

The Ecological Debt

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Extending the notion of environmental justice internationally, the main lines of a theory of ecologically unequal exchanged are sketched here. The ecological debt arises from two separate ecological distribution conflicts. First, as we shall see immediately, the exports of raw materials and other products from relatively poor countries are sold at prices which do not include compensation for local or global externalities. Second, the disproportionate use by rich countries of environmental space or services without payment, and even without recognition of other people's entitlements to such services (for instance, the disproportionate free use of carbon dioxide sinks and reservoirs).

The ecological debt brings together many of the conflicts related to the environmentalism of the poor, and it also puts on the table the question of the languages in which such conflicts are to be expressed. The ecological debt is in principle an economic concept. The first discussions on the ecological debt took place around 1992, largely because of the inputs from Latin American NGO (the Instituto de Ecología Política from Chile). One of the alternative international »treaties« agreed upon at Rio de Janeiro's Earth Summit of 1992 was a Debt Treaty, which introduced the notion of an ecological debt in contraposition to the external debt. Fidel Castro was persuaded by Latin American activists to use this concept in his own speech at the official conference.¹ Also Virgilio Barco, the president of Colombia at the time, had already used the expression in a speech in the United States at M.I.T. commencement ceremony on June 4, 1990. Almost one decade later, Friends of the Earth at its annual general assembly of 1999 made of the Ecological Debt one of its campaigns for the following years. The notion of an ecological debt is not particularly radical. Think of the environmental liabilities incurred by firms (for instance, under the United States Superfund legislation), or of the engineering field called »restoration ecology«, or the proposals by the Swedish government in the early 1990s to calculate the country's environmental debt.²

Ecologically unequal exchange³

The Ricardian theory of comparative advantage showed that if all countries specialized in the production which was internally cheaper to produce in relative terms, all could win by trade. Subsequent elaborations of the theory showed that if countries specialized in productions which relied on the internally most abundant factors (say, natural resources as opposed to skilled labor or manufactured capital), all could win by trading freely. Critics pointed out that relying on comparative advantage would mean, in some cases, to remain locked-in in a pattern of production which excluded gains in productivity from economies of scale (i.e. the infant industry argument for protectionism). Nowadays, the recognition that production

involves also destruction and degradation of the environment brings us to a new perspective in the study of trade between regions and countries. We shall not argue for autarky, or for a strict »bioregional« position. From a purely ecological point of view, there is an argument for importing imports the lack of which would limit production, in the sense of Liebig's law of the minimum. However, the ecological view of the economy as an open system which necessarily depends on Nature for resources and sinks, has given rise to a new theory of ecologically unequal exchange, building on earlier notions such as *Raubwirtschaft* or »plunder economy« coined by geographers and almost forgotten in the discipline (Raumolin 1984).

Unequal exchange had already been pointed out in terms of undervaluation of labour and health of the poor and of deterioration of the terms of trade expressed in prices, and used as part of a theory of underdevelopment. By recognizing the links to the environment, the notion of unequal exchange can be expanded to include unaccounted, and thus uncompensated, local externalities, and the different production times exchanged when extracted products that can only be replaced in the long run (if at all) are traded for products or services which can be produced quickly. By ecologically unequal exchange we mean then the fact of exporting products from poor regions and countries, at prices which do not take into account the local externalities caused by these exports or the exhaustion of natural resources, in exchange for goods and services from richer regions. The concept focusses on *the poverty and the lack of political power of the exporting region*, to emphasize the idea of lack of alternative options, in terms of exporting other renewable goods with lower local impacts, or in terms of internalizing the externalities in the price of exports.

Selling at prices which do not include compensation for externalities and for the exhaustion of resources can be described as »ecological dumping«. This happens not only in the trade of natural resources from South to North but also sometimes from North to South, such as agricultural exports from the United States or Europe to the rest of the world which are directly subsidized, and also indirectly because of cheap energy, no deductions from water and soil pollution and use of pesticides, no deductions for the simplification of biodiversity. We describe the first kind of ecological dumping (from South to North) as ecologically unequal exchange to emphasize the fact that most extractive economies are often poor, powerless, and therefore they are unable to slow down the rate of resource exploitation or to charge »natural capital depletion taxes«, unable to internalize externalities into prices, and unable to diversify their exports. »Dumping« implies a voluntary decision to export at a price lower than costs, as European exports of surplus agricultural products. When oil is exported from the Niger Delta, power and market relations are such that there is no possibility of including the social, cultural and environmental costs of oil extraction in the price. Diamonds from Africa carry heavy unaccounted ecological and social rucksacks. When a country like Peru exports gold and copper, and much environmental and human damage is suffered internally, it is not appropriate to say that the social values of the Peruvians are such that they care little for health and the environment. Rather, we should say that they are unable to defend their interests for a better environment and a better health because they are relatively poor and powerless. In an

economic model, whatever the causes, the result will be the same. The externalities (insofar as they are known) are not factored into the price of copper. In the mathematics of the models, it does not matter if this is a free choice or an imposed decision, whether they are inscrutable preferences or unjust social structures.

The study of the state-sponsored large projects in the 1970s in the Northern Amazonian region of Brazil (mainly iron and aluminum exports) led some pioneering authors (Bunker 1985, Altvater 1987, 1993) to the idea of ecologically unequal exchange. Bunker emphasised the lack of local political power in this region. Differing »production times« together with the valorization (*mise-en-valeur*) of new territories are the notions that Altvater brought into play, in an ecological elaboration of Rosa Luxemburg's theory of the accumulation of capital. Capitalism necessarily incorporates new spaces by means of new transport systems in order to extract natural resources. Spatial relations being modified, temporal relations are altered as well because production in the newly incorporated spaces can no longer be governed by the time of reproduction of nature. Capitalism needs new territories and accelerates the production times. The antagonism (noticed long ago by Frederick Soddy) between economic time, which proceeds according to the quick rhythm imposed by capital circulation and the interest rate, and geochemical-biological time controlled by the rhythms of nature, is expressed in the irreparable destruction of nature and of local cultures which valued its resources differently. Nature is an open system, and some of its organisms grow sustainably at very rapid rates, but this is not the case of the raw materials and products exported by the Third World. By placing a market value on new spaces we change also the production times, and economic time triumphs, at least apparently, over ecological time. As Richard III put it after killing a few of his relatives, what has been done cannot be now amended.

Overexploitation of natural resources is intensified when terms of trade worsens for the extractive economies which have to face payments of the external debt and have to finance necessary imports. This is in fact the trend for many of the Latin American, African and South Asian resource exporters, where a quantum index of exports is growing faster than an economic value index. When coal used to be the main commercial energy source, production and consumption were geographically not far apart (in Europe and the United States), now although there is gas and oil extraction in Europe and the U.S., large amounts travel large distances with a predominant south-to-north direction. Similarly there are increasing net currents of iron, copper, aluminum from south to north (Barham et al. 1994, Mikesell 1988). There is displacement of production of raw materials from North to South, in a context of general increase of the material flows (Roldan and Martinez-Alier 2001).

The inability to bring all externalities and the deterioration of natural resources into the measuring rod of money makes it hard to produce a measure of ecologically unequal exchange, in the fashion that conventional economics is familiar with. The key question is whether standard trade theory has adequately worked out the problems of externalities related to exports. The theory of incomplete markets tries to provide explanations of why externalities might arise and what problems they might bring to known welfare propositions. A substantial part of the recent application of this framework to study trade and environmental issues

focuses on the presence of incomplete property rights over natural resources and services to explain why trade might not be necessarily welfare improving for the exporting country. Shrimp farming destroys mangroves – never mind, the theory says that such losses could be monetarized through appropriate property rights and appropriate markets on the livelihood and ecological functions of mangroves, and then we could know exactly what the balance is. Another way of making this point: negative environmental externalities derived from the export activity can be introduced in the standard trade theory approach by distinguishing between private and social marginal cost of production or extraction. However, the applicability of standard economic reasoning necessarily implies aggregating the externalities, at present values, under a unique numeraire. Economic valuation will depend on relative incomes and on power relations. Moreover, many of the negative effects derived from economic activities cannot be translated into a unique measure. The problem becomes only harder when we consider that the externalities might reach the future as well as the present. In that case, the problem is not only to translate the externalities of the present period into money value but also of the future periods, something that forces us to choose a discount rate, and therefore to choose an intertemporal distributional pattern of costs and benefits.

Standard economic theory points to the need to internalize externalities, something that to the extent possible, is desirable in order to bring the costs of extraction and exporting of natural resources closer to the »real« social costs. The point is that, it is precisely the social and political limitations in achieving this goal, what pushes the analysis outside the neoclassical sphere, towards incommensurability of values (which means the absence of a common unit of measurement across plural values). Incommensurability of values entails the rejection not just of monetary reductionism but also of any physical reductionism.

Trade theorists are used to deal with nominal, real or factorial terms of trade, or even with the notion of terms of trade in embodied labour units as needed for Emmanuel's unequal labour exchange theory (Emmanuel 1972). Attempts at counting in physical units the use of the environment attached to trade are present in the literature. H.T. Odum's theory of unequal exchange in terms of »emergy« is an example (Odum 1987, 1988, Odum and Arding 1991). Emergy is defined as embodied energy. It is similar to Marx's concept of labour value, but in energy terms. Odum is concerned with exposing unequal exchange of emergy between regions or nations, and he discusses trade in terms of their emergy exchange ratio. The periphery is underpaid for the emergy content of its natural resources because they are not properly valued in the market. The problem, as Hornborg points out (Hornborg 1998), is whether Odum intends to give us a normative or a positive approach. That is, whether the emergy content is something that should be used to determine how exports should be paid for, and thus we should aim at an emergy-equity trade, or is just something to be used descriptively, an indicator about unbalances in trade along with measurements in tons of materials and measurements in money values. Trade policy should then take into account several indicators which perhaps show different trends. Hornborg also reviews the use of the concept of exergy to provide a different perspective on the relationship between energy and trade. Exergy stands for available energy. Hornborg argues that market prices are the specific mechanism by which world system centres extract exergy

from, and export entropy to, their peripheries. Furthermore, it would be impossible to understand accumulation, »development«, or modern technology itself without referring to the way in which exchange value relates to thermodynamics, that is, the way in which market institutions organize the net transfer of energy and materials to world centers (Hornborg 1998). One may add that the disposal of waste, like carbon dioxide emissions, with zero market value, is also another key factor to understand economic growth in the North. Hornborg's point is a crucial one because it stresses the importance of understanding the mechanism by which unequal exchange takes place. This is precisely something which a theory of ecologically unequal exchange has to provide, i.e. an explanation of why market prices and market mechanisms have not provided a fair and reciprocal exchange. Still, the use of concepts like *emergy* and *exergy*, aside from the difficulty in their calculation and application, would only account for one aspect of the link between extraction of resources and the environment. The important point is not the difficulty of calculation. In any case the values obtained would be less arbitrary than the money-values given (for instance) to loss of biodiversity. The essential point, as argued above, is that incommensurability applies not only to money value but also to physical reductionism. Can »biopiracy« be reduced to energy calculations?

At any rate, a theory of unequal exchange has to include a clear framework in which to describe how this kind of exchange arises. Theories more in accordance with standard economics, would point to the existence of incomplete markets. This naive body of literature would then highlight the need for establishing property rights, and negotiations in actual or at least in fictitious markets, in order to avoid environmental problems. In ecological economics and political ecology, work is being done instead emphasizing the lack of political and market power of those suffering the externalities. The concept of »environmental liabilities« arising from concrete instances of pollution in mining or oil extraction is significant in this respect. It is certainly implied in the Superfund legislation in the United States (see above), which is not applicable internationally. After listing a number of cases in the United States in which indemnities have been paid by corporations such as Exxon Valdez, a Venezuelan journalist asked: »Being Venezuela a country dominated by the oil and mining industries, the question is, which is the *pasivo ambiental* (i.e. environmental liability) of all this oil and mining activity in our country?«⁴

It is fascinating to watch the diffusion of the term *pasivo ambiental* in a mining and oil extraction context in Latin America as one writes this book. Hector Seje-
novich, from Buenos Aires, was perhaps the first economist to use this term when he calculated the environmental liabilities from oil extraction in the province of Neuquen, Argentina. The Argentinian Minister for the Environment Oscar Massei was quoted on 6 February 2000 (journal *Rio Negro*, online) as saying that regional incentives to oil companies in Neuquen may not include flexibilization of environmental standards. The government, he added ominously, had in its possession the study made for UNDP which evaluated the *pasivos ambientales* from oil exploitation in Neuquen at one billion dollars. In Peru, a new law project was submitted to Congress in 1999 (project n. 786) creating an National Environmental Fund – as sort of internal GEF (Global Environmental Facility, financed by the World Bank), as some congressmen put it. The Fund would finance environmental research, it would restore the environment, it would promote ecological agri-

culture. Its economic resources would come from a percentage of the revenue from the privatization of state enterprises. After complaining about the environmental deterioration in the last decades because of mining and fisheries, after commenting also on increasing desertification and deforestation in the country, congressman Alfonso Cerrate remarked that the *pasivos ambientales* had been a factor in the lack of buyers at the auction which was to privatize Centromin (the State firm which was the successor of the Centro de Pasco Copper Corporation). The question was, »who will pay for the ecological debt? Who will assume the environmental liability (*pasivo ambiental*) accumulated throughout the years by Centromin and other state firms?«

In Chile, new legislation on liabilities after mines are closed was being discussed in 1999 and 2000. The Sociedad Nacional de Minería was aware of a danger of being internationally accused of ecological dumping, and it was in favor of applying international environmental standards adapted of course to national realities. On the topic of the *pasivo ambiental*, it added, discussions were proceeding but the general feeling in the industry was that the State should assume such environmental liabilities.⁵ The Bolivian vice-minister of Mines, Adán Zamora, referring to the pollution in the river Pilcomayo (that flows down from Potosí towards Tarija and eventually Argentina), increased by the bursting of a tailings dyke at Porco belonging to Comsur, had said in 1998: *la nueva política estatal minero-metalúrgica tiene como responsabilidad remediar los pasivos ambientales originados en la actividad minera del pasado* (*Presencia*, 16 June 1998), »the new State policy on minerals and metallurgy has the responsibility of mitigating the environmental liabilities originated by mining in the past«. In fact, environmental liabilities in Potosí reach back to the 16th century much before the Bolivian state came to exist.

Ecologically unequal exchange is born, therefore, from two causes. In the first place, the strength necessary to incorporate negative local externalities in export prices is often lacking in the South. Poverty and lack of power induce the local environment and health to be given away or be sold cheaply, even though this does not mean a lack of environmental awareness but simply a lack of economic and social power to defend both health and environment. In the second place, the ecological time necessary to produce the goods exported from the South is frequently longer than the time required to produce the imported manufactured goods or services. As the North has profited from an ecologically unequal trade, it is in a debtor position.

Quantifying the Ecological Debt

Ecologically unequal exchange is one of the reasons for the claim of the Ecological Debt. The second reason for this claim is the disproportionate use of environmental space by the rich countries. Putting both reasons together, and expressing the Ecological Debt in money terms, these would be the main components:

a) Regarding Ecologically Unequal Exchange:

- The (unpaid) costs of reproduction or maintenance or sustainable management of the renewable resources which have been exported. For instance, the nutrients incorporated into agricultural exports.

- The actualized costs of the future lack of availability of destroyed natural resources. For instance, the oil and minerals no longer available, or the biodiversity destroyed. This is a difficult figure to compute, for several reasons. Figures on the reserves, estimation of the possible technological obsolescence because of substitution, and a decision on the rate of discount are needed in the case of minerals or oil. For biodiversity, knowledge of what is being destroyed would be needed.
- The compensation for, or the costs of reparation (unpaid) of the local damages produced by exports (for example, the sulfur dioxide of copper smelters, the mine tailings, the harms to health from flower exports, the pollution of water by mercury in gold mining), or the actualized value of irreversible damage.
- The (unpaid) amount corresponding to the commercial use of information and knowledge on genetic resources, when they have been appropriated gratis. For agricultural genetic resources, the basis for such a claim already exists under the terminology of Farmers Rights.

b) Regarding lack of payment for environmental services or for the disproportionate use of Environmental Space:

- The (unpaid) reparation costs or compensation for the impacts caused by imports of solid or liquid toxic waste.
- The (unpaid) costs of free disposal of gas residues (carbon dioxide, CFC...), assuming equal rights to sinks and reservoirs (see below).

One objection to the notion of an Ecological Debt is that debts are recognised obligations arising from contracts, such as a sale or a mortgage. A non-recognised debt does not exist, according to this view. However, there are cases in which debts have arisen without a contract. Witness for instance the obligation to pay reparations by a State after a (lost) war, as Germany after the first world war, or to pay some sort of indemnities for infringements to human rights as Germany after the second world war (in the second case, with the agreement of most citizens of the country).

Another objection to the notion of the Ecological Debt is that it implies monetization of Nature's services. I confess, *mea culpa*. Beyond the technical and conceptual difficulties in reaching such money-values, it would be more effective for the South to use the language of Environmental Justice or the language of Environmental Security. However, the language of chrematistics is well understood in the North. The movement in Thailand that opposed eucalyptus plantations used at times a religious language by protecting the trees threatened by plantations with the yellow clothing of Buddhist monks and calling meetings with the ritual *pha pha ba* normally employed for the consecration of temples. This would not impress the IMF in its everyday business. Petitions for forgiveness of the External Debt in the Jubilee 2000 campaign of Christian churches use a biblical language. The banks could reply, how many Brady bonds has the Vatican? Possibly some, but not enough to impress the creditors.

As we have seen the idiom of Environmental Justice has been employed in the United States in the struggle against the disproportionate amount of pollution in areas occupied by minority and low income people. The disproportionate emissions of carbon dioxide is an example of environmental injustice at the international

level. Another idiom might be that of Environmental Security, not in a military sense, but in a sense similar to how we would speak of food security, as an agricultural policy which would assure local availability of food through use of local human and land resources. However, such a definition of »food security« could be contested. Environmental security is likewise a contested concept. It might mean the use of military force to impose a solution to environmental conflicts. In the literature it refers to the guaranteed access to natural resources (such as water) and to environmental services for all, not just the rich and powerful. Environmental security is a condition in which environmental goods and services are used at a sustainable rate, in which fair and reliable access to environmental resources and services is universal, and finally, in which institutions are competent to manage the conflicts associated with environmental scarcity and degradation (Matthew 1999, 13). So the South could argue that the North has produced and is producing a disproportionate amount of pollution, including the greenhouse gases, and that it takes an unfair amount of natural resources, which is not only counter to environmental justice, and it does not only give rise to environmental liabilities, but which puts the environmental security of the South (or at least parts of the South) at risk.⁶

The carbon debt: contraction, convergence and compensation

How to decide the limit or target for emissions of greenhouse gases? How much is enough? Attempts at using cost-benefit analysis of the increased greenhouse effect (as in some reports of the Intergovernmental Panel on Climate Change) are not convincing because of the arbitrariness of the discount rate (Azar and Sterner 1996), and also because many items are not easily measured in physical terms, much less easily valued in money terms (Funtowicz and Ravetz 1994). Moreover, the very pattern of prices in the economy would be different to start with, without the free access to carbon sinks. When (in the IPCC process, 1995) it was suggested that »greenhouse« policy should be guided by a calculus of the economic costs of climate change including an estimate of the economic value of human lives to be lost in some poor countries, there were loud complaints. Some said that the price of human life could not be so cheap. Nevertheless, if the existing distribution of property and income is accepted as a reality, then economic values of an average human life fifteen times larger in the United States or Western Europe than in Bangla Desh, are plausible. Ask insurance companies. There was a discrepancy in the economic values themselves but here it would seem that the economists were right in the sense that »the poor are cheap«. Now, however, why should the poor stay poor, will Bangladesh in fifty years stay poor? This is a different question, which could be factored into the economic cost-benefit analysis of the increased greenhouse effect. There was another more substantial difference of opinion whether economics holds the key to an integrated assessment. It does not. Uncertainties and complexities make it impossible to conduct an honest cost-benefit analysis. Moreover, a cost-benefit analysis goes against the poor, whose willingness-to-pay is necessarily limited. The application of cost-benefit analysis depends also on an arbitrary discount rate. Hence, the plausibility of the appeal to non-economic values. For instance, it can be stated that while humans have different economic values they all have the same value in the scale of human dignity.

Going back to the economic language of the ecological debt, consider the case of the environmental service provided by the permanent carbon sinks (oceans, new vegetation, soils), and by the atmosphere as a temporary deposit or reservoir where the carbon dioxide accumulates while waiting for a permanent sink. Thus, the concentration of carbon dioxide in the atmosphere has increased from 280 ppm to 360 ppm. The decision of the European Union, discussed at Kyoto in December 1997, was to allow the concentration to increase to 550 ppm which would possibly involve a two degree centigrade rise in temperature, with much uncertainty on the range, and even more regarding local effects. That this is a »safe« limit has been strongly disputed (Azar and Rhode 1997). The emissions per person per year are in the United States of the order of 6 tons of carbon, in Europe half of this, in India 0.4 tons. We all breathe in and out more or less the same, and it would be impracticable to reduce carbon dioxide emissions by slow respiration. There are livelihood emissions, and luxury emissions. We are dealing here with one characteristic feature of human ecology, extreme intraspecific difference in the exosomatic use of fuels, differences which are much larger than such national per capita figures reveal. The global average is about one ton of carbon per person/year (global emissions, 6000 M tons of carbon), already excessive, though it will normally increase because of population growth and economic growth. In Kyoto in 1997 and afterwards (as in Bonn in November 1999), the European Union, playing the »leadership game«, proposed a slight reduction in emissions, which the United States found difficult to accept (partly because population is growing in the U.S.) until President Bush's final refusal of the Kyoto Protocol in early 2001. Kyoto gave »grandfathered« rights to the U.S., Europe and Japan equal to their 1990 emissions, on the promise of a reduction of 5.2 per cent for the year 2010. The required reduction in order to avoid further increase in concentration in the atmosphere, is of the order of half the present emissions, that is some 3000 M tons of carbon per year. Although the dynamics of carbon absorption in the oceans, new vegetations and soils depend to some extent of the amounts produced (this is called »CO₂ fertilization«, for the growth of vegetation), it is not disputed that the use of the atmosphere as an open-access reservoir is increasing. The sinks (oceans, soils, new vegetation) are also used on a first come, first served basis, without payment.

There are many instances in which through a change of industrial technology, or through conservation of forests under threat, or through new vegetation, there is a genuine gain in jointly implementing the objectives of carbon emissions reduction. How will such gain be shared? What will be the price of reduction of carbon emissions, or the price of the extra absorption? When the commitment to reduce emissions is small, as at present, then, in principle, the price of a ton of carbon in joint implementation projects will be low because the demand for sinks will be small. The price will be low if local negative externalities from the projects themselves are not factored into the price. The price will also be low when the supply of projects in the South (whether as additional sinks, especially when conservation of threatened primary forests is also accepted, or as changes in techniques which diminish carbon emissions such as substituting natural gas for coal) is large, compared to the demand. However, should the commitment to reduce be of the order of 3000 M tons of carbon per year, as it should be, then the price would

increase enormously. In other words, the stronger and quicker the commitment to reduce, the higher the marginal cost of the reduction. Perhaps, if the owners of carbon sinks are poor, the local selling price of carbon absorption will still be low – then intermediaries would come into play, perhaps southern governments, perhaps northern financial institutions. Instead, if there is not reduction, this implies the persistent and disproportionate use of the sinks (oceans, new vegetations and the soils), and the atmosphere, as de facto property of the rich, and therefore a continuous increase year after year of the ecological debt, at the tune, say of, US\$ 60 billion per year (3000 M tons of carbon which should be reduced at the cost of US\$ 20 per ton). The ecological debt rises on this count because, by not doing the necessary reduction, the rich countries save themselves a quantity which would be roughly of this order of magnitude. One could easily argue that the appropriate average cost to use should be US\$ 100 per ton or even higher. In any case, as a term of comparison, the present accumulated Latin American external debt is in 1999 of US\$ 700 billion (equivalent to only 12 years of »carbon debt« at US\$ 60 billion per year).

A similar calculation was published already in 1995 by Jyoti Parikh (a member of the IPCC), making in substance the same argument. If we take the present human-made emissions of carbon, the average is about 1 ton per person and per year. Industrialized countries produce three-fourths of these emissions, instead of the one-fourth which would correspond to them on the basis of population. The difference is 50 per cent of total emissions, some 3000 M tons. Here the increasing marginal cost of reduction is again contemplated: the first 1000 M tons could be reduced at a cost of, say, US\$ 15 per ton, but then the cost increases very much. Let us take an average of US\$ 25, then a total annual subsidy of US\$ 75 billion is forthcoming from South to North (Parikh 1995).

Such calculations are now being taken up and elaborated upon by NGOs concerned with the social and environmental burdens imposed on poor countries by the service and repayment of the external debt. Thus, Christian Aid made available in 1999 a document on climate change, debt, equity and survival (with the title *Who owes who?*, and pictures of Bangladesh children with water up to their necks) that argues that to mitigate the effects of climate change »we will all have to live within our environmental budget. The atmosphere can only absorb a certain amount of greenhouse gases before disruption begins. So, their emission needs controlling. As, each day, industrialized countries delay action on the 60-80 per cent cuts that are needed, they go over-budget and are running up an environmental or »carbon« debt. Ironically those same countries today stand in judgement over much poorer countries who have comparatively insignificant conventional, financial debts«. Christian Aid's calculation of the »carbon debt« is done in this way: the carbon intensity of GNP is taken as constant, a reduction of carbon emissions in rich countries of 60-80 per cent is assumed, the corresponding decrease in GNP is calculated. The enormous decrease in GNP does not occur because the reduction in emissions does not take place: this is the avoided cost, i.e. the debt. Christian Aid's figures are far too high because small reductions of carbon emissions can be achieved with small marginal costs (perhaps even with win-win opportunities), the marginal cost increasing with the volume and urgency of the reductions. One has to allow for changing in techniques and in the composi-

tion of output. What the »proper« average cost would be, is not so obvious – in the estimate above US\$20 per ton of carbon has been used. The argument for a substantial Ecological Debt accumulating year after year would be true even with price of US\$ 5 or US\$ 10 per ton.

Other Christian groups such as the Canadian Ecumenical Council for Economic Justice have also in 2000 estimated the »carbon debt« in the context of the increasing discussion on the ecological debt (www.ecej.org) and it seems likely in 2001 that the World Council of Churches will adopt this line of thought. There are many uncertainties as to how the future energy systems will develop. Methods for injecting the carbon dioxide into the earth or in aquifers might become practicable and widespread. Photovoltaic energy might become cheaper. The number of windmills is increasing in many places. If we look at the past century, we see that new energy systems are added on top of the existing ones, without substituting for them. The world economy, and especially the rich countries' economy, will be based on fossil fuels at least for thirty or forty years. Afterwards, we do not know. Hydrogen, to be used in fuel cells, should be seen as an energy carrier not as an energy source, because much energy is needed to obtain the hydrogen. Meanwhile, the carbon debt accumulates.

To sum up, countries which are in a creditor position in the ecological debt could give a sense of urgency to the negotiations on climate change (and also on other issues, such as Farmers' Rights), by claiming the ecological debt, which is admittedly hard to quantify in money terms. Perhaps the AOSIS and other countries will push this point, joining in a greenhouse politics based on Contraction of emissions, Convergence to about 0.5 tons of carbon per capita and per year, and in the meantime Compensation, at the same time deploying also the language of their threatened environmental security.

The claim of the ecological debt, when it becomes an important topic in the international political agenda (perhaps the Green ministers in France and Germany could help), will contribute to the »ecological adjustment« which the North must make. The point is not exchanging external debt for protection of nature, as it has been done in some anecdotal cases.⁷ On the contrary, the point is to consider 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.

In »greenhouse« politics this line of thinking is not called the »leadership game« but the »liability game«, which up to now Southern governments have been reluctant to take. Thus, any Latin American audience is easily impressed by the dollar amount that a child of that continent owes to foreigners already at birth, but it is more difficult to awaken interest in the theoretical position as creditor which that same infant occupies in the ecological debt account. This is not yet on the political agenda.

Notes

- 1 Personal communication from Manuel Baquedano, the head of the IEP, Chile.
- 2 See the website of the Ecological Debt campaign, www.cosmovisiones.com. For Sweden, the reports of Arne Jernelov issued by the Swedish Environmental Advisory Council.
- 3 This section is indebted to Maite Cabeza. (Cf. Cabeza Gutiérrez and Martínez-Alier, 2001).
- 4 Orlando Ochoa Teran, *Quinto Día*, 18 January 2000, relayed by J.C. Centeno through the Environment in Latin America discussion list (ELAN at CSF).
- 5 Danilo Torres Ferrari, Los avances de la normativa sobre Cierre de Faenas Mineras, *Boletín Minero* (Chile), 1122, June 1999.
- 6 Authors who have written on environmental security include Thomas Homer-Dixon, Peter Gleick, Norman Myers. See Deudney and Matthew (1999).
- 7 Following the proposal of Thomas Lovejoy, »Aid Debtor Nations Ecology«, The New York Times, 4th October 1984.

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