Gijsels, 1979). Was the factory the source of the arsenic clouds

62 In 1887 'Usine de désarg' started a lead de-silvering operation in Hoboken. From 1919 the name changed to 'Metallurgie Hoboken'. Union Minière (previously known as Union Minière du Haut Katanga) integrated several daughter companies in 1989, including Metallurgie Hoboken, before changing name to UMICORE in 2001. Since 2003, the UMICORE plant in Hoboken has been referred to as Umicore Precious Metals Refining (UPMR). We argue in this paper that UMICORE has inherited the socio-environmental liabilities of the previous companies.

killing off the bees in a wide area around Hoboken? The factory actually admitted that they were the source of this pollution. Farmers later admitted that they were secretly paid compensation for every dead cow, on the condition they kept silent (Merckx, 2008). The research from Debackere forced the government to undertake a larger screening of pollution with heavy metals in the area around the factory.

In 1973, the Provincial Institute for Hygiene (PIH) from the Province of Antwerp did a detailed survey which showed that the levels of lead, copper and cadmium were all several times above the legal limits and increased with proximity to the factory (PIH,1973). At the end of 1973, concerned officials leaked protected information of complaints from local people and measurements of lead at a nearby playground to a group of local doctors. The maximum allowable level of lead at that time was 40 ppm, but on the playground it was 2000 ppm (Merckx, 2008). The Ministry of Health then wrote a letter dated 18 June 1973, to the municipality to discourage the growing of home grown fruits and vegetables in Hoboken, widely practiced in this community.

In 1974, the Doctors for the People (GVHV) published a report on lead poisoning in Hoboken. The Doctors provide free health care to anyone in need, seeing health care as a basic human right. However, the group has also been conceived as a radical Maoïst political organisation, seeing free health care as their way to ‘reach out to the masses’. Their radical political views overshadowed their health research, harming their credibility in the eyes of media, government and universities. Their timing was bad as well, as the oil crisis of 1973 had shocked the economy so the time was not ripe for radical action against employers. Two Doctors nonetheless were elected to the local council of Hoboken in 1976. From the beginning of their mandate they asked to make all results from government research on air and water pollution by the plant public and insisted on further research. Their battle with the company, at that time called Métallurgie, intensified as they improved their research and mobilized people.

In 1977 the Doctors again made a stir by referring to an article published in the internationally renowned magazine *Archives of Environmental Health*, where the air pollution by lead for school-age children in Hoboken was described as dangerous (Roels et al., 1975). Upon this, a Commission under the leadership of Professor Clara was formed, which published its findings at the end of 1977. The message was alarming: “The health situation of the children ages 11 to 12 (the sample group researched) living in the nearby environment of the ‘Métallurgie’ (now UPMR) is under threat, probably for other groups, but primarily for toddlers. There should be a general screening”. Out of 1192 children examined, at least 26 had lead poisoning. At least 65% suffered from what was then called a “lightly increased risk” that needed further medical attention. In total, 37 children were taken to hospital and 22 received intensive treatment for lead disease. Still, Métallurgie claimed that as far as they knew, lead poisoning had never been confirmed for children in Hoboken. The giant research project of Professor Clara, who went on to become the Rector of the University of Antwerp, was dismissed. This is just one example in a long list of many in which the company denied scientific evidence and manufactured **uncertainty**.

Finally, based on the results of this and other research and under increasing public pressure, the government held an environmental summit on the issue in 1978. The summit with experts, professors and the bosses from the factory came to the following conclusions:

“The dust in houses within a range of 500 meters from the factory contains three times more lead than in urban areas (where the level is already high). At a distance between 500 and 1500 meters from the factory, the dust contains two times as much lead. *There is no doubt that the source is the factory ‘Métallurgie’ Hoboken*. This causes increased lead levels in the blood of children. We discourage the growing of vegetables on the soil of the community of Hoboken. Children younger than six should not live in Moretusburg (the neighbourhood in Hoboken closest to the factory) and children younger than twelve should not live in the area surrounding the factory (the first line of houses next to the factory border). *The severity and possible consequences on the health of children who suffer from lead intoxication have been known for a few years*. (Gijsels, 1979)”

Many important conclusions can be drawn from this. First, the cause-effect relationship between the factory and the levels of pollution from heavy metals was established and confirmed. Secondly, Métallurgie could no longer uphold the claim that it had not known what kind of damage it was inflicting on the environment from 1978 onwards, if not earlier. Although the total **ecological debt** runs since the start of production in 1887, Métallurgie has knowingly produced ecological damage since 1978. To the credit of the company, this date was also the beginning of Métallurgie´s emissions reduction policy. However, even with evidence of ecological damage and the resulting efforts, Métallurgie hid information about the true scale of the damage. The official company doctor, Dr. Verhoeven, illegally prescribed sick people with lead abortive pills (Sormental) in order to temporarily lower lead levels in blood, without revealing patients’ true lead levels (Merckx, 2008), a practice which lasted until as late as 1981. Doctor Verhoeven, informally admitted in a conference of company doctors that if he had really respected the rules and regulations, two-thirds of these workers would have been eligible to apply for invalidity under the Fund for work-related diseases (Merckx, 2008).

The implication of this confession cannot be underestimated. It means that the company had prior knowledge of the fact that its workers suffered from work-related health problems but decided to cover them up. It means that if the rules had been followed in the year of his claim alone, the 2000 or so workers who represented two-thirds of the workforce at the time could have claimed around 7.7 million € in compensation[63]. In recent years,

63 Between 2000 and 2007, the average payment by the fund for professional diseases to patients from the sector of precious metals and non-ferrous metals was 3861 euro a year. There are no data before that for this sector, but if we use this average the total cost *in 1981 alone* would be (3861*2000) = 7.7 million €.

emissions have been decreased drastically, safety within the factory has improved and bio-monitoring shows that the vast majority of workers are healthy. However, incidents still happen and every year some workers die for unknown reasons. A large research project on the combined effects of low dose exposure to several heavy metals is currently taking place among the workers at UPMR. Results are expected by the end of 2010 or in 2011. When this data becomes available we could add a chapter on the extent of the health damages to workers, but for the moment we have decided to focus on the much stronger and existing evidence of the direct impact of UPMR on its environment.

2. The case for a causal relation between UMPR production and above- average cancer rates in Hoboken

The current case presents a clear example of **popular epidemiology**, a process in which, as defined by Phil Brown (Brown, 1993), “laypersons gather scientific data and other information, and also direct and marshal the knowledge and resources of experts” in order to investigate a case involving toxic contamination. “Many people who live at risk because of toxic hazards have access to data otherwise inaccessible to the scientist. Their experiential knowledge usually precedes official and scientific awareness, largely because it is tied to the labour and domestic care of everyday life. Whether or not the health hazards in communities and workplaces are due to toxic substances, discovery most often stems from lay observation”. Members of the local community, workers and concerned doctors played key roles gathering evidence of the health hazards related to the company emissions. VODO has been able to tap into this existing layperson data and information to build upon it and use it to search for better and clearer data, with sufficient success to come to this chapter.

Cadmium and arsenic are proven to cause cancer in humans according to the International Agency for Research on Cancer (IARC). This institute, which is part of the World Health Organisation, summarizes the worldwide scientific knowledge on cancer. In 1980 the IARC found that “there is sufficient evidence that inorganic arsenic compounds are skin and lung carcinogens in humans”(IARC, 1980). In 1987 the IARC published an update on all carcinogenic risks for humans. Based on the best available scientific knowledge and many studies, arsenic was again confirmed as causing cancer among humans (IARC, 1987). At that time there was only limited evidence for the carcinogenic risk of cadmium. However, in a new publication in 1993, the institute concluded that “there is sufficient evidence in humans for the carcinogenicity of cadmium and cadmium compounds” (IARC, 1993). For lead, the IARC conclude that “there is sufficient evidence in experimental animals for the carcinogenicity of inorganic lead compounds” and “inorganic lead compounds are probably carcinogenic to humans” (IARC, 2006).

Even if proving a direct correlation between a particular disease and the operation of an industrial plant is very difficult and complex, examples in the literature exist upon which we can base our reflections. A positive correlation between lung-cancer mortality rates and distance from a smelter emitting arsenic, copper, lead and zinc has been proven in Sweden (Pershagen, 1985). A non-ferrous smelter in the US caused a 60% increased risk of lung-cancer, after standardising for smoking habits and profession (Blot, 1986). Based on many other comparable cases elsewhere and on the subjective impression that Hoboken saw a high incidence of cancer cases, six doctors from Doctors for the People decided to do an extensive study on the incidence of cancer in relation to distance from the factory, based on all patients they had consulting with in 1997. At that time, no reliable cancer registry existed, so their effort was pioneering. We briefly present their results below, bearing in mind that this study remains explorative and cannot be used as the unique source to analyse cancers in Hoboken. We also acknowledge the fact that this study does not take into account other potential interfering factors such as medical history, exposure to toxic substances, family history, etc..

In this study, these doctors divided the area surrounding the factory into 6 Zones, depending on the distance from the plant and the dominant wind direction. The first zone consisted of people living 150 metres from the plant, zone 2 of up to 525 metres and so on, up to zone 6, which consisted of the rest of Hoboken. According to this research, in Zone 1 and 2 the chance of getting cancer was 3.5 times higher than for people living in Zone 6. For every Zone nearer to the factory, the number of cancers rose. Through extrapolation of their empirical results they concluded that 171 cancers in Hoboken alone could have been avoided. The six doctors reported 78 cases of persons who died of cancer in 1997 or had cancer between the 1st of January 1997 and 31st December 1997. Cancer cases before 1997 were not considered and skin cancers and minor tumours were excluded. Unfortunately, the team of volunteers did not have the time and resources to standardise their results for the many possible interfering factors such as age, smokers and other living habits.

Despite their shocking preliminary results, no government institute or university decided to do further research, probably as the Doctors were part of an extreme left political group. When the Doctors realised they would not find support from the academic community, nor from the government, they conducted a follow-up study in 1999 themselves. Without any subsidies or means to cover the expenses of their study, the six Doctors looked into their archives and made a geographical distribution of the 303 cancer cases reported in their practice from 1976 to 1998. Again the correlation with distance to the factory was very significant. In Zone 1 they discovered chances of developing cancer were 4 times greater, and for the whole of the neighbourhood of Moretusburg, the chances of getting cancer were 60 to 70% higher than the average for Flanders. Although their study was not standardized to account for example for smoking habits, the theoretical hypothesis that the already-proven pollution caused by Métallurgie also had also resulted in more cancers was in line with both empirically obtained data in the field and with the international literature on the link between these emissions and cancer. Once again, these results do not correspond to a serious epidemiological study but confirm the hypothesis that some cancers of the area could have been due to its industrial pollution.

In parallel, the list of measurements done in Hoboken showing high pollution levels is extensive. Since the 1970s, the institutes that have published one or several reports on air, water and soil pollution from heavy metals in Hoboken include: VITO (Flemish Institute for Technological Research), IHE (Institute for Hygiene and Epidemiology), ISO (Institute for Chemical Research), VMM (Flemish Environment Agency) and OVAM (Flemish Waste Agency). Private environmental consultancies were performed by Ecolas, Tauw, Lisec and UMICORE themselves. The evidence has been so overwhelming that the company no longer denies the fact that they are responsible for the excessive amounts of cadmium, lead and arsenic in soil, water and air around the site. They refer to this damage in explaining their payment for the soil rehabilitation in the area surrounding the factory. However, the company still denies that this excessive ecological damage has caused illnesses among people.

There is further indication of a direct link between pollution from UPMR and cancer in the higher incidence of cancer in Hoboken compared to Antwerp or Flanders, as found in official figures of the official Belgian cancer registry. VODO obtained specific data for Hoboken, Kruibeke and Hemiksem (the latter two are neighbouring municipalities out of the main windpath of UMICORE), including standardised comparisons with Flanders and Antwerp. A smaller geographical scale for Moretusburg, the neighbourhood in Hoboken bordering UPMR, was not available. Between 1999 and 2005, the registry recorded 146 more cancers in Hoboken than what could be expected from the indirect standardised incidence ratios (SIR) based on a comparison with Flanders. The results are standardised for age. Compared with Antwerp, the most polluted city of Flanders, Hoboken still had 129 more cancers than expected. **Tables 1 and 2**[64] summarize the data given by the Belgian cancer registry and include a 95% confidence interval of the figures.

It is important to keep in mind that the higher than average number of cancer cases is an estimate with a probability range rather than an exact number. It means that we are 95% sure that the number in Hoboken is in the relative range between 101 and 116 while 100 is the average of cancer cases we can expect, after standardisation for age. It is relevant to point out here that all action on climate change is based on at least 90% certainty from science that humans are involved in climate change. No matter how cautiously one deals with the figures in Table 1 and no matter with which level you compare Hoboken to (the world, Europe, Flanders or Antwerp), even after standardisation for age the figure of Hoboken always stands out as being significantly higher. In all cases, Hoboken is the only community where the range always stays above 100, which clearly means that we are 95% sure of a higher incidence of cancer in Hoboken than normal (100). The best estimate according to these figures is a total of 146 more cases of cancers when compared with Flanders[65]. Compared to the age-adjusted standardised incidence rate for the World, both males and females in Hoboken suffer from double the amount of cancers as can be expected, while Hemiksem and Kruibeke are below what could be expected. The

64 These data are from the Antwerp cancer registry that existed as a provincial initiative until 2005 ; as a result, they may provide incomplete datasets
65 146=MEN (Observed (787) – Expected (723.7 rounded to 724))+WOMEN (Observed (646) – Expected (563))

difference between Hoboken and the other communities surrounding UPMR, Hemiksem and Kruibeke, is that Hoboken lies directly in the windpath of UMICORE.

Table 1: Invasive tumours (exclusive non-melanoma skin cancer), 1999-2005, compared with data for Flanders, Europe and the World

(Adapted from data provided by the Belgian Cancer Registry in April 2009)

Men	**Tot**	**FSR**	**ESR**	**WSR**	**SIR**	**95% CI**
Hoboken	787	723.7	533.4	360.6	108.8	[101.15;116.35]
Hemiksem	171	208.6	388.6	258.4	82.0	[69.7;94.28]
Kruibeke	318	316.8	494.7	337.9	100.4	[89.34;111.4]
Women	**Tot**	**FSR**	**ESR**	**WSR**	**SIR**	**95% CI**
Hoboken	646	563.0	405.4	296.7	114.7	[105.89;123.59]
Hemiksem	166	157.2	379.7	283.1	105.6	[89.52;121.65]
Kruibeke	233	243.6	345.2	255.4	95.6	[83.36;107.93]

Tot: Total observed cases
FSR, ESR and WSR: Expected cases based on age-adjusted standardised incidence in Flanders, Europe and the World Standard populations (n/100.000 person years).
SIR: Standardised incidence ratio compared to Flanders= (tot/FSR) *100
95% CI: Range of expected cases based on a 95% confidence interval

VODO then asked the registry if this might show that there is a link between a suspiciously high incidence of cancers in Hoboken and environmental cancers caused by UPMR. The registry did not want to suggest that there is this link, but they gave more details on which cancers are most prevalent. They noticed a relatively high percentage of lung cancers, (**Table 3**) suggesting that these might be explained by multiple factors (Belgian Cancer Registry, 2009). The official number of females suffering from lung cancer in Hoboken is exactly double the figure expected when looking at the average for Flanders: 55 cases instead of 27.5. These are official figures from the Belgian cancer registry and the best data available. This is remarkable when compared with the findings of Professor Lison, who was called upon by UPMR to defend the company. Reacting to concerns about the high number of cancer cases in 2006 and 2007, not among inhabitants but among workers in the factory, the Professor claimed that the ten registered and different cancers among workers could not be linked with the exposure to pollutants within the factory (UMICORE, 2008b). In fact, he claimed that *"the type of activities and exposure (Ashes, SO_2, asbestos…) would rather lead to more lung cancers, which is not the case* (UMICORE, 2008b)*"*. The information from Professor Lison was never published but was communicated to workers during the summer of 2009. VODO obtained a copy of this information, but when Professor Lison was asked for further clarification, he refused to go

Table 2: Invasive tumours (exclusive non-melanoma skin cancer), 1999-2005, compared with data for Antwerp, Europe and the World
(Adapted from data provided by the Belgian Cancer Registry in April 2009)

Men	Tot	FS R	ES R	WSR	SIR	95% CI
Hoboken	787	730.8	533.4	360.6	107.7	[100.17;115.22]
Hemiksem	171	211.3	388.6	258.4	80.9	[68.8;93.06]
Kruibeke	318	320.0	494.7	337.9	99.4	[88.45;110.3]
Women	**Tot**	**FSR**	**ESR**	**WSR**	**SIR**	**95% CI**
Hoboken	646	573.2	405.4	296.7	112.7	[104.01;121.39]
Hemiksem	166	160.5	379.7	283.1	103.4	[87.71;119.18]
Kruibeke	233	248.6	345.2	255.4	93.7	[81.69;105.75]

Tot: Total observed cases
ASR, ESR and WSR: Expected cases based on age-adjusted standardised incidence in Antwerp, Europe and the World Standard populations (n/100.000 person years).
SIR: Standardised incidence ratio compared to Antwerp= (tot/ASR) *100
95% CI: Range of expected cases based on a 95% confidence interval

Table 3: Lung cancers, 1999-2005, compared with data for Flanders, Europe and the World
(Adapted from data provided by the Belgian Cancer Registry in April 2009)

Lung Cancer	Tot	FSR	ESR	WSR	SIR	95%CI
Men	159	125.9	107.2	72.3	126.3	[106.66;145.92]
Women	55	27.5	33	23.2	200	[147.14;252.86]

Tot: Total observed cases
FSR, ESR and WSR: Expected cases based on age-adjusted standardised incidence in Flanders, Europe and the World
SIR: Standardised incidence ratio compared to Flanders = (tot/FSR) *100
95% CI: Range of expected cases based on a 95% confidence interval

into detail. His findings in fact represented a rather curious response to the concerns of workers, as an earlier study based on lung cancer patients in Antwerp had shown that those with a professional background in the non-ferrous industry had a 1.6 higher chance of getting lung cancer (Droste et al., 1999). Interestingly his own findings seemed to imply a direct link between UMICORE's production in Hoboken and abnormally high incidences of lung cancer.

As we have pointed out already, examples from Sweden and the US show that similar emissions from non-ferrous smelters caused a much higher incidence of lung cancers (Pershagen, 1985 and Blot, 1986). Two other large research projects in the US found a positive dose-response relationship between blood lead concentrations and lung cancer (Lustberg and Silbergeld, 2002). One possible explanation of why the problem of lung cancer is higher in the surrounding area than among the workers suggests itself: Workers wore protective masks and were subject to following safety rules at all times, but lead was expelled from chimneys 60 meters above the work place, spreading toxic clouds into the wider environment of surrounding inhabitants who did not have masks. However, this does not imply that workers were safer from the risk of cancers than inhabitants, merely that they seemed to have been more protected against inhaling chemicals while working in the factory halls. In addition, exposure to a multitude of other toxic metals before the products entered the ovens, might have caused other cancers among the workers. The number of possible causes and how they relate to each other, such as the combined effect of exposure to several low doses of toxic metals, is not sufficiently known at present. As mentioned earlier, a large-scale study on this aspect using the workers of UPMR as the sample population is currently under way.

The significantly higher incidences of cancers in Hoboken, with lung cancers particularly higher than the expected figures, is a further empirical indication that supports the hypothesis derived from scientific studies by the Belgian cancer registry that there might be a direct link between the historic UPMR emissions and local cancer cases. Further proof of the link between historical pollution from non-ferrous smelters and higher incidences of cancer was given in *The Lancet* in 2006 (Nawrot et al., 2006). The study concluded that exposure to the levels of cadmium caused a higher incidence of lung cancer. Although the context of the Umicore site was comparable, the company did not take the study seriously because of other findings from other scientists. For the people of Hoboken who are suffering from lung cancer it actually does not really matter if the cause is arsenic, lead or whatever other chemicals UPMR is emitting. What matters to them is that they are sick at a rate exceeding world, regional or city averages and that empirical data suggests that UPMR is the cause of their illness. What matters is that no one has received any compensation for health or ecological damage. Lowering emissions and cleaning up the soil is a good start, but it is only a part of addressing a historic legacy of liability and it falls far short of taking up real **corporate accountability** or internalising all **external costs**.

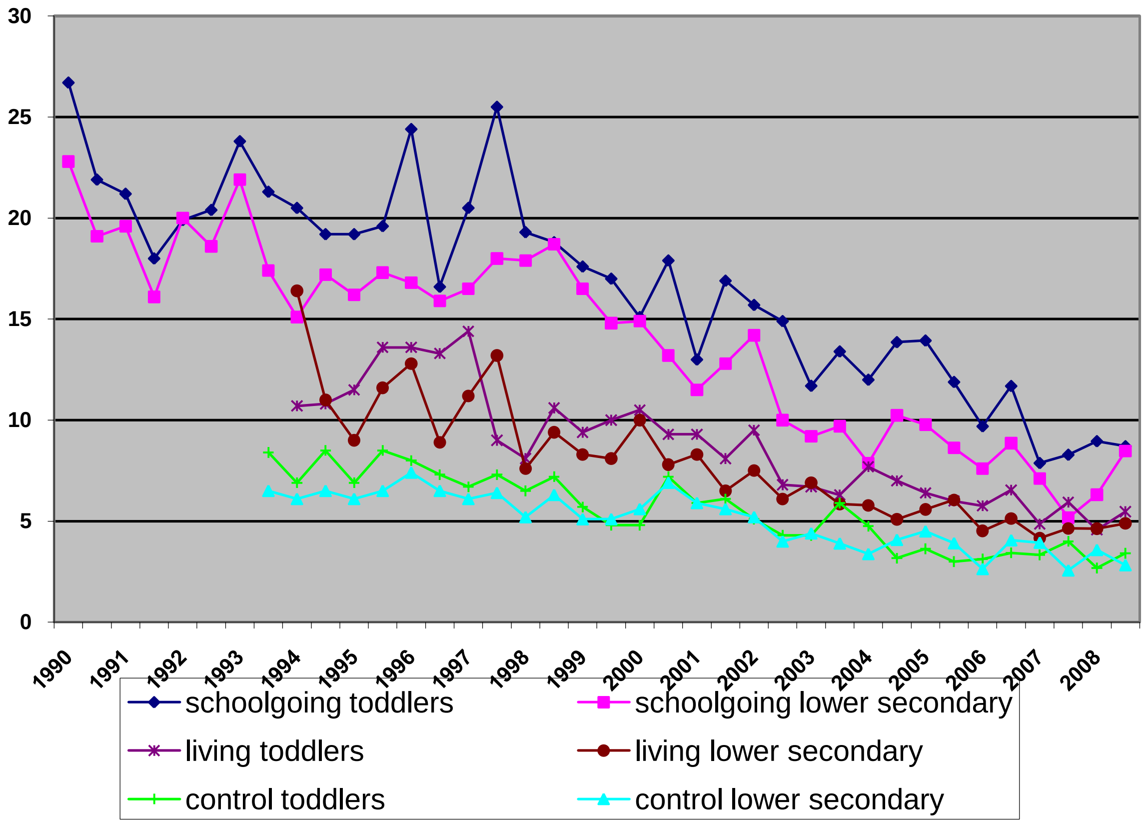
3. The case for a causal relation between UPMR production and other health damages in Hoboken

The identification of other negative health effects directly linked to UPMR is methodologically difficult, and therefore means that any calculation of UMPR's total ecological debt will be an underestimation. However, a substantial body of international literature has been written on other detrimental health effects of lead (Pb) and cadmium (Cd), the most ubiquitous developmental neurotoxins (Pokock et al., 1994; Guo et al., 2004; Chiodo et al. 2004). Typical effects of Pb-exposure and possibly also Cd-exposure are concentration deficits, diminished planning and organisation capabilities and altered behaviour (Viaene et al., 2000; Vermeir et al., 2005). A landmark article on the effects of increased lead in blood for children living near to a smelter was published as early as 1975 in the famous *New England Medical Journal* (Landrigan Ph. J., 1975). In 1979, the medical peer-reviewed magazine the *New England Journal of Medicine* showed that children with increased lead levels had lower IQs and fewer social skills. A high lead level decreases the formation of haemoglobin, necessary for oxygen transport. Acute lead poisoning causes intestine malfunctions, cramps, high blood pressure, kidney stones and eventually coma and death. Chronic lead poisoning leads to asthma, vomiting, nervous system failure with permanent brain damage, and kidney disease.

Apart from the lead problem, emissions such as copper, zinc, cadmium and arsenic cause bone diseases, infections of the mucous membrane, liver and kidney failures among other problems (Staessens, 1996, 1999). Children are more sensitive, especially toddlers. This has not only been proven in international literature, but has also been proven within Hoboken. Children who lived near the plant in Hoboken matured sexually at an older age than others, and testicular volume was significantly smaller for boys (Staessen et al., 2001). Other studies showed that even a low level of lead, under the current norm of 10 µg/dl, has significant effects on the hormonal balance, concentration, causes several social and emotional problems and delays development of walking and language skills for children from 0 to 3 years old (Viaene M.K., Vermeir G., 2009). In Hoboken, a systematic and large-scale study on this issue has never been undertaken. However, one systematic and large scale study done every 6 months since 1978 in Moretusburg-Hertogvelden is available: the lead-in-blood measurements from the government PIH agency.

The PIH studies were the direct result of a request from Professor Clara for a general screening of children in Moretusburg after his 1977 study showing increased lead in blood levels among children 11 to 12 years old (**Figure 1**). The PIH from the province of Antwerp started with biannual measurements in 1978 and continues them until today (Neelen V., 2008). Since 1993 there has also been a biannual screening in a control group and in children living in the region but not going to school there. According to the head of research Vera Nelen, every study since 1978 by the PIH or by the University of Antwerp has shown that the most important factor for explaining the higher lead level is the combination of time and distance from the UPMR-factory. The more time a child spends close to the UPMR factory, the higher the lead in blood level. Figure 1 clearly illustrates this fact. The upper two lines show the evolution of the lead level of two different age groups who both live and take classes in Moretusburg, expressed in µg lead / dl blood. The middle two lines are children who live in Moretusburg but go to school outside the neighbourhood. The lower two lines are children from the control group. Since 1992 the health norm has been 10 µg/dl.

Figure 1: Evolution of lead in blood for children in Moretusburg – Hoboken (µg/dl)
(Source: Provincial Institute for Hygene (PIH), Province of Antwerp)



4. The response from UPMR

By the time people had united against the pollution inflicted upon them by the factory in the 1970s, it was no longer an issues of interest to a few Maoïst doctors and a handful of enlightened professors. Several big demonstrations from mothers of sick children, youth clubs, some lawyers and even the local socialist government took place in 1978, asking for decontamination. People filled sacks with sand and the lead inside it and "brought back the lead to the factory". There were threats to close down the factory from the mayor of Hoboken. A committee of concerned parents finally convinced a judge that a decontamination team should be formed, that the legal limits should be lowered by a factor of ten (Métallurgie had somehow managed to receive exemptions from the legal limits for the area around the factory) and that environmental commissioners should monitor remediation works. There was one important catch though: the Judge also ordered that the parents who had filed the case would have to pay the costs of the experts who would check the claim, in advance. That was the end of the case for the parents, who of course could not pay for that (Merckx, 2008).

However, after an environmental summit in 1978, the official position of Métallurgie changed radically from one of denial to recognition, and some promises were made by the factory. The promises included lower emission norms, the identification of pollution sources, the covering of resource deposits, decontamination works in Moretusburg, vacuum cleaning of roofs, attics and streets, the creation of a buffer zone and soil replacement. Other measures were also pledged: the temporary closure of schools and nurseries, the building of new schools and nurseries and the organisation of sea and forest excursions as a health cure for the children. An information campaign by the Ministry of Health, *Medical Research on Adults of Hoboken* followed up measurements of lead in soil, air and water. These well intended actions, while they demonstrated that Umicore had recognized its negative impacts on the population, were not sufficient to compensate for the total ecological debt of the company.

In the mid-1990s the company further researched data on the presence and extent of historical soil and groundwater contamination. A study conducted by VITO in 1996 concluded that the consumption of home-grown vegetables and groundwater posed a health risk to most children and to a lesser degree, adults (Cornelis, 1996). One year later UMICORE signed a framework with the Flemish government, guaranteeing at least ten more years of research and decontamination works from 1997. In 1999 the company began publishing annual environmental reports and working hard to create a green image. By the time the company name changed from Union Minière to UMICORE in 2001, the company had developed a progressive environmental policy and started to recognise (part of) its historic responsibility. The 2000 environmental report states: "The processing of non-ferrous metals at most UMICORE plants in Belgium, France and the Netherlands started over 100 years ago. Many production techniques used then were very environmentally unfriendly compared to present standards, resulting in soil and groundwater contamination and sometimes inappropriate storage of wastes" (UMICORE, 2001). This first *mea culpa* seemed to acknowledge the possibility of having incurred an ecological debt. But not a comment was made on the ecological debt they incurred in places like Katanga, Congo, where they have a very long history of mining. The global legacy of UMICORE however is beyond the scope of this present study.

Further research done by UMICORE and the Public Waste Agency of Flanders (OVAM) resulted in a second much bigger agreement in 2004 which obliged UMICORE to pay 77 million € for sanitation works around the Flemish sites. In full page newspaper advertisements published after the agreement was signed, UMICORE claimed that they had initiated this deal and turned the page of history, but that is only a part of the story. VODO obtained letters from OVAM to UMICORE from 2001 showing that the company had not complied with the necessary soil research. OVAM research from 2001 for example, indicated heavy pollution of soil and water in several zones around the site, with measurements in neighbouring Moretusburg showing levels of cadmium exceeding the norm up to 59 times (Touchant, 2001). UMICORE had disputed the results of the OVAM studies and gone to court. An agreement was finally signed in 2004 between UMICORE and the first Green Environment Minister for Flanders, Johan Tavernier. Since then, Thomas Leysen who became the CEO of UMICORE in 2000, has taken environmental issues seriously. Leysen is working to create a brand new image for UMICORE as the most sustainable industry of Belgium. By signing the 2004 agreement, UMICORE became one of the first entities to acknowledge a part of its ecological debt on such a scale.

In Hoboken and the direct surroundings of UMICORE sites, UMICORE is today paying for ongoing decontamination works. In the wider area around the sites both UMICORE and the Flemish Government are each paying 15 million €. In their environmental reports, UMICORE (**Figures 2 and 3**) often talks about 'voluntary commitments' with **Corporate Social Responsibility** (CSR) at the heart of its long term strategy, but how far does CSR go? Realizing that the corporate self-regulatory approach has its limits, the corporate accountability movement came into existence in the 1990s (Broad and Cavanagh, 1999). The movement has proposed the development and implementation of regulatory instruments and penalties for non-compliance rather than voluntary self-regulation (Utting and Clapp, 2008). The ongoing debate over whether current voluntary corporate efforts to achieve sustainability are amounting to anything other than **greenwash** is highly relevant in light of the outstanding ecological debt of UMICORE in Hoboken.

Figures 2 and 3: UPMR buildings old and new

(Source: Nick Meynen, VODO)

The goal of this study is to contribute to the search for a methodological framework in which ecological debt can be used as a tool for people searching for **environmental justice**. The final results which follow should not be interpreted as exact figures, but should mainly be seen as a contribution to the development of a methodology, for which UPMR was the most convenient example at hand. If the people of Hoboken want to use it, is up to them.

5. Ecological debt

5.1 Definition and methodology

The idea of ecological debt was first conceived by South American civil society organisations (CSOs) in the early 1990s as a way of re-conceptualising the financial debt owed by the South to the North. It has since been picked up by CSOs all over the world, and followed by scientists who investigated and devised solutions to associated methodological problems (Martinez-Alier, 2002). Martinez-Alier introduced the distinction between private ecological debt by corporations and public ecological debt such as the carbon debt or climate debt. Simms, Rijnhout and Martinez-Alier state that “ecological debts may be very broadly defined. They include pollution, ‘theft’ of resources and disproportionate use of the environment” (Martinez-Alier, Simms, Rijnhout, 2003). The pollution aspect is often also referred to as ecological damage. Ecological economists have often embraced this translation of the ecological debt because it is the most readily calculable. Ecological debt can also be referred to as environmental liability. This paper now asks the question: “What is the minimum ecological debt the UMICORE plant in Hoboken owes to people living in Hoboken?”

To explain why asking this question is relevant and how the question itself should be interpreted, it is imperative to introduce the **post-normal science** framework. Post-normal science was developed to deal with circumstances where normal science alone can not handle the **complexity** of a situation, this is when facts are uncertain, values are in dispute, stakes are high and urgent decisions have to be taken. Originally described by Silvio Funtowicz and Jerome Ravetz , the concept has been used to improve our understanding and ability to deal with surprises such as “mad cow disease” or climate change. In these situations accredited experts were not capable of foreseeing the implications of certain technologies and decisions, so their knowledge was not sufficient to handle the complexity of the problems. Post normal science involves the formation of an “extended peer community” in which stakeholders affected by a problem or decision take part in the assessment process, as they also hold valuable insights (everyday experience, in-depth knowledge of their surroundings). In this participative arena, science is one of many sources of evidence that contributes to feeding policy decisions. For instance, in the climate change debate, even if there still are uncertainties, the stakes, values and the urgency are so high that action is required and public involvement is needed to ensure the quality of the process.

In our case study, even if at first there were uncertainties about the relationship between industrial pollutants and health, the last 100 years of scientific research have radically diminished these. Communities have also mobilized to gather information and to build local health statistics to prove this link locally and to call for action (popular epidemiology). But, the company has worked in the other direction, to increase perceptions of uncertainty, effectively weakening the communities´ demands. Our case is an example of post-normal context, not because there are very high uncertainties (as the company stresses), but because there are very high stakes and urgent decisions to be made. We see overwhelming indications that show a cause-effect relationship between emissions from UPMR and health damages and loss of capabilities among the inhabitants of Hoboken.

To answer the central question of how big the minimum ecological debt actually is, we calculated the associated costs of as much ecological damage as we could find, without pretending to give a full picture of all damages. Some costs, like that of having a lower IQ due to increased lead levels in the blood of toddlers living near the factory, can clearly be linked to the plant, but cannot be calculated. Others, such as the damage done by the high volume of heavy traffic are hard to link to the factory because there are other nearby industries contributing to traffic. There might also be a link with the mass extinction of bees in the 1960s but these incidents are too far away in the past and there is not enough data in existence to allow the investigation of the real cause. In this study, we therefore focused our calculations on the damage caused by lead, arsenic and cadmium emissions from UMICORE in Hoboken for which there is substantial evidence. The goal is to get an idea of the minimum ecological damage done since the moment the company knew they were causing the damage.

Calculations of the ecological debt of a single industrial plant are not new and have had varied impacts, with a few calculations resulting in successful court cases against large polluters. Well-known cases are Bhopal in India or the case against PG&E in the US. The latter was forced to pay 333 million US$ in compensation to victims, the largest settlement ever paid in a class-action lawsuit in US history at the time. Unlike in the US, Belgian law does not permit class-action cases, but even with this legal barrier, some options do exist. Normally, plaintiffs have to pay the costs of experts, which would likely run in the region of a few thousand € per patient. However, a new ruling made in 2007 may offer scope to exempt plaintiffs from these costs if they can prove that their income is insufficient, something that should not be difficult in the case of the average worker or sick person living off of health care allowances. An upfront fee to specialist environmental lawyers remains, but this would be dwarfed by the compensation should a case be won, and could be avoided entirely with the use of pro-deo lawyers. Of course, it is up to victims themselves to decide if and how they want to pursue environmental justice through the courts. The calculation that we make only gives them and the company an idea of what the stakes are. **Figure 4** gives an overview of the ecological debt framework used in this study. Only the elements in bold have been calculated, representing a partial sum of the total ecological debt.

5.1.1 Cancer treatments

The typical treatment cost of cancer patients has been calculated in great detail (see Baker et al, 1989) and is cited in *The Cost of Illness Handbook*[66]. The handbook from the US Environmental Protection Agency is a widely used reference. Baker made an estimation based on the average cost calculated from the only long-term study of cancer costs available. According to these calculations, the total lifetime, incremental, undiscounted direct medical cost for a typical cancer in 1996 dollars comes to US$ 82 581.16.[67] This figure is the starting point of several adjustments for reaching

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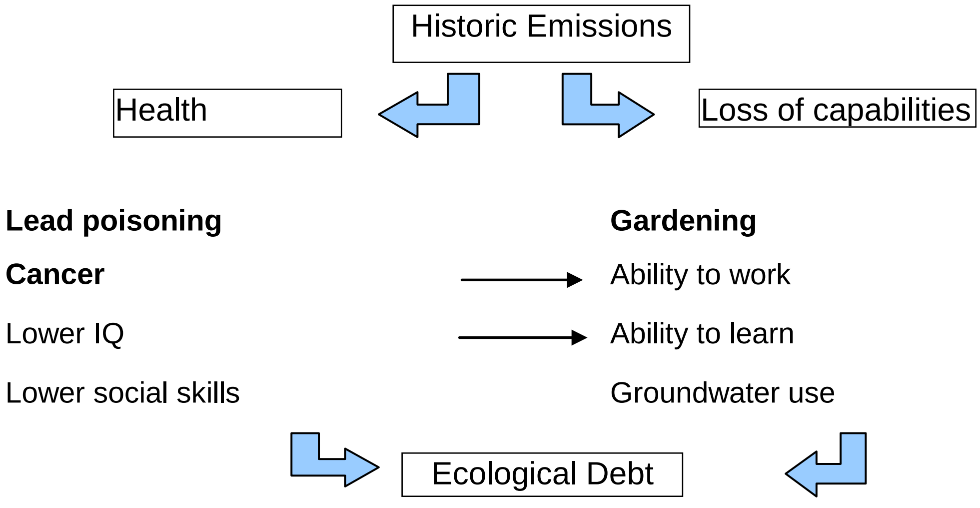
66 This handbook from the US Environmental Protection Agency was developed by the Office of Pollution Prevention and Toxics (EETD, EPAB) under the direction of Nicolas Bouwes (EPA WAM) by Abt Associates, Cambridge, Massachusetts (K. Cunningham, Project Manager).

67 For a wider discussion on the sources, modifications to the data and methodology used by Baker we refer to the update version of the cost of illness handbook, available on http://www.epa.gov/oppt/coi/

Figure 4: Ecological debt framework (Parts in bold are calculated and only represent a part of the total ecological debt).



the best estimate of the cost for our own case.

1. Baker uses a mortality rate of 50%. The mortality rate for cancer in Belgium in 2005 was 43.5%[68]. However, in 1999 the rate was 52.5%. The average mortality rate therefore becomes 48%. Taking into account the uncertainties and our wish to not overestimate our accuracy, we also use a 50% mortality rate, as in the US.
2. Medical costs are subject to inflation. Using the medical care service component of the consumer price index in the US from 1996 to 2009, the costs increased 1.59 fold[69]. We use the value of 2009 for extrapolation up to 1980 because although in 1980 the cost of medical care was less, UMICORE has been able to use that money until now in other capital investments. Since the income from capital has increased more than the cost of medical care in the same period, this is still a calculation to the advantage of UMICORE.
3. Using the average exchange rate from 1999 (introduction of the euro) up to 2008 (the last available yearly average) we multiply the dollar figure by 0.89066 to calculate the value in Euro.[70]

This brings us to the total lifetime, incremental, undiscounted direct medical cost for a typical cancer in 2009 euro equivalent of 116 412 €[71]. If an expert confirms that the cancer is caused by pollution from UMICORE, this is the minimum compensation a patient should get. The official cancer registry noted a higher than expected incidence of cancers of 129 in Hoboken, when compared with the already high levels of the city of Antwerp. Using this

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68 Cancer incidence in Belgium (2008) contains the most recent data from the Belgian Cancer registry. The report mentions a mortality rate of 45% for males and 42 % for females in 2005 but a rate of 55% for males and 50% for females in 1999 (p34)
69 Data from the US Bureau of Labor Statistics on http://data.bls.gov/PDQ/servlet/SurveyOutputServlet
70 Based on the exchange rate on 21 April 2009 on www.xe.com
71 Calculation: (81 926 $) * (1.59538) * (0.89066) and dollar/euro rate average based on http://www.oanda.com/convert/fxaverage_result

most cautious comparison, the total debt from 1999 to 2005 would therefore come to at least 15 million €.

The official cancer registry has no reliable data from before 1999, when pollution was proven to be even higher. The most reliable data available come from the 1998 study from the 6 Doctors who, based on their own patient population in 1997, calculated that in West-Hoboken alone, there were probably 171 more cancers than expected. When we use the same amount of 116 412 € this debt would come to 20 million €. In fact, this figure is rather low if one considers that the time span covers 18 years: from 1980 (when UMICORE was aware that arsenic causes cancer) up to 1997, due to lack of other data. The figure of 129 from the cancer registry is only based on a 7 year span, in a period when pollution levels were much lower than they had been from 1980-1997. At present, the best available data suggest that the number of 300 more than usual cancer cases from 1980-2005 is an underestimation of the real number.

In total, since 1980, 300 incidences of cancer more than the norm have been registered in Hoboken, so if the link with UMICORE could be proven, this would amount a total debt of at least 35 million €.

5.1.2 The value of human life

Unfortunately, half of cancer patients still die, even after treatment. The average amount received by relatives from the life-insurance payment of someone who dies in Belgium is around 300 000 €. In the previous section we calculated that around 300 more than usual cancers were recorded in Hoboken. If half of them survive, a rather optimistic estimate, 150 more than usual cancer related deaths occurred since 1980. Multiplied by the average payment of life insurance, the amount comes to 45 million €. This is what UPMR would owe the families of those cancer patients who actually died from the disease, if the link were proven. However, in this calculation, we have not taken into account the suffering of relatives, data which escapes economic valuation. The payment of life-insurance does not necessarily correspond to the value of human life. To the contrary, it is easy to argue that the **economic value** of human life is infinite, impossible or immoral to calculate due to ethical reasons. That is certainly true and putting a price on the 'value of human life' should never be seen as something companies can internalize in their accounts when considering future plans. The obligation is instead to do everything possible regardless of cost to prevent illness, and of course, death.

One could also argue however, that *not* putting a price on those that have already died and are sick is also unethical toward families left behind with no compensation. While it is impossible to compensate for grief, it is important to make it more difficult for other companies to continue to externalize costs that expose their workers to fatal illnesses. In fact, when one compares the figure of 300 000€ per person with what other companies have been obliged to pay in similar cases, it becomes apparent that this amount is relatively low. In the Chevron case in Ecuador, plaintiffs filed a claim asking 9.5 billion US$ compensation for 1400 deaths from cancer, or 6.78 million US$ per person[72]. Economists Orley Ashenfeiter of Princeton University and Michale Greenstone of the University of Chicago, have proposed that in the US $1.54 million is a more accurate “value of human life”[73]. Greenstone even mentions that this figure is useful when setting out norms for pollution by arsenic. This seems highly relevant to our case, so when we use his calculation on the “value of human life”, the debt from the around 150 cancer deaths would come to 231 million US$ or using the average exchange rate of 0.89066 (in the first ten years of the euro since 1999), the debt would come to 206 million €.

5.1.3 Diagnosing children with increased health risks due to increased lead in blood values and prevention of further lead intoxication

The *cost of illness* handbook contains very specific figures (**Table 4**) on the cost of reducing high lead levels in the blood of children (US EPA, 2007). The PIH has measured the lead in blood levels of children in Moretusburg since 1978 (PIH, 1978-2008). Their biannual results are classified in the CDC tables for interpretation of the risk level of lead in blood. Using the medical care service component of the consumer price index in the US from 1996 to 2009 and converting the costs in Euro, these are the costs for diagnosing, helping (through prevention) and sometimes treating children with increased health risks due to increased lead in blood for each risk class:

Table 4: Cost of reducing high levels of lead in blood of children

(Source: Cost of Illness Handbook, http://www.epa.gov/oppt/coi/ , accessed May 12, 2009)

CDC risk level	cost in 1996 US $	cost in 2009 US $	cost in 2009 €
I	122.7	209.4	149.8
II	241.0	411.3	294.4
III	2632.0	4492.2	3215.1
IV	5200.0	8875.3	6351.9

The results are based on the biannual research in schools in Moretusburg and do not cover all children living in the area, only the ones who go to school in Moretusburg. Further evidence of the under-representation of cases comes from the fact that some of the studies from the PIH do not mention the total student population. In most cases, where the sample size and the total student population size are known, we used extrapolation to find the total cost for the whole student population. Based on the costs related to the different risk classes, the total cost for dealing with lead in blood in Moretusburg since 1978 comes to 11 753 334 € [74].

72 http://www.economist.com/world/americas/displaystory.cfm?story_id=13707679
73 http://www.dailyprincetonian.com/2002/10/09/5646/
74 For details of the calculation refer to Annex 1

5.1.4 Loss of capabilities from gardening

Another historical liability of UPMR is based on the fact that from the early 1970s, the local government of Hoboken began advising people not to grow vegetables and fruits themselves, because of the pollution coming from UPMR. The first such notice was given in April 1973[75] and people had to switch to buying these items instead (although not everyone followed this advice). The ecological debt calculated here is an estimate of the total loss of capabilities for the people of Hoboken who were advised not to grow edible products in their gardens as a direct consequence of pollution from UPMR. Even if home-grown vegetables did not go to market before consumption, they have an economic value. It should be noted that not all people have followed the health advice and some still grow vegetables. However, the ecological damage through emissions from UPMR is there and remains in all but the decontaminated soils just around the factory.

According to figures from the city of Antwerp, Hoboken has 14 626 households with 33 468 inhabitants[76]. The number of households and inhabitants has not changed significantly over the last four decades. According to official figures for Hoboken from 2001, 63.9% of all 13 653 residences have a garden[77]. In 1991, only 57% of 17 081 Hoboken residences had a garden. We do not know the exact number of gardens and residences for other years, so we take the cautious average of 60% and 15 000 residences or 9000 gardens. This is slightly higher than the figures of 7832 gardens in 1991 and 8352 in 2001, as mentioned in the same study from the city of Antwerp. However, they explain that these figures are certainly an underestimation because they are based on respondents only and they acknowledge that a certain number did not respond.

A large-scale study done by several institutes on green waste production in 2007 showed that 26% of people with gardens in Flanders also kept vegetable gardens (M.A.S. et al., 2007). This reduces the estimate of the number of private vegetable gardens in Hoboken to around 2340. This estimate of vegetable gardens does not include commonly managed vegetable gardens, which make up a separate land use category outside of private vegetable gardens. A study ordered by the Flemish department of agriculture and fisheries, executed by the University of Ghent, has shown that they are very popular in the area (Allaert et al., 2007). Half of all commonly managed vegetable gardens in the whole of Flanders and Brussels together are in the province of Antwerp, a province which covers only 21% of the surface area of Flanders. In fact, the study states that most of these commonly managed vegetable gardens in the province of Antwerp are within the city of Antwerp itself. Hoboken is a district of the city of Antwerp, the one with the most green space. The study calculated in detail that in Hoboken there are 24 500 m² of commonly managed vegetable gardens and goes on to mention that there is a demand for increasing this size to 46 100 m². This gives us very good reason to believe that the 24 500 m² existing commonly managed vegetable gardens are used intensively.

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75 Letter from the Ministry of Health to the community of Hoboken, 18 June 1973
76 City of Antwerp (www.antwerpen.be)
77 Based on Stad Antwerpen (2009)

According to Jan Vannoppen, the director of the Society for Ecological Living and Gardening (VELT), an average small vegetable garden of 40 m² produces vegetables worth 920 € per year in Belgium. The large-scale research on green waste production showed that 187.4 m² was the average size of a vegetable garden (M.A.S. et al., 2007). Because Hoboken is an urbanised area with below-average garden size it might be more realistic to extrapolate from the average small vegetable garden of 40 m² suggested by VELT than the average size as calculated for the whole of Flanders. The study from the city of Antwerp showed that in 2001, 56.2% of gardens in Hoboken were bigger than 50m² but that is the total garden size. However, the high demand for more commonly managed vegetable gardens suggests that when people don't find the common space for cultivation they will use their own garden at maximum capacity. Again, in the case of lack of exact data, we use the more cautious estimate of 40 m² average vegetable garden size. VELT also calculated that the cost of maintaining the same 40m² garden is around 182 € per year for tools and seeds. The net profit would therefore be 738 € in the first year and higher in later years, because new tools are not needed every year. But again, we stay with the cautious figure of 738 € profit per year.

To check the figure given by VELT it is useful to look into some other figures. According to the National Institute for Statistics (NIS), average spending on fresh fruit and fresh vegetables is around 500 € per year (not including spices). The difference with the figure of 920 € comes from the fact that the value of home grown vegetables is usually higher because most of them are organically grown and also because people with vegetable gardens usually sell or give some of their crops to friends and family without gardens. Therefore, the figures from the NIS rather confirm that the net profit of 738 € per year for a small 40m² garden is anything but exaggerated. Using these figures, in a single year, the 2340 private vegetables gardens of Hoboken alone could produce 1 726 920€ net profit from vegetables and fruits. The total value of the commonly managed vegetable gardens (at the same rate of 738 € for every 40 m²) comes to 452 025€. The total for one year is 2 178 945€. The local government of Hoboken advised people not to grow vegetables or any food from the end of April 1973 up until 1999. For those 26 years, the total loss of capabilities in Hoboken comes to 56.6 million €[78].

From 1999 the municipality made a distinction between Moretusburg and the rest of Hoboken. For those soils in Moretusburg which have not yet been replaced it is still advised not to grow anything to be eaten. From 1999 to 2009 the population of Moretusburg was around 3000,or a tenth of the population of Hoboken. When we add this up to the debt for the whole of Hoboken up to 1999 we reach 58.8 million €[79]**.** For the other part of Hoboken, certain vegetables are allowed and others not. It is not pertinent here to try to calculate the debt of not being able to grow only a few vegetables but it is important to mention that the real figure is most likely higher than the one we calculate. In fact, the debt should be much higher when considering what UMICORE has been able to do with

78 (2.178.945)*26 = 56 652 570
79 2 178 945 + 56 652 570 = 58 831 515

money it should have paid in compensation in the same period. From 1978 to 2005, spending on fresh vegetables for households increased by 91%, but in the same period the income from capital increased by 237%[80].

More evidence of the underestimation of our calculation comes from the fact that even in neighbouring communes like Kruibeke and Hemiksem, UMICORE's own research from 1996 showed that cultivating vegetables in these communities was dangerous for the health of children due to increased levels of cadmium (Cornelis, 1996). The internal research was labelled confidential, but VODO was able to obtain copies. The report goes on to claim that "the concentrations of cadmium in the soil cause intolerable concentrations in beef. The lead concentration in the soil locally is too high to use groundwater untreated". In fact, the whole of Hoboken had been advised not to use groundwater since 1973. The authorities' ban on vegetable cultivation implies more than economic losses in view of the stress placed on families as they debated threats to their health and the prohibition of an activity they enjoyed. These examples all serve to illustrate that the real, total ecological debt is actually much greater when we look beyond the few aspects that we have calculated in detail. Based on the best available data and using the most cautious options and extrapolations, the total cost from loss of gardening capabilities from 1973 until today comes to a minimum of 58.8 million €.

6. Conclusion and recommendations

In this paper we have tried to calculate the ecological debt for a single production unit. We have selected a large company where a large body of data on their pollution and externalities already existed. We identified a number of environmental damages that together form part of the ecological debt. Our list is neither exhaustive nor perfect, but the calculations of the external economic costs associated with UPMR production are based on the best available scientific references. We can make a distinction between the part of the ecological debt that has already been compensated by UMICORE, the part which needs compensation at present and the part that needs future research to determine the exact need for compensations. For this last part we have only made an estimation, based on the best available data at the moment, of what the scale of the debt would be like if these official data for Hoboken are confirmed as linked to UMICORE.

The first part mainly consists of the 77 million euro UMICORE is spending on replacing the top soil and cleaning the streets and houses just around its production units in both Hoboken and Olen. This is the ecological debt for Hoboken and Olen which has already been paid back. One could add the payments they make to people who find holes in their PVC windows or cars and even the secret payments to farmers who find their cattle dead.

The second part consists of the costs associated with the diagnosis and treatments for children in Moretusburg (the Hoboken neighbourhood closest to the factory), which comes to almost 12 million **€** and the loss of capabilities due to the official health advice not to

80 Statistics Belgium – Federal department of Economy (www.statbel.fgov.be)

grow anything edible in the gardens of Hoboken, clearly related to pollution from UPMR, which comes at around 59 million **€**. Although the former figure is rather detailed and based on actual costs, the latter is based on an estimation of the cost of lost opportunities and needs to be seen within a certain range.

The third part of the ecological debt calculation that we made is the possible ecological debt, which still needs further scientific research. Based on actual costs per cancer patient and on the best estimate of the number of more than normal cancer patients we arrived at a figure of roughly 35 million €. If the link with cancer ever becomes confirmed by further research, we have also made a hypothetical debt calculation for the costs associated with the number of cancer patients who died. Using existing examples in a comparable context on the value of human life, we arrive at a rough estimate of 206 million €.

In order to put these latest potential ecological debt figures into their proper perspective, we have referred to the example of climate change, where similar indications have provoked further research and where actions are being taken before the 100% scientific guarantee has been given. We have also clearly pointed out that this result only gives us an idea of the scale of the problem, without pretending to be precise, nor complete. What matters more is the methodology we developed to reach this figure and its implications for action.

As we have shown in this paper, science confirmed decades ago that the effects of human exposure to a certain level of cadmium, arsenic, dioxin and lead are causing cancers and other health damages. A wide range of institutions and professional consultants have calculated in great detail how much the people around the factory in Hoboken have been exposed to levels of these toxic metals through thousands of measurements in air, water and soil. The results have consistently shown levels of toxic chemicals often dozens of times above the normal health standards. After decades of studies that prove that the factory is the source of this pollution, the company no longer denies this link. However, they do deny that there is a link between their pollution and the high incidence of cancer in the area. We do know from a detailed, but unpublished and unconfirmed, study based on patients' records that there is a clear positive correlation between cancers and proximity to the factory (Baekelandt, 1998). Unfortunately the government or academic community was not ready to build upon their research to do the necessary standardisations. However, we see the same correlation between distance to the factory and lead blood levels from an official 32 year ongoing half-yearly analysis of lead in blood of toddlers who go to school in Moretusburg.

The clearest indication comes from the official cancer registry for Belgium: it clearly shows a remarkably higher incidence of cancers in Hoboken compared with neighbouring municipalities, Flanders or the heavily polluted city of Antwerp. There are even strong indications that the especially higher incidence of lung cancer is caused by UMICORE as their own documents state that the exposure to certain chemical would rather lead to lung cancer then other cancers. All this empirical data only confirm that what international literature has already agreed upon, also could count for Hoboken. It seems that the only thing we do not know at present is the exact number of cancers the pollution from the factory has caused, but we can make a good estimate, based on the best available data. However, cancer is only part of the story. Many other diseases and loss of capabilities have a proven direct link with pollution from the factory. We have only dwelled upon a few of them, where no further scientific research is necessary because the link is already clear. The recognition of the important scale of the problem should lead to the implementation of a large-scale study to the exact extent of the health damage and to identify the victims.

As with the problem of climate change, we should not wait until the precise extent of the damage or the exact percentage of human involvement becomes clear before we take some urgently needed action. Large polluting industries carry a large environmental liability. The people of Hoboken are now paying the external costs of production in the UMICORE factory. It is encouraging that the company has made great efforts to eliminate excessive emissions, lowering the source of the problem substantially. It is also encouraging that the company has already started to pay back a part of its ecological debt. However, victims of UMPR's past excesses have a right to claim compensation for the often drastic damages and losses of capabilities they suffered. UMICORE does not stand alone in this kind of production and implicit consequences for the local environment. We have to recognise that this way of production in general is not sustainable and a drastic change is needed. Business and industry should stop manufacturing uncertainty on the external costs they create. Companies have to do everything they can to stop provoking further external costs and at the same time, they should internalise the external costs they have already accrued.

Finally, this study should not be seen as a critique of UMPR's efforts so far to address its environmental legacy. It should be viewed instead as a source of opportunity for UMPR to become one of the first companies in the world to fully acknowledge its past, present and future responsibilities for environmental and social matters. UMPR now has the chance to take a true leadership role by accepting the notion of ecological debt and mainstreaming both ecological modernisation and corporate accountability within the chemical industry.

6.1 Recommendations:

to UMICORE and the Chemical Industry in general:

- Recognize that a history of production can leave an ecological debt behind.

- Initiate the creation of a Fund that can compensate victims of Lead, Arsenic and Cadmium related diseases by mobilizing the chemical industries in Flanders that cause these emissions. A template might be the fund of the Asbestos industry that already compensates asbestos victims.

- Continue with efforts to reduce the emissions of toxic metals until the levels are not only below agreed world norms (political negotiations) but as low as real health norms require. Continued research and innovation is necessary, but if studies already show for example that children's sexual development is hampered even at much lower levels than current norms, such external damages cannot be tolerated.

- Continue working for a level playing field at the international level, lobbying for this in international institutions. Leysen’s presence in The World Business Council on Sustainable Development provides a good opportunity to not only to press for better environmental laws globally, but also to lead by example.

to the Government of Flanders:

- Initiate a large, multidisciplinary, specialised epidemiological study of the health effects of UPMR on *all* inhabitants of Hoboken, and other sites where the chemical industry is active.

- Work on stronger legislation to keep norms for emissions in line with the latest scientific knowledge on the health impacts of these emissions, without prioritising economic arguments. Protection of the life and health of citizens is non-negotiable.

- Ensure corporate accountability instead of counting on corporate responsibility. Regulatory instruments should ensure obligation rather than only voluntary responsibility, including penalties for non-compliance

- Participate in the active diffusion of the concept of ecological debt.

7. ANNEX 1

This is one of the four tables used to calculate the costs for treating children with increased health risks due to increased lead in blood. The other three tables are nursery school (fall), lower secondary (spring) and lower secondary (fall). All are based on the half-yearly measurements from the official PIH. The calculations are explained below in **Table 5**.

Table 5: Costs for Treating Children with Increased Health Risks Due To Increased Lead in Blood

	CDC risk level											
nursery school (spring)	I	II	III		total sample size	average leadlevel (µg/dl)	total cost (see table 3) in euro	average cost per patient in euro	average cost per patient/average leadlevel	total/sample size	Multiplication factor	extrapolation to total cost
1978					83	33,5	166830	2010	60		1,00	166830
1979					43	36,3	93654	2178	60		1,00	93654
1980					44	34	89760	2040	60		1,00	89760
1981					28	25,4	42672	1524	60		1,00	42672
1982					31	33,7	62682	2022	60		1,00	62682
1983					38	34	77520	2040	60		1,00	77520
1984					41	27,3	67158	1638	60	93	2,27	152334
1985					48	29,8	85824	1788	60		1,00	85824
1986					35	26,4	55440	1584	60		1,00	55440
1987					33	23,5	46530	1410	60		1,00	46530
1988					28	23,5	39480	1410	60	92	3,29	129720
1989					33*	25,1*	49698	1506	60		1,00	49698
1990					38	26,7	60876	1602	60	77	2,03	123354
1991					51	21,2	64872	1272	60	82	1,61	104304
1992	2	19	25	0	46	19,9	86269	1875	94	75	1,63	140657
1993	0	16	40	0	56	23,8	133313	2381	100	73	1,30	173782
1994	2	15	18	0	35	20,5	62587	1788	87	73	2,09	130538
1995	3	20	14	0	37	19,2	51348	1388	72	62	1,68	86043
1996	0	11	21	0	32	24,4	70754	2211	91	64	2,00	141509
1997	0	9	12	0	21	20,5	41230	1963	96	34	1,62	66754
1998	1	13	8	0	22	19,3	29697	1350	70	37	1,68	49946
1999	2	17	9	0	28	17,6	34240	1223	69	41	1,46	50137
2000	1	16	4	0	21	15,1	17720	844	56	36	1,71	30378
2001	6	21	2	0	29	13	13511	466	36	50	1,72	23295
2002	1	24	3	0	28	15,7	16860	602	38	50	1,79	30108
2003	11	26	3	0	40	11,7	18947	474	40	65	1,63	30790
2004	6	27	1	0	34	12	12063	355	30	59	1,74	20932
2005	8	20	7	0	35	13,9	29592	845	61	59	1,69	49883
2006	22	20	1	0	43	9,7	12399	288	30	57	1,33	16436
2007	16	5	0	0	21	7,9	3869	184	23	47	2,24	8660
2008	15	8	0	0	23	9	4603	200	22	47	2,04	9405
	96	287	168	0			1641999		60			2339573
*: average compared to previous and next year												

The first step was to make an overview of all the cases classified in CDC risk level classes by the PIH since 1978. However, from 1978 to 1991 the PIH research used an older CDC classification in use in those days. Conversion was not possible, but a solution to this problem was found.

Let us start with the easier part from 1992 to 2008. Based on the number of cases in each CDC class it was possible, by using Table 1 adapted from the cost of illness handbook, to calculate the total costs of treating these patients. In the spring of 2006 for example, the total cost for the nursery students comes to 12399 euro, based on 43 cases with an average lead in blood value of 9,7 µg/dl. The total student population that spring was 57. By multiplying the 57/43 rate with the total cost, we get a reasonable estimate of the total cost for all nursery students in the spring of 2006: 16436 euro.

The next step was to find a solution for the period before 1992. The 6-monthly reports from the PIH did mention the average lead level in blood from 1978 up to 2008. By dividing the total cost with the sample size we could calculate the average cost per patient. We then divided this result by the average lead level for that year. The idea is that the higher the average lead level, the higher the total cost so there must be some rate. This rate should therefore give us an idea of the cost in the years before 1992, from which we have the average lead level. It turned out that when calculating this rate for the years 1992 to 2008, the rate was 60 on average both for all the spring results from 1992 to 2008 as for the fall results from the same period. We then used this rate to calculate the cost for the years before 1992. A careful observer will notice that this is in fact most likely an underestimation because the table clearly shows that rate actually increased with higher average blood levels, never being under 60 in the years 1992 to 1999. Therefore, applying this rate of 60 for the previous years, where lead levels were even higher, is almost certainly an underestimation of the real costs.

In addition to these calculated costs, it turned out that doing the 6 monthly research itself has cost 387 500 euro (12 500 euro for every year). These costs, together with the 50 000 euro from a one-time-only bigger research on the issue in 1984 have already been included in the total figure.

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Glossary Table of Contents

1 Access and Use Rights

Definition and Purpose

Among the institutional arrangements regulating human-nature relationships, rights and obligations to natural resources, access and use rights in particular play a crucial role (Bromley, 1991; Ostrom & Schlager, 1996; Le Roy, 1996; Van Griethuysen, 2006). Such rights or rules exist in all societies, whether they are tribal, feudal, capitalist or socialist. They basically respond to the universal question of social reproduction and are obviously culture-specific and exhibit considerable diversity and variation. On the one hand, they determine the types of interactions that members of society may or may not have with the natural environment. On the other hand, they are essential factors of power and social status because of the control they confer over natural resources, and as such constitute strategic elements in the dynamics of wealth creation and reinforcement of power. Bromley (1991) uses the term *institutional regime* to refer to the set of institutional arrangements relating to a resource or a set of natural resources.

A typology of rights concerning natural resources

The typology most commonly referred to in the literature is the one proposed by Ostrom and Schlager (1996), which defines a cumulative gradation between rights:

- *Access right:* right to access a resource for any use not involving its consumption; Peluso and Ribot (2003) have defined access as the *ability* (not necessarily the *right*) to derive benefits from things;
- *Withdrawal right:* right to withdraw some elements from the resource;
- *Management right:* right to determine how, when and where a withdrawal may take place;
- *Exclusion right:* right to determine who has rights of access, withdrawal and management, and who is excluded from these rights;
- *Transfer right:* right to transfer a resource or a right over a resource to a third party.

These rights have a cumulative nature (Ostrom & Schlager 1996). For example, management rights usually include access and withdrawal rights. Generally, when agents have more rights, they have greater control over the relevant resources and have greater influence over the evolution of the institutional framework. On the other hand, those who must respect the instituted rights have less power to influence the institutional framework according to just how excluded they are from these various rights.

A typology of institutional regimes

Following Bromley (1991), four types of regimes are usually distinguished, depending on the competent authority responsible for the definition and application of resource use rights:

1. *Open access:* this defines a “non-regime” case as it refers to the absence of institutional arrangements regarding the natural environment: no right or duty is defined

regarding resources and there is no recognised authority to impose sanctions. This is for instance the case of access to fisheries in the high seas in the absence of any regulation. The effects of this type of non-regime are what Hardin erroneously referred to as *The Tragedy of the Commons;*

2. *State regime:* the state has decisional authority regarding resource rights; it can thus determine who will benefit from access and withdrawal rights, who has management authority regarding resources, and it can define the methods of exclusion and transfer of the resources. This regime can also include cases where resource management is delegated to other social actors such as NGOs, private actors or local communities;

3. *Common regime:* the decisional authority for resource rights is jointly assumed by members of a community according to the model of social organization defined by that community (for instance, use of water from a river in a village, through communally owned irrigation infrastructure by communally determined allocation rules);

4. *Private property regime:* private property owners (individuals or organizations) hold property titles over resources, which assures them all rights over resources (access, withdrawal, management, exclusion and transfer). The exercise of these rights remains limited by the measures that ensure the maintenance of the institutional framework in force.

The four regimes presented above represent theoretical categories that can be used to describe characteristics of actual cases, which usually correspond to a combination of regime types. For example, a state – which international law recognises as sovereign over resources situated on its national territory – can give access, withdrawal and management rights to non-state actors (private corporations, conservation agencies, local communities). Also, private property regimes require an authority, generally the state, that is able to impose respect for property rights by non-owners. Thus, each level of rights can correspond to sub-regimes, which in turn can correspond to specific institutional arrangements.

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2. Activist Knowledge

Definition

Activist knowledge refers to all kinds of experience-based knowledge originating from activists in a broad sense, including community groups, NGOs, women's groups, trade unions, grassroots associations and so on. It is generally opposed to "official" sources of knowledge stemming from academic, private sector or governmental research organizations. It is based on the fact that activists tend to develop their own independent knowledge about situations they are concerned with, a process which may result in radically different conclusions than "official" knowledge. As explained by the post-normal science perspective of Funtowicz and Ravetz (1994), in many current socio-environmental problems of importance and urgency, where values are in dispute and uncertainties are high, "certified" experts are frequently challenged by citizens' groups. Strand and Cañellas-Boltà (2006), point out that the unprivileged may actually perceive aspects of a given socio-environmental phenomenon more clearly than the well-off as they are more directly impacted by it. The Love Canal case is an example of this.

An illustration: The Love Canal

The Love Canal is a working-class neighbourhood in the suburb of Niagara Falls (New York State). During the 1970s, the neighbourhood suffered from unusually high rates of sicknesses (miscarriages, birth defects, cancers). Lois Gibbs, one of its residents, started in 1978 to investigate the incidence of diseases in her community and the possible relationship to the 20 000 tonnes of toxic waste that had been disposed of in the canal by the Hooker Chemical Company during the previous twenty years. Her own observations

Figure 9 : Image from http://www.damninteresting.com/the-tragedy-of-the-love-canal

led her to put forward a causal relationship between health problems and the toxic waste dump. The state authorities – together with Occidental Petroleum (which had bought Hooker Chemical) – refused to acknowledge the connection. Even university experts disregarded Gibbs' conclusions.

She and her group (mostly composed of women) struggled for more than two years for relocation. "It was not until women had vandalized a construction site, burned an effigy of the mayor and been arrested in a blockade that government officials began to take notice" (Mellor, 1997: 21). Finally, in 1980, President Carter delivered an Emergency Declaration which moved 900 families from the hazardous area. Gibbs's experience at Love Canal led to her setting up in 1981 a national network, the "Center for Health, Environment and Justice", an organisation that has assisted more than 8000 grassroots groups with organisational, technical and general information nationwide. This environmental justice movement can be seen as an example of the "Environmentalism of the Poor". It is also an emblematic movement of ecofeminism, as women – due to the traditional sexual division of work keeping them outside of 'official knowledge' – are often key developers of activist knowledge.

A note on the status of activist knowledge

Although activist knowledge continues to be regarded with suspicion by many scientists, the use of civil society investigations and publications in political ecology, ecological economics and gender studies is hardly new (Rocheleau *et al.*, 1996; Paulson *et al.*, 2003). Anthropologist Arturo Escobar (2008) is one of the most well-known students of "local activist knowledge". Some academic programs invite knowledgeable activists as speakers or visiting fellows, for instance James Scott's agrarian program at Yale University, and David Harvey's geography program at City University of New York. Promotion of activist knowledge represents one of the main objectives of CEECEC. Activist knowledge can indeed be crucial for social sciences, yet it is not mechanically true that research growing out of a community of poor or oppressed people by itself will bring deeper insights than a study carried out by, say, government.

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3. Affluence and Environmental Impact

Definition and Measurement

Affluence relates to the average consumption of each person in the population. A common proxy for measuring consumption is through GDP per capita. While GDP per capita measures production, it is often assumed that consumption increases when production increases. GDP per capita has been growing steadily over the last few centuries and according to the formula *I=PAT*, called the *impact equation*, is driving up human impacts on the environment.

The equation *I=PAT* was proposed and developed by Ehrlich, Holdren and Commoner in the early 1970s (Ehrlich and Holdren 1971, Commoner 1972, Holdren and Ehrlich 1974). It recognizes that the impact of a human population on the environment can be thought of as the product of the population's size (P), its affluence (A), and the environmental damage inflicted by the technologies used to supply each unit of consumption (T). Sometimes, because of the difficulty in estimating A and T, per capita energy use is employed as a surrogate for their product. Some equate T with impact per unit of economic activity (Dietz and Rosa 1994), and for others T is a rather fuzzy category covering all sources of variation apart from population and affluence (Fischer–Kowalski and Amann 2001).

Alternatives to I=PAT

While the I=PAT equation quickly became established as the norm and has been used and cited by many organisations and individual people ever since, recently, various alternative formulations of the equation have been proposed:

Dietz and Rosa (1994) gave a stochastic (probabilistic) reformulation of the impact equation (STIRPAT – Stochastic Impacts by Regression on Population, Affluence and Technology) which they claimed facilitates the application of social research statistical tools to studies on I=PAT. Their formulation is I = aP b A c T d e. They define A and T as per capita economic activity and the impact per unit of economic activity respectively; a, b, c, and d are parameters and e, a residual term.

Schulze (2002) proposed modifying the formula to I=PBAT, which calls attention “to the many behavioural choices that are immediately available to all individuals”. Schulz points out that affluence and technology do not dictate behavioural decisions. He gives the example of a person who is wealthy and only uses the most efficient devices, and whose environmental impact will still depend on whether or not the person is a profligate consumer.

Willey (2000) noted that consumption is influenced by lifestyle and organisation - improved organisation in rich countries could lead to a reduced per capita consumption, but in poor countries better organisation might lead to a huge increase in consumption. So he proposed changing the impact equation to I = PLOT (population, lifestyle, organisation, technology).

Another tool that has been used to observe the impact of affluence on the environment is the **Environmental Kuznets Curve** (EKC). This is used to model the interrelation between affluence (measured in per capita GDP) and environmental impacts (in terms of physical amounts per capita), while keeping population numbers constant. Technology understood as including all sources of variation apart from population and affluence, shows up as (random) deviation from the 3rd order polynomial function. The environmental Kuznets curve (EKC) hypothesis states (arousing much controversy) that the environment is initially exploited to a great extent in order to create economic growth but when an economy becomes developed enough, the environment becomes more valued, and technical progress makes it possible to create wealth with less environmental stress. Therefore as countries become more wealthy environmental stress will begin to decline at a certain income level. This might be true for some pollutants (such as sulphur dioxide) but it is not true for carbon dioxide emissions, domestic waste, and other variables.

Recent Findings

Fischer–Kowalski and Amann (2001) studied the complexity of the Affluence – Impact relationship, referring to studies on Material Flow Analysis (MFA). At the centre of such studies was the belief that impact need not necessarily grow proportionately to affluence. Therefore, it should be possible to achieve some measure of delinking (or decoupling) of material input and output (impact), and economic activity measured by GDP (a measure of affluence). Delinking came to be subdivided into two categories – relative delinking and absolute delinking. If there was a reduction in environmental impact per unit of GDP, it is termed relative delinking. If on the other hand economic growth continues but the absolute amount of materials used declined, it is termed absolute delinking.

Fischer–Kowalski and Amann argue that the full understanding of the impact equation must take into account the variety of socio-economic systems in different countries and the effects of globalization and trade: “All socio-economic systems for which the I=PAT question may be posed are embedded not only in natural environments but also in networks of social systems with which they interact. The very nature of this interaction seems to be of crucial importance for their environmental (and of course also their economic) performance, and this is even more so in the face of globalization”.

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4. Avoided Deforestation (REDD+)

Programs to Reduce Emissions from Deforestation and Forest Degradation in developing countries

This glossary note refers to the emerging REDD+ arrangements (actions to reduce emissions from deforestation and forest degradation, plus other ways to enhance or otherwise maintain carbon in the terrestrial landscape) of the post-2012 global climate accords. Deforestation and associated land use changes generate on the order of 17-20% of all greenhouse gas (GHG) emissions globally each year, primarily in the form of CO_2 (IPCC, 2007).

Deforestation Hotspots

In some countries such as Brazil and Indonesia, deforestation constitutes the single most important share of national emissions (averaging 54% in Brazil and 44% in Indonesia over the 2000-2005 period according to estimates based on FAO and WRI data). These two countries alone were responsible for an estimated 60.6% of all deforestation in the humid tropics between 2000 and 2005 (Hansen et al., 2008). If deforestation could be substantially reduced in just these two countries it would make an enormous contribution to overall efforts to reduce global emissions. Other countries, such as the Democratic Republic of Congo, also experience serious deforestation contributing to global emissions; but their governance conditions are more precarious (Angelsen, 2009).

The Limitations of Global Climate Accords

The Kyoto Protocol of 1997 signed by parties to the United Nations Framework Convention on Climate Change (UNFCCC) required that only those nations included in its Annex I (high per capita income nations) set targets for emissions reductions. Thus there are no current formal and legally binding limitations set on tropical deforestation even where this constitutes significant shares of national and indeed global emissions. There is no other global mechanism to restrain nations from expanding agricultural and resource extractive frontiers into areas of intact tropical forest.

Despite the failure of the meeting in Copenhagen in December 2009, a post-Kyoto agreement requires adoption of emissions reductions targets by most signatories of the UNFCCC. There are a number of reasons that efforts to reduce deforestation have been addressed as a separate issue within the post-2012 negotiations:

1) Fears on the part of parties engaged in emissions trading that REDD credits would flood the nascent carbon market (see Carbon Trade), undermining the value of Certified Emissions Reductions (CERs) issued by the Clean Development Mechanism (CDM) under the rules of the Kyoto Protocol, and hence undermining CDM related incentives to invest in GHG emissions controls over fossil fuels and associated industrial sources. The overall carbon market could thereby be irreparably weakened as a source of finance for environmental investment. However, REDD would have only a low impact on overall carbon prices provided the emissions reductions commitments assumed by industrial nations are strong enough;

2) Perceptions that additional forest-related emissions reductions would be only temporary in duration, since at some point forests would die off or cease being net absorbers of carbon. Indeed, the possibility of Amazon forests reverting their absorption of CO2 has been backed up by scientific research over many years. The hypothesis is that with global warming, temperature increase above a certain level will result in negative CO_2 balance by forests. (It is currently positive, i.e., there is net photosynthetic sequestration even in forests that are at ecological climax).

3) Leakage of activities such as ranching or crop or tree plantation production. So, you preserve a forest under a REDD scheme and you move to deforest another area. If this occurs internationally it is even more difficult to control, due to the absence of a global authority or agreement to oversee such displacement. By some accounts 80% of leakage would occur beyond the borders of the country from where deforestation is displaced.

4) Concerns of voluntary investors outside compliance based (European Emissions Trading Scheme and CDM) markets who favour devoting resources to reducing deforestation for ecological or cultural co-benefits (such as biodiversity conservation, environmental services such as water resource provision or pollination, or preservation of sacred groves important to indigenous groups, etc....) or social equity effects that are difficult to value.

Other Concerns

Equity concerns have been central to the discussion of REDD, and is one of the reasons that those who support a broader scope (ie., REDD+ and even REDD++, which would include agricultural activity) have been able to obtain greater support in the most recent climate discussions. The fact that much deforestation, particularly in Latin America, is due to agribusiness expansion into the Amazon basin rather than smallholder's shifting agricultural activities, has led to accusations that REDD might just be another way to bail out the large farmer. But the equity matters in REDD are very similar if not superimposed on an already fertile discussion within the realm of Payments for Environmental Services.

A nation state approach to REDD would conceivably permit intra-national leakage to be internalized by the agreement. After all, nation states are the parties to the agreement and must demonstrate progress toward targets, with adequate intelligence regarding the rate of change in land use against adopted baselines (levels of deforestation against which future land use change is compared based on historical land use change or future anticipated demands for forestland conversion). But national capacity to adjust the rate of land use change to meet planned targets is poor at best, not least due to the fact that much deforestation is due to exogenous pressures (Combes et al., 2008) such as incentives for agrofuels expansion in pasture areas far from the forest, but which motivate ranchers to move their cattle out to the frontier.

While good estimates abound of the potential cost of private compensation necessary to offset greenhouse gas emissions generated from forest clearing (opportunity costs + transaction costs), estimates of implementation costs for REDD on the part of national authorities are not readily available (in the Amazon, for example, costs of such additional governance effort is estimated on the order of $300 million/yr; Nepstad et al., 2007). Such costs are at present embedded in monitoring and repressive actions for enforcing existing forest codes, and as budgetary increments on their own are unlikely to be sufficient, meeting them will require compensatory payments and/or other programmatic incentives to motivate landowners to adopt better production practices.

The Way Forward?

Reviews of alternative REDD architectures (e.g., GCP, 2008) suggest that a mixed approach, involving nation state demonstration of progress toward GHG reduction targets combined with voluntary project activities would be most effective in achieving objectives. Alternative carbon accounting architectures, some of which have been described in the literature cited, and in national and institutional submissions to the UNFCCC include:

1) national carbon accounting based on macro land use monitoring, excluding project level activities, to avoid double counting when aggregating reductions;

2) parallel but separate accounting for projects and nation-states, enabling parties to tax carbon credits secured by projects in voluntary markets (thus requiring disclosure of private investments in these markets, but allowing that financing flows bypass the national authority), deducting project reductions from overall national reductions to avoid double counting;

3) nation-state accounts validating all project and non-project emissions reductions, requiring the creation of a national registry of project activities and accomplishments, and

infrastructure for monitoring and validation. In this case control over financing flows could be parallel but accounting would be centralized.

The complexities of these alternatives and their imaginable variants, have led to a state of indecision regarding initiation of activities along these lines, though the desirability of actions to reduce deforestation was endorsed at COP15 in Copenhagen in December 2009 (SBSTA, 2009). This process is clearly unfolding.

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5. Bulk Commodities and Preciosities

Concept Origins

The increased use of energy and materials in the world economy means that many remote areas around the world have become extractive frontiers from where "bulk commodities" essential to the metabolism of the rich economies (oil, coal, gas, iron ore, bauxite, copper, timber, hydroelectricity) or "preciosities" (diamonds, gold, mahogany, aquaculture shrimp) are supplied. The distinction in world systems theory between trade in "preciosities" *versus* trade in "bulk commodities" has been proposed by Wallerstein (1989).

Bulk commodities such as oil or copper are products that are relatively inexpensive per kilogram and that usually have serious environmental impacts during the extraction process. Preciosities on the other hand, have a high chrematistic value per kilogram, and are non-essential for the metabolism of the importing countries or regions, but they may also have large-scale environmental impacts on ecosystems and human livelihoods, as with gold mining (which implies an enormous ecological rucksacks for opencast mining) or shrimp farming (a large industry that has grown in the tropics at the expense of mangroves and human livelihoods) or ivory extraction that has killed so many elephants.

Early bulk commodities (such as guano, wood, cotton, and sugar) played a substantial role in the metabolism of importing countries in the 19th century. In contrast, the local ecological impacts of precious exports of ivory or tiger body parts are great compared to the irrelevance of such trade for the importing countries' social metabolism. In the 19th and early 20th centuries, the countries of today's European Union depended on their own coal and biomass as energy sources. Now they have become large net importers of oil and gas, and may well resort to large-scale agrofuels imports from Brazil, Argentina, Peru, Colombia, Canada. Taking all materials together (energy carriers, minerals, metals, biomass), the European Union (15 countries) imported about four times more than it exported in the year 2000. Meanwhile, Latin America exported six times more than it imported. This almost certainly means heavy environmental impacts in the extractive regions, along with local resistance from communities whose livelihoods are threatened.

Difficulties and refinement

World systems theory has traced a contested distinction between essential "bulk commodities" and "preciosities". Anthropologists, for instance, object to the view that exchanges of preciosities, as distinct from trade in bulk, are not essential to the constitution of world systems. They argue that pure "prestige goods", far from being superfluous, are on the contrary crucial in a social sense (as dowry for instance, or for the accumulation of political power in clientelistic systems).

At the beginning of European colonization, all imported goods were preciosities, for instance silver and pepper. The means of transport at the time made bulky trade impossible. Interestingly, some preciosities have changed status and become staples. Sugar for instance (as Sidney Mintz showed) was a luxury good. But later, as a result of the slave plantations, it became a source of cheap calories, that is, a bulk commodity playing an important role in the bio-metabolism (endosomatic energy) of the English working class. However, some preciosities remain true preciosities, such as diamonds and gold. They are not essential inputs to production processes and they have not become cheap wage-goods. They are genuine luxury goods – even though in the extractive region they destroy human health and the environment, as was the case with the use of mercury in silver mining in Potosi (today's Bolivia) in colonial times.

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6. Carbon Trade

Basic rationale

Launched through the Kyoto protocol in 1997, carbon trading is an approach to controlling pollution by providing economic incentives for reduced emissions of atmospheric carbon dioxide. Carbon trading takes two main forms: "cap and trade" and "offsetting". With cap and trade schemes, governments or intergovernmental bodies set an overall legal limit on emissions in a certain time period (a "cap") and then grant industries a certain number of licenses to pollute ("carbon permits" or "emissions allowances"). Companies that do not meet their cap can buy permits from others that have a surplus (hence the "trade"). The cap is supposed to reduce emissions over time. The goal of the system is to help polluters meet "reduction" targets in the cheapest way possible. Often linked with carbon offsetting schemes, or "emissions-saving projects" such as building hydro-electric dams, the 'cap and trade' concept was created to compensate for continued pollution in industrialised countries in the North. While southern movement and some governments ask for repayment of the Ecological Debt (including the "carbon debt"), Northern governments offer at most "cap and trade" schemes, including the CDM and REDD.

Limits and controversies

Carbon trading does not actually reduce emissions, but gives companies greater room to manoeuvre in addressing the emissions problem (hence the name "flexible mechanism"). Companies exceeding their reduction commitments can sell their surpluses to those who have failed to clean up their activities adequately. Companies that want to keep on polluting save money, while in theory companies that are able to reduce beyond legal requirements will seize the chance to make money from selling their spare credits. But this flexibility comes at a cost – what is cheap in the short term is not the same as what is effective in the long term or environmentally and socially just. The number of permits awarded is usually calculated according to existing levels of pollution (say, with a 10 or 20 per cent reduction), which means that those who have polluted most in the past are rewarded with the greatest subsidy. This is usually called "grandfathering". Hence the observation that "this free gift of pollution rights to some of the worst industrial polluters amounts to one of the largest projects for the creation and regressive distribution of property rights in history" (Gilbertson and Reyes, 2009). At world level, this is what happened in Kyoto in 1997: Annex I countries promised (if anything) a slight reduction of emissions compared to 1990, and they got in exchange a right to occupy the carbon sinks and the atmosphere. Moreover, they insisted in not doing internally the promised reductions but they wanted to use in part the CDM.

The UN-administered Clean Development Mechanism (CDM) is the largest carbon offsetting scheme, with almost 1,800 registered projects as of September 2009, and over 2,600 further projects awaiting approval. Based on current prices, the credits produced by approved schemes could generate over US$ 55 billion by 2012. Although offsets are often presented as emissions reductions, they do not reduce emissions at source, but move "reductions" to where it is cheapest to make them, which normally means a shift from Northern to Southern countries. Pollution continues at one location on the assumption that an equivalent emissions saving will happen elsewhere. The carbon "savings" are calculated according to how much less greenhouse gas is presumed to be entering the atmosphere than would have been the case in the absence of the project. But even World Bank officials, accounting firms, financial analysts, brokers and carbon consultants involved in devising these projects often admit privately that it is difficult to count the actual amount of carbon dioxide saved.

The difficulty is this: "Offsets are an imaginary commodity created by deducting what you hope happens from what you guess would have happened" (Welch, 2007). Since carbon offsets replace a requirement to verify emissions reductions in one location with a set of stories about what would have happened in an imagined future elsewhere, the net result may well be an increase in greenhouse gas emissions!

Carbon offset projects have resulted in land grabs and the repression of local communities. Voluntary offsets, which give consumers in the global North a means to make a payment to assuage their guilt about consumption, and companies the chance to present a green face to the public, run into similar problems. Offsets on the voluntary market exist outside UN regulation, but they have sometimes similarly negative consequences on the communities forced to endure them. Gilbertson and Reyes (2009) add that "these personal offsets individualise the response to climate change, distilling the complexities of a systemic problem of how energy is produced and used, and how land is distributed, into a seemingly simple question of authorising a small payment with the click of a computer mouse".

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7. Carrying Capacity

Definition

This is a term used in the field of ecology to indicate the maximum population of a particular species that a given area of habitat can support over a given period of time without destroying or hampering the resource base.

Calculation

The population of any species (including humans) in a territory may increase in different patterns. It may increase exponentially for a while, i.e. in geometric progression from 1, 2, 4, 8, 16 etc..., sometimes referred to as Malthus' law of population growth. Or, more realistically, it may increase according to Verhulst's law (1838), representing a logistic curve. Population is represented in the vertical axis, and time in the horizontal axis whereby maximum population "k" is determined by the carrying capacity of a territory (**Figure 1**).

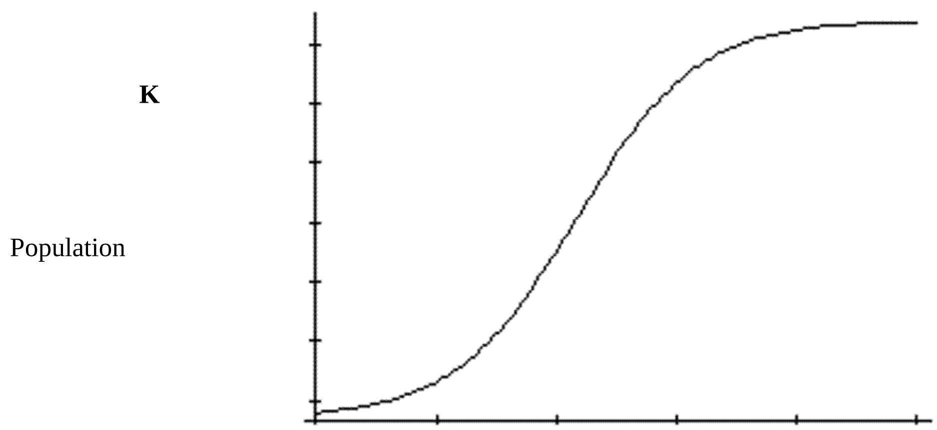

Figure 1: Maximum population according to Verhulst's law

Application

Factors that affect the impacts / pressures of different animal species on a given tract of land and its resources include**:** disease / parasites; starvation; predators; pollution; accidents; old age; hunting; development by humans that results in loss of habitat. Applied to the human species, we can say of a given territory (the Netherlands, for instance) that with its population density of 400 people per km^2 it has exceeded its carrying capacity because there is no way in which this country could sustainably support its population at its current standard of living, directly from the resources in its own territory.

Factors affecting carrying capacity

Carrying capacity can be affected by factors such as technological advances, by trade, and by exosomatic use of energy (fossil fuels). Changes in technology change the carrying capacity of a territory as irrigation and fertilization in agriculture for example, or shorter rotations between crops increase the number of people who can be fed from the resoures of a given territory. Trade among territories increases an area's carrying capacity as elements in short supply locally are imported. In contrast, as availability of fossil fuels decreases with peak oil, the carrying capacity of many territories for humans will decrease.

8. Coasian Bargaining

Origins and Proposition

Coasian bargaining is based on the theorem developed in 1960 by Ronald H. Coase who earned the 1991 Nobel Prize in economics "for his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy". In his article, *The Problem of Social Cost* (1960), he proposes that well-defined property rights can overcome the problems of externalities because many environmental problems arise from poorly defined / lack of property rights. Assuming that property rights are held by the polluter and that transaction costs are zero, the Coase Theorem states that a polluter and a victim can reach a mutually beneficial bargain if the damage from pollution is higher than the polluter's net return from the sale of the good generating the pollution. In this case, a payment from the affected party to the polluter would reduce the pollution.

Thus, the Coase theorem states that the most efficient solution to resolving interdependent uses of the environment, including pollution cases, is a bargaining process among relevant property holders. If the property rights are given to polluters, victims can pay them not to pollute, creating a market-like solution; alternatively, if property rights are given to the victims, the polluters may compensate the victim or buy the right to pollute. Thus the cost of the negotiated outcome is shared between the parties without any external intervention. If transaction costs are minimal, the resulting allocation of resources will be efficient (that is, the resource will be dedicated to its highest valued use) regardless of the initial allocation of property rights. The creation of a market in the Coase solution internalizes externalities, however it does not necessarily bring pollution to a zero-level.

Application

As an example, consider the case of a railroad that passes through wheat fields. The passing trains generate sparks which can burn the wheat. If the legal rights are owned by the farmers, they can require the trains to buy spark catchers to eliminate these fires. However, if that is expensive (that is more than the value of the burned wheat), the train owners may just pay the farmers for the damage done to the crops. If the legal rights are with the train owners, the farmers may just put up with burned crops or (if that is expensive) they can pay the trains to put on spark catchers. In both situations, the socially efficient outcome happens (install spark catchers or burn crops) and the legal rights determine who has to pay.

Another example would be that of a chemicals factory. If the initial legal framework gives people the right to breathe clean air, they could make the factory produce less or nothing at all. However, assume that the factory is willing to pay up to $5 per unit for the right to pollute enough to produce its output. If this amount is considered of greater value than that of clean air, people will take the money and put up with (the economically optimal level of) pollution. On the other hand, if the right to pollute lies with firms, people can bribe firms to pollute less.

The Coasian bargaining approach is an attractive one to some: an economy may be able to achieve Pareto-efficient resource allocation (that is no individuals can be made better off without making someone else worse off) without pervasive government regulation, and society's equity objectives can be separately achieved through the initial allocation of rights to the resource. If victims hold the rights they can market them as they want. Moreover, Coasian bargaining solutions can be particularly interesting for international externalities since there is no supranational environmental protection agency with the necessary authority to impose abatement directives or pollution taxes.

Limits

However, the number of situations for which Coasian bargaining is feasible and desirable is limited. First, Coasian bargaining doesn't eliminate the role of government in assigning initial property rights. This process will be subject to special interest group lobbying and rent seeking. Also, because many environmental externalities are indirect, cumulative, and uncertain and because resorting to the legal system involves inefficiency, the costs of enforcing or striking a Coasian bargain may be large. And, as many externalities are intertemporal, future generations are simply not present to bargain. In this case, a Coasian bargain between private parties for managing externalities cannot take place. In this case government may then become a defender of absent parties.

Anotherlimit to Coasian markets comes from the fact that many environmental externalities, like car emissions or noise in the vicinity of airports, or global effects such as climate change and ozone layer destruction, involve a large number of people. The transaction costs (of aggregating the interests of all the affected parties, hiring lawyers, negotiating an optimal abatement level, and enforcing a market agreement) will then prevent a private bargain even with a clear allocation of rights. Moreover, individuals will be tempted to act as free-riders in negotiations, undermining the negotiations themselves. Individuals would treat the outcome of negotiations as beyond their control and therefore be unwilling to bear any transaction costs (Baumol and Oates 1988). Thus, when externalities take place in future, or when transaction costs are important and when the number of participants is large, Coasian solutions to environmental externalities must be ruled out.

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9. Co-Management and Nature Conservation

Background

Many traditional societies formed – and still form – relatively closed systems in which natural resources are managed through complex interplays of reciprocities and solidarities. Dialogue and discussion among interested parties – what could be referred to as "co-management" – are still practiced in some of these societies. Forms of collective possession and local knowledge are crucial elements in the cohesion and sustainability of traditional systems. The historical emergence of colonial powers and nation states, and their imposed authority over most common lands and natural resources, led to the demise of traditional resource management systems virtually everywhere. Capitalist expansion weakened local systems, including those of customary rights, together with the domination of modern, expert-based, "scientific" practices. Conflicts and mistrust between local communities and the state became widespread. Community-based management was largely substituted by practices imposed through state laws (e.g. land nationalization) or external actors. Following this situation, Borrini-Feyerabend *et al.* (2000) write that "Whether honest dialogue and straightforward confrontation are the best strategy to protect the interests of the less privileged groups can be assessed only within specific contexts".

Some such groups opt for all-out confrontation with little to no space for compromise. This is the choice of some indigenous groups fighting for the basic recognition of their ancestral rights. Others attempt to find a place at the negotiation table with more powerful actors (business, the government) and encounter all sorts of obstacles and difficulties. In some cases, all groups and individuals with interests and concerns about a given territory, area or set of resources understand that co-operation is necessary for effective and efficient natural resource management, and agree to pursue that cooperation in the interest of everyone. This latter attitude may not yet be the most common, but it is spreading. It corresponds to what is referred to as "co-management.

Constitutive elements

According to the leading conservationist Borrini-Feyerabend and her team (2000), co-management of natural resources refers to:

- a pluralist approach to managing resources, incorporating a variety of partners in a variety of roles, to the end goals of sustainable and equitable sharing of resource-related benefits and responsibilities;
- a political and cultural process: seeking social justice and "democracy" in the management of natural resources;
- a process that needs some basic conditions to develop, among which are: (1) full access to information on relevant issues and options, (2) freedom and capacity to organize, (3) freedom to express needs and concerns, (4) a non-discriminatory social environment, (5) the will of partners to negotiate, and (6) confidence in the respect of agreements.
- a complex, often lengthy and sometimes confused process, involving frequent changes, surprises, sometimes contradictory information, and the need to retrace one's own steps;
- the expression of a mature society, which understands that there is no "unique and objective" solution for managing natural resources but, rather, a multiplicity of different options which are compatible with both indigenous knowledge and scientific evidence and capable of meeting the needs of conservation and development.

9.1 Joint Forest Management

Originating in the early 1970s, the related concept of Joint Forest Management (JFM) is the official and popular term in India and elsewhere for partnerships in forest management involving both the state forest departments and local communities. Although schemes vary from state to state, the system works with villagers agreeing to assist in the safeguarding of forest resources through protection from fire, grazing, and illegal harvesting in exchange for non-timber forest products and a share of the revenue from the sale of timber products. It was born in response to the many conflicts over forests, notably the Chipko movement of the 1970s in the Himalayas (Guha, 2009).

The primary objective of JFM is to ensure sustainable use of forests to meet local needs equitably while ensuring environmental sustainability. The central premise is that local women and men who are dependent on forests at the village level have the greatest stake in sustainable forest management. The official ground for JFM was prepared by the Indian National Forest Policy of 1988 which envisaged people's involvement in meeting their basic forest related needs and in managing their local resources. While a valuable initiative, Bina Agarwal has pointed to the "participatory exclusion" of some groups on grounds of gender or caste.

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10. Commodity Chains

Background and definition

The concept of *commodity chains* was introduced by Terence Hopkins and Immanuel Wallerstein in an analysis of trade and capital flows in the global economy prior to 1800, defining it as a "a network of labor and production processes whose end result is a finished commodity" (Hopkins and Wallerstein 1986: 159). Since then different methodologies have been developed to analyze commodity chains:

Value Chain Analysis

A *value chain* describes the activities that take place in a business and relates them to an analysis of the competitive strength of the business. *Value Chain Analysis* is used to identify which activities are best undertaken by a business and which are best provided by others, or outsourced. The *value chain* describes the full range of activities required to bring a product or service from its conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. Production *per se* is only one of a number of value-added links. There are ranges of activities within each link of the chain. Although often depicted as a vertical chain, intra-chain linkages are most often of a two-way nature – for example, specialized design agencies not only influence the nature of the production process and marketing, but are in turn influenced by the constraints in downstream links in the chain (Tallec and Bockl, 2005).

Global Commodity Chain (GCC) Analysis

The primary focus of the Global Commodity Chain (GCC) is analysis of the international trading system and the increasing economic integration of international production and marketing chains. Introduced by Gereffi during the mid-1990s, the GCC concept was developed within an analytic framework of the political economy of development and underdevelopment, originally derived from world systems' theory and dependency theory. It was developed primarily to analyze the impact of globalization on industrial commodity chains.

GCC highlights power relations, which are embedded in value chain analyses. It has shown that many chains are characterized by a dominant party (or sometimes parties) that determine the overall character of the chain, and as lead firms become responsible for upgrading activities within individual links and coordinating interaction between the links. Here there is a distinction between two types of governance: those cases where the coordination is undertaken by buyers ('buyer-driven commodity chains') and, those in which producers play the key role ('producer-driven commodity chains') (Tallec and Bockl, 2005). The relatively capital-intensive manufacture of automobiles, aircraft and electrical machinery can be thought of as examples of producer-driven commodity chains.

“Approche Filière’’

Filière analysis (translated as Commodity Chain Analysis, CCA) was developed by researchers at the Institute ‘National de la Recherche Agronomique (INRA)’ and the ‘Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD)’ (Raikes et al, 2000). It is applied to the analysis of existing marketing chains for

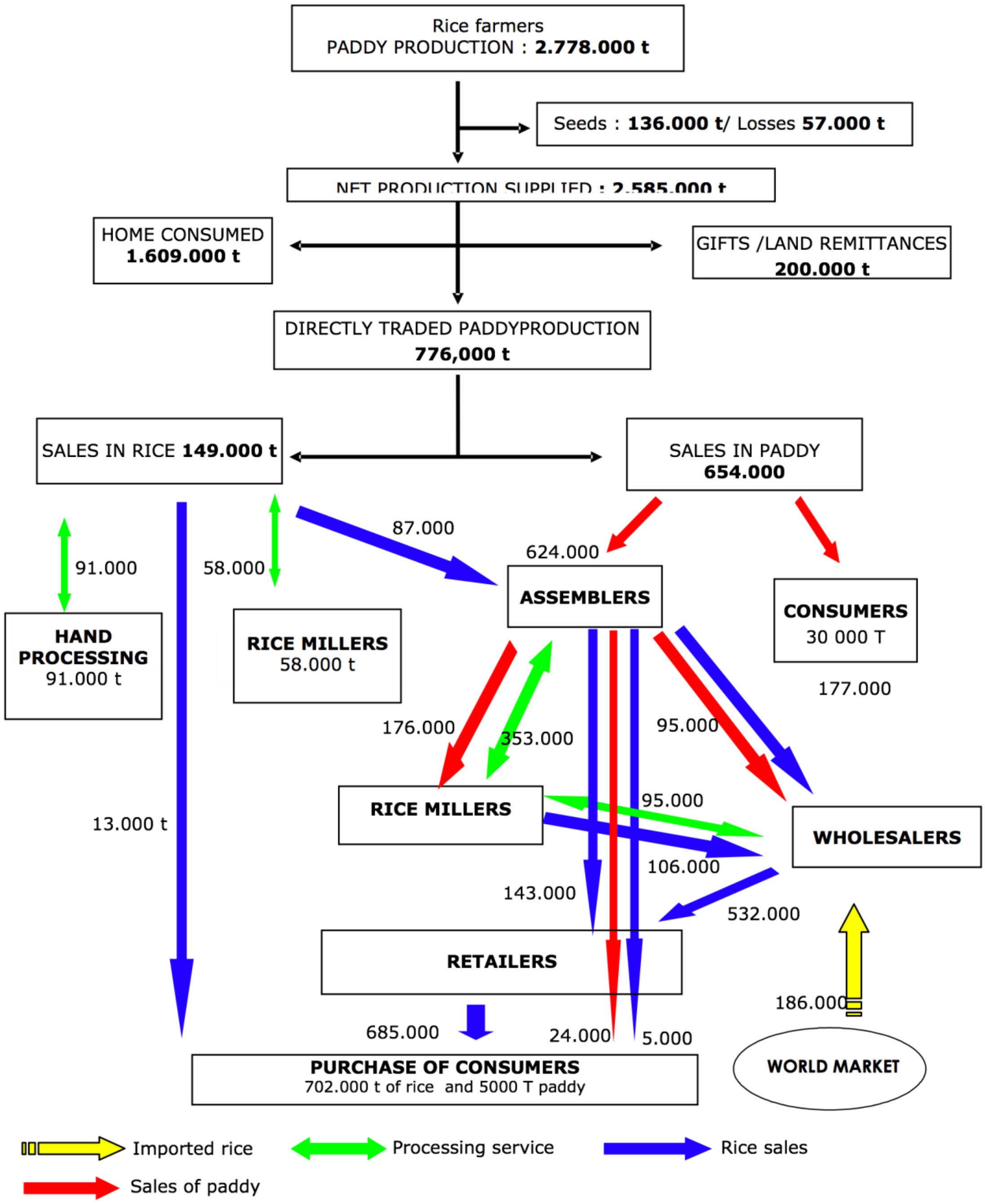

Figure 1: Physical paddy and rice flows (Thailand, 1999).
Based on Etude FAO/UPDR, taken from Tallec and Bockl, 2005

primarily agricultural commodities, assessing how public policies, investments and institutions affect local production systems (Tallec and Bockl, 2005 and Raikes at al, 2000).

Filière analysts have borrowed from different theories and methodologies, including systems analysis, industrial organization, institutional economics (old and new), management science and Marxist economics, as well as various accounting techniques with their roots in neo-classical welfare analysis (Kydd et al., 1996: 23). An *empirical research tradition* has been dominant from the beginning. The main objective of *filière* analysis has been to map out actual commodity flows and to identify agents and activities within a *filière*, which is viewed as a physical flow-chart of commodities and transformations. An example of such a chart is given above (**Figure 1**). The *quantitative tradition* of *filière* analysis has mainly attempted to measure inputs and outputs, prices and value-added along a commodity chain. In addition there exists the *anthropological tradition* within *filière* work. This focuses on markets and power in a ‘real world’ sense. From this point of view, it relates to the GCC approach (Raikes et al., 2000).

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11. Commodity Frontiers

Concept

The search for materials to supply the countries at the centre of the global economy has already extended into the most remote corners of the world. To some extent this is due to resource scarcity as the most accessible deposits have been exhausted. Since we are very near the Hubbert peak in oil extraction (with about half of known reserves already having been extracted) the search for oil has expanded to pristine territories such as the Amazon, and under the world's oceans deep into the sea bed. These "commodity frontiers" are sometimes inhabited by indigenous peoples who have conserved biodiversity. In South America, some of these peoples have not been previously contacted by the outside world.

The "commodity frontiers" for metals are places where the ores are rich, however distant they are from the centres of consumption. Mining companies move into new territories looking for old or new metals or other materials (coal, gas, uranium). At other times, the "commodity frontiers" are situated in new territories suitable for their climate conditions for crops or other materials for the production of inputs for global economic centres. Sugarcane, tea, coffee, and soybean plantations are examples of commodity frontiers, as are tree plantations for rubber or cellulose, or oil palm plantations for biodiesel. "Land grabbing" comes from the expansion of the frontiers of extraction.

11.1 Land Grabbing

Used in earlier times, the notion of land grabbing has had mainly political connotations, referring to the aggressive taking of land, often by military force, for the expansion of territorial holdings or broadening of power. More recently however the term has been applied to the global rush of corporations or countries to buy up or lease farmland abroad in order to secure basic food and / or water supplies or simply for profit speculation. The report by GRAIN, Seized: The 2008 land grab for food and financial security, issued in October of that year documents land grabbing activities, citing the seriousness of threats to local communities across the globe:

"Today's food and financial crises have, in tandem, triggered a new global land grab. On the one hand, "food insecure" governments that rely on imports to feed their people are snatching up vast areas of farmland abroad for their own offshore food production. On the other hand, food corporations and private investors, hungry for profits in the midst of the deepening financial crisis, see investment in foreign farmland as an important new source of revenue. As a result, fertile agricultural land is becoming increasingly privatised and concentrated. If left unchecked, this global land grab could spell the end of small-scale farming, and rural livelihoods, in numerous places around the world."

The CEECEC case study, *Let Them Eat Sugar* highlights land grabbing moves in Kenya's Tana Delta, where the government of Qatar hopes to lease an area of 30 000 ha in exchange for a loan to build a 3.4 billion dollar port in Lamu. The government of Qatar would provide the technical know-how and the technology for the agriculture project and all the produce, probably fruits and vegetables, would be shipped back to Qatar. Another project under development for the area involves the leasing of land at 1$ a hectare to a Canadian company, Bedford Fuels, that plans to plant jatropha for biodiesel in a $300 million project.

Advancing Frontiers

The advance of commodity frontiers is driven by economic growth and population growth. However, even without these sources of growth, there would be need for fresh supplies of fossil fuels, metals and biomass. This is because when energy is spent it cannot be recycled (see Entropy), and because materials can only ever be recycled to a limited extent.

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12. Common Pool Resources

Definitions

According to Ostrom (2008), scholars are still in the process of developing a shared language for the broad set of things called “the commons”. There is frequently confusion about similarities and differences across concepts such as “common-pool resources”, “common-property resources”, “open access resources”, and “commons” in general.

Ostrom (2008) considers that “commons” refers to systems, such as knowledge and the digital world, in which it is difficult to limit access, but one person’s use does not subtract a finite quantity from another’s use. This definition is close to the “public good” definition in economics. Public goods are simultaneously characterized by non-exclusivity (implying that resources can be exploited by anyone since nobody has an exclusive right) and indivisibility (implying that the use of part of the resource by one individual or group does not subtract from the amount available to others).

The “common-pool resources” are characterized by divisibility, which makes a difference to public goods, and include open access resources as well as common-property resources, in opposition to private property resources. The latter are held by individuals and firms creating the basis for the functioning of markets. Ostrom (2008) sees common-pool resources as “...sufficiently large that it is difficult, but not impossible, to define recognized users and exclude other users altogether. Further, each person’s use of such resources subtracts benefits that others might enjoy”. For instance, one person using open air to breath, does not hamper anybody’s else’s use, while using the atmosphere as a dumping ground for large amounts of sulphur dioxide, prevents other people from making (without damage to all) a similar use of it.

Common and Stagl (2005) consider that common property resources include cases where rights are held by communities of individuals, including the government and non-government organizations, and their use can be regulated in a variety of ways by a variety of institutions. Sometimes, property rights exist for common-pool resources, but it is so expensive to enforce them that they are not exercised. In this case, the common-pool resource has a size or characteristics that make it costly, although not impossible, to exclude potential beneficiaries from obtaining benefits from their use.

But, besides the property rights enforcement constraints, it must be recognized that not everything is subject to property rights of some kind. For this reason, we need to consider also open-access regimes where no one owns or exercises control over the resources. Open access resources can be considered a type of common-pool resources where anyone can enter and/or harvest.

Consequences

Open access resources can be exploited on a first-come, first-served basis because no individual or group has the capacity or the legal power to restrict access, promoting a "use it or lose it" situation (Tietenberg and Lewis, 2009). Individuals making decisions on the basis of benefits and costs to themselves will ignore the common-property externalities they inflict on others. Each individual has no incentive to reduce the rate of use and conserve the resource. Economic theory considers this a "market failure" and suggests several direct consequences, concluding that these resources are often overexploited.

The open access problem is known popularly but incorrectly as the "tragedy of the commons", corresponding to the title of a famous article by theecologist Garrett Hardin, published in the journal *Science* in 1968. Hardin confused open-access commons with commons that are the joint property of a community, as stressed by Ostrom (2008): "While Hardin correctly pointed out that valuable open-access common-pool resources would be overharvested, his conclusion of an inevitable tragedy was too sweeping".

Open access resources are overexploited and generally violate both the efficiency and sustainability criteria, although in the absence of scarcity both criteria are not threatened. Common property resources need not suffer over-use and their allocation can be regulated in a way that avoids tragedy.

In synthesis, the shared elements in the definition of common-pool resources include partial or total non-exclusivity - implying that resources can be exploited by any one/community since nobody individually has an exclusive right, and divisibility - implying that the use of part of the resource by one individual or group subtracts from the amount available to others.

Management of the Commons

Fisheries and forests are examples of two common-pool resources that are currently of great concern. Some authors also rightly refer to groundwater basins, pastures and grazing systems, lakes, oceans, and the Earth's atmosphere. According to Ostrom (2008), in the two decades that followed the World Commission on Environment and Development (WCED) report - *Our Common Future* (1987), "...humans have failed to halt the tragedy of massive overfishing of the oceans, major deforestation, and excessive dumping of carbon dioxide in the atmosphere. However, in some specific niches, such as the Maine lobster fishery, the commons are in better condition today than they were a decade or two ago". For this author part of the reason for the mixed results is that most common-pool resources differ vastly from one another. Differences can be found, for example, on the resource characteristics, socio-economic and cultural contexts, and scales. However, granting due importance to management systems and property rights, it must be said that the main driving force of exhaustion of resources is population and economic growth.

The adequate management of a common-pool resource requires a deep understanding about the causes of the (potential/existing) conflict in resource use. Adams et al (2003) emphasize that conflicts over the management of common pool resources are not simply material, as they also depend on the perceptions of the protagonists. Since the problem definition is a critical phase in the policy making process, it is essential a careful and transparent consideration, for the different stakeholders, of their knowledge of the empirical context, knowledge of laws and institutions, as well as beliefs, myths, and ideas. It is essential to promote an effective dialogue to find an adequate policy regime.

Ostrom (2008) defends that the advocacy of a single idealized solution for all common-pool resources has been a key part of the problem instead of the solution. She also considers that many of the most pressing problems future generations will face are on a global scale and that establishing effective governance arrangements on this scale has proved to be more difficult than on a local one. Ostrom argues that common-pool resources may be governed and managed by a wide variety of institutional arrangements that can be roughly grouped as governmental, private, or community ownership, or mixed approaches like the co-management by communities working with governments. The success or failure of each alternative in sustaining resources and providing good economic returns depends on the specific setting. The use of pricing approaches to regulate the use of common property resources, namely those held by the government, is also becoming more widespread.

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13. Complexity

Definition

Complexity is a condition of systems composed of many interconnected parts, where the behavior of the whole system cannot be fully understood by simply analyzing the behaviour of its components.

Complex systems are adaptive and generate a new quality of collective behaviour through self-organization. They are frequently characterized as having extreme sensitivity to initial conditions as well as emergent behaviour that are not predictable or completely deterministic (Meyers, 2009). Failing to understand complexity often leads to policy resistance and the worsening of problems. Ignoring the time and spatial distance between causes and effects typically results in policies that generate transitory improvement before the problems grow worse (Sterman, 2000).

According to Sterman (2000), natural and human systems combine several characteristics which give rise to complexity:

- **Dynamics**, systems change at many different and sometimes interacting time scales;
- **Tight couplings**, which reflects the notion that "everything is connected to everything else", given the multiple intra and inter relationships between actors and natural systems;
- **Feedback**, where decisions made in tightly coupled systems lead to actions which influence subsequent decisions;
- **Non-linearities,** characterizing relationships where the effect is not proportional to cause;
- **History-dependence,** wherein some decisions create path dependence, precluding alternative options and leading to irreversible actions;
- **Self-organization,** describing situations where behaviour arises spontaneously from the internal structure of systems. Small and random perturbations are often amplified and molded by the feedback structure generating different time and spatial patterns;
- **Adaptiveness,** relating to changes in the capabilities and decision rules of the agents in complex systems, leading to evolutionary and learning processes.

Several mathematical and modeling methods and tools (e.g. agent based modeling, cellular automata, game theory, system dynamics) have been progressively applied to scientific, engineering, and societal issues that can only be adequately described in terms of complexity and complex systems (Meyers, 2009).

Complex systems are becoming the focus of innovative research and application in many areas, providing a theoretical justification for a post-normal approach to the management of science-related issues (Funtowicz and Ravetz, 1994). Such is the case in ecological economics, where the engagement of complex knowledge communities has been increasingly advocated for responding to complexly interacting socio-physical systems and environments (Henshaw, 2010).

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Websites

http://comdig.unam.mx

http://www.springer.com/physics/complexity

http://complexityblog.com/

14. Consumption

Definition

A social phenomenon characteristic of all societies in all times, consumption may be defined as the acquisition, use, and destruction of goods and services. It is comprised of the value of goods and services bought by people, as individual purchases are aggregated over time and space. Consumption is then the aggregate of all economic activity that does not entail the design, production and marketing of goods and services, and usually represents the largest component of GDP. Many persons judge the economic performance of their country mainly in terms of consumption level and dynamics. Current income is the most relevant determinant of consumption.

Classification and patterns

Consumption may be classified according to the durability of purchased objects. In this vein, a broad classification separates durable goods (such as cars and television) from non-durable goods (as in food) and from services (as in a restaurant). These three categories often show different paths of growth. In Western countries, consumption has steadily grown over the last 60 years, with the exception of a few deep recessions. Consumption growth has been smoother than that of increases or decreases in private investment or of net export growth. In particular, services have always systematically grown (measured in economic value and in employment statistics) at a fairly steady pace, non-durables have often mirrored the business cycle and durables have often over-shot fluctuations in GDP.

Goods and services are consumed for the satisfaction of needs and wants. Expenditures are influenced by many different factors besides income: general lifestyles, habits, age of the household's members, attitudes toward savings or consumption, a standard level of consumption to maintain or improve over time, decisions regarding active saving strategies, opportunities to obtain consumer credit, past acquisition decisions, innovative sales proposals, and sensitivity to advertising. While orthodox, neoclassical economics insists on "consumer sovereignty", meaning the right of consumers to reveal their preferences in the market buying whatever they want to buy, other traditions in economics (such as the institutional economics of Thorstein Veblen) have tried to find and explain social patterns in consumption. Veblen coined the expression "conspicuous consumption" to account for the behaviour of buyers who buy prestigious goods in order to show their priviliged position in the social hierachy.

in the 1970s Fred Hirsch came very close to taking an environmentalist position when he applied the term "positional goods" to products or services (such as waterfront holiday houses, golf-club membership in arid countries) that are exclusive by nature, and would be inaccessible to the majority of the population even if incomes were to increase. Taking this perspective, one could ask whether automobiles too are "positional goods" at a global level. Viewed critically, marketing literature, as well as the literature on advertising can be used to classify and understand patterns and social motivations of consumption.

In economic theory, there is in general a presumption that goods can substitute for each other. If the price of apples goes up, people will buy pears instead. Exceptions to that rule give rise to the notion of "lexicographic preferences". These are seen as very special cases, as when people in willingness-to-accept-compensation surveys refuse to give up a beautiful landscape or to accept the loss of a species at any price. But this type of preference is not so strange. From a biological point of view, we know that the minimum required amount of water or of food (energy for endosomatic use), cannot be substituted by anything else. In ecological economics, therefore, we dispute the view that consumption is to be explained only by subjective, inscrutable preferences.

14.1 Sustainable consumption

In terms of natural resources, orthodox economics indeed forgets totally that all consumption entails material flows and energy transformation, as well as the work of other people. Contemporary forms of consumption however frequently raise the question of sustainability, so that today most people are somewhat aware that the human species is leaving a legacy of destruction: climate change, biodiversity loss, depletion of various minerals and fuels. Over the past decade an increasing amount of research has intersected consumer issues with environmental degradation. For example, the consumption of many kinds of new household technologies is associated with the consumption of energy, water and other resources. From an ecological economic point of view we face a clear dilemma: on the one hand environmental pressures require that consumption be curbed, probably in absolute terms. On the other hand most economists hold that consumption is closely related to welfare and should grow without limits.

Policy focus

Consumer behaviour is an important determinant of the impact that society has on the environment. The actions that people take and the choices they make – to consume certain products and services rather than others or to live in certain ways - all have direct and indirect impacts on the environment, as well as on personal (and collective) well-being. This is why the topic of 'sustainable consumption' has become a central focus for national and international policies. Max-Neef's distinction between "needs" and "satisfactors" of needs is here very pertinent.

The questions posed by sustainability today are more and more focused on the problem of consumption patterns. In this context, sustainable consumption calls for integrating a series of problems. "Sustainable consumption is an umbrella term that brings together a number of key issues, such as meeting needs, enhancing quality of life, improving efficiency, minimising waste, taking a lifecycle perspective and taking into account the equity dimension." (UNEP, 2001) Unsustainable lifestyles and practices however continue to dominate. Material and energy flows have to decrease at the global level, but how this might be achieved is not clear.

Consumers are seen as multiple and diffuse sources of pollution. In this context, governments rely primarily on increasing consumer awareneness and providing better information about the impacts that products generate in order to help consumers make better choices. But current policies affect the foundations of these choices very little: freedom of action is justified by a free and unfettered market. Sustainable consumption asks us to consider issues that go beyond the individual when we shop. These include not only the ecological impacts of what we buy but also the equity, human rights and political dimensions of sustainability in the production and consumption process of goods and services.

Redefining and addressing consumption

In adopting an ecological perspective, we can return to the etymology of consumption. Consumption comes first from *cum-summa*, which means making the sum, completing, achieving. It would be wise to shift the definition of consumption from one that has come to inherently imply destruction for the sake of human pleasure, back to the etymological roots of the word, to a definition that emphasises, appreciates, and is compatible with the interwoven processes of engaging in relations with the (human and non human) beings in our environment, that complete us as human beings.

To avoid unrealistic propositions in pursuit of sustainable consumption however, social functions of consumption have to be understood. The history of consumption shows us how today's consumer society is extremely fragmented and multiple, focused on a multitude of individuals. This recent social pattern is based on the promotion of individual choices and actions. The rhetoric of 'consumer sovereignty' is counter-productive because it regards choice as individualistic and fails to unravel the social, psychological and institutional influences on private behaviours. What we decide to buy is influenced by many factors, including our age and health, place of residence, income and wealth, moods and social beliefs and relations.

Studies of consumption investigate how and why groups and individuals consume goods and services, and how this affects society and human relationships. Contemporary studies focus on meanings of goods, role of consumption in identity making, and the 'consumer' society. Consumption is not only a way of meeting needs, but also a manner for producing social interactions, and constructing relations to the world through objects. Challenging commodity consumption and accumulation of objects requires other social forms, necessarily more collective. Essential questions in consumption analysis are therefore first, "How do products find their ways into people's lives?", and second, "How do they affect and how are they affected by daily practices?".

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15. Corporate Accountability

Corporate accountability can be defined as the ability of those affected by a corporation to control that corporation's operations. This concept demands fundamental changes to the legal framework in which companies operate. These include environmental and social duties being placed on directors to complement their existing duties on financial matters, and legal rights for local communities to seek compensation when they have suffered as a result of directors failing to uphold those duties (Friends of the Earth, 2005).

Instead of urging companies to voluntarily give an account of their activities and impacts to improve their social and environmental performance, the corporate accountability "movement" believes corporations must be "held to account" – implying enforceability. This is a more radical position than that of CSR (corporate social responsibility) advocates. Over the years, NGOs and local stakeholders around the world have fought countless campaigns against companies over specific issues. Sometimes, firms have been brought to court. Well known cases have arisen under the US ATCA (Alien Tort Claims Act) statute, two well known ones being one from Ecuador against Chevron-Texaco, and another from Bhopal in India against Union Carbide (later Dow Chemical). Such court cases have demanded compensation for the environmental liabilities (or ecological debts) left behind by companies.

Consumer campaigns have persuaded thousands of shoppers to buy recycled paper, fair trade and organic coffee, tea, chocolate and bananas, GM-free food, timber that has been certified as sustainable by the Forest Stewardship Council (FSC), and so on. This is called Green Consumerism. From a corporate accountability perspective, green consumerism and voluntary CSR places a focus on the consumer and on the individual company (often located in the North) and ignores the issues of social and environmental justice for communities (often located in the South).

This begs the question of whether it is right for Northern governments to put the onus on individual and corporate voluntarism, while sitting back and doing nothing as indigenous communities are pushed off their land and rainforests cleared to produce cheap bauxite, oil or gas, or palm oil for Northern consumers? NGOs say that if we are serious about social and environmental justice, the time has surely come to mainstream common standards on social and environmental performance. The way to do this is through changes to the legal framework that would allow people to hold corporations to account for social and environmental wrongdoing.

As summarised by the United Nations Research Institute for Social Development (UNRISD), the emerging corporate accountability agenda includes proposals to establish institutional mechanisms that hold corporations to account, rather than simply urging companies to improve standards or to report voluntarily. Corporate accountability initiatives promote complaints procedures, independent monitoring, compliance with national and international law and other agreed standards, mandatory reporting and redress for malpractice.

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16. Corporate Social Responsibility

Background

The belief that business has a social responsibility is not new. In the early decades of the 20th century a few large industrialists, including Ford and Carnegie engaged in corporate charity and took measures (in education, health-care, and housing) to improve the conditions of workers and communities in which their factories were located (Utting, 2000). Corporate social response broadened slightly in the 1950s when social democracy and welfare legislation took root, and then in the 1960s and 1970s CSR emerged briefly as a high-ranking management concern in the US and Europe, in response to high profile international boycotts, including that against Nestle's aggressive marketing of baby formula in the South as a "safer" alternative to breast feeding (Klein, 2000).

Since then, Corporate Social Responsibility (CSR) has emerged as a form of voluntary self-regulation for firms for managing their engagement with society in the face of increasing pressure from organized civil society and the general public to address the negative environmental and social impacts of companies, particularly transnational ones. From a political economy point of view the ascendancy of contemporary CSR is traceable to the deepening of economic globalization under neoliberalism, and the emergence of its political counterpart, "the good governance agenda" (Hoogvelt, 2001).

Implementation

CSR broadly acknowledges that firms are more than just producers & sellers, with legal and moral obligations in terms to the people they employ, their customers, neighbours, future generations, and thus to society at large. CSR initiatives frequently focus on the conception, implementation and monitoring of internal charters steering internal decisions on social responsibility. Operationally, CSR embraces issues which range from reducing negative environmental impacts on production sites and of products, respecting workers' rights, implementing racial and social anti-discrimination policies, and ensuring financial and managerial transparency. Among the cornerstones of CSR mechanics are monitoring and reporting processes.

The enormous success of CSR initiatives today has a great deal to do with their internationalisation and standardization through transnational institutions and networks, such as the *Global Compact* of the United Nations. The Global Compact asks that signatories commit to principles of transparency, implementation of external monitoring, and to pro-actively implement partnerships - or at least some form of engagement - with civil society. The *Global Reporting Initiative* (GRI) is a standard set of monitoring and reporting processes and indicators. CSR initiatives however are mainly driven by the need for corporate risk management, and often geared toward buying "social license to operate".

As such, much CSR activity is still situated in corporate governance and risk-management departments. This is reflected in the increasing role of CSR in intra-firm business mechanisms, with transnational corporations requiring their manufacturers to adopt CSR policies in order to protect themselves from liabilities that might be incurred down their manufacturing lines and/or supply chains. Adopting a CSR policy has also become a prerequisite in some countries or sectors for participation in public procurement processes.

Problems and concerns

A very large and lucrative industry of private consultancy has evolved around CSR processes. Structurally, the very existence of the CSR industry encourages the *de facto* outsourcing of the bulk of CSR activities, which ironically jeopardizes the internalization of the CSR ethos by business models and throughout all levels and departments of firms, including accountancy. The environmental liabilities of firms are not included in their balances and "bottom lines", unless they become due through court cases or social agitation. (See the UMICORE case in Hoboken, Flanders).

A major concern with CSR is that corporations can quite easily implement apparently robust policies without having to change actual behaviors or reduce impacts on the environment or on people (Clapp 2008). CSR is implemented as an add-on to "business as usual" and initiatives often boil down to a series of statements, overarching policies, charters and monitoring programs which are concluded with an annual set of social partnerships and social sponsoring programs, with little effect. While some proponents sincerely believe CSR means fundamentally changing business practices with respect to social /environmental responsibility, others feel that CSR at best leads to greenwashing.

Accordingly, CSR policies have attracted the attention of NGOs that have emerged to scrutinize CSR reports and compare them with actual corporate behavior. NGOs use CSR policies and reports as leverage with which to expose and influence companies' that violate their own codes of conduct, but this work can be challenging because it is not in the interest of companies to render their functionings entirely transparent, and because the accurate and detailed monitoring and follow-up of CSR claims is very time and resource consuming. For these reasons some NGOs accept funding indirectly, for instance via business councils to which the firms in question are members, losing their independence and ultimately becoming co-opted.

There is also the scientific challenge of assessing the interactions and causalities between corporate CSR performance and financial performance. Whether a robust CSR policy improves business performance is highly questionable. While some early evidence points to the existence of some relationships between both strands of performance, their direction and prescription is far from having been ascertained (Scholtens 2008). The lack of evidence to this effect means that in hard financial times, CSR programmes are the first to be cut under corporate belt-tightening measures.

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17. Customary Rights

Customary rights and legal pluralism

"Customary rights" refer to established, traditional patterns of norms that can be observed within a particular socio-cultural setting. Sets of customary rights and obligations may be called customary law. Customary rights exist where there is a consensus of relevant actors considering them to be "law".

In practice, today, customary law often coexists with formal state law. Such situation corresponds to legal pluralism. Plural legal systems are particularly prevalent in former colonies, where the law of a former colonial authority exists alongside customary legal systems. Economic transactions (sales, rents, wages, credit) are typically governed by Western-type law while non-economic aspects (family, marriage, inheritance) often remain covered by traditional law. Legal pluralism also occurs when different laws govern different cultural groups within a country. For example, in India there are special Islamic courts that address concerns in Muslim communities by following principles of Islamic law. Secular courts deal with the issues of other communities. Legal pluralism also exists to a certain extent in societies where the legal systems of the indigenous population have been given some recognition. Land and environmental conflicts typically occur and they are often expressed as struggles between customary and state legal systems.

The example of Cameroon

Let us give an illustration. The customary rights of Bantu and Baka/Bagyeli societies in Southern Cameroon have been under threat since the beginning of the colonial period, when, in 1896, the German administration introduced written norms using the questionable concept of “vacant and ownerless lands”. In this way, the different colonial administrations were able to appropriate land and resources by transforming Bantu and Baka/Bagyeli customary forests into state property. From 1960 onwards, the independence of Cameroon was not associated with a rupture in this legal philosophy. This can be explained by the fact that pro-Western elites took control of the newly-independent country and that the genuine independence movement was largely suppressed by the French army. Despite local resistances against the first post-colonial legislations, this process of land appropriation culminated with the 1974 law, still the basis of today’s land regime. The colonial notion of “vacant and ownerless land” was retaken for the benefit of the state and ambiguously recognized a limited space for customary institutions. The latter nevertheless remain by far, today, the dominant law in the villages of Southern Cameroon. In this transition from customary systems to capitalism, in Cameroon as elsewhere across the globe, such situation of legal pluralism was – and still is – at the origin of an incalculable number of fierce conflicts between state or private companies exploiting state concessions, and local communities still largely ruled by customary law. Or, rather, the conflicts at these extractive commodity frontiers arise from the threats to local livelihoods, and are expressed as conflicts between legal systems.

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18. Dams (Krutilla’s method)

The development of dams

From the 1930s onwards, dams have been built in most rivers in the world. The Amazon still flows freely, though no longer some of its tributaries. The promotion of large dams, through the new technique of cost benefit analysis of multi-purpose river development, spread from the USA from the 1940s, promoted especially by the World Bank. By this peculiar accounting technique, all present and future values obtained or sacrificed by building a dam, are reduced to a money numeraire, and discounted at present-value. Thus, the costs of building the dam, of buying land and compensating for displacement, the estimated costs of lost fisheries downstream and for lost sediments, are listed and added up in one column, at present (discounted) monetary values, and compared to the benefits in the form of a electricity produced, and of irrigation water also at present monetary values. As we see, externalities are included, valued in money. Cost-benefit analyses have more recently been complemented with the cosmetics of environmental impact assessments**,** which exclude money values. An integrated economic, ecological, social and cultural assessment is not normally practiced although this was recommended by the World Commission on Dams in 2000.

Resistance against dams

The early social hopes placed on hydro-electricity, have been betrayed. Hydro-electricity has been associated with water use for enormous irrigation schemes or for making water available for sprawling urban growth as in southern California. Hydro-electricity is also associated with the export of aluminium, as in Brazil, Venezuela and Ghana. There is a new awareness of the perils from dams such as loss of sediments and silt in deltas; increased local seismicity; salinization of soils in irrigation schemes; loss of fisheries; new illnesses; methane emissions; degradation of water quality; loss of fertile agricultural land; loss of riverine biodiversity; loss of cultural monuments; and risk of dam failure.

Only about one-fifth of all electricity produced in the world is hydro-electricity, but the environmental and social effects of dam building have been enormous (McCully, 1996). In some countries like the USA, little unused potential is still available, and there is even talk of "decommissioning" some dams in the West of the country in order to restore the natural flow of rivers. Decommissioning is also discussed in Third World countries. In Thailand, a leader of the Assembly of the Poor, after fighting for years against the Pak Mun Dam, claimed success in June 2000 when the government agreed to keep open the dam's sluice gates so as to allow the fish to come back to the river. In the world at large, the damage from further possible large dams is larger than that already done. The Sardar Sarovar dam, built on the Narmada River in central India, is intended to stand as a showpiece of Indian economic development. It promised to provide "much-needed irrigation and electricity, but it shall also submerge historic old temples, rich deciduous forests, and at least 250 villages" (Guha, 2000: 100). In reaction a famous protest movement arose – the Narmada Bachao Andolan (Save the Narmada Movement) – lead by Medha Patkar. She and her colleagues fasted outside provincial legislatures, camped outside the Indian Prime Minister's house in New Delhi, and walked through the Narmada valley to raise awareness of the predicament of the displaced villagers.

Can cost benefit analysis be the solution?

Cost benefit analysis cannot provide a rational answer either for the commissioning or the decommissioning of dams because the money-values are contingent on the acceptance of a given structure of social and environmental inequality. Thus, the cost of displacing people will depend on their degree of poverty, and also on their degree of resistance should they refuse to accept the distribution of property rights to the river water and to the environment which the State and the electricity companies defend as being legal. Prices (in actual or fictitious markets) depend on distribution. Moreover, prices are only one type of value among many.

Krutilla's Modified CBA

Within mainstream resource and environmental economics, there has been concern for the natural amenities endangered by energy-producing activities. According to this tradition, because of technological change and substitutability (weak sustainability), there will be no scarcity of resources for the production of a commodity like electricity. However beautiful, landscapes threatened by hydroelectric dams, geomorphological wonders such as the Grand Canyon, and irreplaceable biological diversity will become increasingly scarce and increasingly valued. For that reason, economist John Krutilla proposed a modified cost benefit analysis in order to give more weight to natural amenities.

In a famous case, Krutilla (1967) defended mountain landscapes against hydroelectricity by arguing the electricity would be cheaply available in the future, while landscapes would become more valuable with time. Technology will not advance to the point at which the beautiful landscapes could be replicated (or extinct species resurrected), while the supply of fabricated goods and commercial services would be, in his view, capable of continuous expansion due to technological improvements. He was thinking mainly of cheap nuclear energy. Hence Krutilla's criterion: to modify discount rates to be applied to the stream of benefits (kwh) and to the opportunity costs (loss of landscape amenities) in order to obtain their "corrected" present-values. For Krutilla, environmental amenities such as mountain landscapes or coral reefs will increase their relative scarcity with time, and therefore we should discount their present value at a zero or very low rate of discount.

The background to this analysis is the common and questionable assumption that economic growth is good for the provision of energy and materials, and for correcting the damage caused to the environment. There are two objections to Krutilla's criterion, reflected in the following questions: Will commodity resources really become cheaper (including environmental costs) relative to amenity resources? Why are the natural conditions of livelihood and production, which are not yet commodities, and which are not really "amenities", left out of such analyses?

Conclusion

We know that resistance against large dams often stems from the need to defend the natural conditions of livelihood and production of local populations. Sometimes, in the North, resistance movements bring forward concerns related to "amenity" values or "deep ecology" values, while in the South, as in the movement by the *atingidos por barragens* in Brazil, human material livelihood is often a supreme value compatible with aesthetic concerns and with respect for other forms of life, and indeed also, sometimes, with an appeal to sacredness: "An argument often used by dam builders and backers in developing countries (...) is that concern for the environment is a 'first world luxury' which they cannot afford. In fact the opposite is the case" (McCully, 1996: 58). Opposition to dams in such cases is rather a manifestation of the "environmentalism of the poor".

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19. Decoupling and Dematerialization of the Economy

Definition

The MEFA (Material and Energy Flow Analysis) framework provides a tool to monitor progress in terms of the decoupling (disconnection or separation) of economic and social well-being from the use of biophysical resources. Decoupling may occur in at least three relations: (1) economic growth— e.g. as measured by GDP growth—may be decoupled from material and energy throughput (an increase in ‘‘efficiency’’ leading to ‘‘dematerialization’’), (2) material and energy throughput may be decoupled from social well-being (‘‘sufficiency’’), and (3) social well-being may be decoupled from economic growth (‘‘equity’’) (Haberl et al. 2004). This is shown in the model below.

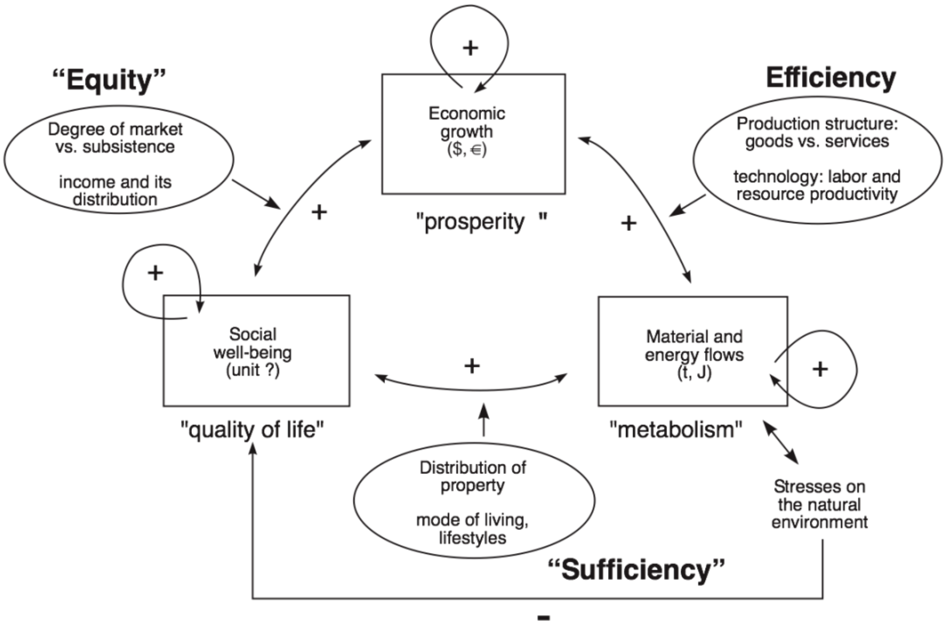

Figure1 : Interrelations of material and energy flows, economic growth, and social well-being.
Source: Modification of Fischer- Kowalski and Haberl (1998), taken from Haberl et al. (2004)

Observed Patterns

According to Haberl et al. (2004) studies on the relation between economic growth and national material throughput reveal three patterns: (1) ‘‘No decoupling;’’ i.e., material throughput increased faster or as fast as GDP, as was the case for Greece in the past two decades (see Eurostat, 2002) (2) ‘‘Relative decoupling,’’ a situation where the amount of material or energy needed to produce $1 of GDP declines over time – this be observed in many countries (see Eurostat, 2002; Fischer- Kowalski and Amann, 2001; Schandl et al., 1999) and (3)‘‘Absolute decoupling’’ in the sense that the aggregate materials and energy throughput of an economy declines over time while GDP continues to grow has taken place in a few industrial economies such as Germany or The Netherlands (Eurostat, 2002) although in this (and the other cases) the trade patterns must be taken into account. For instance, production of material-intensive raw materials and products can be outsourced through trade.

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20. Degrowth

Concept and aims

The concept of degrowth has been described as “an equitable downscaling of production and consumption that increases human well-being and enhances ecological conditions at the local and global level, in the short and long term. The paradigmatic propositions of degrowth are that economic growth is not sustainable and that human progress without economic growth is possible.” (Schneider et al. 2010). Degrowth is not a precisely defined term, but is deliberately ambiguous, a sort of a ‘bombshell’ word to trigger controversy and debate on the “religion of growth”. Advocates of degrowth want to part with the obsessive desire for growth. “Only mad men and economists believe that infinite growth is possible in a finite world”, is a quote attributed to Kenneth Boulding. This critique of the standard economic system on the one hand, and awareness of the social and ecological issues, on the other hand, lead logically to the necessary degrowth of the economy.

Origins of the “awkward term”

Décroissance was used in 1979 by J. Grinevald to translate some articles by Nicholas Georgescu-Roegen’s in a book entitled “Demain la decroissance” (tomorrow, degrowth). The newspaper "La Décroissance” first published in March 2004 then launched the term publicly in France. *Entropia*, an academic journal on themes linked to ‘la décroissance’ has been in press since 2006. In April 2008, an international conference in Paris focused on ‘economic degrowth for ecological sustainability and social equity’. On this occasion, ‘décroissance’ was translated for the English speaking audience as ‘degrowth’, and a second conference on socially sustainable economic degrowth was held in Barcelona in March 2010 (www.degrowth.eu). Proponents of the concept warn very expllicitly that the term should not be confused with ‘recession’, which implies an involuntary process.

History

Critiques of growth began to be vocalised in the environmental and counterculture movements of the 60’s and 70’s. Critiques of industrialisation and marketisation are of course even older, but these took further shape with the oil crisis of 1973. "The Limits to Growth", a report from the Club of Rome was published in 1972. Other works critical of environmental limitations of the economic system were published in the 1970’s: Ivan Illich, Barry Commoner, and André Gorz, are well known authors of that decade. Nicholas Georgescu-Roegen embedded theoretical economics in ecological constraints, the British economist EF Schumacher advocated more local and less technological and technocratic solutions in his book "Small is beautiful", Ivan Illich searched for less alienating and more emancipatory institutions and technologies, and Herman Daly promoted the steady-state. In India, Kumarappa, a Gandhian economist, had published the book “Economics of Permanence” in the 1940s, written in prison.

Essentially five different and overlapping sources can be identified as having driven the conception and development of Degrowth:

1. Ecological economics / bioeconomics: Based on a critique of the market and on established principles of physics and ecology, the limits of ecosystems (‘carrying capacity’) and their resilience are emphasized together with the finite nature of certain resources. There are absolute limits to the scale of global production and consumption, and to the scale national economies can attain without imposing environmental and social costs on others elsewhere or future generations. Degrowth is needed to prevent depletion of resources and overloading of sinks, and to preserve biodiversity.

2. Ecologists / environmentalists. Ecology implies the study of ecosystems and respect for the diversity of life found in ecosystems. The decline of biodiversity is thus a major issue.

The indicator HANPP is relevant in this respect. Economic growth and population growth are pressures on biodiversity.

3. Cultural diversity / post-development. Anthropology and development studies have shown that the idea of development has been imposed as universal by western culture. Growth and unbalanced exchanges between North and South mean that (see ecologically unequal exchange) the world's wealthiest nations are using more than their legitimate share of global environmental resources, and as a result are effectively reducing the environmental space available to poorer nations, and imposing adverse environmental impacts on them. Serge Latouche is a prominent spokesperson of this critique of westernization of the cultures.

4. Democracy / critical politics. Proponents of degrowth insist that the transition to sustainable life patterns has to be democratic, resulting from a collective choice. This leads to a critique of institutions of representative democracy, and the close links between policymakers, orthodox economists and businessmen. Vincent Cheney analyses the weight of commodification on political ideology and practices, joining the ecological economics critique of "chrematistics" and the defence of "oikonomia".

5. Spirituality / voluntary simplicity. This refers to what some call 'the meaning of life' and movements emphasizing spirituality, non-violence, art or voluntary simplicity. Advocates assess consumption as a social process of an ever-growing demand for new satisfactors of needs that are often meaningless. Critiques are aimed at advertising, seen as the paragon of our industrialised societies, with an 'inner revolution' and a more spiritual life called for, based on personal and relations (conviviality) rather than objects.

The birth of a movement

Degrowth has now become a political, economic, and social movement based on environmentalist, anti-consumerist and anti-capitalist ideas. It can be described as a galaxy of people willing to experiment with or advocate alternative ways of co-existing with the goal of maximising happiness and well-being through non-consumptive means: reducing work time, consuming less, while devoting more time to art, music, family, culture and community. These experiments occur at three levels: individual, collective / communal, and political. At the individual level, degrowth is achieved by voluntary simplicity. Conviviality and slowness are endorsed through collective projects (e.g. slow food, transition towns). Proposals for global solutions involve the relocalisation of economic activities in order to end humanity's dependence on fossil fuels and reduce its ecological imprint.

Key arguments

In line with this objection to growth, several critiques are directed at the main economic indicator, GDP (Gross Domestic Product). Growth in GDP results from an increase in production, consumption and investment in the pursuit of economic surplus, inevitably leading to increased use of materials, energy and land. Confronted with an environmentally, socially and culturally destructive crisis of over-accumulation, it is becoming apparent that economic growth is the problem rather than the solution. Degrowth thus champions changing the benchmark from GDP to a measure of sustainable and equitable well-being.

Degrowth also opposes the current notion of sustainable development because while sustainable development aims to address environmental concerns, it does so with the goal of promoting economic growth, growth which has failed to improve the lives of many people and lead to environmental degradation. Despite improvements in the ecological efficiency of the production and consumption of goods and services, global economic growth has resulted in increased extraction of natural resources and increased waste and emissions. Global economic growth has not succeeded in eliminating poverty, due to unequal exchange in trade and financial markets, which has increased inequality between countries. While sustainable development relies on solutions that are primarily technological or managerial, Degrowth in contrast questions the accumulation of capital and commodities through production and consumption.

Critical questions

Degrowth proponents aim to reduce the global ecological footprint to a sustainable level, through decreased and different production and consumption in the “global North”, and increased and different production/consumption in the “global South”. However, while there are clear objectives in the way of a need for a transition towards a just, participatory, and ecologically sustainable society, it is unclear how this transition can be organised and managed. Whether degrowth can be achieved through individual, local or networked activities remains an open question, as does how institutions could or should be transformed to support sustainable degrowth. Many partisans of Degrowth see it as leading in due course to a Steady-State Economy as proposed by Herman Daly in 1973.

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21. Depopulation

Definition and process

Depopulation refers to a process in which the population density of an area decreases steadily over time. Depopulation has affected rural areas almost exclusively. Increased human population is certainly a threat to environmental sustainability, but local phenomena of rural depopulation may be seen also as threats to local environmental sustainability.

Rural depopulation is an effect of the general phenomenon of rural exodus caused by modern economic growth. During industrialization, cities expand rapidly, concentrating the location first of industry and then services. This expansion draws labour in from rural areas, where at the same time, the mechanization of farm activities encourage further rural-to-urban migration. Rural depopulation is a process affecting regions where the rural exodus outstrips natural growth, reducing the total number of inhabitants to a critical level and causing an aging of demographic structures.

Impacts

This process of depopulation provokes a range of environmental impacts. In contrast to Malthusian doctrine and related predictions of the negative pressure exerted by the increase of Human Appropriation of Net Primary Product (HANPP) on biodiversity, depopulation and migration processes can actually increase environmental pressures on biodiverse agricultural production through increased soil erosion and invasions by pests and weeds, leading to reduction of biodiversity. For example, as people leave an area, one dominant habitat (usually secondary forest or savannah) comes to take over from the diverse mosaic of human-maintained landscapes.This 'ecological homogenisation' can lead to a decrease in biodiversity at a local level. Other ecological impacts include soil degradation resulting from inadequate terrace maintenance in mountainous areas, as is the case across large swathes of Mediterranean and Southeast Europe. Abandonment of agricultural lands also affects remaining agriculture in that as plots are abandoned, adjacent plots can suffer increased invasions by pests and weeds, and receive less sunlight due to shading from regenerated forests.

Related phenomenon

Another phenomenon that may be related to depopulation is increased frequency of forest fires as in depopulated regions in the Mediterranean and South Eastern Europe. Whether this increase is related to depopulation is under research, but depopulation does lead to increased fuel load in forests and a lack of feeling of responsibility for forest protection by the local population as well as a lack of people to detect and suppress fires early. Rural depopulation also transforms territory, sometimes leading to a loss of valued cultural landscapes. Neverthless, the rural-urban shift may have positive implications for consumption patterns. Dense urban areas offer relatively more integrated service provision such as waste collection and collective transport.

In order to address these multiple, related impacts, research into the causes of and remedies for rural population should be tied into an exploration of how rural economies can be bolstered through sustainable resource management to stem population drain.

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22. DPSIR

Concept origins

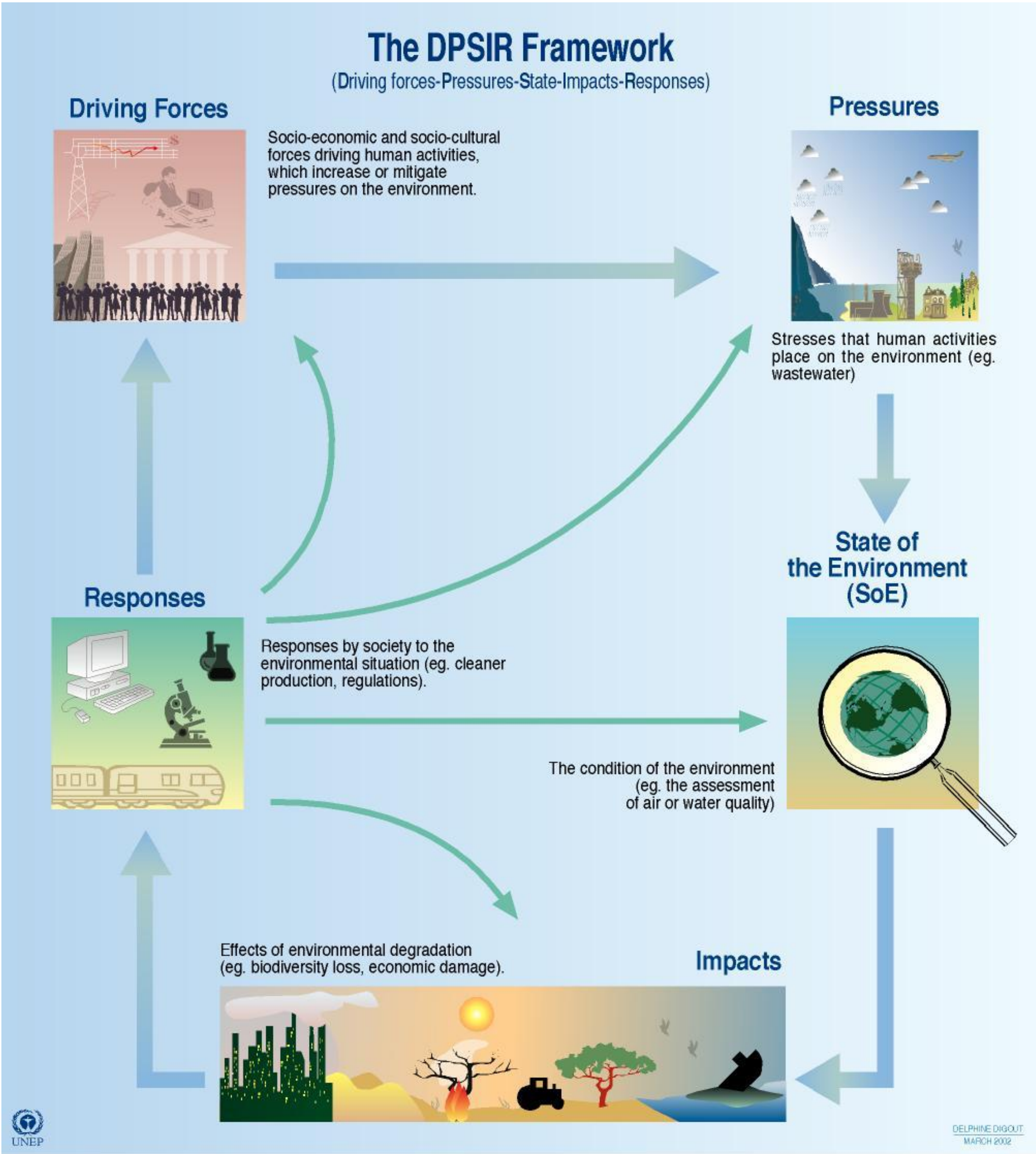
DPSIR is a causal framework developed by the European Environmental Agency (EEA) to describe and communicate the interactions between society and the environment. Based on the PSR (Pressures/State/Response) model proposed by the OECD, it has been applied to the organisation of systems of indicators and statistics in relation to policy aims (e.g. EEA, EUROSTAT).

Elements

(a) **Driving Forces** are the changes in the social, economic and institutional system that directly and indirectly trigger pressures on the environmental state. The EEA defines them as "the social, demographic and economic developments in societies and the corresponding changes in lifestyles, overall levels of consumption and production patterns" (EEA 2007). A classification of four non-hierarchical but interacting levels of driving forces influencing the structure and relation between the social, economic, political and environmental systems has been proposed (Rodríguez-Labajos et al., 2009). From this approach, the "primary driving forces" are the socio-economic activities directly linked with pressures (e.g. industry, tourism) at the management level. "Secondary driving forces" are found at the policy level (e.g. waste policy, laws). In the long term and with a broader spatial sphere of influence there is the level of "tertiary driving forces", ideology and lifestyle (e.g. media, consumption patterns). Finally, the "base driving forces" include fundamental trends (demographic or cultural), that are only influenced by social decisions in the long term (e.g. climate change, demography).

(b) **Pressures** are the anthropogenic factors inducing environmental change (Impacts). They are defined by the EEA as "developments in release of substances (emissions), physical and biological agents, the use of resources and the use of land by human activities", although different approaches to its definition can be found in the literature.

DPSIR Model



Source : Global International Water Assessment (GIWA), 2001; European Environment Agency (EEA), Copenhagen.

Figure 1: Source: Global International Waters Assessment (GIWA), 2001; European Environment Agency (EEA); Copenhagen. (Delphine Digout, UNEP/GRID-Arendal).

(c) **State** may refer to a natural system alone or to both a natural and socio-economic system. According to the focus, indicators of State can be very different. State can refer to a wide range of features, from the qualitative and the quantitative characteristics of ecosystems, the quantity and quality of resources, living conditions for humans, exposure to the effects of Pressures on humans, to even larger socio-economic issues. The combination of the current State and the existing Pressures explains Impacts.

(d) **Impacts** are changes in environmental functions affecting social, economic and environmental dimensions, which are caused by changes in the State of the system. Impacts can include changes in environmental functions such as resource access, water and air quality, soil fertility, health, or social cohesion (Maxims et al 2009). These Impacts trigger Responses.

(e) **Responses** are the policy actions which are directly or indirectly triggered by the perception of Impacts and which attempt to prevent, eliminate, compensate or reduce their consequences. Responses can come from different levels of the society, such as groups of individuals, governments or non-governmental sectors. These Responses can in turn influence trends in the Driving Forces, Pressures, State and Impacts.

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23. Eco-Efficiency

Definition

The concept of eco-efficiency was introduced by the World Business Council for Sustainable Development (WBCSD www.wbcsd.org) in the book 'Changing Course', published in preparation for business sector participation in the 1992 Rio Earth Summit.

This concept describes a vision for the production of economically valuable goods and services while reducing the ecological impacts of production. According to the WBCSD, "eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the

Earth's estimated carrying capacity." In short, it is concerned with creating more value with less impact (i.e. using fewer resources and creating less waste).

Eco-efficiency is a management philosophy, which encourages business to search for environmental improvements that yield parallel economic benefits. It focuses on business opportunities and allows companies to become more environmentally responsible and more profitable.

Core Elements

According to the WBCSD the fundamental elements of eco-efficiency are:

- A reduction in the material intensity of goods or services;
- A reduction in the energy intensity of goods or services;
- Reduced dispersion of toxic materials;
- Improved recyclability;
- Maximum use of renewable resources;
- Greater durability of products;
- Increased service intensity of goods and services.

The reduction in ecological impacts translates into an increase in resource productivity, which in turn can create a competitive advantage for businesses. At a macro level, eco-efficiency is seen as a way to decouple economic growth from its impacts in ecological systems. Progress in eco-efficiency trends are studied by a discipline called Industrial Ecology.

Limitations

Many authors claim that the optimistic view regarding the role of technological win-win solutions will not represent a sufficient response to the challenge of sustainability. Issues such as the Jevons' Paradox (or rebound effect), distribution of the benefits of technological improvements, life styles, production and consumption patterns and empowerment require important changes in social and political organization and governance that go far beyond the technical fixes underlying the concept of eco-efficiency.

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24. Ecological Debt

Concept origins

It has been understood that the present societal use of resources is not sustainable in the long run, mainly because the costs associated with unsustainable activities do not affect those that carry out these activities. The notion of ecological debt focuses on this disequilibrium: the majority who over-exploit the global commons (rich countries) owe an ecological debt to those in possession of resources (poor countries). The poor are not using even a small portion of their legitimate share of the global commons, while the North has been permitted to pollute over the last century without limits and at little cost to build its economy and industrial base cheaply and rapidly.

The first discussions on ecological debt concept took place around 1990, largely thanks to inputs from Latin American NGOs, and then followed by Friends of the Earth International. In 1992, during the Rio Summit, the creation of a Debt Treaty was proposed which introduced the notion of an ecological debt in contraposition to the external debt. Under this proposal, the sizable ecological debts of industrialized countries would be grounds for a compensatory transfer scheme aimed at eliminating, the external debt of many developing countries.

While no official definition of ecological debt exists, the concept addresses pollution, ‘theft’ of resources and disproportionate use of the environment. Accion Ecologica defined it in 1999 as “the debt accumulated by northern industrial countries toward third world countries on account of resource plundering and use of environmental space to deposit wastes”. In 2009, the Centre for Sustainable Development (CDO) at Ghent University proposed as a working definition: (1) the ecological damage caused over time by a country in other countries or to ecosystems beyond national jurisdiction through its production and consumption patterns; (2) the exploitation or use of ecosystems (and its goods and services) over time by a country at the expense of the equitable rights to these ecosystems by other countries.

Application

The ecological debt concept focuses on the lack of political power of poor regions and countries. The debt arises from: (1) exports of raw materials and other products from relatively poor countries or regions being sold at prices which do not include compensation for local or global externalities; (2) rich countries or regions making disproportionate use of environmental space or services without payment (for instance, to dump carbon dioxide).

Ecological debt usually designates a public debt a country has toward other countries (foreign debt) but can also be used to calculate a debt (or liability) from a company (private debt) or a debt a nation has toward future generations (generational debt).

Difficult questions

The notion of ecological debt raises hard political and ethical questions. Should poorer countries get a greater share of resource consumption in the future to compensate? Should poor communities not have the same chance to consume that richer ones have had? Is it just to ask current generations in rich countries to pay for the sins of their fathers? At what period should we start calculating the debt? It might be considered as an injustice to the present generation that we should pay for the debts of past generations, but if we do not take responsibility for the debt of past generations, who should?

Regarding its methodology, the main objection to the notion of ecological debt is that it implies monetization of nature's services, which is not a matter of consensus amongst researchers or campaigners. The method proposed to calculate ecological debt requires money estimates of the value of the environment, which are difficult to make, for various reasons (uncertainties, incomparable impacts, limited substitutability between natural and human-made capital, arbitrariness of the discount rate, ethics barriers). Theoretically it may be possible to put a money value on the ecological debt by calculating the value of the environmental and social externalities associated with historic resource extraction and adding an estimated value for the share of global pollution problems borne by poor countries as the result of higher consumption levels in rich ones. This includes efforts to value the external costs associated with climate change. However, such monetary accounts (Goemmine and Paredis, 2009, Srinivasan et al, 2008) are useful to Ecological Debt campaigners from civil society.

Toward environmental justice

In conclusion, the ecological debt concept casts a new light on our understanding of "sustainable development", not just by adding a historical dimension but by bringing power and justice to centre-stage, to reveal control over resources and pollution burdens as an issue of power relations. The point is not to exchange external debt for protection of nature (ex: debt for nature swaps) but to emphasise that the external debt from South to North has already been paid on account of the ecological debt the North owes to the South, and to stop the ecological debt from increasing any further. The concept is still in a developing phase, with its definition, methodology and political implications under discussion among scientists and campaigners. Nevertheless, it is a concept with the potential to rebalance global forces, to implement sustainability and to achieve environmental justice.

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25. Ecological Footprint

Introduction and definition

Conceived in the early nineties by William Rees and Mathis Wackernagel at the University of British Columbia, the ecological footprint is now widely used by scientists, businesses, governments, agencies, civil society organizations and individuals, working to monitor ecological resource use and advance sustainability.

The ecological footprint is a measure of human demand on the Earth's ecosystems. It compares human demand on nature with Earth's ecological capacity to regenerate resources and provide services. The ecological footprint represents the amount of biologically productive land and water area needed to produce the resources an individual, population or activity consumes and to absorb and render harmless the corresponding waste, given prevailing technology and resource management practices. This area can then be compared with the amount of productive area that is available to generate these resources and to absorb the waste.

Footprint methodology

Ecological footprint analysis calculates the combined demand for ecological resources, expressed as the global average area needed to support a specific human activity. Demand for resource production and waste assimilation are translated into a common area unit by dividing the total amount of a resource consumed by the yield per hectare, or dividing the waste emitted by the absorptive capacity per hectare. Yields are calculated based on various international statistics, primarily from the United Nations Food and Agriculture Organization.

An important component in footprint calculations, particularly for rich countries, is inclusion of the amount of land with new vegetation that would hypotheticallly take up carbon dioxide emissions (in contrast to land actually used for food or timber). In fact, a large part of human-produced carbon dioxide emissions are not taken up through photoshynthesis on land but are taken up by oceans, with about half accumulating in the atmosphere causing the increased greenhouse effect.

In ecological footprint calculations, land and water area is scaled according to its biological productivity. This scaling makes it possible to compare ecosystems with differing bioproductivity and in different areas of the world in the same unit, a global hectare (gha). Six main land use types are considered in ecological footprint accounts: cropland, grazing land, fishing ground, forests for timber and fuelwood, forests for carbon dioxide uptake, and built-up land. For all land use types there is a demand on the area, as well as a supply of such an area.

Usually the ecological footprint of a population is calculated from a consumption perspective, i.e., it measures the land demanded by the final consumption of the residents of the country. This includes household consumption as well as their collective consumption of items, such as schools, roads, etc. Most ecological footprint studies and published reports refer to this perspective. However, the ecological footprint can also be calculated based on production. In this case, a country's primary production ecological footprint is the sum of the footprints for all resources harvested and all waste generated within the country's geographical borders. The difference between the estimates provided by these two perspectives corresponds to the balance between imports and exports.

Footprint results and use

Metrics such as the ecological footprint are a useful tool in the sustainability debate, since they allow us to give an attractive representation (in terms of hectares), easy to grasp, of the present use of natural resources.

For example, using an ecological footprint analysis, Wackernagel and his associates estimate how many planet Earths it would take to support humanity if everybody lived a given lifestyle. According to the Ecological Footprint Atlas 2009 (available at http://www.footprintnetwork.org/images/uploads/Ecological_Footprint_Atlas_2009.pdf), in 2006, humanity's total ecological footprint was 17.1 billion global hectares (gha); with world population at 6.6 billion people, the average person's footprint was 2.6 global hectares. The area of biologically productive land and water on Earth was estimated at approximately 11.9 billion hectares, or 1.8 gha per person. This overshoot of approximately 40 percent means that in 2006 humanity used the equivalent of 1.4 Earths to support its consumption. This is of course a metaphor since there is only one planet Earth. The result is largely due to the accounts of hypothetical land for taking up carbon dioxide emissions.

Global comparisons also clearly show the inequalities of resource use worldwide. Per capita ecological footprint is a means of comparing consumption and lifestyles. While an average inhabitant of Bangladesh or Nepal consumes 0.5 gha per year (in 2006), an average Chinese takes 1.8 gha and an average American 9.0 gha (**Figure** 1).

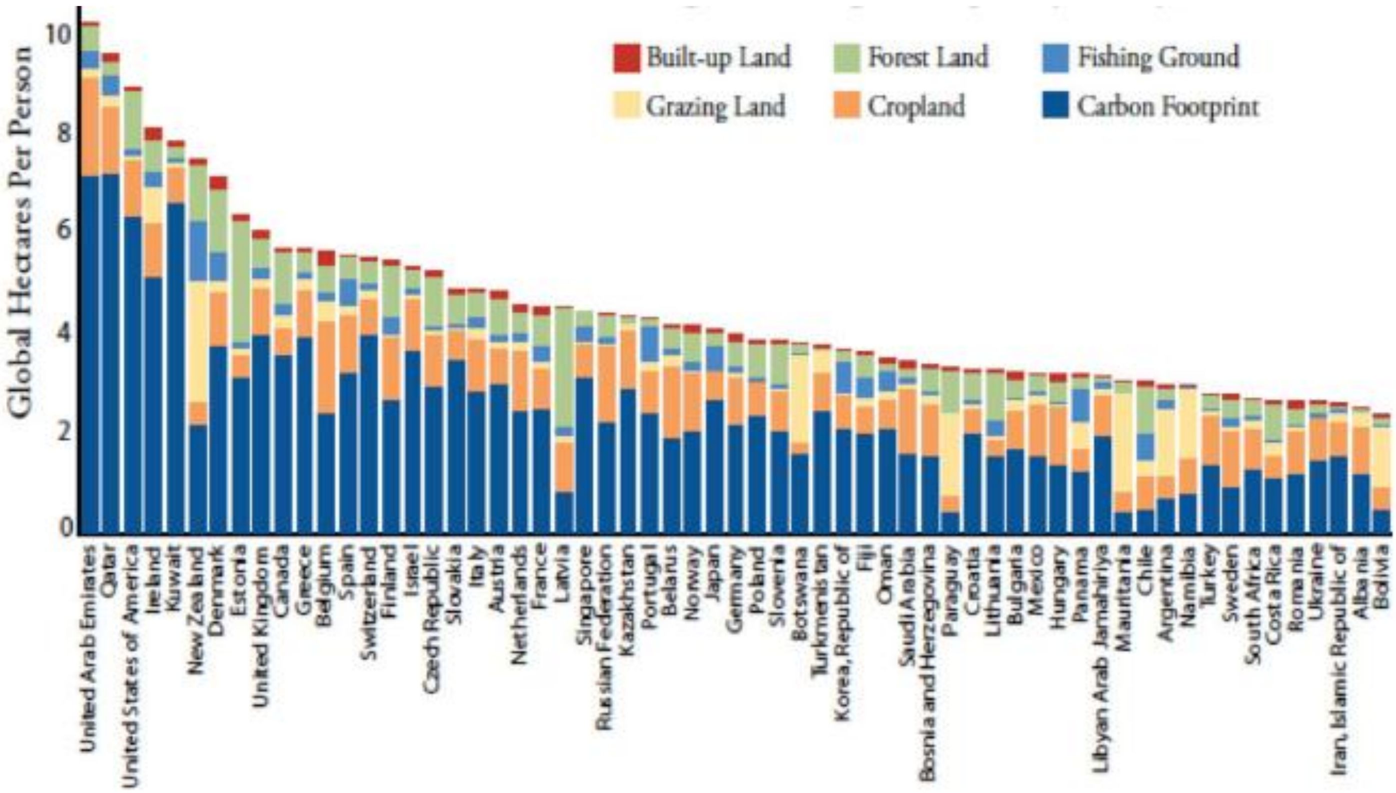

Figure 1: Ecological footprint by country
(Source: Ecological Footprint Atlas 2009)

Ecological footprinting is now widely used around the globe as an indicator of environmental sustainability. Footprints can inform policy by examining to what extent a nation or a region or a city uses more (or less) than is available within its territory, or to what extent the nation's lifestyle would be replicable worldwide. It can also be a useful tool to educate people about carrying capacity and over-consumption, with the aim of influencing individual behavior. Ecological footprints may be used to explore the sustainability of individual lifestyles, goods and services, organizations, industry sectors, neighborhoods, cities, regions and nations. A number of NGO websites allow estimation of one's ecological footprint (http://www.footprintnetwork.org/en/index.php/GFN/page/personal_footprint/ or http://www.myfootprint.org/).

Problems and concerns

The Global Footprint Network (www.footprintstandards.org.) developed the first set of ecological footprint standards in a facilitated public process in 2006, detailing communication and calculation procedures, and continues to work toward an accepted standardized methodology.

The ecological footprint is an intuitively appealing indicator (easy to communicate and understand with a strong conservation message). The indicator is most effective, meaningful and robust at aggregate levels (national and above), but concerns have been raised regarding the use of the ecological footprint as a sustainability indicator. Many criticisms are related to the lack of consideration of aspects such as land degradation, biodiversity loss, toxicity to humans and ecosystems, etc. Also issues such as the distinction between intensive and extensive agriculture, accounting for multifunctionality in ecosystems and neglecting resource scarcity have been raised. It should be acknowledged that the use of natural resources entails a large number of different environmental impacts. One single indicator is unable to illustrate the complexity of these impacts and their interrelations, in particular, regarding burden shifting between different types of impacts. Moreover, two important issues are not properly addressed in EF calculations. First, how much land should be devoted to the maintenance of other "wild" species? Second, why to express the issue of excessive carbon dioxide emissions in terms of hypothetical land required to absorb it?

Therefore, sustainability assessment should not rely on the use of a single tool or indicator, but use a set of indicators covering different perspectives and dimensions of sustainability. See for instance the WWF's Living Planet Report (http://www.panda.org/about_our_earth/all_publications/living_planet_report/lpr_2008/). Ecological footprints may be a powerful and useful tool in this context.

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26. Ecological Rucksacks and Hidden Flows

Definition

An ecological rucksack is defined as the total quantity (in kg) of natural material (M) that is disturbed in its natural setting, and thus considered the total input (I) in order to generate a product - counted from the cradle to the point when the product is ready for use - minus the weight (in kg) of the product itself (Schmidt-Bleek, 1993). The *rucksack factor* of materials *(MI)* is the sum total of natural materials utilised (kg) to make one kg of technical base (raw or starting) materials available (e.g. wood, iron etc.) (Schmidt-Bleek, 1998).

Five different rucksacks have been delineated by the Wuppertal Institute (see http://www.wupperinst.org/en/home/index.html) to describe the overall natural resource intensity of products. These correspond to the 5 environmental spheres of: water, air, soil, renewable biomass, and non-renewable (abiotic) materials (Schmidt – Bleek 1999).

On average, industrial products carry non - renewable rucksacks that are about 30 times their own weight. Only about 5 % of non-renewable natural material disturbed in the ecosphere typically ends up in a technically useful form. In the case of a PC, the ecological (abiotic) rucksack weighs at least 200 kg per kg of product. For base materials (such as iron, plastic or copper), MI values allow the comparison of technical starting materials regarding their resource intensities and thus allow the computation of the rucksack of products, so long as the material compositions of these products are known (Schmidt-Bleek, 1998). MI values (rucksack factors) for non-renewable resources of base materials are for example: round wood = 1.2, glass = 2, plastics = 2 – 7, steel = 7, paper = 15, aluminium = 85 , copper = 500, platinum = 500 000. (Schmidt – Bleek, 1999)

Beyond Rucksacks

In its methodological guide, Eurostat (2001) introduced a new and extended terminology for distinguishing between different types of upstream material requirements, formerly lumped together as ‘hidden flows’ or ‘ecological rucksacks’. Eurostat suggests making a distinction between ‘used’ and ‘unused’ extraction on the one hand and ‘direct’ and ‘indirect’ flows on the other hand. The distinction ‘used’ and ‘unused’ extraction refers to the boundary between an economic system and its natural environment and specifies what should be regarded as an ‘input’ from the environment to the economic system, i.e. what should be regarded as a raw material. Dredging material, excavation material, overburden from mining (the sterile material which has to be removed in order to get access to the gross ores) and unused by- products from biomass harvest are the main components of ‘unused’ extraction.

The distinction between ‘direct’ and ‘indirect flows’, on the other hand, refers to the boundary between a national economy relative to other national economies, i.e. to traded goods. All upstream material requirements for producing imported or exported commodities are denoted as ‘indirect flows’. As goods in different stages of processing are traded, from basic commodities to final products, indirect flows consist of two fractions: The “raw material equivalents” represent used extraction, needed to produce traded goods. Unused raw materials represent the ‘unused’ part of indirect flows. As raw material equivalents represent used extraction, necessary for producing traded commodities, the quantification of raw material equivalents would allow for a standardization of physical foreign trade flows to the same economy-environment system boundary as applied in used domestic extraction (DE) (Weisz , 2006).

According to Weisz, “With such information, both a net trade balance in terms of raw materials and the raw material requirements of domestic final consumption could be calculated for a national economy.” Further “a net trade balance in terms of raw materials is needed to investigate if, and to what extent, a country's domestic final consumption is indirectly dependent on raw materials from abroad“ (Weisz, 2006). Weisz (2006) states that the "ecological rucksacks" or "hidden flows" approach, developed by the Wuppertal Institute may be appropriate for accounting for the unused extraction of a few basic commodities if regional specific coefficients (MI factors) are available, but cannot be applied to the much more complex estimation of raw material equivalents of all imported and exported goods. The reasons for this are that (1) the number of coefficients that would be needed is by far too large to be compiled in practice (2) **LCA** – type approaches such as this lack appropriate standards to guarantee the consistency and comparability of the accounts, in particular when aggregated to larger scales (3) Factors cannot account for the so called second and third round effects of the intermediate use and supply chains of the industrial production system. These intermediate flows have become extremely large in highly industrialized economies (see Ayres et al. 2004).

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27. Ecologically Unequal Exchange

Background and Definition

It has long been mistakenly argued that developed nations are "dematerializing" their economies, that is, that citizens of these countries value more and more consumption of services over material products and therefore they use less materials per unit of GDP or even in absolute terms. Moreover, Ecological Modernization Theory developed in northern Europe observed that some capitalist firms appeared to be incorporating environmental considerations into their decision-making. Both these trends led many observers to assert that economic growth was decoupling from resource consumption, indicating a sort of environmental victory. However, the Environmental Kuznets Curve hypothesis was not confirmed for the use of materials, as economic growth did not lead to less use of materials (in relative terms or even in absolute terms).

A related claim made by World Bank and World Trade Organization analysts states that exports from developing nations are being upgraded and are increasing poor nations' expectations for higher economic growth and development. These arguments however have recently been questioned by researchers constructing a literature on ecologically unequal exchange. Their empirical findings suggest that trade relations remain strongly unbalanced and unfair because many poorer nations (and regions) export large quantities of under-priced goods whose value does not take into account the environmental and social costs of extraction, processing, or shipping. Moreover, the metropolitan regions or countries require for their metabolism increasing amounts of energy and materials at cheap prices.

Ecologically unequal exchange thus refers to the act of exporting goods from poor countries at prices which do not take into account local externalities or depletion of natural resources generated by these exports, in exchange for the purchase of expensive goods and services from richer regions. It focuses on poverty and the lack of political power of the exporting region to stress the lack of alternative options. This exchange of exports from poor to rich nations against goods or services from rich to poor countries tends to be organized by multinational corporations or partnerships between elites in poor nations and import firms in rich nations. This process is facilitated by the International Monetary Fund and World Bank through their structural adjustment loans which require poor countries to stimulate exports of natural resources by devaluing currency and providing various regulatory concessions (such as environmental law waivers) and financial incentives (tax holidays) to foreign investors in return for their money.

Causes and effects

Alf Hornborg explained the structural roots of ecologically unequal exchange in 1998. The rich metropolitan regions of the world require a net inflow of energy and materials at low prices for their social metabolism. Therefore, exporting regions have trade deficits in physical terms, exporting more tons than they import, and selling their exports at a lower price than they pay for their imports. This is a structural condition of the world system. Large amounts of oil, coal and gas flow from relatively poor regions to rich regions. Moreover, during long periods of time there is a constant decrease prices of exports from poor nations (largely natural resources) relative to the prices of exports from wealthy nations (largely manufactured goods or services). As a consequence of this deterioration in terms of trade, more and more natural resource (e.g., forestry) or other primary product (e.g., agriculture and mining) exports are required to purchase imports from rich nations. This often entails extensive degradation in poor nations (e.g., forest loss, water pollution, and air pollution) as increased export production is required to maintain levels of imports. The obligation to pay external financial debts is another factor forcing exports of raw materials.

For example, the export oriented cattle industry in some regions of Latin America is a main contributor to domestic forest degradation. Local elites and transnational firms own and operate most of the high density livestock operations, and meatpacking plants prepare meat for export to the US and to other growing markets in developed countries. Another example is the case of logging corporations degrading the forest in many countries. European-based firms exploited the proximity of West African forests to the coast for export to European markets. These firms even gained access to forested areas in Ghana, Cameroon (see the CEECEC case study on Foresty in Cameroon), and the Ivory Coast, with the majority of wood exported to high-consuming European countries.

Beyond a clear contribution to various forms of environmental degradation, ecologically unequal exchange leads to other problems in poor nations as well, especially poverty and inequality. It also seems to play a role in the particularly important area of global climate change. Indeed, statistical research suggests that participation in international trade increases CO_2 emissions in poorer countries while lowering them in wealthier countries. Therefore, while national CO_2 emissions data may suggest a shift towards relatively low-carbon lifestyles and economies in the north, such countries are not necessarily emitting less, but may simply be displacing their emissions (like "outsourcing" the production of their energy-intensive goods to developing countries). These findings have led to the proposition that the richer nations owe some sort of remuneration (an ecological debt) to poorer nations for the environmental damage embodied in their energy (and material) intensive goods. It is said that wealthy nations have been accumulating a huge debt over centuries by exploiting the raw materials and ecosystems of poor countries.

Analysis

The empirical analysis of ecologically unequal exchange theory has become quite popular among ecological economists who analyze material flows. They have developed detailed accounting frameworks aimed at measuring flows of minerals, fossil fuels and biomass. However, this approach tends to focus on single nations. In order to apply the approach cross-nationally, Jorgenson (2006) developed a more comprehensive measure of "weighted export flows," which enables researchers to test insights of ecologically unequal exchange using data for a large sample of nations. Jorgenson's weighted export flow measure quantifies the extent to which the exports of a given nation are sent to wealthier nations. A higher value on this measure means that a nation sends a higher percentage of its total exports to richer nations.

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28. Economic Valuation

Theoretical framework

Economists value the environment placing a monetary value on ‘goods’ and ‘bads’ arising from changes in environmental quality or resource availability. The rationale for the economic valuation of natural resources is that they somehow impact on the utility (or well-being) of individuals, and that these individuals can identify a satisfactory trade-off between quantities of money and the environmental “goods” and “bads” they want. The objective is to find ways to measure the wide range of effects of environmental change on a single monetary scale. Money is used as the measuring stick to evaluate, although imperfectly, the extent to which individual utility is affected. This approach necessitates applyiing a monetary value to goods that do not have a market value, in an attempt to extend the utilitarian principle of the free market into environmental decision-making.

The economic valuation approach makes several important assumptions (see, for example, Edwards-Jones et al, 2000), including commensurability of values, and assumes a compensatory approach in the evaluation of environmental changes, corresponding to a weak sustainability approach. The total economic value (TEV) of a resource indicates the total value of the resource in so far as it affects human welfare and integrates two broad categories of values: use values, associated with the direct contact with the natural resource in some way, and non-use values, corresponding to the value derived from a resource, either directly or indirectly, but that does not depend on the use of that resource. A full taxonomy of such economic values can be found in any economic valuation handbook (e.g. Dixon et al, 1998), including values categories such as option value, bequest value and existence value.

28.1 Contingent Valuation

Introduction and definition

The contingent valuation method (CVM) is a widely used method for estimating economic values for all kinds of ecosystem services and environmental goods which are not traded in the market and hence have no market price. CVM is typically used to estimate the benefits (or costs) of a change in the level of provision (or in the level of quality) of a public good. This information can then be used in a cost benefit analysis which assesses the impacts of government project or policy. For instance, imagine an increase in public investment out of current taxes for improving the quality of the water in a river by treatment of the sewerage. It is easy to count the costs: the amount of money spent. But what are the benefits? We could try to count them one by one in their respective units, for instance better public health, less bad smells, availability of non-contaminated fish... Or we could ask a representative sample of the concerned local population how much they would have been willing to pay (in the forms of taxes for instance) in order to improve the quality of the water. Adding these results over the whole population, we would have a monetary representation of the benefits obtained.

Use and Non Use Values

CVM can be used to estimate both use and non-use values and it is the most widely used method for estimating non-use values. Use values are those values which are derived from actual use of a good or service, such as visiting a national park or using a beach for recreation. The non-use values do not involve direct use of a resource or ecosystem service. They include everything from the basic life support functions associated with ecosystem, health or biodiversity, to the enjoyment of a scenic vista, having an option to fish or watch birds in the future, or to bequest those options to grandchildren. It also includes the value people place on simply knowing that giant pandas, whales, a certain protected area or a beach exist, even though they will never see or visit them.

Willingness to Pay and Willingness to Accept

The method is applied through conducting a survey in which people are directly asked how much they would be willing to pay (WTP) for a (change in) specific environmental service. It is also possible to ask people what the amount of compensation is that they would be willing to accept (WTA) to give up an environmental service. The first approach is more recommendable. It is called "contingent" valuation because people are asked to state their willingness to pay, contingent on a particular scenario and the environmental service described to the respondent.

The first step is to define a (change in) a good or service being valued (e.g. improving a lake water quality that would lead to a 20% increase in fish stock). Then decisions about the survey itself are made, such as whether it will be conducted by mail, phone or in person, how large the sample size will be and who will be surveyed (e.g. only visitors or both visitors and non-visitors; individuals at the local, national or international scale). Answers to questions regarding survey method and sample size depend mainly on the size of the research budget, while the choice of subjects will depend on the 1) whether one decides to estimate only use or both use and non-use values, and 2) on the uniqueness of goods or services being valued (resources with unique characteristics are likely to have higher non-use value and thus the geographical scope of the survey should be larger). In-person interviews are generally the most effective for complex questions, because it is often easier to explain the information to respondents in person. Also, people are more likely to complete a long survey when they are interviewed in person. However, these are also the most expensive type of surveys. The survey sample should be a randomly selected sample of the relevant population (e.g. every 10th visitor of a national park).

Survey Design

A contingent valuation survey should include (1) a detailed description of a good or service being valued and the hypothetical change regarding the good or service, (2) questions about willingness to pay for a good or service being valued, and (3) questions about respondents' characteristics (age, income, education) and preferably also their *preferences* regarding the good or service. The willingness to pay question should also define a way in which payment would be made (a general tax, a voluntary donation or an entrance fee). For example, a question can be formulated in the following way: "Are you willing to pay __€ for the previously described improvement of the river water quality *in the form of a voluntary donation* per year?". The valuation question is usually followed by a question which identifies the motivation of those respondents who state that they are not willing to pay anything. This enables distinguishing between the so-called protest votes (respondents who are not willing to pay anything because they protest against a scenario presented or a payment method, not because their real value for the good is zero) and the people for whom the good indeed has no value. Protest votes are in most cases excluded from the statistical analysis as they do not reveal people's real value for the good.

Some authors (like Sagoff, in *The Economy of the Earth*) interpret protest answers as refusals to act as consumers when deciding public policies. He believes that the economic approach, which treats individuals as consumers with certain p*references* is limited and that policy issues should be decided by rational legislative deliberation. Thus, he argues that people refuse to give a price because they want to act as "citizens" (deciding upon policy matters by voting, demonstrating, debating) and not as "consumers" in a fictitious market.

The next step is to conduct the survey, which is followed by statistical analysis and reporting of the results. The main result derived from the CVM is the average willingness to pay per person. This figure is then multiplied by the relevant population (all visitors of a beach or all residents of a country, for instance) in order to derive total economic value of a good or service. For example, if the average willingness to pay of surveyed people for establishing a protected marine area is 20€ per person per year, and the relevant population amounts to 200.000 (e.g. annual visitors of the site), then the total benefits of such a project would be €4 million.

Limitations

Although CVM has been widely used in cost benefit analysis and environmental impact assessment for several decades, it has been subject to many critiques. The main concern relates to the reliability and validity of its results due to a number of errors or biases that can occur when applying CVM. The most important biases are:

-when respondents are asked about their willingness to pay hypothetically they tend to give higher values than what they would actually pay in a real situation

-rather than expressing value for the good or service, the respondents might sometimes actually be expressing their feelings about the scenario or the valuation exercise itself (they do not believe that a described change is feasible or that it will really take place)

-respondents may give different willingness to pay amounts, depending on the specific form of payment chosen (e.g. if the form of payment is voluntary donation respondents may give higher values than if asked to pay through higher taxes)

-starting value in the willingness to pay question tends to imply a value for the good (e.g. "Are you willing to pay €5 for…?"), so that a starting value well above the respondent's true willingness to pay amount will increase the stated willingness to pay amount, while starting value well below it will tend to decrease it

-strategic bias arises when the respondent does not provide a true answer in order to influence a particular outcome, i.e. provision of a good

-non-response bias is a concern because individuals who do not participate in the survey are likely to have different values than individuals who do take part in it

References

For a short description of CVM as well as several examples of its application:
www.ecosystemvaluation.org/contingent_valuation.htm

28.2 Cost benefit analysis

Cost-benefit analysis (CBA) is the primary tool / analytical method for economic valuation in public decision-making processes. It is based on a utilitarian ethic, in which changes in utility arise from changes to marketed and non-marketed commodities. The theoretical origins of CBA date back to infrastructure appraisal efforts of France in the 19th century but it was popularized by the World Bank after 1945 especially for the building of dams.

CBA involves valuing, adding up, and comparing in monetary terms the positive (benefits) and negative (costs) effects associated with a particular action/decision. The values of economically relevant costs and benefits over the lifespan of an action are expressed using indicators such as net present value (NPV). For economists, the objective of CBA is to select the most efficient action(s) in terms of resource use. According to CBA criterion, a policy/program/project is justifiable in terms of the public interest and contributes to social welfare if the benefits, to whomever they accrue, outweigh the estimated costs (i.e., NPV is greater than zero).

This approach is in line with the Kaldor-Hicks potential compensation principle, which is a very widely accepted variation on the Pareto criterion. Pareto efficiency is achieved when it is not possible to make some (or all) people better off without making others worse off. The Kaldor-Hicks principle only requires that the *net gains* from an action are positive. If society as a whole gains with the action, and if it is, at least in theory, possible to transfer some of the winners´ gains to the losers, then the project is in the public interest. CBA is intended to help decision-makers to identify projects/programs with potential net gains by evaluating all relevant costs and benefits.

CBA methods

There are several important steps in a CBA:

- Perspective: decide on the perspective from which the study is to be done (Eg: societal, governmental, provider, payer...);

- Project definition: develop a complete specification of the main elements of the project or program and implications in terms of resource allocation (e.g location, timing, groups involved, population of affected people, connections with other projects/programs);

- Classification of impacts: determine the full range of consequences of the project/program, including a physical and quantitative description of the inputs and outputs (e.g. consumption of materials, emissions, effects on local employment levels, land occupation). This can be difficult for regulatory programs;

- Conversion into monetary terms: placing monetary values, estimating the social costs and benefits of these inputs and outputs (including adjustments for inflation and shadow prices);

- Compare the benefits and costs: the various costs and benefits over time are made commensurate through a process known as "discounting", which converts them into what they would be worth today. The fundamental assumption is that future costs and benefits count for less than present ones. To calculate the present values of costs and benefits it is important to select the appropriate discount rate, which is a difficult and sometimes controversial task (see, for example, Field and Field, 2009);

- Project assessment: several indicators can be adopted to make judgements about the overall value of the action under study (e.g. net present value, benefit/cost ratio, distribution of costs and benefits). The relation between total benefits and total costs is a question of economic efficiency. But the distributional issues are also very relevant. Distribution is a matter of who gets the benefits and who bears the costs;

- Sensitivity analysis: since several types of uncertainty are present in a CBA exercise, it is important to test the influence upon decision indicators of changes in the most important variables.

A wide range of techniques have been developed for performing economic environmental valuation, namely for valuing goods and services that do not have a market value. These techniques have been classified in many different ways. For example, Munasinghe (1993) considers three broad groups of economic techniques: a) conventional market approaches – establishing a link between an environmental impact and some other good with a market value (e.g. defensive or preventive expenditures; replacement or restoration costs); b) implicit market approaches – assuming that the behaviour of individuals reveals implicit valuations of features of the environment (e.g. hedonic pricing methods; travel cost method); c) constructed market approaches – simulating a hypothetical market of a particular good or service (e.g. contingent valuation).

Applications

CBA has been widely applied and endorsed in both public and private decision-making processes. Applications in the environmental area can include the assessment of investment and development projects (e.g. public waste treatment plants; beach restoration projects; habitat improvement projects) or policies (e.g. pollution-control standards, restrictions on land development). In the United States, CBA was first used in conjunction with the United States Flood Control Act of 1936. The "Regulatory Right to Know Act", from 2000, required that agencies conduct a CBA of their programs and regulations (USEPA. 2005).

Objections and Criticisms

The status and potential role of CBA in ecological economics is controversial. Several objections and criticisms are described in the literature and/or are part of the scientific debate (e.g. Baer and Spash, 2008; Spash, 2007; Vatn, 2000; Edward-Jones et al, 2000; Hanley and Spash, 1993; Martinez-Alier et al, 1998). Historically, CBA was developed to evaluate well defined small-scale projects, but even at project level there is often skepticism relating to the necessary simplifications and assumptions. Skepticism increases when CBA is used for global-scale problems, where uncertainties surrounding the relationship between causes of environmental problems, their potential impact and valuation raise additional challenges (e.g. Baer and Spash, 2008).

Critiques and objections to CBA are mainly related to the controversial ethical choices and practical application involved, and include aspects such as its: a) incapacity to acknowledge incommensurability and to capture non-economic values; b) incapacity to distinguish distributional aspects (e.g. CBA treats gains and losses equally and is unconcerned with who gains and who loses) assuming the possibility of appropriate compensation, which has implications for equity; c) problems with discounting and its approach to accounting for future generations and non-human species; d) approach to dealing with risk, uncertainty, ignorance and ecosystem complexity, including non-linear and stochastic (random) relations; e) accuracy and acceptability of monetary valuations; f) treatment of irreversibility; g) potential for manipulation and institutional capture; h) lack of a strong sustainability criterion; i) reliance on consumer values which are a limited subset of all values in society (citizen values). In the CBA of dams, Krutilla introduced an interesting discussion in 1967 using different discount rates for benefits and for costs.

Despite the considerable range and number of serious critiques however, the CBA approach remains influential and continues to be applied to valuation of the environment, as it can provide relevant information concerning economic aspects of multicriteria assessment processes.

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28.3 Discount Rate

Basic definition

For the purposes of investors, interest rates, impatience and risk necessitate that future costs and benefits are converted into present value in order to make them comparable with each other. The discount rate is a rate used to convert future value into current or present value. This is realized through the mechanism known as discounting. For instance, if somebody offers to pay to you 105 € one year from now, the present value is 100 € at a discount rate of 5%. This is because you would earn interest of 5 € on a deposit of 100 €. (See "Net Present Value" for more numerical examples).

Justification for discounting

There are two main reasons for discounting. The first, called "pure time preference", refers to the inclination of individuals to prefer 100 units of purchasing power today to 101, or

105, or even 110 next year, not because of price inflation (which is excluded from the reasoning) but because of the risk of becoming ill or dying and not being able to enjoy next year's income. The most famous critique of "pure time preference" came from the Cambridge economist Frank Ramsey in 1928, which observed that discounting later enjoyments in comparison with earlier ones is "a practice which is ethically indefensible and arises merely from the weakness of the imagination". But economists continue to discount the future, as Ramsey himself did, because of the second, and more contemporarily relevant reason: economists assume that today's investments and technical change will produce economic growth. Our descendants will be richer than we are. They will have three, four or even more cars per family. Therefore, the marginal utility, or incremental satisfaction they will get from the third, fourth or fifth car, will be lower and lower. Discounting is justified by the expectation of economic growth. But Ramsey did not take environmental considerations into account.

Methodology

We generally discount future amounts of money using constant discount rates, that is, discount factors of the form $1/(1+r)^t$. This is usually called "exponential discounting", and it implies that values in the distant future tend to have present values close to nothing. Thus, discounting reflects the balance between present and future well being. Low discount rates imply important sacrifices for present generations while high discount rates imply giving low values to future damages, and thus, betting against the environment and future generations.

A distinction can also be made between **public or social** discount rates and **private** discount rates. Both sectors use a positive discount rate (that is $r > 0$) but there is a difference in the fact that the social discount rate is generally lower than the private discount rate. This is for two reasons:

1. Individuals (private sector) are mostly concerned with their own welfare in the very short term, discounting future benefits heavily. On the other hand, the public sector (society as a whole) tends to have a longer-term perspective, entailing lower discount rates.
2. Individuals are more risk-averse, more uncertain about the future than the rest of society, or this is at least what is argued. The discount rate is thus adjusted upward to reflect the greater risk associated with private projects.

Discount rates and sustainability

Whatever the reason for attitudes in favour of discounting, its application to nations or societies with time horizons in the thousands of years is highly questionable, one of the most heavily debated issues in ecological economics. The relationship between future generations and discounting is a crucial issue in discussions of intergenerational equity. High or positive discount rates shift the costs of environmental degradation to later generations, and reduce incentives for long-term environmentally favourable projects. But high discount rates (i.e. high rates of interest) also reduce levels of investment because borrowing money become more expensive and this in turn decrease the use of natural resources. In this case, intergenerational equity and environmental objectives are incompatible to an extent.

From the environmental point of view, instead of exponential discounting when assessing future costs and benefits, a slowly declining rate of discount could be used to give more value to the future. What is really needed however are very low discount rates, with investment (which will increase because of low interest rates) subject to a second filter to ensure their environmental sustainability.

Concerns

Projects dealing with preservation of environmental assets, such as coastal wetlands, wilderness, national parks or estuaries are highly sensitive to discounting, and usually evaluated on the basis of preferences of the current generation. However, environmental costs and benefits often accrue to future generations. In these situations, it is questionable whether the use of a positive discount rate is ethical. For many economists, the use of a positive discount rate reflects people's preference for present consumption, and is considered the appropriate method. For projects addressing environmental issues however, a very low or even a zero social discount rate in the interests of distributional fairness among generations would seem more appropriate. Even minor discounting implies unequal weighting of costs and benefits over time, it is doubtful whether a positive discount rate *can* bring distributional equity. In response to this dilemma, economists have put forth three responses: (1) generational overlap means that current generations take the interests of future ones into account; (2) a zero social discount rate could impoverish the current generation; and (3) historically, the income of current generations has always been higher than of earlier ones, and we can continue to expect future economic growth.

When the conservation of amenities of the natural environment is at stake, some economists (as Krutilla, 1967) argue for very low or zero discount rates. The reason is that for projects with long time horizons, any discounting reduces future costs and benefits almost to zero after a finite number of years. This implies a bias for projects with either short-term benefits (such as development projects rather than projects designed to preserve environmental amenities) or long-term costs (such as the creation of a nuclear plant). In both cases, the well-being of future generations is in danger. Given this, some economists argue that intergenerational equity justifies no discounting at all. Others have even gone further and argued for negative discounting to reflect a need for greater protection of the interests of future generations in natural resource management decisions, as for example in the case of irreversible outcomes such as global warming.

The optimist's paradox

Economic growth might produce virtual Jurassic Theme Parks for children and adults, but it will never resurrect the tiger if and when it becomes extinct. Economic growth theory does not include it in its accounting the costs of the loss of nature, or those of defensive expenditures by which we try to compensate for nature's loss (building dykes against sea-level rise induced by climate change, or selling bottled water in polluted areas). If one tried to add up the genuine growth of the economy resulting from positive technical changes and investments (which nobody would deny), and the loss of environmental services caused by economic growth, the balance would be doubtful. Furthermore, it would involve accounting with complete disregard for incommensurability of values.

Discounting thus gives rise to an "optimist's paradox". Modern economists favour discounting not because of "pure time preference" but (as Ramsey wrote in 1928) because of the decreasing marginal utility (or incremental satisfaction) of consumption as growth takes place. The assumption of growth (measured by GDP) justifies our using more resources and polluting more now than we would otherwise do. Therefore our descendants, who by assumption we anticipate will be better off than ourselves, might paradoxically be worse off from the environmental point of view than we are. Intergenerational equity then requires the incorporation of the widest possible range of economic, ecological, moral, and ethical concerns.

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28.4 Net Present Value

Basic definition

The idea behind the net present value (NPV) is that one Euro today is worth more than one Euro in the future because money available today can be invested and grow. In this regard, it is essential for decision makers to be able to compare the value of money today with the value of the money in the future, in order to determine whether or not to invest in a project.

NPV is a calculation technique used to estimate the value or net benefit over the lifetime of a particular project, often for long-term investments, such as installing energy efficient machines. It allows the decision-maker to compare different alternatives on a similar time scale by converting all options to current monetary figures. A project is considered acceptable (or unacceptable) if the NPV is positive (or negative) over the expected lifetime of the project.

The formula for NPV requires anticipating the time period for which (expressed as t, usually in years) money will be invested in the project, the total length of time of the project (expressed as N, the same unit as t), the interest rate (i) and the cash flow at that specific point of time (C, cash inflow or outflow). With these elements, NPV can be calculated as follows:

$$NPV = \sum_{t=0}^{n} \frac{C_t}{(1+i)^t}$$

An illustration

An illustration can be made by way of a business that is considering changing its lighting by switching from incandescent to fluorescent bulbs. The initial investment to change the lights themselves amounts to €40,000. After the initial investment, this project expects to spend €2,000 to operate the lighting system but, on the other hand, it will also yield €15,000 in savings each year. Therefore, there is an annual flow of €13,000 following the initial investment. If the discount rate is assumed to be 10% and the lighting system is utilized over a 5 year period, the project would have the following NPV calculation:

$t = 0,\ NPV = \dfrac{-40{,}000}{(1+0.10)^0} = -40{,}000.00$

$t = 1,\ NPV = \dfrac{13{,}000}{(1+0.10)^1} = 11{,}818.18$

$t = 2,\ NPV = \dfrac{13{,}000}{(1+0.10)^2} = 10{,}743.80$

$t = 3,\ NPV = \dfrac{13{,}000}{(1+0.10)^3} = 9{,}767.09$

$t = 4,\ NPV = \dfrac{13{,}000}{(1+0.10)^4} = 8{,}879.17$

$t = 5,\ NPV = \dfrac{13{,}000}{(1+0.10)^5} = 8{,}071.98$

The information above allows us to calculate the NPV over the lifetime of the project, that is the sum of the 6 rows (from t = 0 till t = 5) equals €9,280.22. Notice how much the calculation depends on the interest rate or discount rate. A lower rate will favour the change in lights. The question arises, why is the discount or interest rate 10%, or 5% or 2%? Does money "reproduce" itself at 10% per year? Which are the investments that will sustainably yield such a rate of return, once we take out the value of resource depletion and environmental pollution?

Alternative choices and depreciation

Once the NPV is calculated, various alternatives can be compared and choices can be made. Any project with a negative NPV should be dismissed because it implies that this project will probably lose money or at least not create enough benefits. On the contrary, every proposal with a positive NPV should be chosen or, in case of several projects with positive NPVs, the choice would be the alternative with the higher NPV. In most societal choices, the opportunity costs are also considered when making decisions. NPV provides the possibility to minimize foregone opportunity and identify the best possible options. NPV calculations can also be used to account for depreciation. Most assets depreciate over time or, in other words, they lose value. Decision makers should be able to compute a rate that includes depreciation for account balancing and tax purposes, as well as to predict replacement times for the asset in question. NPV and depreciation calculations are strongly valuable in the world of economics since they tell us what projects are better investments and what outcome we may expect in the future.

However, estimations of depreciation rates for natural resources and other environmental issues are rather uncertain. Indeed, natural resources don't always lose value over time. Therefore, in most cases natural resources should not be depreciated when calculating resource NPVs. Also, since there is uncertainty about the future and external effects exist, it is much easier to predict what a company can do and what the reaction will be in the structured world of business than to accurately assess for example the value of a forest to a local economy in future years.

Criticism

There are several disadvantages to using NPV as an investment criterion. The biggest disadvantage is its sensitivity to the discount rate, which is critical in determining the NPV. A small increase or decrease in the discount rate will have a considerable effect on the final output. In our example, if we set the discount rate at 15%, the NPV equals €3,578.02. A discount rate of 20% entails a NPV of €-1,122.04. We thus come from a project that creates €9,280.22 of value to one that destroys €1,122.04 instead. The main difficulty then in computing the NPV of a project is determining which discount rate should be used, and how to project future changes in the discount rate. This is an issue that there is simply no getting around. The use of NPV will also continue to be controversial because of the practice of applying discounting to natural resources/ecosystems in light of their tendency to increase in economic value with the passage of time. Ecosystem valuation is clearly a complex process that does not always result in the assignment of accurate values to natural resources.

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28.5 Travel Cost Method

Introduction and definition

The travel cost method (TCM) is used for calculating economic values of environmental goods. Unlike the contingent valuation method, TCM can only estimate use value of an environmental good or service. It is mainly applied for determining economic values of sites that are used for recreation, such as national parks. For example, TCM can estimate part of economic benefits of coral reefs, beaches or wetlands stemming from their use for recreational activities (diving and snorkeling/swimming and sunbathing/bird watching). However, it cannot estimate benefits of providing habitat for endemic species or offering scenic beauty. It can also serve for evaluating how an increased entrance fee to the Lastovo Islands Nature Park would affect the number of visitors and total park revenues from the fee.

TCM is based on the assumption that travel costs represent the price of access to a recreational site. Peoples' willingness to pay for visiting a site is thus estimated based on the number of trips that they make at different travel costs. It is also called a revealed preference technique because it "reveals" willingness to pay based on consumption behavior of visitors.

Application

The information is collected by conducting a survey among the visitors of a site being valued. The survey should include questions on the number of visits made to the site over some period of time (usually during the last 12 months), distance travelled from visitor's home to the site, mode of travel (car, plane, bus, train, etc.), time spent travelling to the site, respondents' income and other socioeconomic characteristics (gender, age, degree of education). The information on distance and mode of travel serve for calculating travel costs, which is usually done by a researcher. Alternatively, visitors can be asked directly in a survey to state their travel costs, although this information tends to be somewhat less reliable. Time spent travelling is considered as part of the travel costs because this time could have been used for doing other activities (e.g. working, spending time with friends or enjoying a hobby). The value of time is determined based on the income of each respondent. Time spent at the site is for the same reason sometimes also considered as part of travel costs. It is also recommendable to gather information about other sites that respondents visit on the same trip and time they spend at each site. This enables allocating proportional part of total travel costs for each site. For example, if respondents visit three different sites in 10 days and spend only one day at the site being valued then only fraction of their travel costs should be assigned to this site (e.g. 1/10).

Two approaches of TCM are distinguished – individual and zonal. Individual TCM calculates travel costs separately for each individual and requires a more detailed survey of visitors. In zonal TCM the area surrounding the site is divided into zones, which can be either concentric circles or administrative districts. In this case, the number of visits from each zone is counted. This information is sometimes available (from the site management for example), which makes data collection from the visitors simpler and less expensive.

The relationship between travel costs and number of trips (the higher the travel costs, the fewer trips visitors will take) shows us the demand function for the average visitor to the site, from which one can derive the average visitor's willingness to pay. This average value is then multiplied by the total relevant population in order to estimate the total economic value of a recreational resource.

Limitations

TCM is based on the behavior of people who actually use an environmental good and therefore cannot measure non-use values. This method is thus inappropriate for sites with unique characteristics (e.g. Grand Canyon), which have a large non-use value component (because many people would be willing to pay for its preservation just to know that it exists, although they do not plan to visit the site in the future).

Furthermore, there are several methodological issues which remain unsolved. For example, in cases where respondents visit several destinations on the same trip, which part of the travel cost should be allocated to the site being valued? There are several options, such as allocating the costs in proportion to the time spent on each site, according to the importance of a visit to each site for the respondent, or excluding such respondents from the analysis. Obviously, each approach generates different benefit estimates. Moreover, the method assumes that all trips are of the same length (this usually implies that all visits are one-day trips), which is often not the case in practice. It has been suggested that when the length of trips varies, either daily travel costs should be considered or all trips of the same length should be grouped and then each group analyzed separately. Alternatively, multiple-day trips can be excluded from the analysis. However, estimates will differ depending on the approach selected. Another very important issue in TCM is the value of time spent travelling. Since time could be used in other ways (to work and earn extra money, for instance), it is considered as part of the travel costs. But how should the cost of time be measured? Usually either full or a fraction (e.g. one-third) of individual's wage rate is applied. However, depending on the fraction used, the final benefit estimates can differ considerably.

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29. Ecosystem Services

Ecosystem goods and services

Humans have always depended on nature for environmental assets like clean water, nutrient cycling and soil formation. These have been called by different names through human history, but are presently gaining global attention as 'ecosystem services'. Gretchen Daily has defined ecosystem services as '*the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life*' (Daily, 1997). They maintain biodiversity and the production of ecosystem goods, such as seafood, forage, timber, biomass fuels, natural fibre, and many pharmaceuticals, industrial products and their precursors. The harvest and trade of these goods represents an important and familiar part of the human economy. In addition to the production of goods, ecosystem services include life-support functions, such as cleansing, recycling and renewal, and they confer many intangible aesthetic and cultural benefits as well (Daily, 1997).

Ecosystem services transform natural assets (soil, plants and animals, air and water) into things that we value. For example, when fungi, worms and bacteria transform the raw "ingredients" of sunlight, carbon and nitrogen into fertile soil, this provides an ecosystem service. Some authors distinguish ecosystem *functions* from services. Ecosystem functions can be defined as 'the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly' (de Groot, 1994; de Groot et al., 2002). Four different categories of ecosystem functions can be distinguished:

- **Regulation functions**: that relate to the capacity of natural and semi-natural ecosystems to regulate essential ecological processes and life support systems through bio-geochemical cycles and other biospheric processes. In addition to maintaining ecosystem (and biosphere) health, these regulation functions provide many services that have direct and indirect benefits to humans (such as clean air, water and soil, and biological control services).

- **Habitat functions**: natural ecosystems provide refuge and reproduction habitats to wild plants and animals and thereby contribute to the conservation of biological and genetic diversity and evolutionary processes.

- **Production functions**: photosynthesis and nutrient uptake by autotrophs (organisms such as plants or algae that produce their own food, such as carbohydrates , fats or proteins, using photosynthesis or inorganic chemical reactions) converts energy, carbon dioxide, water and nutrients into a wide variety of carbohydrate structures, which are then used by secondary producers to create an even larger variety of living biomass. This broad diversity in carbohydrate structures provides many ecosystem goods for human consumption, ranging from food and raw materials to energy resources and genetic material.

- **Information functions**: because most of human evolution has taken place within the context of undomesticated habitat, natural ecosystems provide an essential 'reference function' and contribute to the maintenance of human health by providing opportunities for reflection, spiritual enrichment, cognitive development, recreation and aesthetic experience.

Evolution and policy uptake of the concept

The concept of ecosystem services was introduced in the late 1970s and 80s by authors such as Westman (1977) and Erlich and Erlich (1981), building on earlier literature highlighting the societal value of nature's functions. Mooney and Ehrlich (1997) coined the the term 'environmental services' in the report *The Study of Critical Environmental Problems* (SCEP, 1970) identifying services such as pest control, insect pollination, fisheries, climate regulation, soil retention and flood control. The initial rationale behind the use of the ecosystem service concept was mainly pedagogic, and it was used mostly by natural scientists to demonstrate how biodiversity loss directly affected ecosystem functions underpinning critical services for human well-being, thus aiming at triggering action for nature conservation (Gómez-Baggethun et al., 2009).

The paper by Costanza et al. (1997) on the value of the global natural capital and ecosystem services was a milestone in the mainstreaming of ecosystem services. The monetary figures presented resulted in a high impact in both science and policy making, manifested both in terms of criticisms and in increasing the development and use of monetary valuation studies (Gómez-Bagethun et al., 2009). The term 'ecosystem services' gained even more popularity and policy relevance, with the publication of the Millenium Ecosystem Assessment (MA) (www.millenniumassessment.org), a four-year study involving more that 1300 scientists worldwide. Sponsored by the United Nations, it adopted a conceptual framework clearly linking ecosystem services to human well-being (MA, 2003). The MA concluded that over half of the world's ecosystem services are being degraded or used unsustainably (MA, 2005). The publication of this assessment placed the concept of ecosystem services at the top of biodiversity policy agenda and has led to an exponential increase in the publication of ecosystem valuation studies. Currently, The Economics of Ecosystems and Biodiversity (TEEB) (http://www.teebweb.org/) is a major international initiative to evaluate the costs of biodiversity loss and the associated decline in ecosystem services worldwide, comparing them with the costs of effective conservation and sustainable use.

Concerns

Growing awareness of the value of ecosystem services, and of the costs associated with their loss, has led to the development of programs and policy initiatives based on the establishment of markets for ecosystem services and in the implementation of payment for ecosystem services (PES) schemes. In spite of the success of some policy initiatives and of the effectiveness of the use of the term 'ecosystem services' for communication purposes, some authors raise concerns regarding the perverse effects of this commodification of nature. For example, Peterson et al. (2010) point to the risks of decoupling of ecosystem function from service, in that many people may be aware of the economic value of a given ecosystem service without recognizing human dependence on local and global ecosystems and on their functioning. The spread of the ecosystem service concept has in practice set the stage for the perception of ecosystem functions as exchange values that could be subject to monetization and sale, with profound ethical and practical implications (Gómez-Baggethun et al., 2009).

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30. Energy use

Distinction in energy use

Ecological economists distinguish (following A. Lotka's ideas of the 1910s) between "endosomatic" and "exosomatic" use of energy by humans. Inside the body, as food energy, adult humans spend per day between 1500 and 2500 kcal on average. A convenient number easy to remember is 2400 kcal, equivalent to 10 MJ (megajoules). Per year, the endosomatic energy use would then be 3.65 GJ (gigajoules, thousands of millions joules). If one person has five times the income of another person, he or she is not going to eat five times more in terms of kcal or joules.

Exosomatically, the use of energy varies according to income and style of living. All humans spend some energy for cooking food (typically more energy is spent in cooking than that in the food itself), and they use energy also for their houses and to produce clothes. In agricultural societies, much energy is used also for domestic animals. In industrial societies, the amount of energy for exosomatic use is drastically higher, whether it is for factories, for transport or for domestic use.

Patterns of energy use

A typology of societies (from hunter-gatherers to agriculturalists using animals to industrial society) reveals a pattern of exosomatic use of energy that increases from 20 GJ per person per year, to 60 GJ per person per year, to 200 or 300 GJ per person per year. The question arises whether the 6500 million people at present on earth, or the 8500 million at the estimated "peak population" towards 2050, will have enough available energy to supply the current level of 200 to 300 GJ per person per year in the rich societies. This is unlikely.

Biomass for food and for fuelwood continues to be an important source of energy for humans. There are programmes to produce "biofuels" for transport needs, but as an energy source biofuels show a low EROI, and moreover they increase the HANPP to the detriment of other species, and they require much "virtual" water in order to grow. The other main sources of energy at world level are oil (about 34%), coal (about 25%, increasing slowly), and gas (24%, increasing quickly). Oil extraction, at 85 million barrels per day in 2009, is reaching a maximum level (peak oil). Coal is plentiful but noxious locally, and also globally because of carbon dioxide emissions. About 7% of the energy supply comes from nuclear energy, 7% is hydroelectricy, and the rest comes from wind energy and solar energy (thermal or photovoltaic) which are increasing rapidly.

However, it will would be extremely difficult to completely substitute renewable energy for fossil fuels (coal, oil and gas) al the present level of energy use, let alone to increase energy use within a system based on renewable sources of energy.

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31. Entropy

Basic definition

A simple way to grasp the fundamental meaning of entropy is to consider that all processes of change are irreversible. Examples include natural processes, such as the growing of a plant, as well as technical processes, such as the burning of fossil fuels in combustion engines. The entropy concept was coined in thermodynamics to capture this fact. Thermodynamics in the science of energy - the name comes from the study of how heat and movemeny convert into each other. Its origins are in the 19th century when scientists like Sadi Carnot, Rudolph Clausius and Lord Kelvin wanted to understand and increase the efficiency at which steam engines perform useful mechanical work. The original notion of entropy has been applied to different contexts outside thermodynamics.

Entropy can also refer to the amount of energy available to humans. As a piece of wood is burned, for example, its available energy – also called “exergy” – decreases as the wood is transformed into high entropy matter - carbon dioxide and other substances useless from an energy point of view, its original exergy dissipated as useless heat. Available energy corresponds to the useful part of energy, which can be transformed into work. The so-called Entropy Law (the “Second Law of Thermodynamics”) uses this definition of entropy to express the everyday experience that transformations of energy and matter are unidirectional. It states that the entropy of an isolated thermodynamic system never decreases, but strictly increases in irreversible transformations and remains constant in reversible transformations. This places significant constraints on natural as well as technical processes. For example, the temperature of a cup of hot coffee left in a cold room will always decrease, never increase, to eventually reach equilibrium with room temperature. In this process, the entropy of the room has increased.

Energy from the sun (produced by atomic fusion) reaches the Earth in very large quantities. The Earth is not an isolated system. It is a system open to the entry of energy although closed to the entry of materials. The energy from the sun is the cause of photosynthesis and the source of the great wealth of life on the planet, i.e. the many forms of biodiversity. Therefore, one cannot jump from the existence of the Entropy Law to a pessimistic view regarding life and human life on Earth. However, in industrial economies we are using energy “stocks” of coal, oil, gas accumulated long ago. As they are used up, their heat content is dissipated. We cannot use these stocks again, or recycle such energy because of the Entropy Law.

Entropy and economics

In the analysis of economy-environment interactions, for example resource extraction, energy use, production, and generation of wastes, entropy is a useful concept. The Entropy Law states that with every energy-based transformation a system loses part of its ability to perform useful mechanical work. After a while, the system's potential for work becomes zero. In the 19th century, thinking that the universe as a whole could be described as an isolated system, it was said that its final state would be a state of maximum entropy and zero potential for work – a state described as "heat death". The evolution of an isolated system towards maximal entropy defines the so-called arrow of time as an expression of irreversibility in isolated systems. For the purposes of the analysis of the use of energy in the economy, we have no need to appeal to "heat death". In fact the economy is not an isolated system, it takes energy and materials from outside, and produces waste and dissipated heat.

Nicholas Georgescu-Roegen (1971), the founder of ecological economics, was the best known economist to realize that the Entropy Law imposes limits on the economic process when it is based on fossil fuels. He considered this "the most economic of all physical laws". His seminal work gave rise to a vast strand of fruitful research. The economy uses low entropy energy and matter from its surrounding natural environment (such as coal or oil), to produce consumption goods, and discards high entropy wastes and dissipated heat back into the environment (such as carbon dioxide).

Application

All taken together, the entropy concept is relevant for economics in various ways and on different levels of abstraction. First, as all processes of change are, at bottom, processes of energy and material transformation the entropy concept applies to all of them. It thus creates a unifying perspective on ecology, the physical environment, and the economy. It allows us to ask questions that would not have been asked from the perspective of one scientific discipline alone. It points to irreversible processes of resource degradation.

Second, the concept allows us to incorporate physical driving forces and constraints in models of economy-environment interactions, both microeconomic and macroeconomic. It is essential for understanding to what extent resource and energy scarcity, nature's capacity to assimilate human wastes and pollutants, as well as the irreversibility of transformation processes, constrain economic action. The entropy concept thus allows economics to relate to its biophysical basis, and yields insights about that relation which are not available otherwise.

Third, the entropy concept provides a tool of quantitative analysis of energetic and material transformations for engineers and managers. It may be used to design industrial production plants or individual components of those such as to maximize their energetic efficiency, and to minimize their environmental impact. Baumgärtner (2003) wrote that "With its rigorous but multifarious character as an analytical tool, its rich set of fruitful applications, and its obvious potential to establish relations between the natural world and purposeful human action, the entropy concept is one of the cornerstones of Ecological Economics".

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32. Environmental Impact Assessment

Background and definiton

Developed in the mid 1970s, environmental impact assessments (EIA) have been increasingly applied to large and medium-sized development proposals. An EIA is an assessment of the possible impacts – positive or negative – that a proposed project may have on the environment. It refers to both a decision making process and a document. The purpose of the assessment is to ensure that decision makers consider the ensuing environmental impacts when choosing whether or not to proceed with a project. It is meant to provide an opportunity for all stakeholders to participate in the identification of issues of concern, practical alternatives, and to identify opportunities to avoid or mitigate adverse impacts.

The International Association for Impact Assessment (IAIA) defines an EIA as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made". After an EIA, the precautionary principle and the polluter pays principle may be applied to prevent, limit, or require strict liability or insurance coverage to a project, based on its likely harms. It can also culminate in follow-up monitoring and mechanisms to secure compliance with conditions for approval. While there is widespread agreement on basic principles of EIA their application differs internationally, particularly in the degree to which alternatives are assessed, the public involved, and follow up considered as part of the process. Quite often, EIAs are applied after the decision to make a project has been taken, and they have a purely cosmetic character.

The fundamental components

A standard EIA theoretically involves stages (IAIA, 2009):

1. To determine which projects require a full or partial impact assessment study;

2. To identify which potential impacts are relevant to assess (based on legislative requirements, international conventions, expert knowledge and public involvement);

3. To assess and evaluate the likely environmental impacts of the proposed project;

4. To identify alternative solutions that avoid, mitigate or compensate adverse impacts (including the option of not proceeding with the development);

5. Of reporting the Environmental Impact Statement (EIS) or EIA report, including an Environmental Management Plan (EMP) and a non-technical summary for the general audience.

6. To review the EIS through public participation.

7. To make decisions on whether to approve the project or not, and under what conditions;

8. To monitor, comply, enforce and audit, monitoring whether the predicted impacts and proposed mitigation measures occur as defined in the EMP, verifying the compliance of proponents with the EMP, and ensuring that unpredicted impacts or failed mitigation measures are identified and addressed in a timely fashion.

Controversies

EIAs are sometimes controversial. In an example taken from Ecuador (Gerber and Veuthey, 2010), the elaboration and use of the EIA of an industrial eucalyptus plantation turned out to be an eminently political process. The EIA started when the project had already been launched and the final report was kept hidden from local environmental NGOs. The EIA did not specify the exact area and location of the eucalypts. A monitoring plan was not provided, nor was there any civil society participation vehicle as stipulated by the Law. Instead of a real popular consultation, the plantation company organized a kind of electoral campaign within the neighboring communities, winning over people by making promises, and thereby benefiting from its powerful and comfortable “donor” position. The company promised employment in the plantation and a compensation plan (that included programmes of microfarms and training as well as the installation of drinking water, health centres, sport fields, new roads and computers).

Moreover, there were many irregularities in the environmental management plan: no chronogram of inspections; non-respect of legal minimal distances between the plantation and the bodies of water; and a lack of the necessary information on the social and environmental impacts. All this resulted in a resistance campaign by a grassroots NGO with the support of local peasants against the plantation. This case is far from being an isolated example.

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33. Environmental (In)justice

Background and definitions

The concept of environmental injustice arose out of recognition that some communities are disproportionately subjected to higher levels of environmental risk than other segments of society. Growing concern over unequal environmental risk and mounting evidence of both racial and economic injustices led to the emergence of a grassroots civil rights campaign for environmental justice in the 1980s in the United States. The concept was taken up by philosophers in the 1990s, and then sociologists, geographers, economists and politicians took interest. Now an international Environmental Justice Movement is flourishing, having emerged out of various struggles, events and social movements worldwide. Linked with environmental justice are the ideas of capabilities, of ecological inequalities and of ecological debt.

The United States Environmental Protection Agency Office of Environmental Justice defined environmental justice as the "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work." The South African Environmental Justice Networking Forum asserts: "Environmental justice is about social transformation directed towards meeting basic human needs and enhancing our quality of life – economic quality, health care, housing, human rights, environmental protection, and democracy. In linking environmental and social justice issues the environmental justice approach seeks to challenge the abuse of power which results in poor people having to suffer the effects of environmental damage caused by the greed of others."

Focus

Environmental justice movements focus on the distribution of environmental risks by race, class and gender, and aim at finding equitable ways of distributing the benefits and burdens of economic growth. Root causes of environmental injustices include the distribution of property rights; institutionalized racism; the commodification of land, water, energy and air; unresponsive, unaccountable government policies and regulation; and lack of resources and power in affected communities. Some individuals, groups, and communities are at special risk from environmental threats. This is especially the case for low income persons, the working class, and people of color whose health may be imperilled by lead in their houses, pollution in their neighbourhoods, and hazards in their workplace. The environmental justice perspective unmasks the ethical and political questions of "who gets what, why, and in what amounts", calling for environmental and public health strategies to ensure the equal protection of all citizens, including indigenous peoples who often live at the extractive "commodity frontiers".

North-South environmental justice

Since the end of World War II, industrialized nations have generated increasing volumes of hazardous waste. The amount of toxins produced around the globe has risen exponentially in the last five decades. Today, it is estimated that nearly 3 million tons of hazardous waste from the United States and other industrialized nations cross international borders each year. Of the total volume of hazardous waste produced worldwide, 90% of it originates in industrialized nations. Some of it is being shipped to nations in South America, Southeast Asia, and Africa. There are two principal reasons for this (Pellow *et al.*, 2001): (1) more stringent environmental regulations are emerging in nations in the North, which provides an incentive for polluters to seek disposal sites beyond national borders; and (2) there is a widespread need for money among Third World nations, rooted in a long history of colonialism and contemporary debt arrangements. This leads government officials in Africa, Asia, and South America to accept financial compensation in exchange for permission to dump chemical wastes in their territory despite the provisions of the Basel Treaty against such trade. Observers have described these transactions as "efficient" (Lawrence Summers' principle) while others prefer the terms "toxic colonialism" and "garbage imperialism".

Closing remarks

Focusing on activism and policy-making, Pellow *et al.* (2001) emphasize the following key points that must be addressed in understanding and leading environmental justice movements. These authors also point out that these four factors may equally help legislators in their rule-making.

- The importance of the *history* of environmental inequalities and the processes by which they unfold. The fact that the future, rather than history, seems to drive environmental activism and policy-making is a grave mistake and often serves to undermine the very intention of legislation predicated on advancing society, without taking into account longstanding traditions, tensions, and institutions.

- The role of social stratification by *race* and *class*, given the fact that the poor and people of colour are generally the most vulnerable to environmental inequalities. However, it must be kept in mind that communities and racial groups are frequently divided, creating intraracial and intracommunity conflicts, often along class lines. This fact is addressed in the subsequent point.

- The role of *multiple stakeholders* in these conflicts. The role of women leaders is noticeable in many environmental justice conflicts worldwide.

- The ability of those least powerful segments of society to shape the contours of environmental justice struggles. Environmental injustices are thus “works in progress”; as resistance is ongoing.

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34. The Environmentalism of the Poor

Origins

Theories of “environmentalism of the poor” (Guha and Martinez-Alier, 1997; Guha, 2000; Martinez-Alier, 2002) and “liberation ecology” (Peet and Watts, 2004) have much in common with the branch of the Green movement that contests the unequal distribution of ecological goods and evils resulting from economic growth. These perspectives are distinct from the mainstream current of environmentalism seeking ecological modernization and eco-efficiency, and also from the older environmentalist current aimed at conserving a pristine nature without human interference. Movements born of environmentalism of the poor also tend to find their home in ‘Third World’ countries, or those of the global South, in contrast to “environmental justice” movements which are mainly found in Northern regions.

Examples: Current and Historical

The environmentalism of the poor manifests itself though conflicts that have an ecological element, including social justice claims and involving impoverished populations struggling against the state or against private companies that threaten their livelihood, health, culture, autonomy. These movements are born from the resistance (expressed in many different languages) against the disproportionate use of environmental resources and services by the rich and powerful. Ordinary women and men strive to correct the wrongs that have been committed against the land, water and air around them. In so doing, they contradict the Brundtland report and its view that environmental damage is caused by poverty. Ecological anthropology, agro-ecology and political ecology are the main academic allies of the environmentalism of the poor. The Chipko movement in India, and the movement of the *seringueiros* linked to Chico Mendes during the second half of the 20th century arguably represent two of the most emblematic cases of environmentalism of the poor.

There are many well known contemporary examples of this type of environmentalism: the Ogoni, the Ijaw and other groups protesting the damage from oil extraction by Shell in the Niger Delta; resistance against eucalyptus in Thailand and elsewhere on the grounds that “plantations are not forests”; the movements of oustees due to dam construction as in the Narmada river in India and the *atingidos por barragens* in Brazil; and the new peasant movements such as *Via Campesina*, against agro-industries and biopiracy (biopiracy refers to the appropriation of knowledge of agricultural or medicinal plants without payment, essentially theft). There are also many historical instances of what could be termed the environmentalism of the poor, although the words ‘ecology’ and ‘environment’ were not used politically at the time and the actors of such conflicts rarely saw themselves as ‘environmentalists’, concerned mainly with livelihood. Two examples related to copper mining come from Rio Tinto, Andalusia in the 1880s against sulphur dioxide; and in the early 1900s against the pollution of the Watarase river by the Ashio copper mine in Japan.

A Growing Movement

As long as problems related to the unequal distribution of ecological costs and benefits remain unaddressed, efforts to pacify protagonists of this type of movement are unlikely to succeed. On the contrary, the publicity given to these struggles through traditional channels of communication and today’s “network society” is a source of inspiration to others opposing forces bent on destroying local and global environments. Ultimately, the sum of these conflicts may represent a powerful social force for greater sustainability.

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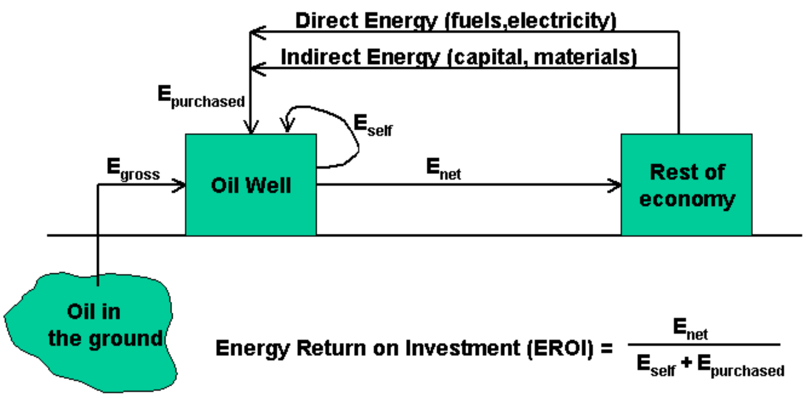
35. EROI (Net Energy Analysis)

Introduction and Definition

EROI (*Energy return on investment)* is an analytic tool for the evaluation of energy systems, that seeks to compare the amount of energy delivered to society by a technology to the total energy required to find, extract, process, deliver, and otherwise upgrade that energy to a socially useful form. The acronym was introduced by Charles Hall. EROI is expressed as the ratio of energy delivered to energy costs. For instance, energy from the Alberta tar sands in Canada or energy from so-called biofuels is very expensive to produce in terms of energy, as the energy surplus obtained is relatively small. To calculate the energy cost of energy, or any good or service, one must be able to quantify in energy terms the fuel, capital, materials, and labor used in the extraction and processing of the energy in question. *EROI* calculations are market-determined to the degree that they depend on the technology, industry structure, discount rate, and prices that exist at the time. Changes in any of those factors will alter the energy costs of goods, and thereby alter the results of net energy analysis (Cleveland 2008).

Net energy analysis seeks to assess the direct and indirect energy required to produce a unit of energy. Direct energy is the fuel or electricity used directly in the extraction or generation of a unit of energy. An example is the natural gas burned in engines that pump oil to the surface. Indirect energy is the energy used elsewhere in the economy to produce the goods and services used to extract or generate energy. An example of this is the energy used to manufacture the drilling rig used to find oil. The direct and indirect energy use is called “embodied” energy (Cleveland, 2008) although in actual fact it is energy that has been spent, dissipated.



$$\text{Energy Return on Investment (EROI)} = \frac{E_{net}}{E_{self} + E_{purchased}}$$

$$\text{Energy Surplus} = E_{net} - [E_{self} + E_{purchased}]$$

Figure 1: Energy Return on Investment (EROI):
(Source: Cleveland, 2008)

Debate

Many economists view net energy analysis as yet another physical model of scarcity which, like the classical economic scarcity model and *The Limits to Growth* physical models, they see as inferior to the neoclassical view of scarcity. Some energy analysts, such as Odum, Hannon, and Costanza, proposed in the early 1970s a theory of economic and social value based on energy, which economists were quick to criticize (Cleveland, 2008).

Contrary to other economists, ecological economists argue that net energy analysis does not provide a theory of value but it has several advantages over standard economic analysis: (1) It assesses the change in the physical scarcity of energy resources, it shows the increasing energy costs of obtaining energy; (2) because goods and services are produced from the conversion of energy into useful work, net energy is a measure of the potential to do useful work in economic systems and (3) EROI can be used to rank alternative energy supply technologies according to their potential abilities to do useful work in the economy.

A good historical work using EROI is Hall et al. (1986). To Cleveland himself, "EROI emphasizes the physical underpinnings of scarcity, while acknowledging the importance of economic factors. It implicitly assumes that changes in the energy cost of energy have important economic implications that may or may not be reflected in prices." Further, economic significance of the EROI to him "does not hinge on the existence or nonexistence of a causal link between changes in the EROI and changes in the structure and direction of change in the economy" in the sense of some form of "energetic determinism", and social and cultural factors too merit consideration" (Cleveland, 2008). The fact is that economic growth will be slowed down as we enter a period of decreasing EROI, that is, of increasing energy costs of obtaining energy. For instance, getting oil as we go down the Hubbert curve (after peak-oil) will very likely require increasing amounts of energy as the oil is to be found in remote places or at great depth under the sea.

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36. Externalities

Basic definition

Social costs – or externalities – are harmful effects and inefficiencies that are not internalized in the production costs of enterprises. Therefore, market prices do not include externalities. The first analyses of externalities were made by the Cambridge economist, Arthur C. Pigou, in the 1920s.

In order to be recognized as social costs, externalities must have two characteristics: (1) it must be possible to avoid them; and (2) they must be part of the course of productive activities and be *shifted* to third persons or the community at large (Kapp, 1963). Pollution, for instance, can be traced to productive activities and can be shown to be human-made and avoidable.

As the great ecological and institutional economist K.W. Kapp (1969) argued, “the basic causes of social costs are to be found in the fact that the pursuit of private gain places a premium on the minimization of the private costs of current production. Therefore, the greater the reliance on private incentives, the greater the probability of social costs. The more reliance an economic system places on private incentives and the pursuit of private gain, the greater the danger that it will give rise to external ‘unpaid’ social costs unless appropriate measures are taken to avoid or at least minimize these costs”.

36.1 Cost-shifting

By shifting part of the costs of production to third persons or to the community at large, producers are able to appropriate a larger share of the natural product than they would otherwise be able to do. Alternatively, it may be claimed that consumers who purchase the products will get them at lower prices than they would have been able to do had producers been forced to pay the total costs of production. The fact that social costs raise issues of income redistribution makes them matters of political controversy and power relations.

The example of North-South trade

Environmental problems associated with trade of natural resources include ecosystem destruction, biodiversity loss, and land, water and air pollution. Worsening terms of trade prevent internalisation of these social and environmental externalities. In this sense, countries specialised in extraction activities where commodity prices tend to fall over time tend to have fewer opportunities to internalise environmental costs into prices. Moreover, private sector practices, such as transfer pricing, can make the situation even worse. If international conditions determining prices make the South less able to internalise externalities, then there is a transfer of wealth from poor countries to rich countries, or, in other words, the North is transferring environmental costs to poor countries. This mechanism is referred to as ecologically unequal exchange.

While neoclassical economics looks at environmental impacts in terms of externalities which should be internalized into the price system, ecological economists see externalities

– following Kapp – not as 'market failures' but as 'cost-shifting successes' allowed by social asymmetries in the distribution of property rights, income and power (Martinez-Alier and O'Connor, 1999). Under the Suharto regime in Indonesia for instance, mining and plantation companies expanded on a massive scale at the expense of local peasant and indigenous populations, often protected by military forces. As Martinez-Alier has put it (2001): "It would be a cruel joke to say that a suitable environmental policy (implementing the "polluter pays principle") would have allowed externalities to be internalized into the price of exported copper and gold. Environmental economists forget to include the distribution of political power in their analysis. Some of them even believe in their touching innocence that environmental damages arise because of 'missing markets'".

Alternative Approaches

Such cost-shifting gives rise to environmental movements manifesting themselves in local and global conflicts. These movements employ a variety of languages and strategies of resistance, and they cannot be gagged by cost benefit analysis. For policy, what is needed is not cost-benefit analysis but rather a non-compensatory multi-criteria approach able to accommodate a plurality of incommensurable values.

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37. Extractive Periphery

Trade and Growth

According to economic theory, the basis for international trade is the existence of inter-regional differences in endowments of natural resources (and therefore raw materials), technology and climatic conditions. Hence, trade widens the growth potential of nations by making resources available that are not locally based and making produce marketable for which local demand would be too low. According to classical understanding (see Smith, 1776; Ricardo, 1817; Innis, 1930; Heckscher 1919, Ohlin 1933) trade would lead to a situation in which all economies would finally gain advantages (Eisenmenger et al., 2007).

Core - Periphery Perspectives

During the 1950s and 1960s however, economists were already discerning diverging national pathways to industrialization, even where countries departed from similar starting points, with new theories evolving to explain why this should be the case (Eisenmenger et al., 2007) These drew upon new applications of theoretical concepts of 'imperialism' (see e.g. Baran, 1975 and Mandel, 1968), 'dependency theory' (Prebisch 1950; 1959), and the 'world systems perspective' (e.g. Amin 1976, Wallerstein 1979). According to these approaches, in the existing world system, *peripheral countries* specialize in the production of primary commodities such as raw minerals and agricultural products that are less technologically sophisticated, are more labour-intensive and exposed to severe competition on world markets, thus leading to low prices and low surplus. Primary products from these *extractive peripheries* are then exported to industrialized *cores*, which are characterized by a high level of capital accumulation and complex production activities (Eisenmenger et al., 2007). Here production is based on advanced technologies, highly mechanized production structures and higher wages. *Industrial* cores then sell their high-tech and capital-intensive products to the *peripheral countries* (Eisenmenger et al., 2007).

This exchange on world markets leads to an outflow of surplus from the *periphery* to *the core* due to the fact that: "*Peripheral countries* specialize in exports of agricultural products and raw materials, where they are confronted with an increasing competition from other developing countries, which forces them to reduce prices to keep export revenues. This leads to a worsening in the terms of trade, and *they* have to export ever more goods in order to obtain the same revenues to support the imports needed (Eisenmenger et al., 2007) Secondly, low salaries are found in the periphery due to the massive 'reserve army' of labour generated through technological progress in agriculture (Eisenmenger et al., 2007). Revenues from increased efficiency thus result in lower prices of exports instead of increased income for workers (Emmanuel 1972). Economic development in the periphery is therefore complementary to economic development in the centre. Specialization in exports of raw materials, in the medium and long run, supports underdevelopment in the periphery and development in the centre. Even worse, the specialization in exporting raw materials leads to a depletion of domestic natural resources by selling out the domestic resource base (Eisenmenger et al., 2007).

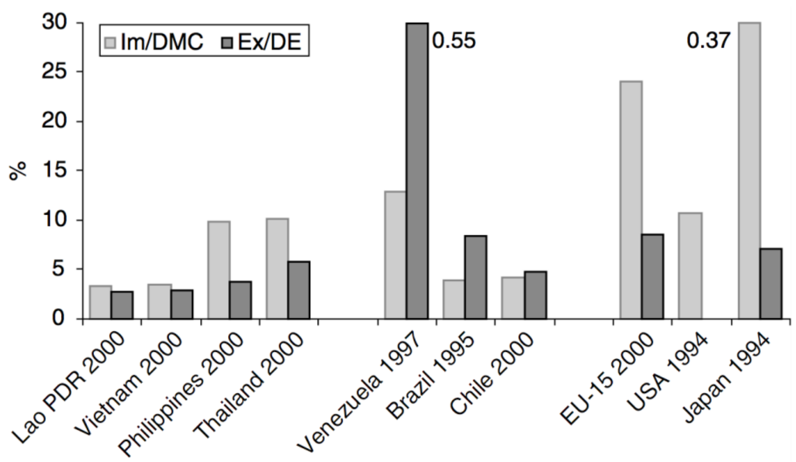

Figure 1: Trade intensities:
Imports in proportion to Domestic Extraction and to Domestic Material Consumption in tons
(Source: Eisenmenger et al. (2007)

Figure 1 shows the relation of imports to domestic consumption (in tons) (DC) and exports to domestic extraction (in tons) (DE) for *core* and *peripheral or semi-peripheral* countries. Whereas in Venezuela a huge amount of domestic extraction is exported, Japan relies to large extent on imports for domestic consumption. Notice also that Chile's exports do not take into account the "ecological rucksacks" of mining.

37.1 World Systems Analysis

So how did this 'economic world order' originate? According to Wallerstein's "world-systems analysis" the coincidence of an extended feudal crisis leading to growing class conflict, a pronounced cyclical economic downturn, and serious climatological difficulties led the ruling classes of late medieval western Europe to seek a solution to their diverse problems in foreign territorial and commercial expansion. But besides permitting the elites to perpetuate their sway at home, these policies quite unintentionally established a new economic order founded on a world-wide division of labor and political units of disparate strength. In the course of a century, a tripartite system of *core*, *semiperiphery* and periphery emerged and became firmly integrated and self-perpetuating through unequal exchange in the market (DuPlessis, 1988).

DuPlessis (1988) adds that the northwestern European core of Holland, England and northern France were the strongest states, with the most profitable economic activities and most efficient forms of labor control, allowing this area continually to skim off the bulk of the economic surplus generated elsewhere and thereby reinforce its superiority. In stark contrast, the *periphery* (Latin America, Eastern Europe and much of the Mediterranean basin) was deficient in every respect, but its grain, bullion and raw materials, produced inexpensively, provided the resources that permitted the core both to specialize in more lucrative activities and to exploit the periphery ruthlessly and thoroughly. The *semiperiphery*, comprising the remainder of western and southern Europe, along with portions of central Europe and British North America, was intermediate in political structure and power, economic activities, modes of labor domination, and destiny. During the seventeenth century, some segments managed to move toward core status, while others fell into the periphery, but despite these shifts and others within the other two zones, neither the overall structure nor the dynamics of the world-system changed after the sixteenth century.

To DuPlessis the focal point of Wallerstein's work is the rise and elaboration of capitalism, a project that seeks to elucidate the means by which a system of production of goods for exchange in the market became hegemonic over much of the globe. Although Wallerstein situates capitalism's center in Western Europe, DuPlessis says, "he conceives of it not as having been initially articulated there and subsequently diffused over much of the rest of the earth, but as worldwide from the start." Wallerstein denies the view existing among many Marxists that much of the "Third World" remained feudal until very recently and is only now undergoing the transition to capitalism. In his interpretation, even the most backward lands have long been part of the world economy, which has been wholly capitalist and inherently unequal since its inception in the sixteenth century (DuPlessis, 1998).

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38. Fair Trade

Concept

Fair Trade today is a global movement, with thousands of small-scale producers and workers in over 50 countries in the South organized in partnerships with NGOs from the North to trade fair coffee, tea, chocolate, fruit juice, rice, etc. This movement aims at raising awareness in the North and offering Southern producers improved terms of trade along the principle of justice and the objective of development.

What is Fair Trade?

Many different definitions of Fair Trade can be found among the myriad of NGOs, cooperatives, and world shops busy with this issue of global justice. However, in 2001, a common definition was agreed on by the main Fair Trade networks: *Fairtrade Labelling Organisations International* (FLO); *International Federation for Alternative Trade* (IFAT; now WFTO); *European Fair Trade Association* (EFTA); and *Network of European World Shops* (NEWS!). Since then, the definition below has been recognized by the European Parliament (2006), the European Economic and Social Committee (2009) and the European Commission (2009):

"*Fair Trade is a trading partnership, based on dialogue, transparency and respect, that seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions to, and securing the rights of, marginalized producers and workers – especially in the South. Fair Trade Organizations, backed by consumers, are engaged actively in supporting producers, awareness raising and in campaigning for changes in the rules and practice of conventional international trade*."

Fair Trade is also a product label with a certification system conceived as an independent guarantee to consumers of the distinctive quality of the products they buy. The Fairtrade certification system is run by a separate company (FLO-CERT), which checks compliance with Fair Trade standards, which stipulate for example. that companies trading Fair Trade products must:

- Pay a price to producers that aims at covering the costs of sustainable production: the Fairtrade Minimum Price.

- Pay an additional sum that producers can invest in development: the Fairtrade Premium.
- Partially pay in advance, when producers ask for it.
- Sign contracts that allow for long-term planning and sustainable production practices

Historical overview

The philosophical principles underlying the concept can be traced back to Aristotle (and his ideas of justice, equity and goodness), but the concept as it is known now first appeared after WWII in the USA, with the 'Ten Thousand Villages' (formerly Self Help Crafts) project in the late 1940s, and then with Oxfam UK in the late 1950s, when Oxford students introduced the sale of crafts made by Chinese refugees in Oxfam shops. In 1964 Oxfam created the first Fair Trade Organization, but parallel initiatives were taking place in the Netherlands, notably with the message "*by buying cane sugar you give people in poor countries a place in the sun of prosperity*".Networks of engaged citizens have been crucial in the constitution of the Fair Trade movement, working as volunteers in Fair Trade shops in order not only to diffuse products but also ideas.

The second UNCTAD conference (United Nations Conference on Trade and Development) in Delhi in 1968 was crucial in enabling developing countries to bring the debate to an international political forum with the motto "Trade not Aid", adding equity to the international agenda.

From the 1960s onward, Fair Trade became associated with objectives of economic and social development: at a micro scale, aiming to provide a supplementary income to families, and at a global scale, to make international trade fairer and make mainstream business more aware of its social and (later) environmental responsibility. In the 1980s, the idea of the Fair Trade label was conceived by a Dutch church-based NGO, leading in 1988 to the "Max Havelaar" label in The Netherlands. Within a year this label had managed to secure a 2 percent market share for its labeled coffee, and similar non-profit Fair Trade labelling organizations flourished. In 1997, some order was introduced with international standards and a certification process agreed by the Fairtrade Labelling Organisation (FLO). Labeling and certification has brought Fair Trade to mainstream business, as: *"Currently, over two-thirds of Fair Trade products are sold by mainstream catering and retailing."*

Challenges ahead

From its origins, this movement has aimed to redistribute incomes from Northern consumers to producers of the South, and to question and raise awareness of mainstream models of development and globalization in the North and South. The current challenges of Fair Trade are to couple a wide diffusion of the concept, a certification system and the selling of Fair Trade products through conventional distribution networks with these initial principles of education and advocacy.

Indeed, mainstreaming Fair Trade product into large-scale distribution has led to an increase of market share which benefits to southern producers. However, this was also synonym of a focus on the logic of consumption rather than of civic coordination. Further, it has turned Fair Trade into a genuine market niche leading to clear risk of Fair Trade "*being* *re-absorbed by the market and captured by dominant actors of the food system*" (Renard, 2003). The danger could come from the institutionalization process itself, and its tendency to minimize social and environmental requirements towards the minimum consensus. To avoid this, the certification procedure has to keep standards high and the Fair Trade labels have to remain the symbol of moral values associated to the specific social interactions on which Fair Trade was built and which legitimize it. It is also worth mentioning that many essential bulk commodities traveling from South to North (oil, gas, copper, iron ore…) are not included in Fair Trade circuits.

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39. Forest Economics

Definition

Analogous to a basic definition of economics, forest economics is defined as a science of allocation of scarce resources among competing means to satisfy human (consumers) wants and needs for forest products (Gregory, 1987). With roots in conventional neoclassical economics, this applied science combines principles of forestry and economics to issues such as pricing, buying, selling, ownership and tenure, taxation and management of forest resources (wood, wildlife, medicinal herbs, water provision, etc) and forest lands. It is mainly focused on sustained yield timber management, resource extraction and commodity production, excluding a wide range of forest values (ecological, aesthetic, spiritual, etc). The forest is viewed as a storable renewable resource and forestry as a capital-demanding field of investment with long rotation (production) periods and easily measurable stock growth.

Application

Trees grow according to the logistic function or Verhulst curve, that is, they grow quickly at the beginning, and then more slowly. The private owner of a forest (or rather, of a tree plantation) who wants to maximize its profits, thus compares a) how much (s)he will earn by delaying by one year the cutting and selling of the trees, to b), how much (s)he will earn by cutting and selling the trees today and putting the money in the bank for one year. The higher the rate of interest (or equivalently, the higher the discount rate), the more inclined (s)he will be to shorten the rotation period.

We could compare this to Hotelling's rule in oil extraction economics, where a high discount rate or interest rate implies selling faster the oil stock. Here the resource does not grow. There is a fixed stock of oil produced by photosynthesis millions of years ago. The profit mazimizing owner of an oil well (who follows neoclassical economics) will compare how much he makes by leaving oil in the ground or by taking the oil out. If he takes and sells the marginal barrel, he earns now the interest that the bank will pay on the difference between price and extraction cost. If he leaves oil in the ground, he earns the discounted value of the future revenue (again future price minus extraction cost). If the discount rate or interest rate is high, he will sell the oil quickly.

Returning to forest economics, here the resource itself is growing. One of the most basic and well-known solutions for the single stand rotation problem is found in the Faustmann Rule. This is a model that is used to calculate the ideal rotation period with an infinite time horizon when forest management consists in determining the moment for clear-cutting. You cut the trees, and start again another rotation period. Should you cut often or rather wait while the trees are still growing a little? The model computes the age at which an even-aged forest stand (plantation) should be harvested in order to maximize the return to forestry (Touza-Montero & Termansen, 2001). It focuses on the age-class structure of forest stands assuming all rotations of land are identical (Touza-Montero & Termansen, 2001). According to this rule, the optimal time to harvest a standing forest is when the marginal benefits of delaying the harvest equal the opportunity costs of waiting. In fact, Faustmann explained that "economic optimal rotation is less than the rotation that produces the maximum average annual biological yield" since forest cutting means income from timber and also, moreover, some income from the land now free of trees (for pastures, for instance, while the trees start to grow again) (Raunikar & Buongiorno, 2007). The price of the product is the key input for this principle that considers only timber products.

Inclusion of non-timber values

Hartman (1976) reviewed Faustmann's rule, addressing the importance of the non-timber values in the Faustmann's rotation solution, taking into account "the additional flow of amenity outputs if the harvest is delayed" (Touza-Montero & Termansen, 2001). The non-timber values of mature forests are, for example, flood and erosion control, wildlife and clean water provision, carbon sequestration, recreation, and many others. According to Hartman's rule, if these services are more valuable than those of a new plantation, the harvest age should be extended. When is then the optimum moment to cut the trees? Perhaps never.

Implications/Issues

Using the principles of classical Forest Economics, conventional forest management (CFM) leads to timber exploitation focusing on profit rather than on sustainable management practices, having negative impacts on biodiversity and provision of **ecosystem services**. Sustainable Forest Management (SFM) in contrast, is a new paradigm with broader social, economical and environmental goals, taking an ecosystem approach that recognizes multiple forest values, to achieve balance between societal demand for forest products and protection of the forests (Forest Europe, 2009).

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40. Funds and Stocks

Background: Natural resources are not homogeneous

While conventional economics tries to approach natural resources through monetary means, ecological economics stresses the need to make the biogeochemical characteristics of resources explicit. This allows for a distinction between the ecological and economic potential of resources, with respect to growth and sustainability for instance. Given the radically different characteristics of resources, erroneous conclusions tend to be drawn when they are conceptualized as undifferentiated “natural resources”.

Nicholas Georgescu-Roegen (1971), one of the founders of ecological economics, proposed a fundamental distinction between funds and stocks of natural resources:

- *Funds*, such as wood or fish, built up and maintained by solar radiation are able to renew themselves and provide both ecological and economic *services*, as long as the conditions necessary for their renewal are met. Funds correspond to renewable resources.
- *Stocks*, such as oil or copper, constitute limited reservoirs of organised matter and mineralised energy resulting from biogeochemical processes on a geological and not a historical time scale, but from which it is possible to extract *flows* of energy-matter. These flows can only be exploited for a relatively short period of human history, leaving stocks depleted and the environment degraded by their dissipation of energy-matter. Stocks correspond to non-renewable resources.

Distinguishing unequal economic potentials

This distinction between funds and stocks sheds light on their different economic potentials (Georgescu-Roegen, 1971; Steppacher and van Griethuysen, 2008). The growth potential of living or biotic resources – funds – is naturally limited and therefore cannot fuel exponential economic growth. However, the limited capacity of biotic resources to supply economic growth is compensated for by the quality of being renewable. The lesson is: *limited growth yet potentially sustainable.*

The case of non-renewable mineral resources – stocks – is quite different. Since the industrial revolution, mineral resources have been capable of inducing exponential growth: stocks of energy-matter can be used to develop machines and motors that allow an even quicker exploitation of stocks. However, as the process quickens, stocks get irreversibly depleted at an increasing pace while natural assimilation capacities are overloaded. Fuelled by the limited stock of mineral resources in a limited natural environment, exponential economic growth is inexorably limited to a given historical period. The lesson is: *exponential growth without sustainability*.

The distinction between services of funds and flows of stocks highlights the specific *temporal characteristics* of different natural resources. Given that biotic resources depend on ecological reproductive cycles, the availability of their services is subject to the natural calendar. It is therefore not possible to exploit these funds (land, labour and equipment) to their full capacity. That is why economic activities in traditional agrarian economies are diversified and organised in accordance with the cyclical rhythms of nature. On the other hand, the flow of mineral resources from stocks does allow continuous productive activity. This characteristic which reduces costs and makes specialisation possible is an essential element of industrial production.

Conclusion

Given the institutionalised growth dependency of western civilisation, it is not surprising that nearly all technological progress over the last 150 years has been based on the substitution of renewable by non-renewable resources, in industry, agriculture and services alike. Modern agriculture now uses fossil fuels energy to a great extent, so that if we make the balance between energy output and energy input in the agricultural and food system of industrial countries, we have a declining EROI. An activity that was sustainable is now unsustainable. In such a context, an undifferentiated concept of natural resources is highly problematic owing to the fact that the per capita consumption of fossil fuels mineral resources is very unequally distributed. This failure to differentiate hides the economic privilege that goes with control over mineral resources and fossil fuels (in rich industrialized countries) as well as the particular difficulties that are inherent in the use of biotic and other renewable resources, particularly in combination with high population growth (in poor agricultural countries).

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41. GDP Accounting and Critiques

Definition and methods

Macroeconomic accounting establishes the size of the economy by measuring the Gross Domestic Product. It is called “gross” because the depreciation and amortization of capital (deduction of capital expenses over a period if time) has not yet been deducted from it, to yield the National Income. There are three ways of calculating GDP, and all yield the same final number. The first way is to calculate the sum of all revenues or incomes in the economy, wages plus firms’ profits plus land rents. The second is to calculate the total expenditures, in consumption and investment. The third method is to count the sum of all “values added” in the economy, that is the market sales of goods and services minus the costs. When we allow, as we must, for the existence of government, we include its expenditures that are financed by taxes on incomes or on sales. But notice that one could calculate the GDP of a state-less economy (or with a state consisting only of one GDP accountant). The GDP must not be confused with the government budget. There are very small differences between the GDP and the GNP (Gross National Product) that do not concern us here.

Well known deficiencies

There have been many critiques against GDP accounting from the environmental point of view. As recently as the September 2009 President Nicolas Sarkozy addressed the French national statistics agency on the adequacy of GDP in measuring a country’s economic well-being. Backed by the report of a commission including Nobel Prize economists

Amartya Sen and Joseph Stiglitz, he requested that the agency give greater consideration to factors such as quality of life and the environment (versus solely relying on GDP's reporting of goods and services marketed) in determining the nation's overall "health". In fact, Sarkozy should have referred to previous critiques of national income accounting by the early ecological economists Georgescu-Roegen 1971, Roefie Hueting, 1980, Herman Daly, 1973, René Passet, 1979. Even more disgraceful was not to quote Sicco Mansholt, a president of the European Commission who in 1972 wanted to debate GDP growth. Acknowledging the critiques against GDP from the 1960s and 1970s is a matter of intellectual honesty. It also reinforces today's arguments because one cannot attribute the critique of GDP only to sour grapes in the economic crisis of 2008-09.

Eco-feminist economists (Marilyn Waring, *Counting for nothing*, 1988) have long insisted on the fact that unpaid work (domestic and voluntary work) comprising a large number of hours is not included in the GDP. As Julie Nelson writes in *Ecological Economics* (69, 2009): "One would search in vain in the most paradigmatic models of economics for any inkling of where the materials used in production came from, or where the detritus from the production process goes. Similarly, one would search in vain … for a discussion of where economic agents come from, or where they go (and who takes care of them) when they are broken or used up". In other words, economic accounting focuses on production for the market. It forgets the costs of social and environmental reproduction. Along these lines, Jeroen van den Bergh, a leading ecological economist, recently authored an article (its initial title was "Abolishing GDP") trying to explain why despite "all theoretically and empirically motivated criticism of GDP as a social welfare and progress indicator, its role in economics, public policy, politics and society continues to be influential".

Because of the economic crisis of 2008-09, in many countries some economic indicators are deteriorating, some environmental indicators improving, and some social indicators improving while others are deteriorating. These should not be added up into a single index. The Human Development Index takes into account social factors apart from GDP but it does not take into account environmental damages. It also correlates closely with GDP. A single convincing economic-social-environmental index does not exist. Therefore what is needed is a "political downgrading" of GDP, and the introduction of participatory multi-criteria assessments to judge where the macro-economy is going.

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42. GDP of the Poor

Introduction: GDP and the environment in developing countries

Standard GDP (gross domestic product) statistics are unable to take into account the real livelihood basis of many poor sectors of the world population, nor environmental liabilities and degradation. Different ways of correcting this have been proposed (see a review in Common and Stagl, 2005: chap. 5). In fact, the economic importance of biodiversity and ecosystem services does not figure in the GDP accounting and the real costs of depletion or degradation of natural capital (e.g. water availability, water quality, forest biomass, soil fertility, topsoil, inclement micro-climates, etc) are not recorded in GDP statistics although they are crucial for many people. Sukhdev (2009) (with H. Gundimeda and P. Kumar) has argued that the contribution of natural resources and ecosystem services to livelihoods and well-being should be estimated and recognized, through what they called the “GDP of the poor”. The GDP of the poor encompasses all these sectors (forest, water, soil, etc.) from which much of the developing world’s poor draw directly their livelihood and employment. Rich people depend on the environment more than poor people – they use more resources and they use the sinks to a greater extent. But rural poor people use (and know) the environment in a more direct way. It is not surprising that they so often complain when they lose access to land and water to mining companies or tree plantations.

Impacts on the poor

The impacts of ecosystem degradation and biodiversity loss mostly affect that proportion of the GDP that can be termed “GDP of the poor”. Indeed, poor people usually are hit hardest by the misuse of environmental resources as they depend on them most heavily. A recent attempt by the NGO the Green Indian States Trust (GIST) to develop the “GDP of the poor” in India provides a good illustration. The NGO showed that although the value of forest services such as fresh water, soil nutrients and non-timber forest products was only around 7% of national GDP (when it was given a money value), it amounted to some 57% of the income of India’s rural poor people (see **Fig. 1**).

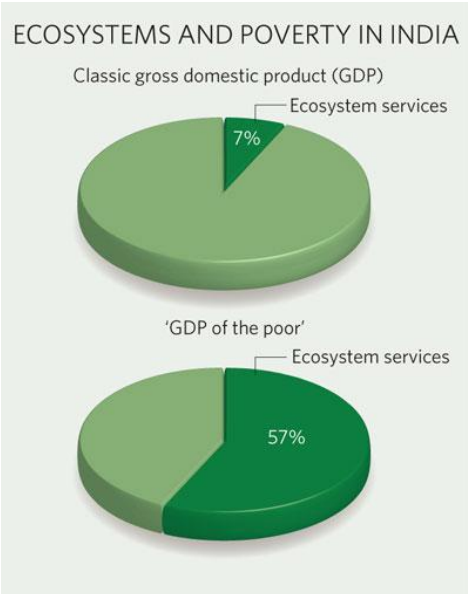

Figure 1: **Comparison between standard GDP accounting and the “GDP of the poor”, with respect to ecosystem services**
(Sukhdev, 2009, based on GIST, 2003).

There are many calls for changes to the current economic paradigm to solve this problem of declining public goods crucial for the poor. One is through TEEB (the Economics of Ecosystems and Biodiversity), a global study that aims to draw attention to the tangible benefits of biodiversity, and to highlight the growing costs of biodiversity loss and ecosystem degradation. Despite this praiseworthy effort to include the needs of the poor in national accounting, it is nonetheless true that the economic valuation of ecosystem services and natural resources in general remains highly problematic.

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43. Green Accounting

Definition

Green accounting is the popular term for environmental and natural resource accounting, which incorporates environmental assets and their source and sink functions into national and corporate accounts (Bartelmus, 2008).

Application

The United Nations first issued a handbook on a System for integrated Environmental and Economic Accounting (SEEA) in 1993. SEEA introduces nature's environmental and economic assets and the 'environmental cost' of their degradation and depletion into the System of National Accounts (SNA). Asset accounts (see **Figure 1** below) measure the value of opening and closing stocks of economic and environmental assets, and their changes during an accounting period. Changes in assets are brought about by the formation and consumption of produced and natural capital (assets) and other non-economic influences such as discoveries, natural disasters or natural regeneration. The latter, i.e. 'other asset changes,' are recorded outside of income and production accounts and affect the conventional indicators of cost, income, product and capital formation. National environmental accounting requires adding up inputs, outputs and environmental impacts, and combining them into environmentally adjusted ('greened') indicators. The SEEA uses both monetary values (prices, costs) and physical weights (in particular the

			Assets		
		OPENING STOCKS	Economic assets	Environmental assets	
	Industries	*Households/Government*	+		*Other countries*
	DOMESTIC PRODUCTION	*FINAL CONSUMPTION*	*CAPITAL FORMATION*	*CAPITAL ACCUMULATION*	*REST OF THE WORLD*
SUPPLY of products	Output				Imports
USE of products	Intermediate consumption	Final consumption	Gross capital formation		Exports
CAPITAL use	Capital consumption		Capital consumption		
NATURAL ASSET use	Environmental cost	Environmental cost	Natural capital consumption		
			+		
			Other asset changes	Other asset changes	
			=		
		CLOSING STOCKS	Economic assets	Environmental assets	

Figure 1: SEEA flow and stock accounts.
(Source: Bartelmus, 2008)

mass of material flows) to this end (Bartelmus, 2008).

According to Bartelmus' review, case studies of green accounting have applied market valuation mostly to natural resource depletion. In the absence of market prices for non-produced natural assets, natural resource rents earned by selling resource outputs in markets are used for estimating the net present value and value changes (notably from depletion) of an asset. For environmental degradation, maintenance costs of avoiding or mitigating environmental impacts can be applied. A few studies used damage valuations of environmental impacts (Bartelmus, 2008).

However, we may ask how could we possibly give a money value to the loss of biodiversity (in the present rapid extinction) by any of these methods. We do not know what we are physically losing (which species disappear, micro-organisms for instance), much less can we give money values to such loss.

Strengths and weaknesses

Bartelmus sees a particular strength of green accounting as the measurement of environmental costs caused by economic agents of households and enterprises. According to him: "The well-known polluter/user pays principles hold the responsible agents accountable for their environmental impacts" and "it can assess the economic and ecological efficiency of different environmental protection measures by governmental and non-governmental organizations" (Bartelmus, 2008).

Critics however argue that the use of market values amounts to ‘pricing the priceless’ categories of nature. In their view, assessing environmental assets and their services in monetary terms ‘commodifies’ nature, or turns the products and services of nature into merchandise or commodities with money prices, whose intrinsic value should not be subjected to market *preferences* (Bartelmus, 2008).

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44. Greenwash

Definition

The term “*Greenwash*” was coined by environmental activists to denounce misleading advertising campaigns made by industrial corporations to depict themselves more environmentally-friendly and ecologically-conscious than they actually were. There is no consensus over an appropriate definition of Greenwash, however a simple and clear one is: *“disinformation disseminated by an organization so as to present an environmentally responsible public image”*. The origin of this name derives from ‘whitewash’, defined by the Cambridge Advanced Learner’s Dictionary as *“an attempt to stop people from finding out the true facts about a situation”*. Similarities with the term ‘brainwash’ (*“make someone believe something by repeatedly telling him that it is true and preventing any other information from reaching him”*) can also be underscored.

Identifying Greenwash

Greenpeace, one of the world’s leading environmental NGOs, identifies 4 different types of corporate Greenwashing. The first (Dirty Business) highlights cases in which companies advertise a green product, while their primary activities are heavily polluting. One example is found in the automotive industry whereby companies advertise the production of ecological cars (manufacturing only a few thousand units per year) while continuing to produce several thousand heavily polluting cars per month. A second category (Ad Bluster) is used to *“exaggerate an environmental achievement to divert attention away from environmental problems”*. This is the case when a company spends more for advertising campaigns than actually coping with environmental pollution. Third (Political Spin) is the paradox of a company promoting a 'green' profile, while investing massively in anti-environmental lobbying activities. Last (It's the law, stupid!), companies use advertising campaigns underlining major environmental achievements while these behaviors had already been required or mandated by existing laws.

Consequences of and reactions to Greenwash

Greenwashing is bad practice for several reasons. It is harmful for the environment, because it tends to minimize the real environmental effects of products or industries advertised as 'green'. It is negative for consumer protection, since consumers are victims of misleading information and therefore are more likely to lose confidence in green products in general. It is detrimental to companies themselves, because their reputation regarding public perception might worsen, resulting in exactly the opposite of what the commercial was meant to achieve. Regulation of this practice exists in Europe, under the Unfair Commercial Practice Directive 2005/29/EC which implies more state control, but its implementation at the national level still varies between those member states that focus primarily on unfair competition and those putting consumer protection first. To counter proliferation of Greenwashing, some environmental NGOs have launched annual 'Greenwash awards', in order to raise awareness in the media and to draw public attention to corporate social responsibility (CSR) strategies that merely give the *impression* that the necessary steps for managing pollution are being taken.

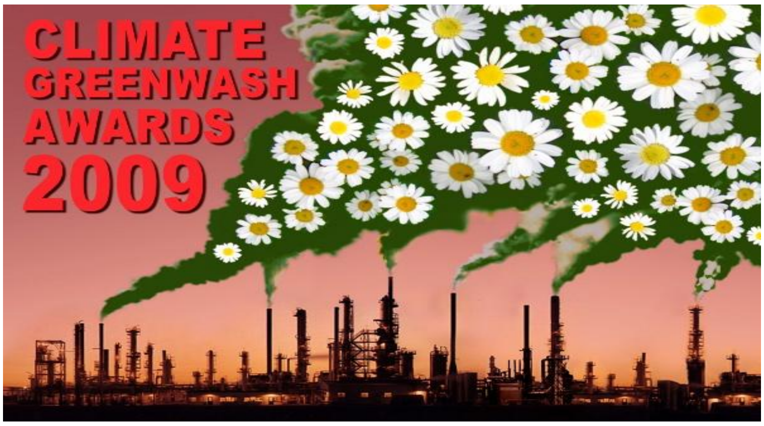

Figure 1: Image taken from www.climategreenwash.org

New tendencies

The risk of being accused of Greenwashing by NGOs has driven companies to adopt new strategies. It is often alleged that multi-national corporations finance the watering-down of serious political commitments to greenhouse gases reductions and obligations, and try to undermine scientific evidence about man-induced climate change through the sponsoring of "independent think-tanks". Another interesting tendency is what has been termed “government greenwash”. In the context of growing public awareness of climate change issues, this term refers to governments’ efforts to promote ‘green’ rhetoric in order to gain public support, while continuing support of heavily polluting industries or sponsorship of projects with well-known environmentally devastating consequences.

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http://stopgreenwash.org/criteria

45. HANPP and Colonization

Background and definition

Colonization of natural processes has been defined as ‘‘the intended and sustained transformation of natural processes by means of organized social interventions for the purpose of improving their utility for society’’ (Weisz et al. 2001:124). For example, agriculture transforms natural terrestrial ecosystems into agro-ecosystems. The relevance of colonization for sustainability does not lie in the amount of matter or energy expended, but in the effectiveness in changing the dynamics of a natural process in a socially desired way. The efficiency of colonization depends on how well one understands the processes at hand and how effectively one is able to control and manipulate them. The notion can be applied to several biological processes (e.g. domestication of animals, genetic engineering, etc. including land use—that is, the colonization of terrestrial ecosystems). Colonization does not imply that society controls all aspects of a natural system. Normally only a few key variables are actively controlled or influenced, and the dynamics of the systems are still, to a large extent, determined by self-organization. For example, on cropland agriculture it controls species composition, soil fertility, and nutrient (and sometimes water) availability, but it does not change the climate nor the principal photosynthetic reaction in plants (Haberl et al. 2004).

Humanity's impact on the biosphere's structures (e.g., land cover) and functioning (e.g., biogeochemical cycles) is considerable, exceeding natural variability in many cases (Crutzen and Steffen 2003). Up to 83% of the global terrestrial biosphere has been classified as being under direct human influence, based on geographic proxies such as human population density, settlements, roads, agriculture and the like (Sanderson et al. 2002); Hannah et al. (1994) estimate that about 36% of the Earth's bioproductive surface is "entirely dominated by man". *HANPP, the "human appropriation of net primary production,"* is an aggregated indicator that reflects both the amount of area used by humans and the intensity of land use (Haberl et al. 2007b).

Why HANPP?

Humans depend on land and the resources it provides for their subsistence. Plant biomass is one of the most important of these resources. Humans depend on it for: food directly and as feed for livestock, other energy (e.g. firewood, agro-fuels), paper pulp and construction material as well as other **ecosystem services** such as retaining water, maintaining soil and storing carbon. In addition humans also depend on land for infrastructure and living space and for all these purposes alter natural land cover, reducing its vegetative productivity, as well as destroying and extracting biomass, hence reducing the energy available for other species. Biomass- based subsistence economies, are those in which communities depend almost entirely on local biomass for their survival. One CEECEC case study from India, in Mendha Lekha, Maharashtra, studies such a society.

Plants through photosynthesis convert and store energy from the sun, part of which they use for their own functioning and growth. The leftover energy, called net primary production (NPP) does not only provide energy for human existence but also plays an important role for the survival of other organisms and ecosystem functioning , as it constitutes the basis of most food chains.

HANPP measures to what extent land conversion and biomass harvest alter the availability of trophic (biomass) energy in ecosystems. It is a prominent measure of the "scale" of human activities compared to natural processes (i.e. of the "physical size of the economy relative to the containing ecosystem;" Daly 2006:1). As human harvest of biomass is a major component of HANPP, it is also closely related to socio-economic metabolism (Ayres and Simonis 1994, Fischer-Kowalski and Haberl 1997) as measured by material flow accounts (MFA). The basic question of how much of the biosphere's yearly biomass flows is used by humans was first posed in the 1970s by Whittaker and Likens (1973), and it took more than a decade until the first comprehensive – and still relevant – answer to that question was given by Vitousek et al. (1986) (Haberl et al. 2007b).

Approaches to HANPP

Like other scientific concepts, different approaches may lead to substantially different empirical results. Various authors have approached HANPP from different angles and have consequently used a variety of definitions (see Vitousek et al. (1986), Wright (1990), Rojstaczer et al. (2001) and Imhoff et al. (2004).

Haberl (1997) proposed a definition of HANPP that has proven its usefulness in spatially explicit (Haberl et al. 2001) as well as long-term (e.g. Krausmann 2001) studies on a national scale. This definition defines HANPP as the difference between the amount of NPP that would be available in an ecosystem in the absence of human activities (NPP_0) and the amount of NPP which actually remains in the ecosystem, or in the ecosystem that replaced it under current management practices (NPP_t). NPP_t can be calculated by quantifying the NPP of the actual vegetation (NPP_{act}) and subtracting the amount of NPP harvested by humans (NPP_h) (Haber et al 2007b). NPP_h includes primary crop harvest but also harvest losses i.e. residues or biomass destroyed during harvest, grazing and human induced fires. Based on the above HANPP is therefore defined according to the formula:

$HANPP = NPP_0 - NPP_t$ with $NPP_t = NPP_{act} - NPP_h$.

The difference between NPP_0 and NPP_{act} represents the reduction of NPP_0 through the conversion of natural land cover to other types of land cover i.e the land use induced productivity changes which one denotes as ΔNPP_{LC} (Haberl et al. 2007a) HANPP is therefore also equal to $NPP_h + \Delta NPPL_C$.

In order to calculate HANPP according to the above formulas and **Figure 1** requires information on the development of land use, productivity of vegetation, biomass harvest and related harvest factors. This is provided through agricultural and land use statistics, yearly productivity values and agricultural literature.

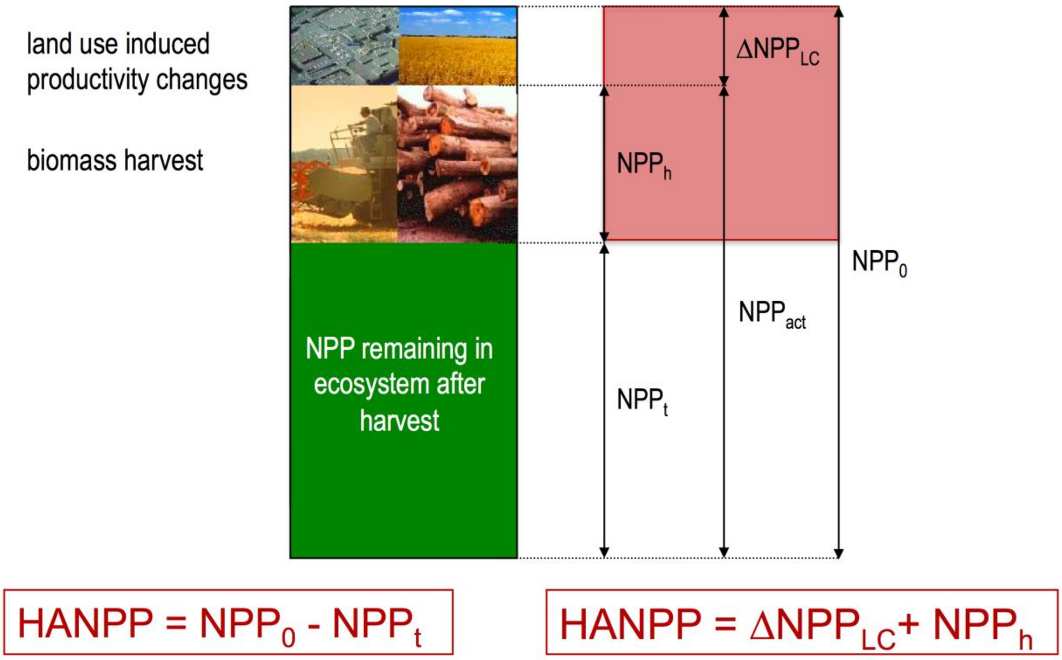

Figure 1 : Calculating HANPP

Implications of HANPP

An obvious implication of HANPP is that growth in the amount of biomass used by humans for their socio-economic metabolism must be envisaged with caution. Biomass already plays a significant role in global socio-economic energy supply, currently contributing some 9-13%, that is 35-55 EJ/yr (1 EJ = 10^{18} Joule), to the global supply of technical energy (fuelwood, agrofuels). This figure, however, by far underestimates the importance of biomass for humanity's "energetic metabolism": Global human biomass harvest, including crops, by-products, grazing by livestock, fibre consumption and forest products amounted to about 235 EJ/yr around 1993. Notable future increases in biomass demand are expected. The projected growth of world population (until "peak population" is reached in abut 2050) together with likely changes in human diets towards meat consumption, are strong driving forces for further increases in the amount of biomass required as food and feed. Moreover, many energy scenarios also envisage increases in the amount of biomass used for energy provision.

HANPP alters energy flows within food webs and based on the species-energy hypothesis, has been hypothesized to contribute to biodiversity loss (Wright 1990). HANPP is relevant in the context of global water flows (Gerten et al., 2005), carbon flows (e.g. DeFries et al. 1999) and – as biomass contains nitrogen (N), and N fertilizer is an important factor for agricultural productivity – N flows.

It also relates to important global sustainability issues such as endemic malnourishment of a large proportion of world population (FAO, 2005), the ongoing conversion of valuable ecosystems (e.g., forests) to infrastructure, cropland or grazing land (see e.g. Millenium Ecosystem Assessment, 2005) with detrimental consequences for biodiversity (Heywood and Watson, 1995), and global, human-induced alterations of biogeochemical cycles (e.g. Steffen et al., 2004) (Haberl et al 2007b).

In addition to looking at HANPP in relation to a certain territory, it is also useful to investigate the HANPP embodied in certain biomass-based products (see Haberl et al. 2009). Products derived from using land and appropriating biomass are seldom consumed locally or domestically but are often produced for export. Therefore some countries or communities might have a high HANPP on their territory but this might not actually reflect their consumption of HANPP. Or put differently, the environmental impacts on a particular territory might not stem from local consumption. Embodied HANPP reflects this disconnect between areas of production (and therefore appropriation of biomass) and NPP and consumption of final products. So on top of showing how certain products draw on ecosystems, it can also be used as a socio-political indicator of resource distribution and unequal exchange. In this context, the related questions of who appropriates NPP flows most and at what cost, of who controls them and in which form, and of who controls land in terms of biomass production (quantity), are highly relevant.

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46. Hazards, Disasters, and Complex Disasters

Definition

The term ‘disaster’ has its roots in Latin, *dis* – and - *astro*, meaning ‘away from the stars’. In other words, a disaster was seen as an event arising from an unfortunate astrological configuration. The UN defines an international disaster as “a serious disruption of the functioning of society, causing widespread human, material and or environmental losses which exceed the capacity of the affected society to cope using only its own resources”

(UN, 1992). Thus, not all adverse events may be classified as a disaster: only those that affect humans, and overwhelm response capacity. Disasters may be natural (earthquakes, hurricanes, tsunamis, floods, famines, fire, etc.) or man-made (arising out of war and technological failures). The same natural causes (say, an earthquake of similar magnitude) may have very different impacts on human society, through what is called “the social amplification of risk”.

Characteristics and Causes

Scholars have identified some recent trends in the occurrences, impacts and causes of natural disasters. First, the world is facing disasters on an unprecedented scale with about 400 disasters reported each year. The OFDA/CRED International Disaster Database (EM-DAT) reports a 20-fold increase in the occurrence of natural disasters since the 1950s affecting 250 million people annually. In the last decade (1998-2007), natural disasters claimed an average of 70,000 lives per year and an annual economic loss of US$ 77 million (EM-DAT). These figures must be read with caution since much of this rise can be attributed to the increase in the variety of sources used (e.g. insurance companies, WHO, World Food Programme) as well as more people reporting disasters, however small they may be, due to improved communication technology and want of humanitarian aid. However, in the last 30 years, with acute monitoring and improved reporting mechanisms there still has been a four times increase in the number of recorded disasters (Guha-Sapir et al. 2004).

In general, two causes are attributed to the increased frequency of natural disasters. The first is climate change (natural and anthropogenic) and environmental degradation resulting in the loss of buffer zones (such as mangroves, dunes, wetlands), destabilization of slopes, etc.. The second reason for increased natural disasters relates to the patterns of increased human settlements in vulnerable areas, particularly growing urban conglomerates making millions of people susceptible at once (Guha-Sapir 2004, Coppola 2006).

While disasters make no distinction between rich and poor countries in their occurrence, the human impact of disasters on poor countries have been disproportionately high owing to their proportionately large surface area and population, together with a lack of effective disaster mitigation and management structures (Guha-Sapir 2004, Coppola 2006). On an average it is reported that 65% of disaster related deaths and injuries are sustained in countries with per-capita income lower than $760 annually, although these countries account for only 11% of the world’s “at-risk” population (UNDP, 2004). Thus, inferences have been drawn that links a nations’ vulnerability to disasters with that of their human development index (Noji 1997, Guha-Sapir 2004, Coppola 2006).

Economic Impacts

Economic losses from disasters have increased 15 times since the 1950s (EM-DAT). However, most of the economic damage occurs in high income countries as compared to poorer nations. The total economic damage between 1991 and 2005 has been about US$

800 billion in rich countries, while in developing nations it was only half (EM-DAT). Some of the reasons for this are the fact that the poor and their possessions are cheap, the high concentration of wealth and physical structures in rich urban centres, dependency on technology and energy for economic activities that may fail during a disaster (Coppola 2006).

However, the loss in terms of percentage of GDP hits the poorer nations harder. Scholars argue that the aftermath of a disaster exacerbates the debilitating causes of poverty in developing countries (Guha-Sapir 2004, Coppola 2006). In other words, developing economiesin the wake of a disaster must reallocate a sizeable portion of their GDP to recovery that would otherwise be used for development projects and social programs elsewhere in the country. In some cases, this can prove to be ruinous to the developing economies as compared to their industrialized counterparts. For example, in 1998 hurricane Mitch incurred a loss equal to 42% of the GDP of Honduras and 50% of Nicaragua, the total loss being less than US$ 3.5 billion (EM-DAT). The 1990 cyclone in Samoa amounted to a loss of US$ 119 million, which was equal to 62% of their GDP. On the other hand, the Kobe disaster that amounted to US $ 159 billion cost only 3% of Japan's GDP (Guha-Sapir 2004).

Factors of Vulnerability

There seems to be consensus that the main cause of vulnerability to natural disasters is poverty and underdevelopment. Guha-Sapir (2004) lists four factors affecting vulnerability, all of which are linked to underdevelopment: (a) *Physical*, that is the level of exposure of a population to potential hazard, (b) *Social*, that includes variables such as population growth, inherent conflicts and insecurity, gender or age discrimination, and access to social security nets, (c) *Economic*, that translates into dependency on agriculture, economic diversification, access to loans, insurances and basic infrastructure, and (d) *Environmental*, such as soil degradation and erosion, biological and chemical pollution, and water availability. All of these are linked to underdevelopment and poverty as a direct cause, and so the common response to reducing effects of natural disasters is to encourage development in poorer nations.

The Centre for Research on the Epidemiology of Disasters (CRED) has established a voluminous online database on disasters and their trends (http://www.emdat.be/). For a disaster to be entered into the EM-DAT database, i.e. be classified as a disaster, at least one of the following criteria must be fulfilled:

• Ten (10) or more people reported killed.
• Hundred (100) or more people reported affected.
• Declaration of a state of emergency.
• Call for international assistance.

EM-DAT distinguishes the following general disaster types:

- Geophysical disasters, defined as "events originating from solid earth", e.g. earthquakes, volcanoes - dry mass movement
- Meterological disasters, defined as " events caused by short-lived/small to meso scale atmospheric processes (in the spectrum from minutes to days), e.g. storms
- Hydrological disasters, defined as "events caused by deviations in the normal water cycle and/or overflow of bodies of water caused by wind set-up", e.g. floods i.e. wet mass movement
- Climatological disasters, defined as "events caused by long-lived/meso to macro scale processes (in the spectrum from intra-seasonal to multi-decadal climate variability), e.g. extreme temperature, drought, wildfire and
- Biological disasters, defined as one "caused by exposure of living organisms to germs and toxic substances" e.g. an epidemic. Also included in this group are insect infestations and animal stampedes.

Complex Disasters

The term 'complex disasters' was first introduced by Singh and colleagues (based on their research in the Nicobar islands in the aftermath of the tsunami of 2004) to characterise a situation where the logic of humanitarian aid comes into conflict with that of sustainability. Such a condition arises when the goals of humanitarian aid and sustainability become incompatible in terms of their system of meaning, goals, structures and approach in a post-disaster context (Singh et al. 2008, Singh 2009).

Thus, a 'complex disaster' refers to a state that has become more vulnerable than it was prior to the disaster itself, as a consequence of inappropriate human interventions leading to (a) a breakdown of institutional structures and thus a loss of reorganising capacity, (b) failure of the society to maintain its material and energetic metabolism with its environment, and (c) creation of dependence on higher systems for continuous resource flows for its survival.

a) **Breakdown of institutional structures (loss of stabilizing and reorganizing capacity)**: The vast literature on resilience has argued that socioecological systems in general retain varying capacities to 'absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks' (Walker et al. 2004). In the context of hazards and disasters, societies are able to overcome the damages brought about by the occurrence of natural hazards, either through maintaining their pre-disaster social fabric, or through accepting marginal or larger change in order to survive (Gaillard 2006). We take it that the capacity of societies to reorganise themselves and find a new stable state are embedded in their existing institutional structures that help to maintain and regulate social and power relations as well as their relationship to nature. Institutions may be referred to as conventions, norms and formally sanctioned rules of society providing expectations, stability and meaning essential to human existence (Vatn, 2006). Thus, they may vary from formal family or political structures to informal rules and norms that govern societal behaviour. Breakdown of institutions as a consequence of inappropriate interventions may result in the loss of these inherent attributes for restoration and reorganization into a new stable state, thereby increasing the level of distress and vulnerability than what had been just after a disaster. In this sense, the loss is not in physical terms, but in the *capacities* of society to reorganise itself.

b) **Failure of the society to maintain its metabolism / changes in society-nature interactions:** The second variable central to the notion of complex disasters relates to the failure of the society to maintain its metabolism in the way it once did. This relates to the notion of 'society's metabolism**'**, where a society organizes (via their formal and informal institutions) material and energy exchanges with its natural environment necessary for the maintenance and reproduction of a society: they extract primary resources and use them for food, machines, buildings, infrastructure, heating and many other products and finally return them, with more or less delay, in the form of wastes and emissions to their environments. Any society's existence would be impossible without these biophysical exchanges with nature. The quantity and structure of matter and energy a society draws from its environment largely depends on their mode of subsistence and lifestyle, which in turn is related to technology.

c) **Increasing dependency on higher systems**: Since the last decades large parts of the agrarian 'developing world' have become increasingly integrated within a global division of labour and the world market. Under the rubric of development, nation states have devised programmes to expedite this process by introducing a variety of services (education, medical, legal), transport infrastructure, subsidies, and fossil fuel based technologies in agriculture. While they indeed improve the quality of life to some extent (access to clean water, health care, legal rights, etc.), these interventions require heavy inputs of resources from the outside to sustain them. In other words, these economies – still largely unchanged and quintessentially retaining an agrarian mode of production – are not able to generate an income to pay for the quality of life based on increased resource flows or subsidies from outside. Over time, these societies become dependent on constant supplies, subsidies and services to meet their needs, the failure of which may lead to set-backs and impoverishment. Humanitarian aid, if inappropriately organised, may guide the system into a similar system of dependency and vulnerability.

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47. Institutions

Institutions and agents

Contrary to standard economic theory emphasizing the role of individuals – including its “new” institutional economics variant –, ecological economists, through authors such as Daniel Bromley (2006) or Arild Vatn (2005), have highlighted the prominent role of institutions in shaping behaviours, interests and values. In so doing, they have explicitly espoused the legacy of the classical (or “old”) school of institutionalism originating from Thorstein Veblen, as well as, arguably, from Karl Marx. This heterodox economic tradition understands the economy as one of *existing constructs*, with all of its history and variety (as opposed to a deducted structure based on a set of axioms) determining how people/societies organize themselves to secure their sustenance. It emphasizes interdependencies and coordination phenomena.

Institutions are sometimes understood as organizations (such as the Catholic Church, the United Nations, etc.). This understanding is often found in the political sciences and is quite similar to everyday usage of the term. However, classical institutionalists (and, for that matter, ecological economists) tend to carefully distinguish between institutions and organisations. For them, organizations are agents, and institutions *constitute* both organizations and individuals.

Two views on institutions

Institutions are also understood as synonymous with “rules”. Again, the “new” and the “old” schools of institutional economics have different perspectives on this issue:

- For Douglas North (1990), one of the leading “new” institutionalists, institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. The “new” school sees institutions as external constraints while individuals continue to be seen as autonomous. Behaviour will be somehow maximize utility or satisfaction attained within these constraints and it will be, in relation to others, instrumental and/or strategic (hence the use by the “new” institutionalism of competitive market and game theory models).

- In contrast, the classic (or “old”) institutionalists regard institutions as *forming* individual behaviour. They simplify and offer meaning to situations. For Thorstein Veblen (1919), institutions are “settled habits of thought common to the generality of man”. In the same vein, Scott (1995) argues that “institutions consist of cognitive, normative, and regulative structures and activities that provide stability and meaning to social behaviour. Institutions are transported by various carriers – cultures, structures, and routines – and they operate at multiple levels of jurisdiction”.

These two definitions are very different. They represent each side of the divide between methodological individualist and social constructivist ontologies. In sum, a definition by an ecological economist (Vatn, 2005) that combines the most important aspects emphasized by classical institutionalists is the following: Institutions are the conventions, norms and formally sanctioned rules of a society. They provide expectations, stability and meaning essential to human existence and coordination. Institutions regularize life, support values and protect and produce interests.

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48. Languages of Valuation

Environmental Conflicts: Clashes of Valuation Languages

Environmental conflicts are fought in different 'languages', that is, within different reference frames. Conflicts therefore might arise out of clashes of different interests or because of the existence of different value systems (see e.g. landscape values below). In the case of mangroves for instance, some people want to preserve them against the shrimp industry because they appreciate their ecological and aesthetic values. Other people want to preserve them because they make their livelihood and survive from them, and/or because they understand their practical role in coastal defence and as fish breeding grounds. Other people (or the same people, in other contexts) might appeal to the sense of culture and place mangroves provide for their traditional inhabitants. They might even argue that there are sacred mangroves. In all cases, environmental conflicts are expressed as conflicts of valuation, either within the parameters of one single standard of valuation, or across plural values. Thus, in a gold mining conflict, the company will probably argue in terms of the money to be gained (and shared locally for employment, taxes and royalties), while the opposition may argue for instance in terms of the uncertain risks to health from cyanide used in open cast mining, and/or in terms of the infringement of indigenous rights to the territory under Convention 169 of ILO.

48.1 Landscape Value

Landscape value corresponds to an attachment or emotional bond that people develop with places. There are strong cultural ties to landscapes and feelings for the visual beauty of mountains, lakes, coasts, forests, etc., which are a common bond among people or social groups of a given region. Arguments related to landscape values are commonly heard in Europe from opponents to the construction of wind farms for example. Landscape values may also be important for the tourism industry and landscapes can therefore be managed as a key component of tourism infrastructure.

Landscape value often has an association with environmental and natural resource values. The values that people appreciate in a landscape may often also be important ecologically. Landscape values can be divided into *use value*, that is, places that provide tangible benefits (such as economic value through, for instance, tourism, or recreation value) and *non-use value*, namely places that have spiritual, identity or ecological values.

To see value solely in terms of biomass, energy, culture, livelihood, or to maintain an a priori refusal of techniques of economic valuation in actual or fictitious markets, indicates a failure to grasp the existence of value pluralism, hence of different languages of valuation. It is possible to believe that, "shrimp and gold exports are valuable items of world trade", while also recognising that, "valuable ecosystems and valuable local cultures are destroyed by shrimp farming and gold mining". Which then is the true value of one pound of farm-raised shrimp or the true value of a gram of gold? The reduction of all goods and services to actual or fictitious commodities, as in cost benefit analysis, can be recognized as one perspective among several, legitimate as a point of view and as a reflection of real power structures. But who then has the power to simplify complexity, ruling some viewpoints as out of order?

Application

The agents of environmental conflicts are not so well identified as the agents of Ricardian or Marxian economic conflicts – landlords and capitalist farmers, in one case, capitalists and proletarians, in the second case. It might be that a fight against effluents is led by a group of conservationists, or by a group of local women concerned by children's health, or by a group of indigenous people demanding compensation, *i.e.* demanding in the language of economists the "internalization of externalities", or appealing to non-chrematistic values (such as human livelihood or the sacredness of the land).

The management and resolution of local or global ecological distribution conflicts requires cooperation between many different actors such as businesses, international organizations, NGO networks, local groups, and governments. Whether this cooperation can be based on common values and on common languages is questionable. Whenever there are unresolved ecological conflicts, there is likely to be not only a discrepancy but incommensurability in valuation (Faucheux and O'Connor 1998; Funtowicz and Ravetz 1994; Martinez-Alier, Munda and O'Neill 1998; Martinez-Alier and O'Connor 1996).

The claims to environmental resources and services of others, who are differentially empowered and endowed, can be contested by arguing inside a single standard of value or across plural values. As pointed out by O'Connor and Spash (1999), conflicts about access to natural resources or about exposure to environmental burdens and risks may be expressed:

- *in one single standard of valuation* (usually monetary). How should the externalities (*i.e.* cost-shifting) caused by a firm be valued in money terms when asking for compensation in a court case? An appeal to economists versed in cost benefit analysis and contingent valuation would be appropriate here.
-
- *through a value standard contest* or dispute, that is, a clash in the standards of value to be applied, as when loss of biodiversity, or in cultural patrimony, or damage to human livelihoods, or infringement on human rights or loss of esthetic or sacred values are compared in non-commensurable terms to economic gains from a new dam or a shrimp farm or a mining project or from oil extraction. There is a clash in standards of valuation when the languages of environmental justice, or indigenous territorial rights, or environmental security, or sacredness, are deployed against monetary valuation of environmental burdens. Non-compensatory multi-criteria decision aids or participatory methods of conflict analysis are appropriate for this type of situation.

Any social group can simultaneously use different standards of value in support of its economic and environmental security. This is particularly true of subordinate social groups.

Moreover, in complex situations marked by uncertainties and synergies, the disciplinary approach of experts is not appropriate. So, incommensurability of values arises not only because of different interests but also because of complexity that entails a plurality of legitimate perspectives and values. This point is made vivid by one question, “What is the price of oil?” asked by Human Rights Watch in 1999 in a report on the Niger Delta.

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49. Lawrence Summers’ Principle

Origins of the Principle

Lawrence Summers is a US economist, former President of Harvard University, former Chief Economist of the World Bank, and presently working in the Obama administration. The “Lawrence Summers’ Principle” – a term coined by Martinez-Alier (1994) – can be summarized by the formula “the poor sell cheap”. This “principle” originates from a 1991 memo written by Summers while he was the World Bank’s chief economist. In this memo, he promotes dumping toxic waste in the Third World for economic reasons:

> “*Just between you and me, shouldn’t the World Bank be encouraging more migration of the dirty industries to the LDCs [Least Developed Countries]? […] A given amount of health impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that.”*

The Economist (February 8, 1992), to which the memo was leaked, found the language “crass, even for an internal memo”, but “on the economics his points are hard to answer”. As Harvard economist Stephen Marglin said, “people who have not been exposed to a college course in [standard] economics are likely to be outraged by the memo […]. After a freshman course in economics, college students begin to think like economists – that is the point of freshman economics after all – and will explain why and how both the low-wage and the high-wage countries benefit from the relocation of toxic wastes”. Indeed, from Summers’ viewpoint, such relocation is a win-win solution promoting economic growth in both countries and regions.

In taking this view however, Summers takes for granted (1) that any kind of growth benefits the poor; (2) that LDCs will have to follow the same development path as rich countries, namely through a polluting capitalist industrialization; (3) that prices fairly reflect environmental and social costs in both countries/regions and across social groups; (4) that both countries/regions are equally free to enter into such an exchange (and, by the same token, that governments accurately represent their populations!); and (5) that uncertainties are negligible, for instance with respect to long-term health or environmental costs.

The Principle in Action

The Philippine Associated Smelting and Refining Corporation (PASAR) provides an example of such assumptions at work (Korten, 1992). PASAR is a Japan-financed and built copper smelting plant located near the town of Isabel (Leyte Province). It produced copper cathodes and ships them to Japan for processing. The 15,000 residents of Isabel, a poor rural farming and fishing community, were promised development, including jobs in the smelting plant and cheap electricity from the related geothermal power project. However, the jobs turned out to be mainly part-time or contractual to do their dangerous and dirty nature. The geothermal plant did provide cheap electricity for the smelter, but the rates to local residents increased. Gas and waste water emissions from the new facilities containing high concentrations of boron, arsenic, heavy metals, and sulfur compounds contaminated rivers and the local bay, reducing rice yields, damaging the forests, threatening the local water supply, reducing fishing yields, and increasing incidences of upper respiratory disease. Although the local economy has grown, Isabel’s poor – the project’s professed beneficiaries – have been impoverished and started to protest against the company.

Many marginalized populations offer attractive locations for those who advocate the relocation of toxic waste facilities or polluting industries as a means to give employment and increase growth. One conspicous example is the export of ships for dismantling in Alang, on the coast of Gujarat in India. The health risks from asbestos and heavy metals are born at a low economic cost by poor labourers working on the beaches. In such cases, there is no real defence against pollution dangers through market negotiation over potential damages to property rights. The market and pseudo-market valuation of damages indicate that it is much cheaper to locate such industries in poor areas than where the rich live. As Martinez-Alier (2007) pointed out, "poor people are well advised to defend their interests in languages different from that of compensation for externalities, because in the economic sphere 'Lawrence Summers' principle' ('the poor sell cheap') is operative". The Environmental Justice movement in the United States that struggles against what it calls "environmental racism", also likes to quote from Lawrence Summers´memo of 1991.

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50. Natural (Environmental) and Social Capital

Definition

Capital is traditionally defined as produced (manufactured) means of production. A more functional definition of capital is a fund or a stock (a fishery or forest, an oil well, or a set of machines in a factory) that yields a (sustainable or unsustainable) flow of valuable goods or services into the future. What is functionally important is the relation of a fund or a stock yielding a flow – whether the fund or stock is manufactured or natural is in this view a distinction between kinds of capital and and not a defining characteristic of capital itself (Costanza and Daly, 1992:38).

Types of capital

Based on the above definition Costanza and Daly distinguish three broad types of capital: *natural, human* and *manufactured*, "which correspond roughly to the traditional economic factors of land, labour and capital" (Costanza and Daly, 1992:38).

Natural capital are the natural ecosystems that yield a flow of valuable ecosystem goods or services into the future (Costanza, 2008) For example, a population of trees or fish provides a flow or annual yield of new trees or fish, a flow that can be sustainable year after year. The sustainable flow is "*natural income*"; it is the yield from "*natural capital*". Natural capital may also provide services such as recycling waste materials, or water catchment and erosion control, which are also counted as natural income. Since the flow of services from ecosystems requires that they function as whole systems, the structure and diversity of the system is an important component in natural capital (Costanza and Daly, 1992:38).

Costanza and Daly point out the distinction between natural capital and income and natural resources and find the following definition most appropriate "natural capital and natural income are aggregates of natural resources in their separate stock and flow dimensions, and forming these aggregates requires some relative valuation of the different types of natural resource stocks and flows." So "capital and income have distinct evaluative connotations relative to the more physical connotations of the term 'resources'" (Costanza and Daly, 1992:38).

They differentiate two broad types of natural capital: (1) renewable or active natural capital, and (2) non-renewable or inactive natural capital ("Funds" and "Stocks" in Georgescu-Roegen's terminology). Renewable natural capital is active and self-maintaining using solar energy (e.g. ecosystems). Ecosystems can be harvested to yield ecosystem goods (e.g. wood) but they also yield a flow of ecosystem services when left in place (e.g. erosion control, carbon capture, recreation). Non-renewable natural capital is more passive (e.g. fossil fuel and mineral deposits) and yields no service until extracted (Costanza and Daly, 1992).

In addition to natural capital there is *human-made capital*. Here they distinguish between (1) *manufactured capital* such as factories, buildings, tools and other physical artefacts, and (2) *human capital* i.e. the stock of education, skills, culture, and knowledge stored in human beings. Agricultural seeds have been selected by humans for thousands of years, they require human knowledge to be used.

Manufactured, human and *renewable natural capital* decay at substantial rates and must be maintained and replenished continuously. The stock of *non-renewable natural capital* also decays but at a very slow pace so this can be ignored, however once it is extracted and used it is gone. *Renewable natural capital* produces both ecosystem goods and services, and renews itself using its own capital stock and solar energy. Excessive harvest of ecosystem goods can reduce renewable natural capital's ability to produce services and to maintain itself. *Manufactured capital, renewable natural capital* and *non-renewable natural capital* interact with human capital and economic demand to determine the level of marketed goods and service production. (Costanza and Daly, 1992).

Much of the discussion on Sustainability in ecological economics revolves around the issue of the limits to substitution between the different forms of capital. For instance, can manufactured capital be substituted for natural capital (can a larger fleet of fishing boats substitute for scarcity of tuna fish)?

Goodwin differentiates between five kinds of capital: financial, natural, produced, human, and social. All are stocks that have the capacity to produce flows of economically desirable outputs, their maintenance being "essential for the sustainability of economic development" (Goodwin, 2007). *Financial capital* refers to system of ownership or control of physical capital. It facilitates economic production but is not itself productive. *Natural capital* is made up of the resources and ecosystem services of the natural world. *Produced capital* is made up of physical assets generated by applying human productive activities to natural capital and capable of providing a flow of goods or services. *Human capital* refers to the productive capacities of an individual, both inherited and acquired through education and training, while *social capital*, consists of a stock of trust, mutual understanding, shared values and socially held knowledge. However not all capital can be classified clearly into only one form. E.g., when people deliberately create stocks of new seeds through selective breeding, such seeds may be seen as partly natural and partly produced – and also as embodying human and social knowledge (Goodwin, 2007).

Elaborating on *natural* and *social capital* Goodwin states: "It was from a largely homocentric point of view that economists first began to label stocks of clean water and air, as well as forests, fisheries, and the ever evolving systems that support them – and us – as *natural capital*. While the term was originally used only for those aspects of nature that humans were actually using – and especially the parts that they were depleting, such as fertile topsoil – growing awareness of the intricacy and delicate balance of the relationship between the natural environment and human economies is encouraging many to think of our total natural environment as precious natural capital" (Goodwin, 2007).

Social Capital Today

According to Goodwin (2007) in present-day industrialized economies, recognition of *social capital* by economists is fairly recent, and has been strengthened by "the observation that variations in social capital across communities and societies can help to explain some of the differences in their economic development"(Goodwin, 2007). Social capital now frequently refers to those characteristics of a society that encourage cooperation among groups of people (e.g., workers and managers) whose joint, interdependent efforts are needed to achieve a common goal such as efficient production. Studies suggest that strong norms of reciprocity lead people to trust and to help one another, and that dense networks of civic participation encourage people to engage in mutually beneficial efforts rather than seeking only to gain individual advantage at the possible expense of others. *Social capital* furthermore, resembles other forms of capital in that it generates a service that enhances the output obtainable from other inputs, without itself being used up in the process of production. (Goodwin, 2007). To understand the notion of social capital, we must refer to institutions.

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51. Natural Capital Depletion Tax

Background

Natural capital refers to the land, air, water, living organisms and all formations of the earth biosphere that provide us with ecosystem goods and services required for survival and well-being. It is also the basis for all human economic activity. It comprises renewable resources and also exhaustible stocks on fossil fuels and minerals. We should be taxing what we want less of (like pollution or depletion of finite natural resources)?

Manufactured and human capital has traditionally been measured to calculate economic performance while natural capital has always been neglected, leading to loss of resources, the degradation of natural environments and the loss of valuable ecosystem services. Sustainability requires maintaining natural capital intact, or at least it requires to slow down its loss while waiting for positive technological changes and peak human population. In order to achieve this, an economic instrument to encourage the conservation of natural capital would be useful. One possibility is a natural capital depletion tax.

A proposed tax reform

Developed by ecological economists Robert Costanza and Herman Daly, executive and author Paul Hawken, and ecologist John Woodwell (1995,1998), their “ecological tax reform” proposal calls for a revenue neutral tax shift. In other words, it would not add to the total tax burden, and would even be compatible with tax reduction, but it would radically shift the target of taxation and replace much current income tax (and also taxes on labour in the form of social security contributions) with a "natural capital depletion tax".

The aim of the proposed tax reform is to provide incentives to use natural resources and ecosystems (natural capital) in a sustainable way. Consumption of natural capital would be taxed to the extent that materials are not recycled, encouraging "closed loop" use to the possible extent. For example, the use of fossil energy (which of course cannot be recycled) would be taxed but might be offset with credits for investment in renewable alternatives. This provision would encourage the development of energy efficient technology and renewable sources of energy.

According to the authors, shifting the tax burden from income (and labour) to pollution and depletion would benefit both the economy and the environment by encouraging employment and income, reducing the need for government regulation, and promoting the sustainable use of natural resources and ecosystems. The revenue neutral aspect of the tax shift would not raise costs for business, rather offering businesses appropriate incentives to develop new technologies, improving production efficiency and environmental performance.

Moreover, since the natural capital depletion tax would be applied mainly at the input side of the economy, the tax would pass through the whole system, influencing the prices of all goods and services that consumed natural capital, either directly or indirectly. This would encourage the development of products that do not consume natural capital, which would then have a competitive advantage in the marketplace and tend to displace their non-sustainable alternatives.

Winners and Losers

As often with tax reform proposals, there would be both winners and losers. Extractive industries for instance would probably be directly affected. Companies able to adapt however, would find new opportunities, and thus profits. In addition, because any consumption or value added tax has a regressive character, income transfers or other protections might be necessary to prevent the tax burden from falling too heavily on the poor. The Natural Capital Depletion Tax would particularly favour the raw materials exporting countries or regions.

Difficulties in implementation

The real strength of the proposal for a natural capital depletion tax is its potential to align a powerful economic tool with the physical reality of the world we inhabit. However most governments are reluctant to impose such taxes, particularly for fear of political unpopularity and damaging national competitiveness. Instead many countries in Latin America and Africa are forced to export cheap raw materials by the burden of the payments of the external debts, while industrial countries are emphasising policies of energy efficiency achieved through technological means (such as labelling, standards and best practice schemes), and deregulation of national fuel industries to bring about more competitive markets. These measures in industrial countries ironically are likely to create a rebound effect whereby lower energy prices lead to greater energy consumption, and increased economic growth.

The concept of natural capital depletion tax is problematic in that it is hard to see how the tax level could be rationally set when the total volume and accessibility or recoverability of a resource is unknown. As an example, the penalty level and urgency level of conservation is very different if the depletion rate appears to be 10%, 0.1% or 0.001% of the total resource per year. We are approaching peak oil and later peak gas. Proven reserves are depleted to a few decades-worth of production. Extraction should be taxed but then the rate of prospecting for other sources such as coal will increase until the companies feel secure again. The limits of exploiting living resources of the sea are perhaps more apparent, but procedures such as aquaculture and fertilising the sea may radically change equations and assumptions.

There is the also the matter of implementation: a system of natural capital depletion taxes would require an international agreement or cartels (such as OPEC) to prevent free market access to resources from countries with no natural capital depletion taxes.

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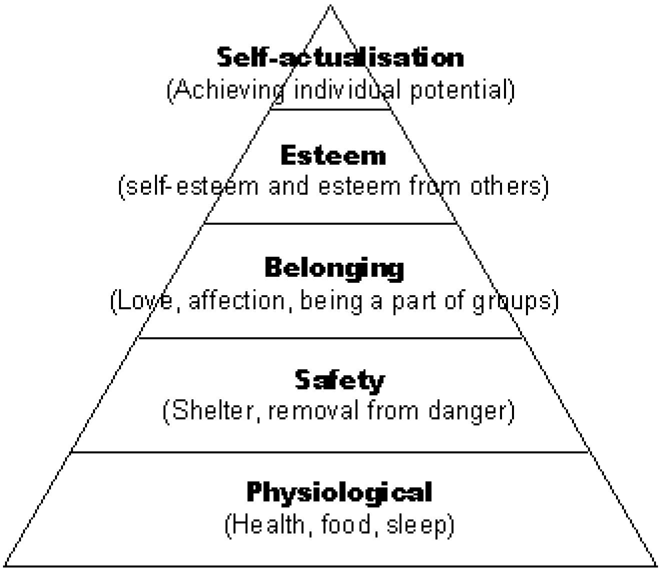
52. Needs

Maslow’s pyramid

The notion of needs was initially developed in the field of psychology by Abraham Maslow to explain individual motivation process (Maslow, 1943). His “hierarchy of human needs” consisted of five needs, ranked in a pyramid: physiological (hunger, thirst, warmth, sleep, etc), safety (protection, order, law, etc), belongingness and love (affection, family etc), esteem (competence, approval and recognition), and self-actualization needs (realising personal potential, self-fulfilment, seeking personal growth and peak experiences). The core principle according to his theory is that an upper need cannot be satisfied until those lower in the hierarchy are met.



Critiques

This hierarchy has been criticised from many angles. For example, individuals can have affection even if their physiological needs are not fully satisfied. Moreover, the model implies that only sufficiently well-off people can achieve self-actualization, which contradicts the realities of for example, poor artists who have developed well their individual potential. In the context of environmental protection (which this model regards as a self-actualization need) the hierarchical assumption has been used to justify the position that poor countries must first meet their basic needs before tackling environmental goals such as mitigating climate change (Furfari, 2007). This kind of reasoning tends to legitimate any kind of economic growth in poor countries, a strategy that is not shared by everyone, especially from a sustainability perspective.

Refinements by Max-Neef

In response to the limitations of a Maslow's hierarchy, Chilean ecological economist Manfred Max-Neef created his model of "Human scale development", aiming to build a human needs theory for development. For Max-Neef, "*fundamental human needs are finite, few and classifiable and are the same in all cultures and in all historical periods. What changes, both over time and through cultures, is the way or the means by which the needs are satisfied*" (Max-Neef, 1991). Nine fundamental needs are identified (subsistence, protection, affection, understanding, participation, leisure, creation, identity and freedom). While there is some overlap between Max-Neef and Maslow with regard to the categories of needs (for example subsistence resembles physiological needs, protection is similar to safety, and affection is related to belongingness), Max-Neef rejects the hierarchical principle and considers fundamental human needs as a system where "*no need is more important per se than any other and* [where] *there is no fixed order of precedence in the actualization of needs (that need A, for instance, can only be met after need B has been satisfied)*" (Max-Neef, 1991: 49).

Max Neef's model is composed of two other variables (see **Table 1** below). Firstly, there are four "*satisfiers*", i.e. means to meet these needs: being (personal or collective attributes/qualities), having (institutions, norms and material things), doing (personal or collective actions) and interacting (settings). The second variable relates to "economic goods "defined as objects or artifacts affecting the efficiency of a satisfier, thus altering the threshold of actualization of a need, either in a positive or negative sense. With these variables it is possible to build a matrix of needs and satisfiers to diagnose the level of satisfaction of the nine needs in a specific group or society. The model can also be used to determine the satisfiers required for fulfilment of the needs of this group and, therefore, to conceive a strategy for development aimed at the actualization of human needs (Max-Neef, 1991).

Doyal and Gough (1991) have also developed a theory of human needs, considering their realization a precondition of a fulfilled life. In this model, two universal basic needs and eleven intermediate needs are identified.

NEEDS	Being (qualities)	Having (things)	Doing (actions)	Interacting (settings)
Subsistence	physical, emotional and mental health	food, shelter, work	work, feed, procreate, clothe, rest/sleep	living environment, social setting
Protection	care, adaptability, autonomy	social security, health systems, rights, family, work	cooperate, plan, prevent, help, cure, take care of	Living space, social environment, dwelling
Affection	respect, tolerance, sense of humor, generosity, sensuality	friendships, family, relationships with nature	share, take care of, make love, express emotions	privacy, intimate spaces of togetherness
Understanding	critical capacity, receptivity, curiosity, intuition	literature, teachers, educational and communication policies	analyse, study, meditate, investigate	schools, families, universities, communities
Participation	adaptability, receptivity, dedication, sense of humor	responsibilities, duties, work, rights, privileges	cooperate, propose, dissent, express opinions	associations, parties, churches, neighborhoods
Idleness	imagination, curiosity, tranquility, spontaneity	games, parties, spectacles, clubs, peace of mind	day-dream, play, remember, relax, have fun	landscapes, intimate spaces, places to be alone, free time
Creation	imagination, boldness, curiosity, inventiveness, autonomy, determination	skills, work, abilities, method, techniques	invent, build, design, work, compose, interpret	spaces for expression, workshops, audiences, cultural groups
Identity	sense of belonging, self- esteem, consistency	symbols, language, religion, values, work, customs, norms, habits, historical memory	get to know oneself, grow, commit oneself, recognize oneself	places one belongs to, everyday settings, maturation stages
Freedom	autonomy, passion, self-esteem, open-mindedness, tolerance	equal rights	dissent, choose, run risks, develop awareness, be different from, disobey	temporal / spatial plasticity (anywhere)

Table 2 : Human scale development, Max Neef 2001
(Source: whiteweek.wordpress.com/)

Implications for sustainability

These recent models of needs have implications for well-being theory, at the individual and societal level, and in ecological economics (Jackson and Marks, 1999). Indeed, in Max-Neef's theory, unsatisfied needs are seen as poverties, broadening the concept of poverty to more than a lack of income and beyond monetary measures. Following this reasoning, development means the alleviation of multiple poverties and becomes the social analogue of individual self-actualization, relevant to both North and South (Dodds, 1997). Furthermore, by distinguishing basic needs from economic goods, a needs-based welfare conception puts in question the positive relationship between increased material consumption and increased satisfaction of needs, especially of non-material needs. Therefore it contradicts the conventional economic approach which regards needs as subjective desires and preferences that can be satisfied through consumer choices, questioning the primacy and the uni-dimensional role of economic growth in the improvement of human welfare. In terms of sustainability, this opens the door to arguments that environmental imperatives should not be viewed as constraints on human welfare and that the satisfaction of needs and development do not automatically imply natural resource depletion.

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53. NIMBY (Not in My Back Yard)

Definition and origins

NIMBY is an acronym for "not in my back yard". According to the Collins dictionary, people affected by the NIMBY syndrome are those who object to the occurrence of something if it will affect them or take place in their locality. For a long time, governments and corporations have built unwanted and/or hazardous projects (often in predominantly poor neighbourhoods), with little regard for public consultation or consideration. In order to defend their neighbourhoods, health, security and way of life, local communities had to band together in order to defend their local area against these decisions. Opposing residents themselves are sometimes referred to as "*Nimbies*".

NIMBY is characterized by intense, sometimes emotional, and often adamant local opposition to the situating of proposals that residents believe will result in adverse impacts. Project costs and risks, such as effects on human health, environmental quality, or property values, are geographically concentrated while the benefits accrue to a larger, more dispersed population. The recurrence of Nimbyism in recent years may be traced to the public's broad embrace of new environmental values and its fear of dreadful and unknown technological risks - such as hazardous waste, toxic substances, and nuclear power, as well as to a dramatic increase in publicly available information on health and environmental risks of proposed facilities. Additional factors are a decline of confidence in the ability of government and industry to make informed, prudent, and equitable decisions about risky technologies, and statutory creation of new opportunities for public participation in administrative and judicial processes.

Almost all of the literature that deals explicitly with the NIMBY syndrome (published since the late 1980s) originates from the USA. The term is widely used by those involved in or commenting upon local development disputes, but is also used to discredit project opponents, pejoratively describing opposition and undermining the legitimacy of community assertions against proposals such as those for nearby tall buildings, wind turbines, incinerators, power plants, mobile phone network masts, new roads or railways. People using the expression NIMBY consider opponents to new projects as having a narrow and selfish view of the situation. In the Southern context however it has a very different meaning which is strongly linked to community power and grassroots democracy. Since NIMBY, many expressions have emerged around locally focused social movements: NOOS (Not On Our Street) ; LULU (Locally Unwanted Land Uses) ; NIABY (Not In Anyone's Backyard) ; NOPE (Not On Planet Earth) ; NIMTOO – (Not In My Term Of Office) ; CAVE (Citizens Against Virtually Everything) ; GOOMBY (Get Out Of My Backyard); NOTE (Not Over There Either) ; and BANANA (Build Absolutely Nothing Anywhere Near Anyone).

Approaches to NIMBY

Both the scholarly literature and recent politics reveal two kinds of responses to the rise of NIMBY, one highly critical and one fairly positive. The former is clearly the predominant view. Critics of the NIMBY response argue that as a result of the social and political developments noted, essential projects have become impossible to situate, thus restricting or delaying local economic development and technically superior solutions to problems such as hazardous waste disposal. Nimbies are seen as small groups skewing the system in their favour; using political opportunities to obtain outcomes that suit them at the expense of other people and their rights. In this way they selfishly erode the rights of the larger community.

The figure below offers a model of this conventional view of the NIMBY phenomenon:

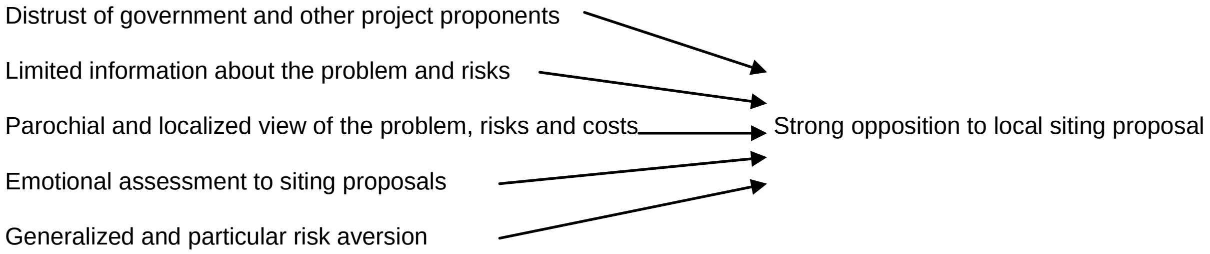

Figure 1 Citizen Participation and the Nimby Syndrome: Public Response to Radioactive Waste Disposal

(Source: Kraft & Clary, 1991)

The more positive assessments of NIMBY politics suggest that the public's position on siting issues may be rational and politically legitimate. Citizens may have a fairly good grasp of the issues and a reasonable concern for genuine risks to community health and welfare that are ignored by technical and administrative elites. From this perspective, local opposition may serve a broader public interest, for example in identifying important weaknesses in expert analyses underlying siting proposals (see post-normal science) and forcing consideration of a broader range of sites, some of which may be more technically suitable. NIMBY protests are essentially clashes of incommensurable values, and clashes over whose values can be legitimately expressed. Such conflicts are often the only way citizens can express their concerns and influence government policy.

In 1971 in Australia, a small group of concerned local women from Hunters Hill joined together in order to conserve the last remaining bush land on the Parramatta river known as Kellys Bush (Mundey). This group combined with the Builders Labourers Federation (BLF) to oppose the planned development on the site. The BLF put a development ban on Kelly’s Bush, preventing a high-density development and this ban became known as a Green Ban. From there Green Bans ‘mushroomed’ under the BLF and a number of significant sites were preserved, including the Rocks area and Centennial Park in Sydney. The emergence of Green Bans highlights how a local group made a difference, not only in their local community, but also in broader society. They were the catalyst for the formation of a larger social movement and had a much broader impact in the long term.

Examples such as the one cited above illustrate a broadening and deepening of public involvement in decision-making, especially through innovative mechanisms of education and participation which offer significant political influence to citizens and promote a cooperative search for solutions. We argue that policies on technological risks should be based on democratic principles to promote a number of important objectives: to encourage technical review by a diverse set of policy actors, to facilitate consideration of public fears and concerns, and to build public support for policy implementation. Despite its now frequent occurrence in a diversity of settings, there have been few rigorous efforts to conceptualize the NIMBY response or to assess its policy implications, and only a handful of empirical studies that help to clarify its behavioral and political dynamics.

Ban the term NIMBY?

Although many people might be cynical of their motivations and although some Nimbies are motivated by fear of outsiders and protecting their assets, most NIMBYs actually try to create change at a local level and seek to create better communities. The fact that these groups can be found around the world indicates that there is a broader element to their objectives and in this sense they might be considered an immature expression of a social movement, which under the right conditions and leadership could expand into a fully-fledged social movement. NIMBYs are a result of and reaction to a local political and social context. Their meaning, shape, size and definition are all relative to these contexts, as well as to the individual personalities involved. They share a sense of community and as a result also shape the identity of the people involved. In contrast with the negative depiction of NIMBYism, local resistance can be viewed as an essential starting point and ongoing component of dynamic environmental movements. However, given that the term NIMBYism has come to be synonymous with limited, selfish or irrational responses, continuing to describe local

Figure 1: March organized by residents and farmers against a project of landfill, Essonne, France
(Source: www.adse-saintescobille.com)

protesters as NIMBYs makes little sense given growing recognition of the diversity of concerns typically raised, factors which constrain local responses, the inevitability of attempts to protect one's own backyard as inevitable and perhaps even environmentally positive.

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54. Opportunity Cost

Definition

Opportunity cost is one of the most basic concepts in economics. A fundamental rule in economics is “never do anything unless it is worth more than its opportunity cost”. Opportunity cost expresses the idea that for every choice, the true economic cost is the sacrifice of the next best opportunity. Or, in other words, the opportunity cost is the net benefit forgone because the resource providing the service can no longer be used in its next-most-beneficial use. As an example, suppose a farmer cuts down a forest to expand his cropland. If the consequent loss of timber, firewood, and water purification function is the next best use of the land, then the value of timber, firewood, and water purification is the opportunity cost of the expanded cropland. Another example would be the choice to use a particular section of a river either for canoeing or to generate electric power. Since the dam needed to generate power would flood the rapids, the two uses are incompatible. The opportunity cost of producing power is the foregone net benefit of canoeing.

Opportunity cost and resource scarcity

The concept of opportunity cost is linked to the notion of scarcity of resources. Indeed, the economic system has a certain endowment of relatively scarce resources (land, industrial machinery, raw materials, labour). Each use implies an opportunity cost from using the resource for one use rather than for another competing one. If someone chooses to spend time resting rather than making a bookshelf, the opportunity cost is the value of that bookshelf that might have been produced. Time is the scarce resource; using it to rest entails a clear loss of opportunity for shelf-making. Thus, opportunity costs are not restricted to monetary or financial costs: the real cost of output forgone, lost time, pleasure or any other benefit should also be considered as opportunity costs.

It can also be used to measure the economic effect of the rising scarcity of a natural resource by computing how much a society must give up to obtain an additional unit of the resource. Moreover, differences in resource quality affect the economy through the opportunity cost. Opportunity cost is equal to the goods and services that cannot be produced because energy is used to produce an alternative good or service. For example, energy used to harvest timber cannot be used to heat a home.

Uses

The opportunity cost approach is a very useful technique when benefits of certain uses, such as preservation, protection of habitats, cultural or historical sites, cannot be directly evaluated. For example, the cost of preserving forests for a national park rather than harvesting them for timber would be assessed by using the forgone income from selling timber. Similarly, in the Yasuni ITT proposal in Ecuador in 2007, the government was ready to forego the revenue from the extraction of 850 million barrels of oil (taking into account the benefits from conservation of biodiversity, the rights on the indigenous population, and the carbon dioxide emissions avoided), but the government asked for external contributions from other countries to cover half the “opportunity cost” (that is, half the foregone revenues that would be obtained by extracting and selling the oil).

Issues

In this way opportunity cost plays a crucial part in ensuring that scarce resources are used efficiently. It has been described as expressing "the basic relationship between scarcity and choice." However, we must point out that difficulties in assessing the benefits from environmental preservation can lead to the inefficient allocation of resources. The concept of opportunity cost is also at the heart of a debate between standard (environmental) economics and ecological economics in the way they see the world. While the former sees the economy as the whole, drawing from nature or the environment as sectors of the macroeconomy (forests, fisheries, grassland, mines, wells, ecotourist sites, and so on), the latter envisions the (macro) economy as a part of a whole, namely the earth, its ecosystems and its atmosphere, within a finite, non-growing and materially closed ecosystem.

Starting from this point, if the economy grew in a void (as it does according to standard economics), it would encroach on nothing and its growth would have no opportunity cost so that it could expand without limit. But since the economy grows into a finite ecosystem, the growth of the macroeconomy overlaps onto the non-growing whole, implying a sacrifice of something (the opportunity cost). Thus growth *does* have a cost and, at some point the continued growth of the macroeconomy will cost us more than it is worth. This is what is referred to (in Herman Daly's words) as uneconomic growth. In a situation where the economy was very small relative to the ecosystem (as in pre-industrial times), there would be no need to stop growing since resources would be abundant and the opportunity cost for economic expansion would be insignificant. But in the long run, with continued growth, we would arrive at state in which the opportunity cost of growth was significant. According to many ecological economists and advocates of sustainable economic degrowth, we are already in such a situation.

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55. Participative Democracy and Public Participation

From theories of democracy…

The origins of 'democracy', wherein the power ('kratos') is exerted by the people ('demos'), may be traced back to ancient Greece. Since Plato and Aristotle, many prominent thinkers have added to an array of theories of democracy, such as Locke, Rousseau, Mill, Dewey, Pateman, Habermas and Dryzek. Democracy has become the internationally predominant system of governance, a 'universal value', according to Sen (1999). He argues that democracy has a plurality of virtues, including: i) the 'intrinsic' meaning of political participation and freedom to achieve human wellbeing, ii) the 'instrumental' importance of assuring governments' responsibility and accountability, and iii) the 'constructive' role in value formation and understanding the needs, rights and duties of citizens.

Varied forms of political government have been advocated, from 'direct democracy´, where the citizens exert the decisions directly, to the widespread system of 'representative democracy', where elected representatives act in the interest of the people. Many scholars call for extensive participation and a more meaningful engagement of the public in modern nation-states, to avoid narrowing the practice of representative democracy to voting in elections (NRC, 2008).

In this context, 'participatory democracy' has emerged as a catchphrase for more genuine, popular or progressive forms of democratization. Aragonès and Sánchez-Pagés (2009) define it as a process of collective decision-making where citizens have the power to decide on policy proposals and politicians assume the role of policy implementation. Participatory democracy provides opportunities to overcome the shortcomings of representative democracy by combining it with elements of direct democracy. In this system, citizens lead by making a policy proposal, which the elected representatives may subsequently decide to implement. The notion of a reduced scale of government is an integral element of the definition of participatory democracy, which taps into the notion of subsidiarity.

The theory of democracy has recently taken a 'deliberative turn', whereby democratic legitimacy increasingly rests on authentic deliberation rather than on voting or interest aggregation. "Deliberative democracy" has supporters and detractors. According to the former, deliberation induces individuals to reflect upon their interests and preferences, becoming amenable to changinging them and reach a workable agreement that follows a certain decision rule (e.g. consensus, unanimity, or majority). Critics however, argue that deliberative democracy favours conditions for strategic behaviour and fosters chaotic and arbitrary outcomes.

…To theories of participation

Public participation is intrinsic to democratic governance. Hence, theories of democracy have in turn led to theories of public participation (NRC, 2008). Renn and Schweizer

(2009) reviewed these theories, proposing six broad theoretical concepts categorizing the processes that channel public input into public policy making:

- **Functionalist**, where participation aims to improve quality of decision output, and follows a rationale that argues for representation of all knowledge carriers, integrating systematic, experiential and local knowledge;

- **Neo-liberal**, which aims to represent all values and preferences in proportion to their share in the affected population, thus focusing primarily in the collection and representation of (well-informed) public preferences;

- **Deliberative**, where competition between participants' arguments is promoted with respect to criteria of truth and normative validity, reaching consensus through argumentation;

- **Anthropological**, which is based on the belief that common sense is the best judge in reconciling competing knowledge and value claims, thus promoting the inclusion of non-interested laypersons representing social categories such as gender, income and locality;

- **Emancipatory**, where the goal is to empower less privileged groups and individuals, by strengthening the resources of those who are more negatively affected and challenging traditional power structures in society;

- **Post-modern**, whereby participation aims to demonstrate variability, plurality and legitimacy of dissent, thus leaning towards acknowledgement of plural rationalities. Within this concept, mutually acceptable arrangements are sufficient and there is no need to reach a final product or joint statement (i.e. reaching closure).

The justifications for active public involvement in decision-making processes can be aggregated into three categories: i) normative reasons – both society and individual citizens are enriched through the encouragement of social and individual learning, ii) substantive reasons – accommodating multiple views improves understanding of the issues and subsequently the selection of more appropriate solutions; iii) instrumental reasons – success of policy implementation is promoted through the encouragement of collaborative relationships.

Forms of public participation

In democratic societies, people participate through different ways, such as voting, expressing opinions on public issues and governmental actions, forming interest groups, influencing decisions by demonstrating or lobbying, filing lawsuits to contest actions, establishing partnerships with government agencies or mobilizing attention to issues through artistic expression (NRC, 2008). All these forms fall under a broad definition of 'public participation', whereby public concerns are integrated, to a lesser or greater extent, into governmental or corporate decision-making.

In the context of environmental assessment and decision-making, 'public participation' usually refers to a narrower conception describing any "organized process adopted by elected officials, government agencies, or other public or private – sector organizations to engage the public in environmental assessment, planning, decision-making, management, monitoring, and evaluation. These processes supplement the traditional modes of public participation…(such as those in electoral and legislative processes)" (NRC, 2008).

There are multiple and sometimes conflicting interpretations of 'who' is involved in 'public participation' and 'stakeholder participation'. The former term often refers to individual citizens or relatively unorganized groups of individuals, while the latter usually involves organized groups with a vested interest in a decision. However, some authors prefer to merely use the label 'public participation', applying it to the full range of interested and affected parties:

- **General public**, all individuals who are not directly affected by the issue, although they may be part of public opinion on it;
- **Observing public**, which includes the media, cultural elites and opinion leaders who may comment on the issue;
- **Directly affected public**, including individuals and unorganized groups that experience direct, positive or negative, effects from the policy outcome;
- **Stakeholders**, the organized groups which are or will be affected by or that have a strong interest in the outcome of a decision.

Therefore, the key message is to employ a clear terminology and distinguish between the different types of target 'publics' to involve in a participatory process.

Practical issues in the design and implementation of participatory processes

Taking stock of a growing body of literature on public participation in environmental assessment and decision-making, several authors (e.g. Antunes et al., 2009; NRC, 2008) have proposed a set of critical issues to be considered in the setup, design and management of participatory processes.

At an inception stage, government agencies should cater for (NRC, 2008): i) clarity of purpose, ii) a commitment to use results in decision-making, iii) appropriacy of funding and staff, iv) appropriate timing of participation in relation to decisions, and v) a commitment to self-assessment and learning. One of the critical decisions to be made during process setup concerns selecting the desired level of intensity and influence of public input on decisions. The options are often represented along a 'spectrum of participation impact', ranging from information and consultation, to involvement, collaboration and empowerment (**Figure 1**).

IAP2 Spectrum of Public Participation

International Association for Public Participation

Increasing Level of Public Impact →

	Inform	Consult	Involve	Collaborate	Empower
Public participation goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
Example techniques	▪ Fact sheets ▪ Web sites ▪ Open houses	▪ Public comment ▪ Focus groups ▪ Surveys ▪ Public meetings	▪ Workshops ▪ Deliberative polling	▪ Citizen advisory committees ▪ Consensus-building ▪ Participatory decision-making	▪ Citizen juries ▪ Ballots ▪ Delegated decision

Figure 1: Spectrum of public participation impact
(Source: IAP2, 2007)

In designing the process, close attention should be paid to the relationship between the level of participation impact and the participatory methods deployed. There are no clear-cut solutions, although certain tools and techniques fit particularly well to specific contexts, purpose and desired level of participation impact, as suggested by **Figure 1**. The options for the implementation of a participatory process include a variety of methods and tools, thoroughly reviewed in several studies. Furthermore, process design should be guided by the principles of inclusiveness, collaborative problem formulation, transparency and good-faith communication (NRC, 2008).

Finally, the management of scientific inputs and multiple information sources in a participatory process is another issue of utmost importance and considerable debate. This resonates with the Post-Normal Science framework, according to which knowledge needs to be increasingly 'democratized' in complex decision processes, paying attention to the multiple legitimate perspectives of 'expert' and 'lay' constituencies, and considering both facts and values. As argued by Vatn (2009) participatory methods and deliberation represent rule structures that facilitate the articulation of participants' values. Management of information and quality assurance are then critical features of participatory processes, guided by principles of inclusiveness, socially robustness of knowledge, and transparency.

Participatory democracy in practice...

Illustrations of various forms of participatory and deliberative democracy in action may be found in the experiences of 'participatory budgeting' in Porto Alegre, Brazil (Aragonès and Sánchez-Pagés, 2009), in the reform of public education systems in Chicago, USA, and in the governance of local villages in India (see the CEECEC case study on Hiware Bazaar). With the emergence of alternative ways of conceiving the so-called 'progressive' forms of democracy, the opportunities for public participation will continue to expand in increasingly decentralized, interdependent and networked democratic societies (NRC, 2008).

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56. Payment for Environmental / Ecosystem Services

Definition

Ecosystems provide services to humanity such as clean water, climate stabilization and protection from storms and erosion (IUCN, 2008). Ecosystem services refers to the many natural processes by which ecosystems, and the species that make them up, sustain and fulfil human life, generating benefits for people, including commodities and regulating, supporting, and cultural services. The type, quality, and quantity of services provided by an ecosystem can be affected by the resource use decisions of individuals and communities. When the benefits of an ecosystem service flow primarily to others than those who make management decisions, public interests and the interests of the resource manager may be misaligned. ‘‘Payments for ecosystem services’’ (PES) have emerged as a policy solution for realigning the private and social benefits that result from decisions related to the environment. The goal of this instrument is to make landowners and resource managers internalize the benefits that they generate for society. Think of a highland landowner that allows cattle near the water sources – the PES will compensate him for the opportunity cost of foregoing having cattle in those areas.

Implementation

PES is an incentive-based mechanism, whose approach is based on a theoretically straightforward proposition: pay individuals or communities to undertake actions that increase levels of desired ecosystem services. A formal definition has been given by Wunder (2007): ‘‘A PES scheme, simply stated, is a voluntary, conditional agreement between at least one ‘seller’ and one ‘buyer’ over a well defined environmental service - or a land use presumed to produce that service’’. A simplified representation of PES schemes can be found at http://www.fao.org/ES/ESA/ pesal/aboutPES5.html. The common aspects in several definitions refer to voluntary transactions where:

1. a service provider is paid by or on behalf of service beneficiaries,

for agricultural land, forestry, coastal or marine management practices,

that are:

2. expected to result in continued or improved service provision beyond what would have been provided without the payment.

PES schemes encompass a diversity of mechanisms ranging from voluntary compensation schemes for forest maintenance or agro-silvopastoral practices in Central America, to non-voluntary compensation for reforestation in China and Vietnam, and sometimes agro-environmental subsidies and certification schemes in the European Union and the United States. Latin America (Costa Rica, Ecuador, Mexico and Colombia) has been particularly receptive to this approach (Pagiola et al, 2005). In Europe, a PES initiative was developed and implemented by Vittel (Nestlé Waters) in North-Eastern France. REDD and other forms of carbon trade may be understood as PES.

Types of Schemes

According to FAO (http://www.fao.org/ES/ESA/pesal/aboutPES5.html) there are different types of Payments for Environmental Services schemes, namely:

a) Direct payment schemes: the government pays landowners, on behalf of civil society, and sometimes with contributions from the private sector, to adopt improved land management options and thus address a particular environmental problem.
b) Product-based PES schemes: consumers pay a "green premium" in addition to the market price of a product or service, in order to ensure an environmentally friendly production process and the protection of environmental services, which is verified through independent certification.

In the past decade, payment for ecosystem service (PES) schemes have represented a growing trend in conservation policy, developing rapidly in both developed and developing countries around the world (Wunder et al, 2008), mainly around three groups of environmental services:

- water quality and quantity, often including soil conservation measures in order to control erosion and sediment loads in rivers and reservoirs and to reduce the risk of land slides and flooding;
- carbon sequestration (and in some cases protection of carbon storage) to respond to demand from the voluntary and regulatory greenhouse gas emissions markets;
- biodiversity conservation, by sponsoring the conservation of areas of important biodiversity (in buffer zones of protected areas, biological corridors or even in remnant patches of native vegetation in productive farms) and protecting agricultural biodiversity.

PES is sometimes referred to as a “market-based instrument” or a “market for ecosystem services”, since it is basically a new type of subsidy, but unlike traditional subsidies, which are financed by taxpayers at large, payments can be financed directly and voluntarily by the beneficiaries (users) of the ecosystem services PES help maintain.

They are applied at different scales, ranging from micro-watersheds to entire watersheds that may cut across state, provincial, or national boundaries. WWF is exploring the possibility of a transboundary scheme for the Danube River. In Costa Rica, a country-wide program has been implemented since 1997. A government agency is in charge of this program as a representative of the beneficiaries. All landowners that produce one of the ecosystem services listed in the law are potential participants of the program. In other places, small scale programs have been developed to solve specific problems such as water provision (Echaverria et al, 2004): water consumers in a locality pay landowners upstream to protect watersheds.

Issues

Payments for ecosystem services should not be seen as an end in itself, but it is a policy tool with several advantages (see, for example, UNEP website):

- potential to raise awareness of the values of biodiversity and ecosystems.

- opportunity to engage previously uninvolved actors (especially in the private sector) in conservation activities.

- opportunities for communities to improve their livelihoods through access to new markets.

- potential platform to integrate conservation and climate efforts into a common policy framework.

- potential to increase collaboration amongst Multilateral Environmental Agreements, in the international context.

- facilitates the transition from an economy of production to an economy of stewardship.

While the principles are clear, however, designing and implementing a system of payments for environmental services in practice is often difficult. PES programs in place differ substantially, reflecting the adaptation of the basic concept to very different ecological, socioeconomic, or institutional conditions, as well as design options, sometimes as a consequence of mistakes or the need to accommodate political pressures. PES can be viewed from 'urban-rural', 'upstream- downstream', 'North-South' and 'core-periphery' perspectives.

Echavarria et al (2004) describe a PES development process in ten steps, which may not be sequential: 1. Identify a situation where there is a "seller" and "buyer" of an environmental/ecological service; 2. Create the institutional capacity to implement a market mechanism; 3. Develop inter-institutional links; 4. Know what is going to be sold; 5. Develop and implement a negotiation strategy with the political decision-makers; 6. Develop environmental education projects for the communities; 7. Develop a formal and transparent organisational structure for decision-making and implementation; 8. Establish an appropriate payment system; 9. Monitor and evaluate the process; 10. Make corrections and reinforce successful measures.

Gómez-Baggethun et al (2010) point that the focus on monetary valuation and payment schemes has contributed to attract political support for conservation, but also to commodify a growing number of ecosystem services and to impose the market logic to tackle environmental problems. In this context, some problems are referred in the literature in both the demand and the supply sides (Wunder, 2007; Kosoy et al, 2007). It is argued that PES may become counterproductive. Assume that the service (for instance, water supply from the highlands) was supplied as a matter of course and as a social obligation for free. When a system of payment is introduced to guarantee quantity and quality of water, the logic has changed. If the payments are now seen as insufficient, appeals to social obligation will be useless.

A critical dimension of PES systems concerns their impact on the poor. According to Pagiola et al (2005), PES may reduce poverty by making payments to poor natural resource managers. Although PES programs are not designed for poverty reduction, there can be important synergies when program design is well thought out and local conditions are favourable. However, payment mechanisms are limited for addressing issues of equity (Echavarria et al, 2004). They may eventually lead to changes in property rights against the poor or against indigenous groups.

Previous experience with incentive-based approaches suggests it is unlikely a PES approach will always be able to simultaneously improve livelihoods, increase ecosystem services, and reduce costs. Potential tradeoffs among these goals can arise and must be assessed (e.g. Kosoy et al, 2007; Jack et al, 2008).

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57. Peak Oil

Background

Modern industrialized economies are highly dependent on a variety of non-renewable resources. The scarcity and depletion of some of them had already been a major subject of concern for thinkers and economists in the past, as fertile land was for Malthus (1798) or coal for Jevons (1865). These considerations were dismissed by the next generations of economists when the potentials of fertilizers and petroleum became evident, facilitating the emergence of modern agriculture. It would take until the 1970s with its two consecutive oil-shocks and the publication of *The entropy law and the economic process* (Georgescu-Roegen 1971), *The limits to growth* (Meadows, Meadows et al. 1972), and other books by H.T. Odum, Barry Commoner, F. Schumacher, for the debate to awaken again.

Definition

Today, with the depletion of "proved reserves" of oil being only 40.5 years away at current consumption rates (BP 2008), the debate around the limits of non-renewable resources is seemingly becoming less marginalised and abstract. However, its point of departure, namely *depletion*, is ill-conceived. The critical moment for human society is not when the last drop of oil will be extracted; in fact this will never happen. One hundred percent recovery of most resources is physically and economically impossible. Conventional petroleum fields for example usually have an average recovery rate of only around 35%. Instead, the critical point is that of maximum or peak extraction, as this is the point when the resource stops being "cheap". Prices will increase not only because demand will continuously outstrip supply but also because the second half of the remaining resource is usually of a lesser quality, more difficult to extract and/or in politically unstable regions (e.g. Nigeria).

In the case of petroleum, this phenomenon is today referred to as *Peak Oil* and was first described by petroleum geologist M. King Hubbert (1949). He argued that production peaks in the form of bell shaped curves that could be observed for individual oil fields, would eventually occur for entire oil regions, countries and eventually the world. These production peaks and the shape of the curve could be predicted mirroring the discovery

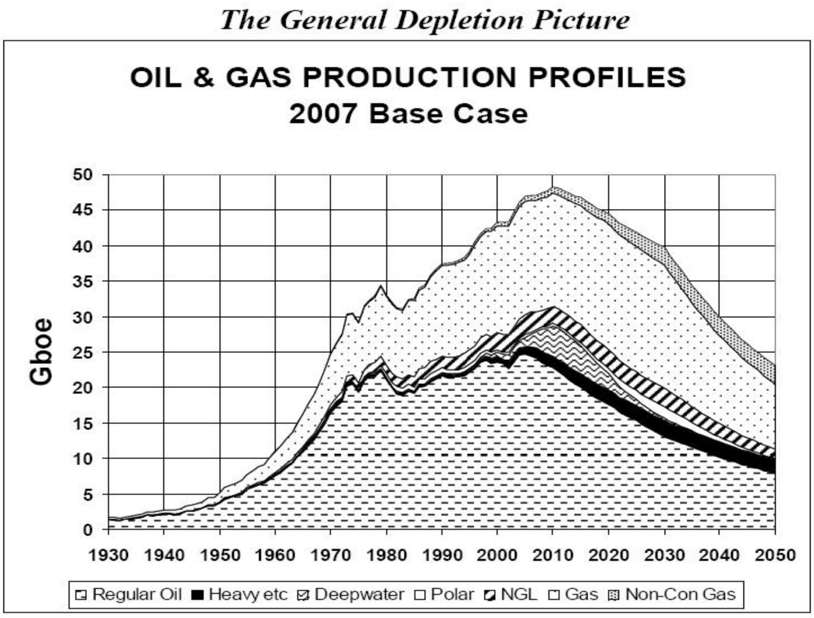

Figure 1: Source: ASPO

peak curve. However, several “resource conditions” must hold:

First, the resource must be key, so that demand for it rises steadily over time. In fact, it could be argued that the abundance of some resources and therefore their relative cheapness in

itself stimulates further increased demand in the first place. This initial abundance gives way to an increasing amount of applications. Second, substitution must be costly, difficult or impossible. Third, market access to the resource must be granted i.e. extraction is allowed by the resource owner (usually nation states). The more important the resource, the higher the international pressure on resource owners to grant this access. Finally, reasonable profits must be able to be gained by the entity (state or a private company) involved in extracting the resource. The higher the profits involved, the larger is the incentive for a resource owner to grant access. The US was a role model for satisfying all these conditions. Discovery had peaked in the 1930s, which allowed Hubbert (1956) to predict the US peak for the lower 48 US states for 1971, being only a few months off the actual peak in October 1970. Resource conditions, which diverge from those described (e.g. the owner does not grant access for political reasons), can lead to depletion curves which differ from that described by Hubbert, at least over the short run.

Today the Peak-Oil debate has become quite lively (Hirsch 2005). Fundamental disagreement exists over the question of *when* peak oil is going to happen and *how important* it is going to be for the world economy. On the one hand there are the “geologists” which are also referred to as the “pessimists” because they argue that Peak Oil is more or less imminent and will have devastating consequences for human society (e.g. Campbell and Laherrere 1998). This position is close to that of ecological economists, who generally believe in the absolute scarcity of low entropy resources (e.g. Georgescu-Roegen 1971).

On the other hand there are the “optimists” who argue that market forces, driving up oil prices when scarcity increases, will lead to increased exploration and will inspire human ingenuity to develop substitutes and alternatives for oil. This group is also referred to as the “economists”, because market forces and technological change are believed to render Peak Oil a mere anecdote without any potential for causing a major enduring economic. In line with this reasoning Saudi Oil Minister Sheikh Ahmed Zaki Yamani famously said: "The Stone Age came to an end not for a lack of stones and the oil age will end, but not for a lack of oil."

A very important argument made by the “pessimists” is that, since every system has its particular energy source, the system will change radically once this resource. This is to counter those who believe we can easily substitute oil and gas as major energy sources, with for example, shale oil, tar sands, nuclear energy or renewable energy (agro-fuels, wind, solar, geothermal). If the properties of the potential new energy source are different in terms of net energy (Odum 1971) or Energy-Return On Investment (EROI), which is essentially the case for the alternatives to oil and gas that we know of, then the human economic system is bound to change radically.

Other important concepts within ecological economics are those of post-normal science and complexity, relevant to Peak-Oil as far as the *technological optimism* of the "economists" mentioned above is concerned. The positivistic belief that all human problems have technological solutions that can be devised by human ingenuity seems to contribute to the fact that Peak-Oil has not been featured as an urgent issue in the appropriate arenas. Economics textbooks have not mentioned Peak-Oil, as they could and should have done since 1950. In reality most technological advances of our society are results of and dependent on the enormous energy affluence provided by fossil fuels.

Finally Peak-Oil has important implication for the conflicts that take place at the "commodity frontiers". This is not only of relevance for the exploration of oil, which is pushing further into so far untouched environments (as in certain parts of the Amazon forests or Alaska) but also for most other raw materials.

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58. Policy Instruments for Sustainability

Economic, Regulatory and Voluntary instruments

Governments can act through different public policy instruments in order to support behavioral change towards sustainability. Instruments can vary according to the degree of public intervention: from the most intense (regulatory instruments, also referred to as 'command and control' mechanisms) to a mix of incentives and disincentives (economic instruments) and to the least intense (educative/voluntary instruments). Literature often refers to 'stick' (regulation) as a coercive mean of intervention, or 'carrot' (economic instruments) as a set of incentives/disincentives, or 'sermons' (educative/voluntary instruments) as a mean to inform society of the advantages or disadvantages of given behaviors. However, this distinction might be misleading, because on one hand economic instruments can also be used as 'stick'; on the other hand, the margin between regulatory, economic and educative instruments is blurred and in many cases the adopted policy is a result of a combination of different approaches.

Price-based economic instruments

Economic instruments are widely used in western policy-making. One of the most common categorization of economic instruments distinguishes price-based instruments and quantity-based instruments. Price-based economic instruments stand upon the concept of price signals: consumers will be oriented towards sustainable products because their price is lower than that of polluting products. We can differentiate between positive (incentives) and negative (disincentives) price-based instruments: subsidies and tax reductions (or exemptions) are positive instruments because they reduce costs of green goods; on the contrary, ecological taxation is an example of negative instrument because it affects negatively prices of polluting goods. A more practical example of positive price-based mechanisms is government subsidies to invest in renewable energy technologies (ex. solar panels) at households and at business levels. With regards to negative price-based economic instruments, the typical example is carbon tax: it applies to all forms of energy production from conventional sources (oil, coal) which are responsible for CO_2 emissions. Another example would be a "natural capital depletion tax".

Quantity-based economic instruments

The second main category of economic instruments is quantity-based mechanisms. The main principle behind quantity-based economic instruments is that governments quantify a level of allowed emissions and create an artificial market of pollution permits, based upon a price set by the scarcity of emission allowances. This mechanism makes it expensive to pollute because heavily-polluting 'participating entities' have to pay more to buy emission allowances. The system offers also incentives to reduce emissions because better performing 'participating entities' can make profits by selling exceeding emission allowances. Quantity-based mechanisms are also known as cap-and-trade systems. This was applied in the United States to sulphur dioxide emissions, similar to proposals for carbon trade. An existing case of cap-and trade systems is the European Union Emission Trading Scheme, which applies to energy producers and energy-intensive industries at European level. Another interesting example, but rather difficult to implement, concerns the Personal Carbon Allowances: in theory, it might be possible to extend the emission market to individuals, so that people are required to buy or sell emissions according to the quantity of emissions released in their everyday life (Parag and Strickland 2009).

Other examples

Finally, there are also other policy interventions that do not adequately fit in the two above-mentioned categories. Let us take the example of public direct investments, which can also be considered to a certain extent as an economic instrument: in particular green public procurements (state buying) can be an important instrument in the pursuit of sustainability in the public sector; as well as public-private partnerships used to invest in green rail infrastructure. Other policy instruments reflect the interaction between regulatory and economic instruments: for example, environmental liability of companies generally comes from regulatory laws but companies are incentivized not to pollute in order to avoid payment of the fine (economic disincentive). On the contrary, nuclear energy firms are exempted from liability for nuclear accidents, and they are not forced to pay for the costs of long term disposal of nuclear waste. Reversal of these regulations would increase their costs. Eco-labelling is another example of combination of regulatory and economic instruments: on the basis of the well-known A to G rating for domestic appliances (regulatory instrument), governments can sponsor subsidies or tax advantages for high-efficient goods in exchange of low-efficient ones.

Negative aspects and the way forward

One of the aspects that need further analysis relates to negative consequences of any given economic instrument. Positive price-based instruments require considerable efforts from government budgets and, besides their effectiveness in the short-term, they are not economically sustainable in the long term. Negative price-based instruments, on the contrary, might entail additional production costs for companies which consequently pass costs through the final consumers. Effects of higher final prices are the loss of competitiveness for companies with activities on the international market, therefore affecting employment negatively. Quantity-based instruments may also produce negative social problems: increasing prices of basic goods (notably energy prices), unemployment, and uneven distribution of costs and benefits of the environmental policies across society.

The debate on instrument choice (regulatory, economic or voluntary) generally tends to focus on economic cost and environmental effectiveness of the policy instrument supported. Nowadays, it is recognized that voluntary agreements are the least environmentally effective measure (as it has been the case for car industry's average fleet standards); however some educative and informative measures are still necessary to build up a general consensus about sustainability policies. For instance, fair trade rests on persuasion. Neo-liberal economists consider regulatory instruments too invasive regarding market freedom; nevertheless very strong regulation is socially well accepted in cases like the prohibition of asbestos, of tobacco smoking in public places, and in other instances. Generally, economic instruments are assumed as the most cost-effective measures to reduce negative externalities at the least cost; nonetheless market-based instruments can exacerbate social inequalities. Current and future policy instruments fostering sustainability should look at balances between different policy instruments, including compensation measures for vulnerable groups.

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59. Policy Instruments for Sustainable Tourism

Typology

Policy instruments for more sustainable tourism management are not different in essence from instruments in other fields of environmental public policy. They can be classified into economic (or market based), regulatory (or command and control) and institutional instruments. Economic instruments comprise environmental taxes, user fees, financial incentives and tradable market permits, regulatory instruments include quotas and zoning, while institutional instruments refer to eco-labels and changes in property rights. Sometimes a combination of various policy instruments might be more effective than implementing a single one.

Tourist environmental tax

This tax is levied on tourists for environmental purposes. Debates on the consequences of levying a tax in tourism usually focus on the effects on the number of tourists due to higher prices. Whether or not a drop in tourism income will result depends mainly on the amount of tax being levied and the ability of a destination to compensate for higher prices with a higher quality of tourism products and services. Different levels of environmental tax in high and low tourist seasons can enable more equal distribution of the number of tourists during the year, and consequently reduce pressures on the environment and increase the stability of incomes. Although there are many different ways in which tourist environmental tax can be collected, the tax bases that embrace the majority of tourists and are most frequently used in practice are either tourist arrival or departure, or number of nights spent at a destination.

User fees

When access to a specific environmental resource can be controlled, charging user fees to tourists provides a simple mechanism to capture part of the benefits they derive from the use of the resource. The most common applications of this instrument in tourism are entrance fees to protection areas, as in Croatia's Lastovo Islands Nature Park or in Djerdap National Park in Serbia, both of which feature as case studies in CEECEC.

Financial incentives

These can be designed to change behaviour either by increasing or reducing the prices of particular goods or services. There are many ways in which financial incentives for reducing negative tourism impacts might be applied. Governments can encourage introducing the use of environmentally friendly equipment for water and energy-saving at hotels by lowering taxes, providing subsidies or reducing import tariffs. In a similar manner, taxes or tariffs on non-environmental goods or services could be raised. Incentives in the form of taxes on construction activities, taxes on second homes and higher building permit costs might be useful for reducing construction activities that frequently coincide with tourism development.

Eco labels

These can be applied to almost any product or service offered to tourists that satisfy certain environmental criteria (accommodation facilities, tour operators, beaches, restaurants, marinas, or tourist destinations). Because of the major growth in the number of eco labels over the last 15 years, many of them are not known to the wider public and tourists are confused. To be meaningful, an eco label must be internationally recognized and administrated by a reputable organization. The "Blue Flag" is probably the best-known international eco label in tourism, which has been awarded to beaches and marinas in 36 countries worldwide. Green Globe 21 is also a certification for sustainable travel and tourism products and services, used principally in Asia, the Caribbean and Australia.

Quotas

Setting a limit on the number of visitors admitted to a destination during a determined period of time may include closure of certain places, like environmentally fragile areas at certain times; establishing a maximum number of accommodation units; determining a maximum number of persons allowed at certain tourist attraction, particular area or a whole country. These instruments prevent overcrowding and consequently natural resource degradation. Bhutan is the only country that has introduced a tourist quota at the national level. Its quota allows 6000 foreign tourists and 3000 tourists from neighbouring countries per year, with established fixed minimum daily expenditures per tourist. These controls are exercised through visa procedures and arrangements with tour operators. However, in the EU the right to free mobility of people represents an obstacle for implementing this measure.

Zoning

Zoning regulation can be a very effective instrument for limiting construction activities, which is one of the biggest problems related to environmental degradation caused by tourism development. This instrument allows for planned tourism development and is relatively inexpensive and easy to implement. The Physical Plan is usually the basic implementing document. It can restrict construction in environmentally sensitive areas (e.g. 100 meters from the coast) or minimize areas allocated for new construction. It usually also determines development standards, like building density and height limits, which control many aspects of the layout and design of tourist facilities. In the Maldives, for example, regulations state that the built environment should utilize no more than 20% of the total land area in order to maintain the natural beauty of an island environment. Moreover, two-storey buildings are allowed only if there is enough vegetation to screen them from view. Another example is Djerdap National Park, which has three different protection zones. Ecological economic zoning has also been proposed in another context (climate change policy) to protect Brazilian rainforests under the REDD (Reduced Emissions from Deforestation and Forest Degradation) initiative, the focus of another CEECEC case study.

In the context of tourism, tradable market permits could be applied under a zoning scheme for example, to prevent excessive construction due to tourism development. Authorities can set a maximum allowable construction quota, measured in cubic meters of built space or number of rooms per year in each area or zone, consistent with their objectives to limit further urbanization. Building permits could be allocated according to some equitable and widely accepted rules and then traded on the market. Establishing a construction limit would also limit tourist accommodation, diminishing pressures of tourism on the environment. This is not different in principle from trading in fishing quotas or cap-and-trade systems for sulphur dioxide or carbon dioxide emissions.

Change in property rights

State ownership of natural resources, land, protected areas and national parks often results in infrastructure under-investment, excessive resource depletion and environmental degradation. Private or community ownership can prove to be more successful, both in financial and environmental terms. In the case of Croatia, many tourism problems stem from state-owned hotels, inherited from the communist regime. Since the state has no funds for needed investment in these facilities, they are now considerably degraded. Consequently, they attract guests with lower purchasing power, which then affects all tourism-related businesses. Hotel privatization processes completed in Croatia over the last 15 years confirm the positive effects of the instrument, as hotels that were privatized have been refurbished and now operate rather successfully. A change in beach property rights might improve their quality further as experience with concessions suggests. This policy instrument is therefore holds particularly potential for facilitating a higher quality of specific tourism products.

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60. Political Ecology

Description of the field

Political ecology analyses social forms and human organisation that interact with the environment. This burgeoning field has attracted scholars from the fields of anthropology, forestry, development studies, environmental sociology, environmental history, and geography. Its practitioners all query the relationship between economics, politics, and nature. Notwithstanding their varied background, these researchers advocate fundamental changes in the management of nature and the rights of people. A review of the term political ecology shows important differences in emphasis. Some definitions stress political economy while others point to more formal political institutions; some identify environmental change as most important, while others emphasise narratives or stories about that change.

Political ecology is at the confluence between ecologically rooted social science and the principles of political economy. It explicitly aims to represent an alternative to “apolitical” ecology. The field synthesizes the central questions asked by the social sciences about the relations between human society and its bio-cultural-political complexity, and a significantly humanised nature. Political ecology thus emcompasses the issues of the clash of individual interests and the potential for collusion that lie at the heart of political economy, and ecology’s concerns with our biological and physical environment and emphases on holistic analysis that connects with the more social and power-centred field of political economy.

Origins

The program or movement now being called political ecology appears to have emerged in reaction to certain features of human ecology or ecological anthropology as it was practiced in the 1960s and early 1970s. In particular, there was a reaction to the neglect of the political dimensions of human/environment interactions. The term "political ecology" was coined in French (ecologie politique) by Bertrand de Jouvenel in 1957, and in English by anthropologist Eric R. Wolf in 1972. The origins of the field in the 1970s and 1980s were a result of the development of radical developments in geography and cultural ecology. Historically, political ecology has focused on phenomena in and affecting the developing world. The questions of conservation and wilderness are also central to research. Conservation is indeed a human process that defines what nature is.

Underlying assumptions

More recently, political ecology has realised links with gender studies and social movement analyses. The broad scope and interdisciplinary nature of the field lends itself to several definitions and understandings. However, common assumptions across the field give it relevance. Raymond L. Bryant and Sinéad Bailey have developed three fundamental assumptions in practicing political ecology:

- First, costs and benefits associated with environmental change are distributed unequally. Changes in the environment do not affect society in a homogenous way: political, social, and economic differences account for uneven distribution of costs and benefits. Political power plays an important role in such inequalities.

- Second, this unequal environmental distribution inevitably reinforces or reduces existing social and economic inequalities. In this assumption, political ecology runs into political economies as “any change in environmental conditions must affect the political and economic status quo.” (Bryant and Bailey 1997)

- Third, the unequal distribution of costs and benefits and the reinforcing or reducing of pre-existing inequalities hold political implications in terms of the altered power relationships that are produced.

Application

Political ecology attempts to provide critiques as well as alternatives in the interplay of the environment and political, economic and social factors. Robbins (2005) asserts that the discipline has a "normative understanding that there are very likely better, less coercive, less exploitative, and more sustainable ways of doing things".

From these assumptions, political ecology can be used to:

- inform policymakers and organizations of the complexities surrounding environment and development, thereby contributing to better environmental governance.
- understand the decisions that communities make about the natural environment in the context of their political environment, economic pressure, and societal regulations
- look at how unequal relations in and among societies affect the natural environment, especially in context of government policy

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61. Polluter Pays Principle

Definition and origin

The polluter pays principle is an environmental policy principle which requires that the costs of pollution be borne by those who cause it. The polluter pays principle is normally implemented through two different policy approaches: command-and-control and market-based. Command-and-control approaches include performance and technology standards, such as environmental regulations in the production of a given polluting technology. Market-based instruments include pollution or eco-taxes, tradable pollution permits and product labeling.

The idea that taxation can be used to correct or internalize externalities was first introduced by A.C. Pigou in 1920 and has been generally accepted by economists as an efficient means to remedy inefficiencies in the allocation of resources, but it is understood that other social considerations such as equity, rights, political considerations and enforcement costs may tip the balance toward a preference for other policy instruments despite being less cost-effective. Pigou suggested that abatement should be pursued up to the point where the marginal cost of further abatement (reflected in the emissions fee) is just equal to the marginal benefit from reducing pollution. This "optimal pollution" tax is widely referred to as the "Pigouvian rate."

Application

Most of the time the polluter pays principle takes the form of a tax collected by government and levied per unit of pollution emitted into the air or water. As a policy instrument for the control of pollution, a tax on emissions will theoretically reduce pollution because firms or individuals will reduce emissions in order to avoid paying the tax. Under a range of market conditions, standard economists assume that pollution tax will generally be more cost-effective at reducing pollution than regulations: the total abatement cost of achieving a specified level of pollution reduction will generally be lower under a pollution tax than for a command-and-control approach that achieves the same reduction in pollution.

The polluter pays principle has received support from most countries of the Organisation for Economic Co-operation and Development (OECD) and from the European Community (EC). In international environmental law, it is mentioned in Principle 16 of the 1992 Rio Declaration on Environment and Development. At the international level the Kyoto Protocol is another tentative example of the polluter pays principle: parties that have obligations to reduce their greenhouse gas emissions must theoretically bear the costs of reducing (prevention and control) such polluting emissions. However, we know that an excessive amount of carbon dioxide has been produced by burning fossil fuels for many decades, and the polluters have not paid anything, hence, the Ecological Debt (or Carbon Debt, or Climate Debt) owed by the industrial countries. The rest of the world is (as Ecuador´s Foreign Minister Fander Falconí put it in Copenhagen in December 2009) as “passive smokers”, suffering the consequences without any compensation. Similarly, there is not the slightest intention internationally of forcing to pay for other very large externalities, such as biodiversity extinction.

Despite the fact that the polluter pays principle was publicized by early conservationists as a means to reduce ecological pollution or in general ecological damages, many observers still consider it a “vague concept”. However, the Exxon Valdez case would be an example of its application. In 1989, the oil tanker ran aground and over 300,000 barrels of crude oil poured into Alaskan waters. Exxon was in principle required to pay $125 million in fines to the federal government and the state of Alaska, as well as $900 million for a fund to be doled out by government officials for environmental projects, among other things. In addition, Exxon was put under tremendous political pressure to restore the shoreline. It thus engaged in an extensive and costly cleanup operation, with controversial results.

Concerns

Most of the sophisticated theoretical developments of the polluter pays principle that have been carried out in the neoclassical economics literature have relied on strong assumptions about the workings of the economy including competitive markets, profit-maximizing firms, rational consumers, and, in mathematical terms, “well-behaved” preferences and technologies for production. Thus, it should be remembered that relaxing one of these assumptions can alter the conclusions reached and thus that results must always be evaluated and interpreted with great care. Moreover, an “optimal level” of pollution is often meaningless from an ecological point of view. It is indeed usually difficult for ecologists to establish a clear pollution threshold not to be exeeded. Most of the time, such objectives end up being the realm of uncertainty, where another policy principle may prevail, the precautionary principle!

Many local small and medium-sized firms cannot internalize environmental costs in their products or finance cleaner technologies, and governments often lack the power to force (e.g. extractive) industries to internalize environmental costs. In sum however, ecotaxes usually fit well into the ecological economics framework. Environmental taxes are tools for achieving two different kinds of government goals: the provision of public services and goods, and the protection of environmental quality. The joint pursuit of both goals using taxation can thus enable government to justify doing more of both.

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62. Popular Epidemiology

Definition

Popular Epidemiology is the process by which laypersons gather scientific data and information and enlist the aid of experts to understand disease. Epidemiology is "the study of the distribution of a disease or a physiological condition in human populations and of the factors that influence this distribution." Popular epidemiology therefore is when the lay public does work that is traditionally done by corporations, experts, and officials. This can involve citizen-propelled investigations of naturally occurring diseases for which no firm is responsible. However, popular epidemiology is usually employed when the issue is environmental pollution or occupational disease. In some cases, the persons and organizations responsible may have knowledge about the dangers to the public health, but do not act due to vested interests. The process of popular epidemiological investigation is therefore one of activism, in which epidemiological findings are immediately employed to understand the causes of community health problems and alleviate suffering or also to ask for compensation for liability. For instance, have cancer related deaths due to pollution (see the CEECEC UMICORE case) escaped the official medical surveys? How to count the cases of illness caused by Chevron-Texaco practices in the Amazon of Ecuador between 1970 and 1990 in areas without doctors? (San Sebastian and Hurtig, 2005). Environmental health activists are by definition acting to correct problems that are not addressed by established corporate, political, and scientific communities.

Science and uncertainty

The cases of "popular epidemiology" that arose in the Environmental Justice movement in the United States, and similar cases elsewhere, teach several important lessons regarding the relationship between scientific rigour, human health and the assessment of uncertainty. Firstly they show the value of popular epidemiology in the detection of environmental risks. This is because people have access to data about themselves and their environment that is not available to scientists (disappearance of animals, health problems, bad odours). Citizens who feel they may be at risk may also react more quickly than authorities and their involvement makes studies possible that would not otherwise be due to lack of money and personnel. For example, some methods of lay detection can be as simple as setting up a hotline to report health problems, while government studies need time to mobilize financial resources.

Epidemiology carried out by affected communities and scientists may also differ regarding the burden of proof and the direction of proof. For example, in science we may consider 2 types of errors:

•Type 1 error: (not finding a relationship when it exists)

•Type 2 error: (finding a relationship when it doesn't exist)

For a scientist a Type 2 error is more damaging to his reputation. However, when investigating whether toxic chemicals harm the environment, privileging Type 1 errors over Type 2 errors is at odds with the public health concerns of communities. A community is therefore more likely to apply the precautionary principle, opting to err towards proof that there is no harm rather than waiting to prove harm without a doubt.

Science and values

Finally, popular epidemiology raises the issue of value neutrality in science. In cases of responsibility for environmental health there is often a trade-off between economic growth and the health of the community or the environment. Government or corporate scientists may not necessarily value these two variables in the same way as the affected community. Furthermore, while science claims to be value neutral and objective, studies in the field cannot be compared to studies in a laboratory. In real life situations, health impacts can easily be attributed to other factors, such as lifestyle choices, such as smoking. Corporate and government actors will thus magnify the inherent uncertainties in proving "sound science" in an effort to avoid liability.

The corollary of popular epidemiology is the precautionary principle, which aims to shift the burden of proof from exposed communities onto producers and distributors of toxic waste and to implicitly prioritzes democratic over private interests in an attempt to pre-empt harm to the environment and humans. Until this is put into practice, popular epidemiology remains a valuable tool for communities dealing with risks to their health and environment.

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63. Post-Normal Science

Introduction and definition

Post-Normal Science (PNS) is a problem-solving framework developed by Silvio Funtowicz and Jerome Ravetz according to which a new conception of the management of complex science-related issues is proposed. The PNS framework was introduced at the inaugural conference of the International Society for Ecological Economics in 1990.

In “normal” science, uncertainty, value loadings and plural legitimate perspectives tend to be neglected, whereas according to the “post-normal” view, these are integral elements to science. Difficult policy decisions are often needed in cases where the only existing inputs are subjective value-judgments, as opposed to the traditional “hard” and objective facts presented by traditional sciences. Hence, in the cases where facts are uncertain, values are in dispute, the stakes are high and decisions are urgent, a PNS strategy is advocated. Complementarily, when uncertainties and stakes are lower, an expert-based approach and traditional problem-solving strategies, such as applied science or professional consultancy, may be effective (**Figure 1**).

PNS recognizes that the current challenges faced by science-related policy are not characterized by regular, simple and certain phenomena. For example, in relation to many environmental, health or sustainability issues, the answers provided by “normal” science are necessary but not sufficient. The CEECEC case study by A Sud on the waste conflict in Campania, Italy for example, is presented as a as a Post Normal Science problem. Within this context, PNS provides a coherent framework for an extended participation in decision-making, whereby the quality assurance of policies relies on open dialogues between all those affected (i.e. what Funtowicz and Ravetz call “extended peer communities”).

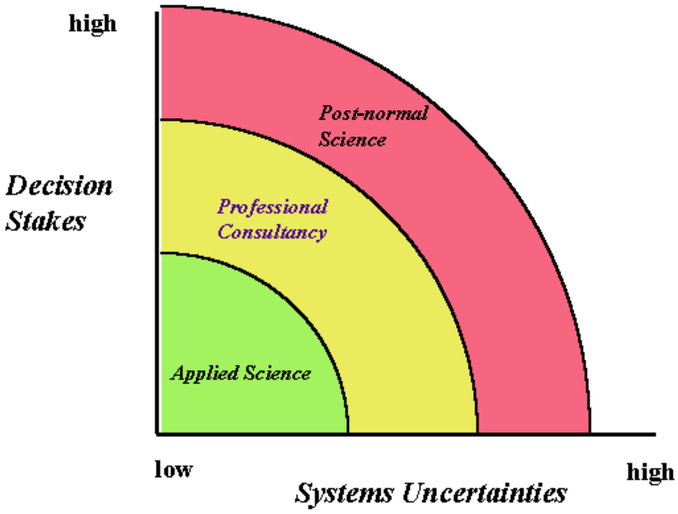

Figure 1: Post-Normal Science diagram
(Source: Funtowicz and Ravetz 2008)

Elements and principles of Post-Normal Science

The main elements and principles of PNS include (Funtowicz and Ravetz, 1990; Funtowicz and Ravetz, 1994):

1. The scientific management of uncertainty and of quality

In the issue-driven research of PNS, the characteristic uncertainties are large, complex and less well understood than in matured quantitative sciences. Hence, the management of uncertainties should rely on explicit guidelines and credible set of procedures such as those provided in the NUSAP notational system. The NUSAP categories stand for "Numeral", "Unit", "Spread", "Assessment" and "Pedigree", enabling the different sorts of uncertainty in quantitative information to be expressed in a standardized way and presented transparently to all the actors involved in a policy process.

The principle of quality, understood as a contextual property of scientific information, is central to the management of uncertainty in PNS. It allows tackling the irreducible uncertainty and ethical complexity that are central to the resolution of complex issues. Consequently, PNS calls for the development of new norms of evidence and discourse, where knowledge is extended to peer communities for quality assurance purposes. Thus, one of the basic principles of PNS is the inclusion of laypersons, such as citizens and other non-experts in the assessment of quality. PNS recognizes that all those with a desire and commitment to participate in the resolution of the relevant issues are expected to enrich the nature of policy debates involving science.

2. The multiplicity of perspectives and commitments

As policy processes become dialogue, knowledge is "democratized," encompassing the diversity of legitimate perspectives and commitments. Again, the guiding principle in the dialogue on a PNS issue is quality rather than "truth". Most complex issues entail a plurality of actors and multiple dimensions of analysis that are difficult to condense in a single scale of measurement. It is accepted that there is no sharp distinction between “expert” and “lay” constituencies. As a consequence, both types are needed to enrich the comprehension of the whole. Extending decision processes requires the creation of conditions to identify, involve and engage the relevant community, thus entering the realm of participatory processes. The contribution of social actors is understood not merely as a matter of broadening participatory democracy, but as a legitimate input to the co-production of knowledge. These extended peer communities are increasingly being created, with different forms and power arrangements, such as “citizens’ juries”, “focus groups” or “consensus conferences”;

3. The intellectual and social structures that reflect problem-solving activities
Unlike previous models of science, PNS does not attempt to define unifying conceptual foundations or to create closed boundaries in a field of research. Hence, the unity in PNS is primarily derived from an ethical commitment to the resolution of an issue rather than from a shared knowledge base. This commitment will take social actors through the appropriate problem-solving activities and dialogues. In this fluid context, quality assurance processes maintain the integrity of the intellectual structures that inform research, supported by the appropriate institutional structures or arrangements.

An extended tutorial on PNS (“Environmental Policy under Conditions of Complexity”), case study reports and additional supporting materials are available from www.nusap.net.

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Websites:

www.nusap.net

alba.jrc.it/main.html

postnormaltimes.net/blog

64. Precautionary Principle

Concept

Human life is full of risks which we have to deal with. Science and technology can help in diminishing some risks of nature, as it is the case for example with life expectancy. On the other hand, science and technology have also contributed to the creation of new threats to human existence or quality of life. The emergence of increasingly unpredictable, uncertain, and unquantifiable but possibly catastrophic risks has confronted societies with the need to develop an anticipatory model in order to protect humans and the environment against these uncertain risks of human action: the precautionary principle.

Origins

The precautionary principle traces its origins to the early 1970s in the German principle *Vorsorge*, or foresight, based on the belief that the society should seek to avoid environmental damage by careful forward planning. The *Vorsorgeprinzip* has been developed into a fundamental principle of German environmental law and was invoked to justify the implementation of robust policies to tackle acid rain, global warming, and North Sea pollution. The precautionary principle then flourished in international statements of policy. The principle was introduced in 1984 at the First International Conference on Protection of the North Sea. Following this conference, it was integrated into numerous international conventions and agreements (Bergen declaration on sustainable development, Maastricht Treaty of the European Union, etc.). On a national level, several countries have made the precautionary principle guides to their environmental and public health policy. In the United States, the precautionary principle is not expressly mentioned in laws or policies. However, some laws have a precautionary nature, and the principle underpins much of the early environmental legislation in this country (The National Environmental Policy Act, The Clean Water Act, The Endangered Species Act).

Definitions

The precautionary principle is based on the adage that “it is better to be safe than sorry”. However, there is no universally accepted definition of the principle. Despite the fact that the precautionary principle has formulated in many different ways in many different places, the definition in the Rio Declaration is the one most often referred to:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. (Rio Declaration 1992, Principle 15).

This definition is rather weak, calling for the *consideration* of precautionary intervention rather than requiring such intervention. A stronger definition can be found in an EU communication that demands intervention to maintain the high level of protection required by the EU. It states that:

The precautionary principle applies where scientific evidence is insufficient, inconclusive or uncertain and preliminary scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or *plant health may be inconsistent with the high level of protection chosen by the EU (EU, 2000).*

Despite the lack of consensus on definition, each formulation of the precautionary principle shares the common prescription that scientific certainty is not required before taking preventive measures. Moreover, most versions involve some degree of burden shifting to the promoter of an activity or product. Finally, all the definitions lack to answer the question of the amount of precaution to apply in a given circumstance.

Relevance

The precautionary principle is relevant to many issues, especially those of environment and public health; global warming or sharp climate change, extinction of species, introduction of new and potentially harmful products into the environment that threaten biodiversity (e.g. genetically modified organisms), threats to public health due to new diseases or techniques (e.g. AIDS transmitted through blood transfusion), persistent or acute pollution (asbestos, endocrine disruptors, etc.), food safety (e.g. Creutzfeldt-Jakob disease), and other new bio-safety issues (e.g. artificial life, new molecules).

Controversy and critiques

Besides its apparent simplicity, the principle has given rise to a great deal of controversy and criticisms.

- The precautionary principle is said to not be based on sound science. In this sense, critics claim that decision-makers are sometimes selective in their use of the precautionary principle, applying it for political reasons, rather than scientific reasons.

- When applying the principle, society should establish a threshold of plausibility or scientific certainty before undertaking precautions. Indeed, no minimum threshold is specified across the definitions so that any indication of potential harm could be sufficient to invoke the principle. Most times, a ban on the product or activity is the only precaution taken.

- Another often raised criticism points to the potentially negative consequences of its application; for instance, a technology which brings advantages may be banned because of its potential for negative impacts, leaving the positive benefits unrealized.

- Some say that the precautionary principle is impractical since every implementation of a new technology carries some risk of negative consequence.

The debate on the precautionary principle indicates its growing prominence in policy-making about risks to human health and the environment.

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65. Property Rights

The standard economic definition

In standard economics, property rights refer to a bundle of entitlements defining an owner's rights, privileges, and limitations to the use of a resource. An efficient structure of property rights is said to have three characteristics: *exclusivity* (all the costs and benefits from owning a resource should accrue to the owner), *transferability* (all property rights should be transferable from one owner to another in a voluntary exchange) and *enforceability* (property rights should be secure from seizure or encroachment by others). Conventional economic theory assumes that a resource owner with these three characteristics has a significant incentive to use that resource efficiently because a loss of value of this resource represents a personal loss. Also, clearly defining and assigning property rights should resolve environmental problems by internalizing externalities and relying on incentives for private owners to conserve resources for the future. However, this assumes that it is possible to internalize all environmental costs, that owners will have perfect information, that scale economies are manageable, transaction costs are bearable, and that legal frameworks operate efficiently. Strengthening markets and creating and strengthening property rights should – so the story goes – reduce such problems. We know that private owners discount the future, they value present revenue over future private and social benefits when they operate in a market system.

The different categories of property rights

Property rights come in many forms (Ostrom, 1990; Bromley, 1991; Heinsohn and Steiger, 2003), encompassing a few basic categories:

- Private property rights are held by individuals and firms and can be transferred between them, most of the time through the exchange of money. Private property rights are the basis for markets to the point that markets cannot exist without them.

- In state-property regimes, governments own and control property. This type of regime exists to varying degrees in all countries of the world. For example, parks and forests are frequently owned and preserved by governments. In communist countries, governments may own all resources. Problems can occur with state-property rights when the incentives of rule-makers for resource use diverge from the collective interest. For example, toxic and radioactive waste had accumulated in Russia by the year 2990 because central plans which established national priorities favoured growth over environmental protection.

- Common-property regimes refer to properties jointly owned and used by a specified group of co-owners through formal (specific legal rules) or informal (protected by tradition or custom) entitlements. While there are numerous very successful examples of common-property regimes such as Swiss alpine common property regimes, unsuccessful examples exist also. Population pressure and increased demand from outsiders undermines collective cohesion to the point where traditional rules became unenforceable leading to overexploitation of the resource and lower incomes for all.

- Open access regimes can be exploited on a first-come, first-served basis because no individual or group has the legal power to restrict access. The consequences of open access have become popularly known as what Hardin (1968) misleadingly called "the tragedy of the commons".

The transition to a Western-type property system

The transition to capitalism has historically been preceded by land appropriation by large private landowners or by the state, through different kinds of "enclosure movements" – physical as well as legal. The English version of this process was defined by Polanyi (1944) as a "revolution of the rich". During the 19th and 20th centuries, former colonial administrations introduced Western-type property rights in order to secure their access to natural resources. They often transformed customary common pool resources – such as forests – into state property. This phenomenon led to an unequal repartition of property rights allowing capitalist accumulation through the dispossession of community customary rights. A Western-type property regime is indeed central in the functioning of capitalism itself by standardizing the economic system, by fixing the economic potential of resources in order to allow credit and selling contracts, and by protecting (by armed force if needed) property and transactions (Heinsohn and Steiger, 2003).

Today, the approach of standard economics still emphasizes the necessity to extend a Western-type property system to all kind of goods and services in order to ensure growth and even "sustainability". Surprisingly, such policy is still frequently referring to Hardin's (1968) "tragedy of the commons", based on the erroneous conflation of open access and commons. The important point is to achieve a correct match between institutions, and cultural and biophysical environments. Indeed, anthropological studies have shown that societies have often developed institutions regulating access rights to natural resources and duties between different community members in order to ensure the social functioning of the group and the management of natural resources (Berkes, 1999). Thus, the transformation of common pool resources into state and private property has often been socially unequal and ecologically unsustainable.

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66. Rebound Effect (Jevons' Paradox)

Introduction

A central concept in industrial ecology, the term Jevons' Paradox was derived from a passage in W. S. Jevons, *The Coal Question*, 1865, in which the author analyzes improvements in the efficiency of the steam engines over the last decades. The first steam engines powered by coal had very low efficiency, of the order of 5%. They produced a lot of noise and a lot of dissipated heat, and only a little bit of effective work in spinning or weaving machines, or moving the first trains. With time efficiency improved, and Jevons posited that this increased efficiency would not necessarily lead to a decrease in demand for coal by manufacturers and railway companies. On the contrary, increased efficiency in fact led to a decrease in the actual cost of coal per unit of work done. It could lead therefore to an increase in the demand for coal. This was later called the "Rebound Effect".

Application

For instance, consider an increase in the efficiency of transport by motor car of 20 percent. This means that a similar car now can travel 20 percent more miles that the previous model, with the same amount of petrol. What will car buyers do? They might decide to travel the same amount of miles as before, saving petrol, or they might decide (depending on the price-elasticity of demand) to travel more miles (or to buy bigger cars), therefore not saving petrol to to the same extent or not saving petrol at all. As another example, assume that you change your electric light bulbs to longer lasting energy saving bulbs. You have paid some initial amount of money to buy the new bulbs but per month you are now spending less KWh and therefore less money, for the same amount of lighting. What are you going to do with the money you are saving? First you pay back the initial investment. Once this is done, it is unlikely that you are going to put more light bulbs around the house. But it is not unlikely that this extra money will now go at least in part to extra tavel or extra consumption, entailing some extra amounts of energy expenditure.

A point of caution

When we see that increased efficiency in the use of energy (or materials) is coupled with increased use, we cannot directly conclude that the Jevons' Paradox or the Rebound Effect is at play. It may be that increased efficiency is leading, hopefully, to less use of energy (or materials), but nevetherless this can be nullified by a simultaneous increase in incomes due to economic growth, ultimately resulting in increased use of energy (or materials). Here we must pay attention not to the price-elasticity of demand but to the income-elasticity of demand. In fact, the main cause of the increased social metabolism of the economy is economic growth. It is not Jevons' Paradox or the Rebound Effect.

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John M. Polimeni, Kozo Mayumi, Mario Giampietro, Blake Alcott: The myth of resource efficiency: The Jevons Paradox, Earthscan, London, 2008, 184 p.

67. Resilience

Definition

Resilience may be defined as the capacity of a system to absorb disturbance and reorganize while undergoing change, so as to still retain essentially the same function, structure, identity and feedbacks. In ecological systems, resilience is a measure of how much disturbance an ecosystem can handle without shifting into a qualitatively different state. It is the capacity of a system to both withstand shocks and surprises and to rebuild itself if damaged. There are several examples of ecological systems that have undergone dramatic changes in structure and function as a response to external stresses, such as the shift of a freshwater system from a state of clear water, benthic vegetation, oligotrophic macrophytes and abundant fish to a eutrophic state characterized by turbid water, blue-green algae and where fish is absent. Another documented example is the case of marine systems changing from a state dominated by coral reefs, kelp forests and rich biodiversity to a state dominated by algae and urchins and depleted fish stocks. Many ecologists no longer focus on the "carrying capacity" of given territories (with their assumed smooth Verhulst's curves indicating maximum populations of species that one territory could carry) but rather focus on the resilience of ecosystems.

Social resilience is the ability of human communities to withstand and recover from stresses, such as environmental change or social, economic or political upheaval. Resilience in societies and their life-supporting ecosystems is crucial in maintaining options for future human development. Resilience, for social-ecological systems, has three defining elements: (1) the magnitude of shock that the system can absorb and remain within a given state; (2) the degree to which the system is capable of self-organization; and (3) the degree to which the system expresses capacity for learning and adaptation. More resilient socio-ecological systems are able to absorb larger shocks without changing in fundamental ways. When massive transformation is inevitable, resilient systems contain the components needed for renewal and reorganization (Folke, et al., 2002).

In summary, resilience is the potential of a system to remain in a particular configuration and to maintain its feedbacks and functions, and involves the ability of the system to reorganize following disturbance-driven change.

Resilience assessment and management

Management can destroy or build resilience. Managing for resilience enhances the likelihood of sustaining development in a changing world where surprise is likely. The focus is on maintaining the capacity of the system to cope with whatever the future brings, without the system changing in undesirable ways.

The two aims of resilience management are: (1) to prevent the system from moving to undesired system configurations in the face of external stresses and disturbance (this can be achieved either by increasing resistance or by allowing a greater array of "safe" resource use options) and (2) to enable the system to renew and reorganize itself following a massive change. This adaptive capacity, i.e., the capacity of a system to adapt and shape change, resides in aspects of memory, creativity, innovation, flexibility, and diversity of ecological components and human capabilities.

Diversity is a key element for resilience in social-ecological systems. When the management of a resource is shared by diverse stakeholders (e.g., local resource users, research scientists, community members with traditional knowledge, government representatives), decision-making is better informed and more options exist for testing policies. Active adaptive management whereby management actions are designed as experiments encourages learning and novelty, thus increasing resilience in social-ecological systems.

Resilience assessment and management involves the following main steps:

1. **Resilience of what?** The first step of a resilience assessment involves defining the system of interest and specifying issue(s) of concern. This is accomplished by describing the key attributes of the system, based strongly in stakeholder inputs;
2. **Resilience to what?** This involves indentifying the main disturbances and processes that may influence the system, i.e. studying external disturbances and the development processes (policy drivers and stakeholder actions) to which the desirable configurations are expected to be resilient. Visioning and scenarios can be a useful tool in this stage;

3. **Resilience analysis.** This step consists of exploring the interactions of the first two items to identify possible driving variables and processes that govern the dynamics of the system, looking especially for threshold effects and other non-linearities. Modeling can be used at this stage to develop further understanding of the dynamics of the system.

4. **Resilience management.** The final step involves a stakeholder evaluation of the whole process and the implications of the emerging understanding for policy and

management actions. This does not mean that the process is aimed at finding the 'right' policies that keep the system in some pre-defined optimal path, but in defining a set of rules that enhance the system's ability to reorganize and move within some configuration of acceptable states, without knowing or caring which particular path the system might follow.

The Resilience Alliance has developed a set of workbooks to support resilience assessment directed for practitioners and scientists that can be downloaded from http://www.resalliance.org/.

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68. Resource Intensity and Resource Productivity

Definition

Resource intensity is a measure of the resources (e.g. materials, energy, water) required for the provision of a unit of a good or service. It is usually expressed as a ratio between resource input and product or service units provided (expressed in value, mass, volume, or other unit deemed as appropriate). Resource productivity, the inverse of resource intensity, is a measure of the output (expressed either as units produced or as economic value) per unit of resource input.

Resource productivity and resource intensity are important concepts in the sustainability debate. They are essential concepts to measure the progress of dematerialization strategies, aimed at decoupling resource input (and the corresponding environmental burdens) from economic development. Dematerialization refers to the absolute or relative reduction in the quantity of materials used and/or the quantity of waste produced in the generation of economic output. The objective for efficiency-led sustainability strategies is to promote dematerialization by maximizing resource productivity, while minimizing resource intensity.

As stated above, resource intensity is often defined in the ecological economics literature as the ratio of materials use to value added, which in the case of an economy is equivalent to gross domestic product (GDP). The following equation summarizes this definition (modified from Cleveland and Ruth, 1999):

$$IU_i = \frac{X_i}{GDP} = \left(\frac{X_i}{Y}\right) \times \left(\frac{Y}{GDP}\right)$$

where,

IU_i – resource intensity for material i

X_i – consumption of a given material *i*

Y – output of industries that consume material *i*

GDP – Gross Domestic Product, which reflects the total output of the economy

The equation shows that resource intensity is determined by two factors. The first term on the right-hand side of the equation is the material composition of product, which reflects changes in the mix of materials used to produce individual goods and services. The second term is the product composition of output, which reflects changes in the mix of goods produced by the economy.

The resource intensity of an economy may change due to a number of factors, namely (Cleveland and Ruth, 1999):

- Technical improvements that decrease the quantity of materials used to produce a good or service. Examples include metal use in the beverage container industry, materials use in automobile manufacture and communications.

Substitution of new materials with more desirable properties for older materials. An example is the substitution of optical fibers for metal wire in communications.

- Changes in the structure of final demand - the mix of goods and services produced and consumed by an economy changes over time due to shifts among sectors, such as the rise of the service sector, or shifts within sectors, such as the increasing dominance of computers and other high-technology goods within the manufacturing sector.

- The saturation of bulk markets for basic materials. This line of reasoning holds that as an economy matures, there is less demand for new infrastructure such as bridges, roads, railways, steel factories, and so on, reducing the need for steel, cement, and other basic materials.

- Government regulations that alter materials use. A prominent example is the regulation of lead additives in gasoline and other products that contributed to a sharp decline in the IU of lead.

The intensity concept can be applied to different resources/pressures such as materials input, energy consumption, greenhouse gases emissions and water use. Different indicators have been used to measure resource intensity for these areas of concern.

Indicators of resource intensity

The most widely known indicator of resource intensity is MIPS – Material Intensity Per Service unit, that was proposed by Schmidt-Bleek at the Wuppertal Institute (Schmidt-Bleek, 1994). Note that the denominator in MIPS is not the amount or value of product, but the number of service units provided. The whole lifecycle from cradle to cradle (extraction, production, use, waste/recycling) is considered. MIPS can be applied in all cases where the environmental implications of products, processes and services need to be assessed and compared. A practical application of the MIPS concept is called material intensity analysis. Material intensity analyses are conducted on the micro-level (focusing on specific products and services), as well as on the macro-level (focusing on national economies). You can go for instance to http://www.wupperinst.org/en/projects/topics_online/mips/index.html for calculation and data sheets for MIPS computation as well as a set of publications on this issue.

Energy intensity is an indicator that is often used in energy policy and climate change debates. The energy intensity of an economy is a measure of the country's energy efficiency. It is calculated as the amount of energy consumed per unit of GDP generated in the economy. This indicator is also used to measure the energy efficiency of products and services such as appliances and buildings, vehicles and transportation systems.

Water productivity is also a widespread concept, namely in the context of agricultural water use. For example FAO – the UN Food and Agriculture Organization defines *crop water productivity* as 'the amount of water required per unit of yield' (http://www.fao.org/landandwater/aglw/cropwater/cwp.stm), in reality is a measure of *crop water intensity*.

Discussion

Several critiques have been raised on the use of concepts such as resource intensity and dematerialization as guiding principles and measuring sticks for the formulation of sustainability strategies.

First of all, indicators such as MIPS or water intensity do not tell us anything about the qualitative aspects and the environmental impacts associated with the weight of material resources or volume of water used. Different materials have quite different environmental impacts and a reduction in the amount used can actually lead to higher environmental burdens if it is the result of replacing some materials by more environmentally harmful substitutes (that are for instance scarcer or more toxic). Also, when the denominator is expressed as an economic value, an observed decrease in resource intensity may be due to a reduction in the amount of materials used or to an increase in the economic value of the products.

Another important issue is the discussion around the so-called 'rebound-effect' or Jevons' Paradox, which translates as the risk of increased resource productivity enabling higher economic growth. The associated increase in the scale of the economy may lead to an overall environmental burden that may outgrow the improvements achieved by increased resource productivity.

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69. Scenarios and Visioning

Scenarios: Definition

Prospective, forward-looking studies include a vast range of concepts and approaches, which aim at exploring plausible and/or preferable futures to improve decision-making processes. Examples of methods used in futures studies include scenario building, visioning, forecasting, cross impact analysis, simulation and modelling). Since the foundations of modern-day techniques by the Rand Corporation in the 1950s, these methods have been applied both in private organizations and in public policy domains, as a basis for strategic planning.

Scenarios are alternative images of how the future might unfold. They represent coherent and plausible stories about the co-evolutionary pathways of human and ecological systems. In other words, scenarios are internally consistent descriptions of plausible future states of the world. Many authors maintain that scenarios are not forecasts or predictions. For ecological economics, one main virtue of scenarios is that they force the integration of findings from different disciplines.

Application

Scenarios have been increasingly used to support planning, assessment and implementation of decisions regarding environmental and sustainability issues, serving a variety of purposes:

- **Policy analysis**, providing a picture of future alternative states of human and ecological systems in the absence of additional policies (‘baseline scenarios’) and comparing these with the future effects of environmental policies (‘policy scenarios’);

- **Raising awareness** about emergent problems and about possible future interrelationships between different issues;

- **Broadening perspectives** on certain themes, accounting for larger time and spatial scales of analysis, and highlighting consequences of strategic choices in society;

- **Synthesising information** about possible futures, including both ‘qualitative’ (e.g. in the form of narratives/storylines, diagrams or other visual symbols) and ‘quantitative’ scenarios (e.g. providing information in the form of tables and graphs, usually based on the results from computer models);

- **Dealing with uncertainty and complexity**, by confronting decision-makers with the present lack of knowledge about system conditions and underlying dynamics, thus rendering more transparent and precautionary decision-making processes;

- **Promoting public participation**, allowing for the integration of normative dimensions of sustainability, widening the knowledge base, developing a common language and enhancing mutual learning.

An important distinction is usually made between 'exploratory' and 'anticipatory' scenarios. The former, also known as 'descriptive', begin in the present and explore trends into the future, giving way to a possible sequence of emerging events. In some studies, this approach to scenario building is referred to as 'forecasting', where the goal is to provide the most likely or probable projection of future conditions. On the other hand, anticipatory scenarios start with a prescribed vision of the future and then work backwards in time to figure out how this future could emerge. The term 'backcasting' is frequently used to describe a particular anticipatory approach wherein normative scenarios are developed backwards from a particular 'desired end-point' or set of goals.

Unlike forecasts, backcasts are not intended to reveal what the future will likely be, but to explore the feasibility and implications of different futures according to criteria of social or environmental desirability. Finally, it should be underscored that for environmental and sustainability problems, a combination of anticipatory and exploratory approaches may be appropriate. To this extent, it is possible to identify an array of desired end-states and then test these against forward-looking analyses departing from initial conditions and drivers of change.

Some ilustrations

A typical scenario in environmental studies includes the following structural building blocks: i) the driving forces, which influence the changes in the relevant system of analysis, ii) the time horizon and time steps, and ii) narratives or storylines describing the main features of the scenarios. However, depending on the selected approach, there are many procedures for developing scenarios. For example, in the Millennium Ecosystem Assessment, which explored possible future changes in the provision of ecosystem services, the procedure for selecting the scenario building blocks started with the identification of two broad uncertainties – the connectivity of social and political organizations (global connection versus regional disaggregation) and the nature of the policies and practices implemented by these organizations (reactive versus proactive). By clustering the scenarios around these contrasting branches, four main scenario storylines were developed – 'Global Orchestration', 'Technogarden', 'Adapting Mosaic' and 'Order from Strength'.

There are many other well-known examples of scenarios developed in environmental and sustainability studies. The EEA (http://scenarios.ew.eea.europa.eu) organizes such studies according to their focus on **regions** (e.g. UNEP's Global Environmental Outlooks, Global Scenario Group's Great Transition scenario), **themes** (e.g. the WBCSD's water scenarios, IPPC’s emissions scenarios, EEA’s land-use scenarios for Europe - PRELUDE), and specific **sectors** (e.g. FAO’s world agriculture scenarios).

Visioning: Concept and methodologies

A ‘vision’ for an organisation, group or community is an image of what they desire to be, and which they have the power to bring to life. The process of developing a vision – ‘visioning’ or ‘envisioning’ – is concerned with eliciting desirable futures for the purposes of assisting in strategy development and providing decision-making guidance. O’Brien and Meadows (2001) highlight the following generic stages in visioning methodologies:

1) **Analysis of the current situation and assessment of external factors**. This stage may be performed before or after the development of the vision. While some authors defend that a prior assessment grounds the vision in realism, others argue that it constrains the ability to think of ‘ideal states’ by focusing on current conditions and capabilities;

2) **Developing the vision**, i.e., identifying the desired future states. Visions may consist of vibrant descriptions of audacious goals, as well as reflective or instinctive statements addressing the aspired futures;

3) **Connecting the future to the present**. As indicated above, the concept of ‘visions’ is closely linked to a backcasting approach to the development of scenarios, although the linkages between the vision and the current state may also be supported by forward planning methods;

4) **Testing the vision**, checking for internal feasibility and robustness given the potential external conditions.

Types of application

In order to define the contexts in which visions are claimed, used or developed, van der Helm (2009) identified seven types of visions and their basic distinguishing characteristics: 1) **Humanistic**, addressing universal betterment; 2) **Religious**, addressing worldly life in relation to the hereafter; 3) **Political**, related to ideologies and providing a sense of leadership and support; 4) **Business/organisational**, commonly expressing an organisation’s ambition and leadership-driven management; 5) **Community**, consensual integration of actors and collective action; 6) **Policy support**, increasingly found in the domain of public policy making; and 7) **Personal**, developed within personal development projects.

Forstater (2004) elaborates on yet another type of vision which is regarded as central to ecological economics – the pre-analytical vision of seeing the economy in terms of metabolic flows, as a subsystem of a wider biophysical system. As argued by Meadows (1996) and Costanza (1997), a coherent and relatively detailed, shared vision of both the way the world works and of the society we wish to achieve is vital to moving towards sustainability goals. Building such a responsible vision is a supra-rational task of imagination that comes from values, not logic.

In recent years there has been a proliferation of methods combining visioning with multi-stakeholder deliberative decision-making processes, which include ‘Scenario Workshops’, ‘Future Search Studies’ and ‘Community Visioning’. Kallis et al. (2009) reviewed these methods comparing their standout features, describing a visioning exercise in the context of sustainable water management in a Greek island.

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70. Social Metabolism and Accounting Approaches

Social Metabolism: A Biophysical Approach to the Economy

In recent years a consensus seems to have grown that regards sustainability as a problem of the interaction between society and nature (Haberl et al. 2004). The precise nature of this interaction is biophysical: It is the continuous throughput of materials and energy on which each socio-economic system depends and which constitutes its relation to the natural environment. Such an understanding of society as a socially organized and thermodynamically open system has been termed *social* (Fischer-Kowalski and Haberl 1993) or *industrial metabolism.*

The application of the biological concept of metabolism ("Stoffwechsel") to social systems can be traced back to Marx who, influenced by Liebig and Moleschott, talks about the "metabolism between man and nature as mediated by the labour process". Such a biophysical approach to the economy was not unusual at the turn of the 19th century but arguably did not form an integrated school of thought until recently (see Martinez-Alier 1987; Fischer-Kowalski 2002). This biological analogy grew from the observation that biological systems (organisms, but also higher level systems such as ecosystems) and socio-economic systems (human societies, economies, companies, households etc.) decisively depend on a continuous throughput of energy and materials in order to maintain their internal structure (Fischer-Kowalski and Haberl 1993).

Social Metabolism Accounting Methods

The social concept links material and energy flows to social organization, recognizing that the quantity of economic resource use, the material composition and the sources and sinks of the output flows are historically variable as a function of the socio-economic production and consumption system. When speaking of metabolism however, one must have adequate knowledge of the system that has to be reproduced. Only then is it possible to assess the material and energetic flows required for the maintenance of the system in question. Most likely the system is a society at a specific level of scale and might be described as an organized set comprising a cultural (symbolic) system and those material elements accorded preferential treatment by the cultural system (human population and material artefacts) (Fischer-Kowalski and Weisz 1999). The flows are accounted where society appropriates or releases materials from or to nature.

Today, *social or industrial metabolism*, along with standardized methods to account for its energy flow, material flow, and land use aspects, provides the basis for empirical analyses of the biophysical structure of economies and for developing strategies towards more sustainable production and consumption patterns. A number of operational tools have been developed to analyze the biophysical aspects of social metabolism, its associated driving forces and environmental pressures (Haas et al. 2005***)***. Examples outlined below include material and energy flow analysis (MEFA, or MFA), input-output analysis (IOA) and life cycle analysis (LCA), but other instruments in the social metabolic toolkit include

HANPP, EROI, and Virtual Water, as well as related concepts such as ecological footprinting and ecological rucksacks.

70.1 Material Flow Analysis (MFA)

Material flow accounting (MFA) is a specific environmental accounting approach, aiming at the quantification of social metabolism. MFA is applicable to various geographic and institutional scales. MFA at the national level (denoted as economy-wide MFA) is probably most advanced in terms of methodological standardization and indicator development. Economy-wide MFAs are consistent compilations of the annual overall material throughput of national economies, expressing all flows in tons per year. After the seminal work of Robert Ayres and Allen Kneese, MFA was “reinvented” in the 1990s as a consequence of the growing importance of the notion of sustainable development. In recent years, methods for economy-wide material flow accounting have been harmonized and a large number of material flow studies for both industrial and developing countries have been published to date.

As MFA accounts for materials entering and leaving a system, the mass balance principle applies. Based on the conservation of mass principle it states that matter can neither be created nor destroyed. The mass balance principle can be formulated as: All material inputs into a system over a certain time period equal all outputs over the same period plus the stock increases minus the releases from stock. In principle net stock changes can be positive, indicating net accumulation, or negative, indicating stock depletion. In MFA, the mass balance principle is used to check the consistency of the accounts. It also provides one possibility to estimate the net additions to stock (NAS).

A flow is a variable that measures a quantity per time period, whereas a stock is a variable that measures a quantity per point in time. MFA is a pure flow concept. It measures the flows of material inputs, outputs and stock changes within the national economy in the unit of tonnes (= metric tonnes) per year. This means that in MFA stock changes are accounted for but not the quantity of the socio-economic stock itself. Although MFA is a flow concept, it is still important to define carefully what is regarded as a material stock of a national economy because additions to stocks and stock depletion are essential parts of the MFA framework. The definition of material stocks is also crucial in identifying which material flows should or should not be accounted for as inputs or outputs.

In MFA, three types of socio-economic material stocks are distinguished: artefacts, animal livestock, and humans. Artefacts are mainly man-made fixed assets as defined in the national accounts such as infrastructures, buildings, vehicles, and machinery as well as inventories of finished products.

Highly aggregated indicators are derived from MFA. These are: domestic extraction (DE), direct material input (DMI), domestic material consumption (DMC), physical trade balance (PTB), total material requirement (TMR), total material consumption (TMC), and net additions to stock (NAS). Overall, these indicators are intended to represent a proxy for aggregated environmental pressure comparable to aggregated energy use or aggregated land use. By relating these MFA indicators to macro-economic parameters (predominantly GDP) resource efficiency indicators can be derived which measure either material use per unit of GDP (resource intensity) or vice versa GDP per unit of materials used (resource productivity). For benchmarking national economies per capita values are commonly used (Haas et al. 2005).

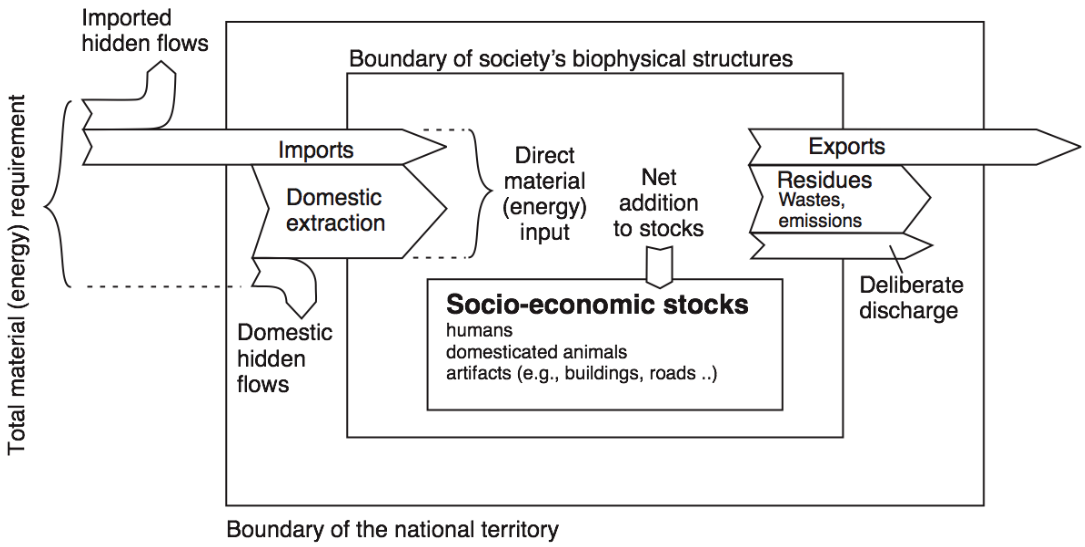

Figure 1: Society's material (and energy flows) within the M(E)FA framework.
(Source: Haberl et al 2004)

70.2 Input-Output Analyses (IO)

Input-output economics is a body of theory created by Nobel Prize laureate Wassily Leontief in the late 1930s and was originally designed to analyse the interdependence of industries in an economy. Since the late 1960s, IO analysis was extended to allow for addressing economy-environment relationships, focusing predominantly on energy use and pollution. Within industrial ecology, IO analysis has been applied increasingly to **LCA** (see below) in past years. Limited work has been done concerning the application of IO analysis to economy-wide MFA.

For input-output computations to deliver reliable results, an appropriate level of disaggregation by sectors or commodities is necessary. The most common IO approach is where the measurement to express the quantities of output of all sectors of the economy is money value (expressed in national currency and current prices). Such a table is called a monetary input-output table (MIOT). Another approach is a purely physical model based on an input output table where the quantities of the output of all sectors are measured in one single unit of mass. Such a table is called a physical input-output table (PIOT). Also for a PIOT sectoral input must equal sectoral outputs, according to the mass balance principle (Weisz 2006).This approach involves the exhaustive physical coverage of the movement (origins and uses) of most environmentally relevant materials induced by an economic region (sometimes disaggregated to the level of elements or simple chemical compounds). The PIOT method traces how natural resources enter, are processed, and subsequently) as commodities, are moved around the economy, used, and finally returned to the natural environment in the form of residuals. It undertakes the detailed investigation of intersectoral physical flows of environmental resources inputs and commodity weights and residuals, and given this intersectoral specification and transactions matrix structure, has the ability to evaluate the cumulative environmental burden (total direct and indirect effect material requirements and pressures) of private consumption and other final demand for the products of different industries.

The third approach is a mixed unit model based on an input-output table where the output from the production sectors is measured in mass units and the output from the service sectors is measured in money value. In a mixed unit input-output table only total output, but not total input, can be computed, because total input would imply adding different units. It follows that no input output equation can be applied to a mixed unit input-output table (Weiz 2006).

70.3 Life-Cycle Assessment (LCA)

Life-cycle assessment (LCA) is an environmental management tool for identifying (and comparing) the whole life cycle, or cradle-to-grave, environmental impacts of the creation, marketing, transport and distribution, operation, and disposal of specific human artifacts. The approach considers direct and, ideally, related processes and hidden, nonmarket flows of raw materials and intermediate inputs, and waste and other material and energy outputs associated with the entire existence or "product chain" or "system". The LCA procedure often involves a comparison of a small number of substitutable products assumed to provide a similar consumption service.

Life Cycle Assessment is conducted to answer questions such as:

*How do two different manufacturing processes for the same product compare in terms of resource use and emissions?

*What is the benefit of changing technology (chemicals)?

*What are the relative contributions of the different stages in the life cycle of this product to total emissions?

*What is the environmental footprint of my product, service, and company?

*How can I decrease it? What matters the most?

*What is my Carbon contribution to Green house effect?

Life Cycle Assessment (LCA) evaluates the mass balance of inputs and outputs of systems and to organize and convert those inputs and outputs into environmental themes or categories relative to resource use, human health and ecological areas (http://www.science-environment-consulting.com/en/life-cycle-assessment.html).

70.4 Life Cycle Inventory (LCI)

The quantification of inputs and outputs of a system, i.e. material and energy flows (Ekvall and Finnveden 2001) is called Life Cycle Inventory (LCI) (http://www.science-environment-consulting.com/en/life-cycle-assessment.html)

In the case of multi function processes an allocation problem arises in LCI: Concerning production processes with more than one product – this is: What share of the environmental burdens of the activity should be allocated to the product in question i.e. included in the LCI? The chosen solution to the allocation process can have a decisive impact on results of an LCI and a number of different solutions have been proposed including a standard procedure by the 'The International Organisation for Standardization' (ISO 14041, 1998) ***(***Ekvall and Finnveden 2001).

70.5 Life Cycle Impact Assessment (LCIA)

Life Cycle Impact Assessment (LCIA) converts "inventoried" flows into simpler indicators. In a Life Cycle Impact Assessment (LCIA), essentially two methods are followed: problem-oriented methods (mid points) and damage-oriented methods (end points). In the problem-oriented approaches, flows are classified into environmental themes to which they contribute. Themes covered in most Life Cycle Assessment (LCA) studies are: Greenhouse effect (or climate change), Natural resource depletion, Stratospheric ozone depletion, Acidification, Photochemical ozone creation, Eutrophication, Human toxicity and Aquatic toxicity. These methods aim at simplifying the complexity of hundreds of flows into a few environmental areas of interest. EDIP and CML 2000 methods are examples of problem-oriented methods. The damage-oriented methods also start by classifying a system's flows into various environmental themes, but model each environmental theme damage to human health, ecosystem health or damage to resources. For example, acidification - often related to acid rain may cause damage to ecosystems (e.g., in the Black Forest in Germany), but also to buildings or monuments. In essence, this method aims to answer the question: Why should we worry about climate change or ozone depletion? EcoIndicator 99 is an example of a damage-oriented method.

Impact assessment methods have been developed as tools to broaden the information and context of Life Cycle Inventory (LCI) data, which refer mainly to mass and energy. The fact that LCI indicates that certain emissions are associated with certain environmental themes or impact categories does not imply that the studied product or system actually causes effects. It means however, that in the course of the life cycle, emissions are generated that contribute to a pool of similar emissions known to be associated with these environmental themes or impact categories. Used this way, Life Cycle Assessment is an appropriate tool for helping to determine to what extent a particular product, process or ingredients emissions may be associated with a particular impact category (http://www.science-environment-consulting.com/en/life-cycle-assessment.html).

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http://publikationen.lebensministerium.at/publication/publication/view/2625/28603

Local Studies Manual - social ecology working paperin progress – visit under
http://www.uni-klu.ac.at/socec/inhalt/1818.htm

71. Social Multi-Criteria Assessment

Multi-criteria assessment

Multi-criteria assessment (MCA) is a decision-making tool used to evaluate problems when one is faced with a number of different alternatives and expectations and wants to find the best solutions with regard to different and often conflicting objectives. The ability of MCA to deal with complex and unstructured decision problems in the sphere of environmental and natural resource management, which involve a number of conflicting ecological, environmental, societal and economic objectives, multiple interests groups and different languages of valuation is widely acknowledged.

MCA constitutes both a framework for structuring decision problems, as well as a set of methods to generate preferences among alternatives. MCA has the potential to take into account conflicting, multidimensional, incommensurable and uncertain effects of decisions explicitly enabling it to focus more on the "decision process" itself, and not on a final result (Munda, 2008).

A multi-criteria problem is characterized by the presence of a finite set of alternatives (for instance alternative corridors for a railway or different design options for a regional transportation system) and the existence of different (and often conflicting) evaluation criteria under which we evaluate each alternative (e.g. impacts on land use, travel costs, people affected – see http://www.ceecec.net/wp-content/uploads/2008/09/TAV-matrix.JPG for an example of alternatives and criterion in the context of the CEECEC case study on TAV). The MCA problem may then be represented in the form of a matrix (alternatives x criteria) depicting the evaluation of each alternative regarding to each criterion.

Supposing that it is possible to evaluate each alternative in relation to each criterion, we can obtain a weak ordering of the alternatives for each criterion, ranging from best to worst. The multi-criteria decision problem consists of ranking the alternatives according to an ordering that is a legitimate synthesis of the criteria. Generally, there is no solution optimizing all criteria at the same time and compromises have to be found. A wide set of multi-criteria methods have been developed for this purpose. These methods have particular features regarding information requirements, criteria assessment, modeling of preferences and decision rules.

MCA in a participatory context

Multicriteria methods may provide a powerful framework for policy analysis in the context of sustainability problems, since they can accomplish the goals of being inter- or multi-disciplinary (accounting for the multiple dimensions present), participatory (open to all stakeholders), and transparent (Munda, 2008). Stakeholder participation may be included in the overall structure of the MCA process: alternatives and criteria generation, evaluation of alternatives and discussion of results (Antunes et al., 2006).

The subjectivity of MCA, common to every evaluation process, should be treated with caution. One possible way of dealing with subjectivity is to design participatory MCA processes where criteria selection, weighting and aggregation steps are performed with the input of a broader group of actors, in order to account for different interests and values

(De Marchi et al., 2000; Munda, 2008) or combining MCA with participatory techniques (Antunes et al., 2006; Kallis et al., 2006). Each manner of conducting MCA is closely connected to participation, as a way to validate the overall structure and framing of the analysis. It should however be noted that participation is a necessary condition but may not be sufficient for reaching transparency and accountability.

71.1 Social Multi-Criteria Evaluation (SMCE)

A way of approaching the issue of participation in MCA is through the adoption of a Social Multi-criteria Evaluation (SMCE) framework, which defines the concept of evaluation as a mixture of representation, assessment and quality check connected with a given policy problem, based on a specified objective (Munda, 2008). SMCE aims to foster transparency, reflection and learning in MCA decision processes, simultaneously integrating political, socio-economic, as well as ecological, cultural and technological dimensions of the problem.

For the purpose of obtaining evaluation criteria, SMCE examines stakeholders' objectives and expectations, trying to avoid as much as possible a technocratic approach. As various dimensions are taken into account, the main goal is to find a balance between them, aiming at "compromise solutions" (Munda, 1995). Weights in SMCE are understood as importance coefficients and not as trade-offs. Aggregation conventions used are non-compensatory mathematical algorithms, meaning that criteria with smaller weights can be also influential, which excludes the complete compensability concept. Additional features are profound social actor analysis and conflict analysis (equity matrix for consensus

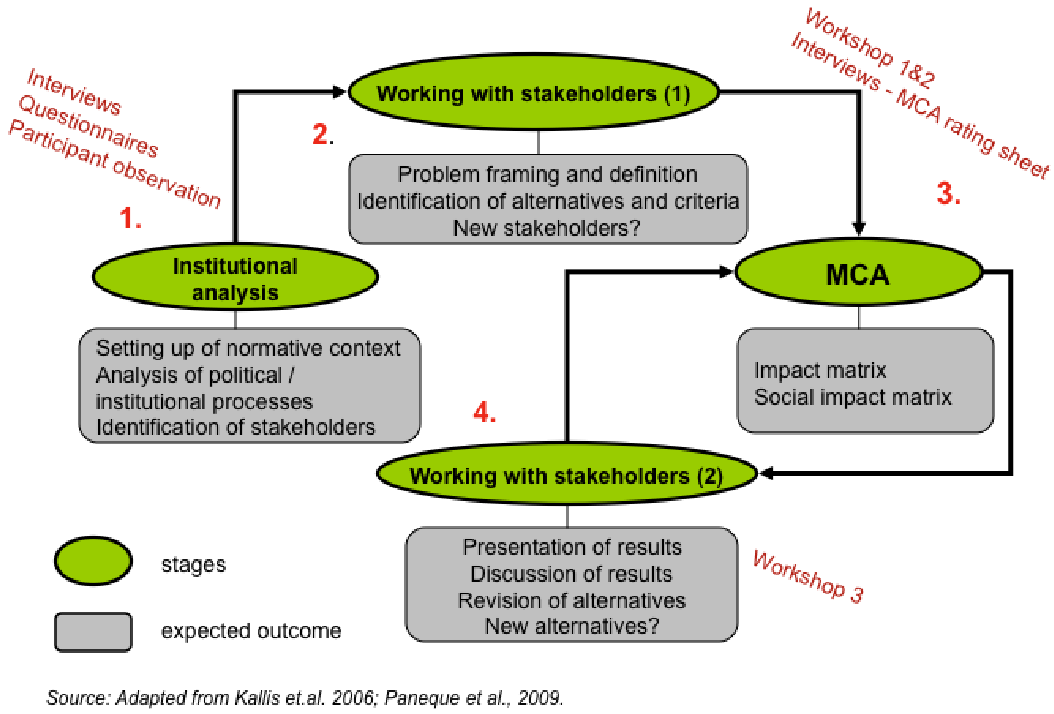

Figure 1: Steps in an SMCE process

seeking). NAIADE, the Novel Approach to Imprecise Assessment and Decision Environments is a discrete SMCE method developed by Munda (1995) that combines the use of mixed information types and conflict analysis. NAIADE produces a ranking of alternatives according to the set of evaluation criteria, and indications of the distance of the positions of the various interest groups and a ranking of the alternatives according to actors' impacts or preferences (Munda, 2008). **Figure 1** illustrates the steps typically undertaken in a SMCE process, and descriptions of the application of SMCE frameworks to different sustainability problems are described in Munda, 2008; de Marchi et al. 2000;and Antunes et al. 2010.

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72. Sustainable Extraction

Neoclassical versus ecological economics on extraction

The economics of natural resources has a relatively long history dating back to Malthus and Jevons in the 19th century and to Hotelling in the 1930s. Hotelling (1931) developed an influential theory of depletion of oil or mineral deposits in which he described optimal non-renewable resource extraction. In short, Hotelling proposed a way of calculating the optimal rate of depletion for such resources (based on a given discount rate). In standard economics it was believed that if resources were scarce and if market participants knew they were scarce, then resource prices would rise and alternative resources would become profitable. In this way, scarce resources would little by little be substituted by other resources. This corresponds to the model of weak sustainability.

Standard economics is in general much more optimistic than ecological economics, usually showing a great deal of confidence in the ability of prices and market processes to steer the behavioural responses of producers and consumers. Unsustainable extraction or, better said, growing scarcity of a given natural resource is argued to lead to responses of substitution, savings and recycling of materials, and technological innovations at process and product levels, through price information. Ecological economics, in contrast, is more pessimistic about such responses and often refers to the entropy law implying irreversible changes (Georgescu-Roegen, 1971). Accordingly, ecological economics emphasizes strong sustainability. It argues that extraction of non-renewable resources cannot be "sustainable" by definition and that it is crucial to acknowledge this point. However, the sustainable extraction of renewable resources such as wood or fish is possible if related to a careful understanding of reproduction and growth rates.

A note on economic growth

Ecological economists directly link economic growth to the increased extraction of natural resources (renewable or non-renewable). Some even link it to environmental conflicts. Most researchers in this school of thought state that damages to nature and environment have assumed such proportions that continuing growth will almost surely lead to ecological disasters. In this context, soil erosion, deforestation, enhanced global warming and loss of biodiversity are regarded as urgent problems. Ecological economists express serious worries about the resilience of ecosystems, which depends on the complex connection between global bio-geo-chemical processes and "life-support" functions of the biosphere, which are presently under severe pressure from human activities. In terms of methods of analysis of growth-versus-environment, standard economics has recently focused attention on partial empirical analysis through studies that examine de-linking between certain environmental indicators and income per capita ("environmental Kuznets curves"). Instead, ecological economics relies more on complex systems analysis that incorporates feedback mechanisms between natural resource extraction, economy, growth, environmental quality, population growth, welfare level and health status.

As an illustration of this approach, ecological economists have examined the metabolism of extractive industries. They have for instance shown that the extraction of natural resources is associated with the transformation of enormous amounts of energy, both in the extraction process itself and in subsequent processes of concentration, smelting, filtering and refining. In order to extract resources from supplies with low concentrations of a desired material, the amount of energy use per useful unit of output needs to rise (see EROI), and increasingly so. This means that as the economy grows over time, energy use will follow. Technological improvements and recycling can slow down the unfolding of such patterns, but not permanently postpone them. This model of resource extraction takes a significantly broader approach than the traditional, Hotelling-type models of standard environmental economics.

73. Tragedy of the Commons: Hardin's Mistake

Concept origin

The concept of "The Tragedy of the Commons," stems from Garrett Hardin's influential article, in which he referred to all common-pool natural resources that were not either government or privately owned. As a metaphor he envisioned a pasture open to all, in which each herder received an immediate individual benefit from adding animals to graze on the pasture and suffered only delayed costs (with his fellow herders) from overgrazing. Hardin (1968) concluded: "Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons".

Hardin further states that "in a reverse way, the tragedy of the commons reappears in problems of pollution" i.e inputs into the commons such as "sewage or "chemical, radioactive, and heat wastes into water" (Hardin, 1968) He writes: "The rational man finds that his share of the cost of the wastes he discharges into the commons is less than the cost of purifying his wastes before releasing them". Since this is true for everyone, we are bound to "foul our own nest," so long as we behave only as independent, rational, free-enterprisers" (Hardin, 1968) Hardin gives an example in the development of maritime fisheries. "Maritime nations still respond automatically to the shibboleth of the 'freedom of the seas'. Professing to believe in the 'inexhaustible resources of the oceans', they bring species after species of fish and whales closer to extinction" (Hardin, 1968)

Avoidance of the tragedy of the commons, according to Hardin will require coercive laws, but should be a "mutual coercion" agreed by the majority of people. Most importantly, he argues, there is a need for coercion over reproduction: "The most important aspect of necessity that we must now recognise, is the necessity of abandoning the commons in breeding. No technical solution can rescue us from the misery of overpopulation. Freedom to breed will bring ruin to all" (Hardin, 1968). He also states "to couple the concept of freedom to breed with equal right to the commons is to lock the world into a tragic course of action" (Hardin, 1968).

73.1 Enclosure of the Commons

Regarding human rights Hardin argues that every restriction on commons rights ("enclosure of the commons") involves the infringement of somebody's personal liberty. But, he says, infringements made in the distant past are accepted today as they are not seen as a "loss", while "newly proposed infringements" are "vigorously opposed" with "cries of rights and freedom". " But what does freedom mean?" he asks, and concludes that, as Hegel put it "freedom is the recognition of necessity" and that the underlying problem is that if we continue to insist on all present-day freedoms we will bring "universal ruin" (Hardin, 1968)

Comment

Many authors have pointed out that Hardin mistakenly wrote "commons" when he meant "open access". Nagendra and Ostrom (2008) say that: "A common-pool resource can be managed under any of the following property-rights regimes: government ownership (where a formal government ranging in size from a local city all the way to national government claimed ownership of the resource and the right to fully determine who could or could not use and under what circumstances); private ownership (where a single individual or private firm has full claims to determine use patterns; community or common property ownership (where a group of individuals shares rights to ownership); or "no ownership" or "open access," which is what Hardin assumed in his illustrative case." Therefore open access is only one out of four general possibilities that can relate to a common-pool resource.

Critiques

According to Vatn (2005) any property regime except open access – be it private, common or state/public property – may have very precise rules or norms establishing the necessary incentives for resource use. However, such property regimes also have incentive problems when externalities appear due to the "fact that resources and natural processes are interconnects – linking various resource uses necessarily to waste production." In economic terms he states "this can be translated into 'high costs of keeping different agents and their uses apart'. If it were possible to costlessly demarcate all streams of benefits, all processes, there would be no external effects. Each agent would own and consume only his or her own parts". But given the existing interrelations in natural resource systems, this is impossible. And even if it were possible, it would ruin the quality of the resources, since their very functioning depends on their working together.

Evidence from the field and from research around the world has emerged to show the multiple rules-in-use found in successful commons regimes around the world. To be effective, rules must be generally known and understood, considered relatively legitimate, generally followed, and enforced. "Effective, sustainable community management of common property natural resources is also more likely to occur when the boundary of the resource is easy to identify, changes in the state of the resource can be monitored at a relatively low cost, the rate of change in resource condition and in the socioeconomic and technological conditions of users remains moderate, communities maintain frequent social interactions with each other that increase trust within the community (thereby increasing social capital), outsiders can be relatively easily excluded from accessing the resource (preventing large-scale invasion of the resource by outsiders), and rule infractions are monitored and sanctioned (Nagendra and Ostrom, 2008).

Nagendra and Ostrom (2008) conclude that: "Just as government ownership does not represent a final solution for the sustainable use of natural resources, […] neither is community management a panacea for all the ills that plague natural resource management. Instead, much more attention needs to be paid to the adaptive crafting of institutions that fit socio-ecological systems, and policy scientists need to recognize diversity in the institutions that can assist human users to devise arrangements for sustainable management of a resource" (Nagendra and Ostrom, 2008).

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Talk given by Elenor Ostrom: http://www.youtube.com/watch?v=ByXM47Ri1Kc

74. Transaction Cost

Definition

In economics, a transaction cost is a cost incurred in making an economic exchange. For example, when buying a good, the cost paid integrates not only the price of the product itself, but also the energy and efforts required to find out which variety is preferred, where to get it and at what price, its cost of travelling, the cost of making a legal contract and so on. All of these costs, except for the price of the product itself, represent transaction costs.

Use in Ecological Economics

For ecological economics, an important focus is placed on the role of transaction costs when discussing Coasian bargaining, and in general in the management of emissions trading and in the use of incentive mechanisms for environmental protection. Environmental governance typically involves administrative transactions rather than market transactions. Here are some examples of well known transactions:

- Search and information costs: costs associated with market research
- Bargaining costs: costs of making an acceptable agreement with the other party.
- Policing and enforcement costs: costs of making sure the other party sticks to the terms of the contract and of taking appropriate actions, mainly through the legal system, if this is not the case.

For example, McCann and Easter (1999) measure the magnitude of transaction costs associated with four different policies to reduce non-point source (NPS) pollution. In their study, transaction costs integrate information collection and analysis, enactment of enabling legislation including lobbying costs, design and implementation of policy and support and administration of on-going programmes, monitoring/detection, and persecution/inducement costs. They directly measure through interviews with program staff and others the amount of labour input required, which then is translated into monetary costs. The results show that the tax on fertilizer has the lowest transaction cost and the expansion of a permanent conservation easement program (below) has the highest transaction cost.

Conservation easement programs are those in which ownership rights to land are transferred to a private charitable conservation organization or government agency without transferring ownership of the land. The organization or agency then “holds” those rights (the easement) in perpetuity, even if the land is sold or bequeathed by the landowner to another party)

Various emissions trading systems have been increasingly used to replace traditional command-and-control approach in environmental regulation. However, transaction costs are generally high in some marketable permit programs. As a consequence potential gains from trade are far from being realized. Several factors have been identified as contributors to high transaction costs in emissions trading:

1. the inability in some programs of buyers and sellers to identify each other;
2. regulatory approval is costly and lengthy;
3. firms face enormous uncertainty in anticipating how regulators would determine their baseline emission levels and emission reduction.

Issues

For individual products traded in markets, transaction costs are relatively low and sufficiently overcome by the agents performing the transaction to complete an exchange. But in reality, transaction costs are likely to be very important each time an externality affects more than a very few agents, which is frequently the case. For example, a farmer who pollutes his water supply may be one of numerous upstream farmers affecting thousands of downstream neighbours. Bringing all the relevant agents to the negotiating table would be almost impossible, and even if it could be achieved, free-riding could become a problem. For example, if a person lives on the banks of a stream polluted by farmers and if her neighbours agree to pay to reduce pollution, she would prefer that level of reduction for free to even more reduction at a positive cost to herself.

Beside the lack of a standardized definition, another shortcoming comes from the difficulty in estimating transaction costs. This is namely because production and transaction costs are jointly determined, so that it is hard to estimate transaction costs separately. In empirical studies, a direct measurement of transaction costs is simply the economic value of resources used for locating trading partners and executing transactions, but it can also be measured by calculating the difference between the price paid by the buyer and the one received by the seller.

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75. Uncertainty and Risk

Definitions and taxonomies

The notion of "uncertainty" is used in many scientific fields, often encompassing a multiplicity of related concepts. In broad terms, uncertainty may be defined as being any deviation from the unachievable ideal of completely deterministic knowledge of a relevant system (Walker et al., 2003).

Uncertainty characterizes most assessment, policy and management processes that have unpredictable consequences. In a risk assessment context, the United States Environmental Protection Agency refers to uncertainty as "our inability to know for sure - it is often due to incomplete data" (http://www.epa.gov/riskassessment/). In the Millennium Ecosystem Assessment, uncertainty is defined as "an expression of the degree to which a future condition (e.g., of an ecosystem) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable" (MEA, 2003).

Uncertainty may have different types of sources, from quantifiable errors in the data to ambiguously defined terminology or uncertain projections of human behavior. Uncertainty measurements can therefore be represented by quantitative metrics (e.g., a range of values calculated by various models) or by qualitative statements (e.g., reflecting the judgment of a team of experts) (MEA, 2003).

Several nomenclature systems have been developed for describing the different types of uncertainties. For example, Funtowicz and Ravetz (1990) explored the differences between three sorts of uncertainty:

- **Inexactness**, i.e. a technical level of uncertainty involving the random and systematic errors in empirical quantities;
- **Unreliability**, which is related to methodological uncertainties arising, for example, from an incomplete understanding and from the approximations made when describing the structural and functional characteristics of a system under study;
- **Border with ignorance**, which refers to an epistemological level of uncertainty (e.g. omissions of processes and parameters due to ignorance – "ignorance of ignorance").

In a context of environmental contingencies and crisis, the checklist developed by De Marchi (1995) supports the identification and ranking of different types of uncertainty (Table 1).

Table 1 – Types of uncertainty in environmental emergencies (Source: http://www.nusap.net)

Type of uncertainty	Definition
Institutional	Refers to the role and actions of institutions and their members and stems from the diversity of cultures and traditions, divergent missions and values, different structures and work styles among personnel of different organizations. High institutional uncertainty can hinder collaboration or understanding among agencies, and can make the actions of institutions difficult to predict.
Legal	It is relevant when agents need to consider future contingencies of personal liability for their actions (or inactions). High legal uncertainty may result in defensive responses in regard to both decision-making and release of information. Legal uncertainty may also play a role where actions are conditioned on the clarity or otherwise of a legal framework in allowing one to predict the consequences of particular actions.
Moral	Arises from the underlying moral issues related to action and inaction in a given issue. De Marchi notes that "moral uncertainty is linked to the ethical tradition of a given country be it or not enacted in legislation (juridical and societal norms, shared moral values, mores), as well as the psychological characteristics of persons in charge, their social status and professional roles". Moral uncertainty would typically be high when moral and ethical dimensions of an issue are central and participants have a range of understandings of the moral imperatives at stake.

Proprietary	Arises from asymmetries between potential users of information and knowledge about an issue. Some people or groups have information that others don't and may assert ownership or control over it. Proprietary uncertainty is typically high when knowledge plays a key role in assessment, but is not widely shared among participants.
Scientific	Arises from the scientific and technical dimensions of a problem and is intrinsic to the processes of risk assessment and forecasting.
Situational	Relates to "the predicament of the person responsible for a crisis, either in the phase of preparation and planning, or of actual emergency. It refers to individual behaviors or personal interventions in crisis situations" (De Marchi, 1994) and as such represents a form of integration over the other six types of uncertainty. That is, it tends to combine the uncertainties one has to face in a given situation or on a particular issue. High situational uncertainty would be characterized by situations where individual decisions play a substantial role and there is uncertainty about the nature of those decisions.
Societal	Arises when different communities (with different sets of norms, values, and manner of relating characteristic of their societies) have different approaches to decision-making and assessment. Societal uncertainty would typically be high when decisions involve substantial collaboration among groups characterized by divergent decision-making styles.

As indicated in **Table 1**, there is an ethical dimension to decision-making and the handling of uncertainty when the lives of others are at stake (e.g. decision to approve new drugs or chemicals that have uncertain human health and environmental consequences). Within this context, Tannert et al. (2007) developed the “Igloo of Uncertainty” (**Figure 1**) wherein dangers and risks are discriminated in the field of uncertainty – a danger is present regardless of choice, whereas a risk is either optionally accepted or imposed.

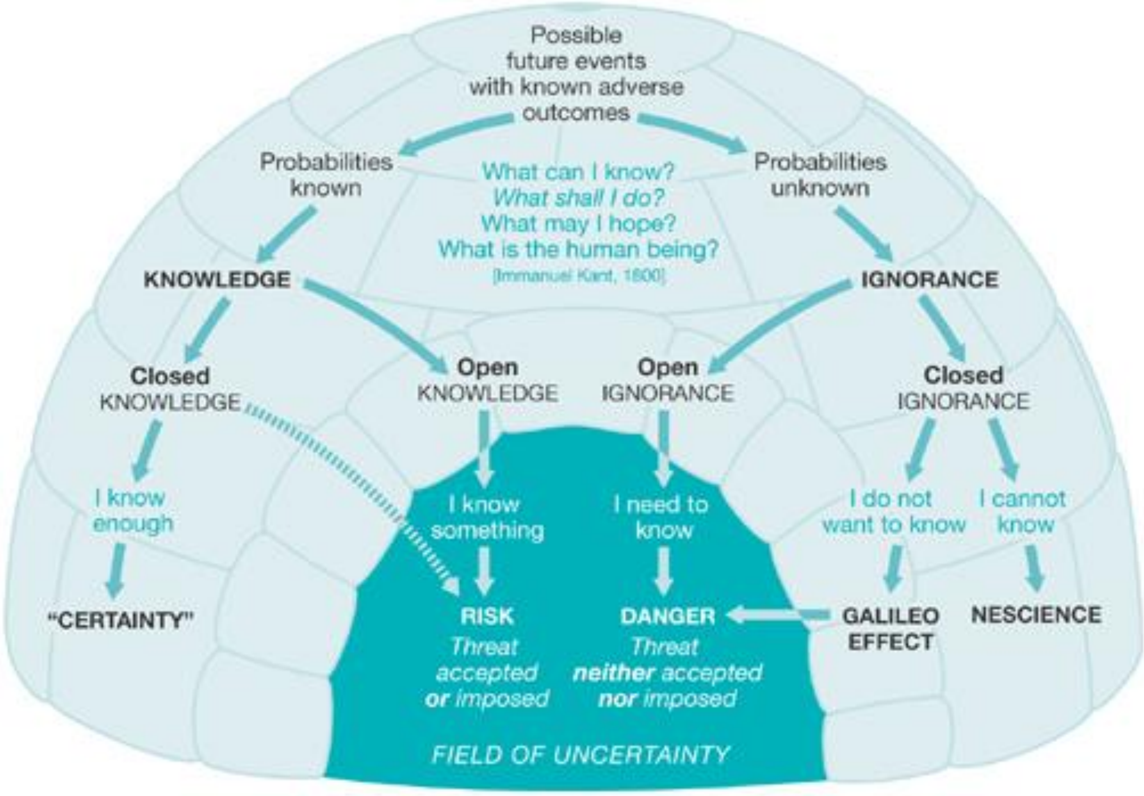

Figure 1: The Igloo of Uncertainty
(Source: Tannert et al., 2007)

Finally, it is also important to clarify the differences between "uncertainty", "risk" and "ignorance" in relation to different states of knowledge and associated examples of public action (Table 2), since what is sometimes loosely referred to as "uncertainty" often mixes up these concepts (EEA, 2001).

Table 2 – Uncertainty, risk, ignorance and their relationship with different states of knowledge and suggested public policy action (Source: EEA, 2001)

Concept	State of knowledge	Suggested action
Uncertainty	• Known impacts • Unknown probabilities	*Precautionary action* Action taken to reduce potential hazards
Risk	• Known impacts • Known probabilities	*Prevention* Action taken to reduce known risks
Ignorance	• Unknown impacts • Unknown probabilities	*Precaution* Action taken to anticipate/identify/reduce the impact of "surprises"

Dealing with uncertainty

According to the Post-Normal Science framework, the management of uncertainties should rely on explicit guidelines and credible set of procedures such as those provided in the NUSAP notational system. The NUSAP categories stand for “Numeral”, “Unit”, “Spread”, “Assessment” and “Pedigree”, enabling the different sorts of uncertainty in quantitative information to be expressed in a standardized way and presented transparently to all the actors involved in a policy process. For extensive guidance on tools for the assessment and communication of uncertainty, see the NUSAP website at http://www.nusap.net.

Adopting a precautionary approach in a context of uncertainty is often recommended as a strategy for public policy action. The precautionary principle is an overarching framework that governs the use of foresight in situations characterized by uncertainty and ignorance, where there are potentially large costs to both regulatory action and inaction (EEA, 2001). The sound application of the precautionary principle to issues of complexity, uncertainty and controversy requires the support of key elements of “good governance”, such as fairness, transparency and accountability (EEA, 2001).

Scenarios and forward-looking studies are practical tools that can help to explore key uncertainties and their implications across a wider range of contrasting futures.

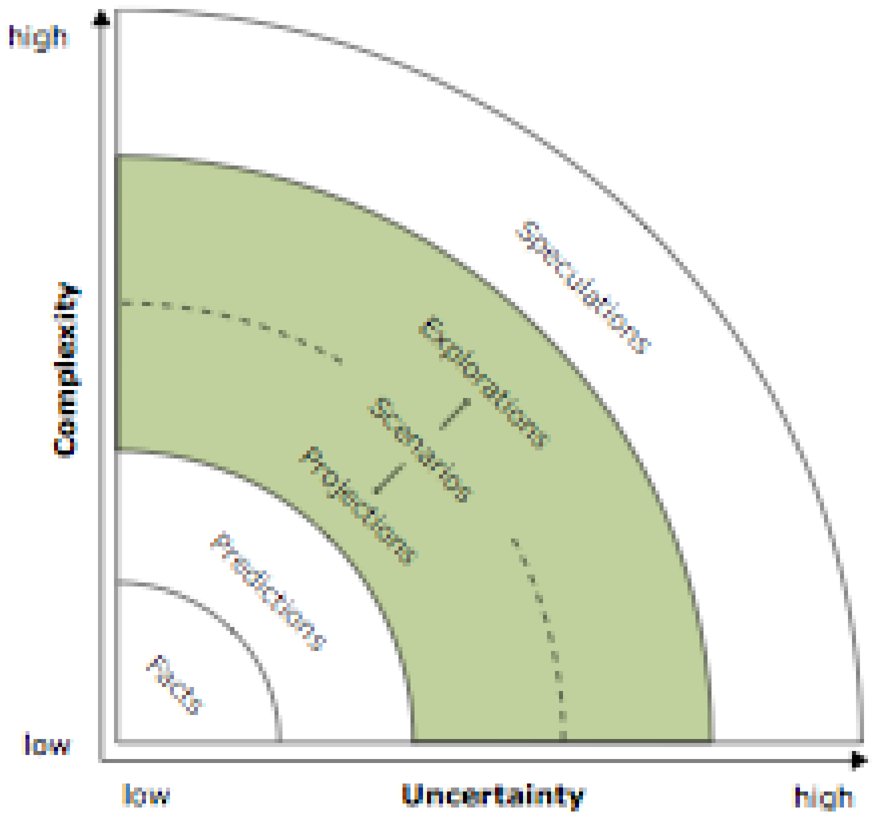

Figure 2: The role of forward-looking assessments in understanding future environmental challenges and dealing with complexity and uncertainty
(Source: Zurek and Henrichs, 2007)

As depicted in **Figure 2**, in the face of future uncertainties, scenarios and forward-looking assessments and also visions, can help to structure and explore choices by revealing their possible long-term consequences, thus supporting strategic planning and decision-making.

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www.nusap.net

alba.jrc.it/main.html

leidraad.pbl.nl/

76. Value Incommensurability

Conventional versus ecological economists

Values are often incommensurable. This means that they cannot be measured in the same units. The environment is often a site of conflict between competing values and interests represented by different classes and groups. How are such conflicts to be understood? The approach of standard economics is to use of a *common unit* – a monetary numeraire

– for all the different values and then to look for a compromise (a trade-off) between all of them within a market context. By “values” we understand what is considered important, but what do we really mean: conservation of nature? sacredness? livelihood? aesthetics? money? national sovereignty? Typically, conventional economists apply monetary compensation to an injured party in order to solve conflicting claims. In some cases, like when asking for redress in a court of law in a civil suit, this is all that can be done: asking for money as compensation for damages. This approach assumes therefore the existence of *value commensurability*, that is, that all values can be translated into money.

Ecological economists, in contrast, accept *value incommensurability* (Martínez-Alier *et al.*, 1998). If a territory is sacred, what is its value in money terms? If the livelihood of poor people is destroyed, can money really compensate for it? If we leave without generations with a changed climate, can we really compensate them in money terms? Nobody knows indeed how to convincingly estimate the monetary price of cultural, social or ecological impacts of deforestation and biodiversity loss, for instance. Instead of appealing to a unique numeraire, other ways are available for resolving problems related to a plurality of values.

The example of Southern Cameroon

In Southern Cameroon for instance, the valuation languages used by local populations are diverse. Most of the time, it is not the language of Western conservation (e.g. “biodiversity protection”) nor it is one of standard economics (e.g. “monetary compensation”): local populations use the languages of defence of human rights, urgency of livelihood, defence of cultural identity and territorial rights, and respect for sacredness. The “Pygmy” Baka provide an illustration of this. Because of logging, the Baka lose bush meat, territories, trees, and collection spots for forest products. Another complaint is that they often suffer from noise pollution from chain saws and trucks. In the Baka cosmology, when God created the world (humans and Nature), its favourite activity was to listen to the bees. So, humans had to stay quiet in order not to disturb God. But one day, some Baka began to make noise in the forest and God punished them by transforming them into wild animals. Noise is thus considered by Baka as a severe impact of logging since it is directly related to their religion, creating a “spiritual prejudice”. In view of this, it is misleading – as standard economists do – to try to reduce such a diversity of languages to a single monetary measure and to put a price on forest degradation.

Conflict resolution

Conventional conflict resolution through cost benefit analysis and monetary compensation is therefore inappropriate because it denies the legitimacy of other languages. It simplifies complex value systems related to the environment into monetary units. Moreover, if the only relevant value becomes money, then poor people are disadvantaged as their own livelihoods are cheaply valued on the market, so compensation will be minimal. Therefore, market prices and monetary valuation are themselves tools of power through which some sectors impose their own symbolic system of environmental valuation upon others, thereby defining exchange values and allowing the trade-off of economic benefits and socio-environmental costs in their own favour. In fact, we realize that poor people are well advised to defend their interests in languages different from that of monetary compensation for damages, because in the capitalist sphere the Lawrence Summers' principle ("the poor sell cheap") is operative.

It appears that only a truly democratic debate can solve valuation contests. Social multi-criteria evaluation is a tool from ecological economics that allows the comparability of plural values and sometimes helps to reach compromise solutions. It also shows what coalitions of actors are likely to be formed around different alternatives (Munda, 1995). In reality, however, it is usually the most powerful actor that imposes its own viewpoint and language of valuation. In this context, quite obviously, conflicts are sometimes the only way to change power relations that favour dominant actors and to advance towards equity and sustainability (Martínez-Alier, 2002).

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77. Virtual Water and Water Footprints

Definition

Humans consume water directly for drinking, cooking and washing, but much more for producing commodities such as food, paper, cotton clothes, etc…The amount of water that is used in the production processes of commodities during their entire life cycle is referred to as the *Virtual Water* contained within them. 'Virtual' water can be further divided into blue water (water that evaporates from rivers, lakes, or aquifers in production processes such as irrigation), green water (rainfall that evaporates during crop growth), and grey water (water polluted after agricultural, industrial and household use).

The *water footprint* of an individual, community or business is defined as the total volume of freshwater that is used to produce the goods and services consumed by that individual or community or produced by the business

Some sample water footprints are set out below:

- The production of one kilogram of beef requires 16 thousand litres of water.
- To produce one cup of coffee we need 140 litres of water.
- The water footprint of China is about 700 m^3 per year per capita. Only about 7% of the Chinese water footprint falls outside China.
- Japan with a footprint of 1150 m^3 per year per capita, has about 65% of its total water footprint outside the borders of the country.
- The USA water footprint is 2500 m^3 per year per capita. (source:www.waterfootprint.org)

Application

Since the per capita consumption of Virtual Water contained in our diets varies according to the type of diet (from 1m3/day for a survival diet, to 2.6m^3/day for a vegetarian diet and over 5m^3 for a USA style meat based diet) it is clear that the moderation of diets (reducing meat consumption) can have a big impact on virtual water use. However, the precise impact of a water footprint depends entirely on where water is taken from and when. An increased footprint in an area where water is plentiful is unlikely to have an adverse effect, but an increase in an area experiencing scarcity could result in the drying up of rivers, the destruction of habitats and livelihoods, and the extinction of species – in addition to affecting agricultural prices, supplies and local economies. Some proponents of virtual water argue for the need for a labelling scheme, with the water footprint of a product clearly set out so as to encourage demand management. This would help consumers and policy makers recognise links between production and consumption.

On the policy level, a water scarce country can import products that require a lot of water in their production (import of Virtual Water) to relieve pressure on its own resources. This is a strategy first adopted by Israel, which imports almost all cereals. Conversely, arguments are made that dry countries such as Spain should not be exporting tomatoes with a high virtual water content to wet Northern Europe. Exports of paper pulp, soybeans, or ethanol from Latin America to Europe or China imply large exports of virtual water. This type of global Virtual Water trade has geo-political implications: it induces dependencies between countries.

Critiques of Virtual Water Accounting

Virtual Water proponents believe insufficient attention is placed on demand management in comparison to supply management. In their opinion consumer demand management through education/information, labelling schemes has been overlooked because consumers and policy makers don't recognise links between production and consumption.

One problem with virtual water labelling is that water content should be considered bearing in mind its geographical and temporal importance (50 litres of water taken from England is not the same as from the Sahara, or from Valencia in summer (high tourist season when water is scarce). Similarly, an agricultural product grown with rainwater is not comparable with one grown with irrigated water extracted from non-renewable ground water. Thus virtual water gives no indication if water is being used within sustainable extraction limits, which can change annually based on rainfall. Finally, the virtual water argument can also have consequences politically, particularly regarding equity. Water released from one use will not necessarily be used more efficiently, or distributed more equitably. If water is released from agriculture, and farmers grow lower-value crops with less water requirements, the released water could easily be absorbed by urban users, or by the industrial sector instead of being distributed more equitably among the rural poor.

Websites:

www.waterfootprint.org
www.worldwatercouncil.org

http://www.waterfootprint.org/index.php?page=cal/waterfootprintcalculator_indv

78. Weak vs. Strong Sustainability

Sustainability and capital stocks

The concept of 'sustainable development' was first introduced by the International Union for Conservation of Nature and Natural Resources (IUCN) in 1980, but only gained wider societal and political relevance in 1987 with the publication of the report by the UN World Commission on the Environment and Development. This report, often referred to as the 'Bruntland report' (WCED, 1987), defines sustainable development as 'development that meets the needs of the present, without compromising the ability of future generations to meet their own needs'.

Capital may be defined as a stock that possesses the capacity to generate a flow of goods and services that satisfy human needs. We can disaggregate the capital stock available to generate this flow into four different types of capital (Costanza and Daly, 1992; El Serafy, 1991; Ekins et al., 2003):

- **Manufactured capital**, comprising material goods – tools, machines, buildings, infrastructure – which contribute to the production process but do not become embodied in the output and usually are 'consumed' in a period of time longer than a year;

- **Human capital**, that comprises all individuals' capacities for work;

- **Social capital**, that comprises the networks and organizations through which the contributions of individuals are mobilized and coordinated;

- **Natural capital**, that provides goods and services such as resources for production processes, absorption and recycling of wastes, water catchment and flow regulation or control of erosion processes. Natural capital can be further sud-divided into renewable natural capital and non-renewable natural capital.

Wealth creation is the process of using these four types of capital in combination to produce the flows of goods and services that people want/need. In order to sustain these flows of goods and services, and ensure their availability for future generations, it is necessary to maintain the level of capital stock. If the capital stock decreases, then it will not be possible to generate the same flow of goods and services. Therefore, maintenance of current capital stocks is a first condition for sustainability.

Weak and strong sustainability

If sustainability depends on the maintenance of the capital stock, then an important issue is whether it is the total stock of capital that must be maintained, with substitution allowed between the different capital forms, or whether certain components of capital, in particular natural capital, are non-substitutable, i.e. they contribute to welfare in a unique way that cannot be replicated by another capital stock (Ekins et al., 2003). This discussion has led to the definition of different degrees of sustainability, ranging from very weak sustainability, which assumes complete substitutability between the different capital stocks, to very strong, which assumes no substitutability, so that all natural capital must be conserved.

The following three degrees of sustainability can be distinguished (Costanza and Daly, 1992):

- **Weak sustainability** is concerned with maintaining the total capital stock intact, without regard to the partitioning of that capital among the four kinds. This would imply that the various kinds of capital are more or less substitutable, at least within the boundaries of current levels of economic activity and resource endowment.

- **Strong sustainability** calls for the maintenance of the separate capital stocks, assuming that natural and human-made capital are not perfect substitutes, but complementary. For proponents of strong sustainability, the substitutability of manufactured for natural capital is seriously limited by such characteristics of natural capital as irreversibility, uncertainty and the existence of ‘critical components of natural capital which make a unique contribution to welfare’ (Ekins et al, 2003; Daly 1991).

- **Absurdly strong sustainability**, by which we would never deplete anything. Under this assumption, non-renewable resources could not be used, since their use would always mean decreasing capital stock and therefore would be unsustainable.

Several arguments have been raised within the ecological economics community in defence of the strong sustainability paradigm and calling for the maintenance of the natural capital stock, namely (Costanza and Daly, 1992; Ekins et al, 2003; Dietz and Neumayer, 2007):

- The recognition of the impossibility of substituting for basic life support systems, namely the global environmental system that provides the basic functions of food, water, breathable air and a stable climate;

- The acknowledgment that manufactured capital is, in the end, produced from natural resources with the help of human capital. This statement shows clearly that the two forms of capital are complementary rather than substitutes;

- The irreversible character associated with the loss of certain components of natural capital (e.g. the extinction of a species), which generally does not happen in manufactured capital;

- The acknowledgment of the risks, uncertainties and ignorance that surround our understanding of the functioning of ecological systems, meaning that we cannot tell what the effects associated with the loss of natural capital will be.

The concept of 'critical natural capital' has emerged in this context, as natural capital which is responsible for the important environmental functions and which cannot be substituted in the provision of these functions by manufactured capital (Ekins et al., 2003).

Sustainable management of natural capital

Adopting a strong sustainability standpoint, the following operational rules have been proposed to ensure sustainable management of natural capital stocks (Daly, 1991; Costanza and Daly, 1992):

1. The scale of human activities in the biosphere should be limited to a level that is within the carrying capacity of natural capital. Sustainability must deal with sufficiency, as well as efficiency, and cannot avoid limiting physical scale;

2. Technological development should focus on allowing for an increase in the efficiency of resource use rather than in increasing throughput (the flow of goods and services from natural to human systems and the associated flow of wastes from human to natural systems);

3. Renewable natural capital stocks, both in source and sink functions, should be managed on a sustainable basis, meaning that:
a. Harvesting rates should not exceed regeneration rates;
b. Waste emissions should not exceed the renewable assimilative capacity of the environment;

4. Non-renewable natural resources should be exploited no faster than the rate of creation of renewable substitutes. This is sometimes called El Serafy's rule (1991). The revenue from exhaustible resources such as oil is divided into two parts, one of which can be freely spent in consumption provided that the other part is invested into new sustainable sources of energy that will completely substitute for the depleted resources. This is in fact close to "weak sustainability" than to "strong sustainability" but then the question arises: should we leave oil in the ground instead.

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79. Well Being

Use

The term well-being is most commonly used to describe what is ultimately good for a person. The question of what well-being consists of is of great importance for various disciplines, such as economics, philosophy and psychology. Well being is associated with two core notions - quality of life and happiness. Related are the concepts of freedom, human rights and social progress.

Evaluation

When evaluating the general well-being of individuals and societies, we usually refer to quality of life. It is used in a wide range of contexts, including the fields of international development, healthcare, and political science. Quality of life should not be confused with the concept of standard of living, which is based primarily on income. Instead, quality of life indicators include wealth and employment, and others pertaining to the built environment, physical and mental health, education, recreation and leisure time, and social belonging.

While quality of life has long been an explicit or implicit policy goal, adequate definition and measurement have been elusive. Diverse "objective" and "subjective" indicators across a range of disciplines and scales, and recent work on subjective well-being surveys and the psychology of happiness have spurred renewed interest. Regarding happiness, since it is subjective and hard to measure, other measures are generally given priority. It has also been shown that happiness, as much as it can be measured, does not necessarily increase correspondingly with the comfort that results from increasing income. As a result, standard of living should not be taken to be a measure of happiness.

In the 19th century, economists believed that happiness, which they called utility, could in principle be measured. By the 1950s, this view had been almost abandoned by neoclassical economists. However, in past decades, psychologists and a few economists have been studying peoples' feelings and investigating what makes them happy. The emerging insights are very important in relation to the study of the satisfaction of human needs and desires, but are still largely ignored in neoclassical economics. Several countries and International organizations are now questioning the divergence between economic growth and well-being improvements. Empirical studies have pointed out that income growth does not imply an increase in the quality of life and well-being enhancements. Economies are growing while social and income inequalities keep rising along with new poverties and social exclusions. As a result, social capital and cohesion are weakened with effects on crime, violence and life satisfaction.

Rethinking Growth and Well-being

These socio-economic phenomena call for a critical review of the nexus between economic growth and well-being. Does the GDP index tell us something about well-being measures? GDP does not include some positive components of well-being (social capital, social and cultural consumptions, etc.) but does account for components which have negative impacts on well-being (pollution, inequalities, etc.). As a consequence, economic indicators are poor measures of well-being. The need for a better evaluation of individual and collective well-being has shifted attention from GDP measures towards alternative measures both at macro (ex: Human Development Index, Index of Sustainable Economic Welfare, Genuine Progress Indicator) and micro levels – subjective measures of well-being.

Examples of new indicators of well-being:

- National Accounts of Well-being (New Economics Foundation) use comprehensive data from a survey of 22 European nations examining both personal and social well-being. Personal well-being describes people's experiences of their positive and negative emotions, satisfaction, vitality, resilience, self-esteem and sense of purpose and meaning. Social well-being is made up of two main components: supportive relationships, and feelings of trust and belonging.

- Human Well-being Index (Prescott-Allen, IUCN) is an attempt to overcome some of the limitations of GDP and the Human Development Index as measures of national wellbeing. Its main purpose is to form a component in a wellbeing indicator that addresses issues of sustainability and the "well-being" of the ecosystem. HWI is a composite of five domains: health and population; wealth; knowledge and culture; community; equity.

- The Happy Planet Index (New Economics Foundation) is designed to challenge well-established indices of national development, such as GDP and the HDI, which are seen as not taking sustainability into account. Each country's HPI value is a function of its average subjective life satisfaction, life expectancy at birth, and ecological footprint per capita.

Examples of programs integrating wellbeing:

- The Stiglitz report of 2009, which calls for measure of well-being alongside growth. This report adds to the literature on indicators of economic well-being and social progress and substantiates the voices of early pioneers like Hazel Henderson and Herman Daly. According to Stiglitz, *"GDP has increasingly become used as a measure of societal well-being and changes in the structure of the economy and our society have made it an increasingly poor one; many things that are important to individuals are not included in GDP."* The academics recommend including other factors, such as sustainability and education.

- Beyond GDP initiative (European Commission, European Parliament, Club of Rome, OECD and WWF), which work on improving measures of progress, wealth and well-being. In August 2009, the European Commission released its Communication "GDP and beyond: Measuring progress in a changing world". The Communication outlines an EU roadmap with five key actions to improve our indicators of progress in ways that meet citizens' concerns and make the most of new technical and political developments.

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