

Environmental Justice and Economic Degrowth: An Alliance between Two Movements¹

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Ecological Economics, Social Metabolism, and Political Ecology

The flows of energy and materials in the world economy have never been as large as they are today. This increased metabolism causes more and more conflicts on resource extraction and waste disposal and is giving rise to a movement for environmental justice around the world (Agyeman, et al. 2003; Carruthers 2008; Pellow and Brulle 2005; Pellow 2007; Roberts 2007; Walker 2009). Even an economy without growth, if based on fossil fuels, would need to obtain new sources of energy at the “commodity frontiers” (Moore 2000) because energy is not recycled. The words “environmental justice” were initially used in the United States in the early 1980s for local complaints against “environmental racism,” i.e., the disproportionate pollution burdens in areas primarily inhabited by disadvantaged ethnic groups (Bullard 1990, 2005; Pulido 1996; Camacho 1998; Cole and Foster 2001; Carmin and Agyeman 2010). Now the term is applied to spontaneous movements and organizations that resist extractive industries and organize against pollution and climate change (Martínez-Alier 2002) anywhere in the world. It also includes the networks or coalitions they form across borders (Bandy and Smith 2005). Environmental justice speaks to both intragenerational and intergenerational distribution. It addresses non-distributional dimensions of justice, such as recognition of the legitimacy of social actors to speak out in protest (Schlosberg 2007) and inclusion of all who are affected by resource extraction and pollution (Agarwal 2001).

EJOs (environmental justice organizations) are potential allies of the environmental groups in rich countries that criticize the obsession with the narrow economic measure of Gross Domestic Product (GDP) growth, which defines economic growth in the mainstream and permeates the political sphere. These groups form the degrowth movement (Latouche 2007), whose origins partly lie in the field of ecological economics.

Ecological economics is a transdisciplinary field born in the 1980s (Costanza 1991, 1996; Ropke 2004; Martínez-Alier and Ropke 2008; Spash 2009) from a confluence of interests between ecologists, who studied the use of energy in the human economy (Odum 1971; Jansson 1984), and dissident economists (Daly 1968, 1973, 2007), who followed Nicholas Georgescu-Roegen’s (1966, 1971) and Kenneth Boulding’s (1966) teachings. Work by K.W. Kapp on social costs (1950) and by Kneese and Ayres (1969) on the pervasiveness of externalities was also influential. Ecological economics takes a comprehensive view of the interaction between economy and ecology. As such, it encompasses the physical study of the economy (social metabolism), the study of the effect of property rights on the environment and the relation between institutional change and environmental management, the study of the environmental sustainability of the economy (e.g., can manufactured capital substitute for so-called “natural capital?”), and the economic valuation of positive environmental services and negative “externalities.” It also employs multi-criteria evaluation (MCE) methods to rank alternatives in the presence of

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incommensurable values. Thus, instead of reducing all values to money by doubtful assumptions and controversial discount rates as is done in Cost-Benefit Analysis, participatory MCE methods (Munda, 2008) are able to establish and rank alternatives while accepting a plurality of values.

Social metabolism refers to the flows of energy and materials in the economy. The study of social metabolism overlaps with industrial ecology. Sometimes it is called social ecology (as in the Sozial Ökologie institute in Vienna led by Fischer-Kowalski); it measures the links between economic growth and use of energy (Warr and Ayres, et al. 2010) and tests the absolute or relative dematerialization of the economy (relative to GDP) by studying material flows.

Energy flows in the economy have been analyzed for a long time (Cottrell 1955; Martínez-Alier and Schlüpmann 1987, Martínez-Alier 2007; Haberl 2001a, 2001b; Cleveland 2008a, 2008b; Hall, et al. 1986; Sieferle 2001; Debeir, et al. 1991). One main point of interest is the rise or decline in the EROI (energy return on energy input), the inverse of the energy cost of obtaining energy. Accounts of material flows are now done as a matter of course by Eurostat, the E.U. statistical office. They are also calculated for Southern countries, with results often emphasizing the existence of large physical trade imbalances (Russi, et al. 2008; Perez-Rincon 2006, 2007; Vallejo 2010; Vallejo, et al. 2010), where exports in tons are larger than imports in tons (and also often more energy intensive).

Political ecology (Blaikie and Brookfield 1987; Robbins 2004; Peet and Watts 1996; Rocheleau, et al. 1996; Bryant and Bailey 1997) studies ecological distribution conflicts and the use of power to gain access to environmental resources and services, or to shift the burdens of pollution according to ethnic origin, social class, caste, or gender. It focuses on local and international resource extraction and waste disposal conflicts (of which climate change is arguably the largest), and it analyzes the power struggles on the procedures for decision-making in environmental issues, including the allowing or banning of different valuation languages. Political ecology also studies environmental movements, as does environmental sociology.

This article builds on the knowledge provided by these sustainability sciences.

Trends

Nearly 20 years after the first Earth Summit, the United Nations conference in Rio de Janeiro in 1992 that drew more than 100 heads of state, the environmental trends are alarming. The E.U. and UN objective of halting the loss of biodiversity by the year 2010 has not only failed, it has been abandoned in practice. The HANPP (human appropriation of net primary production), a measure of the consumption of natural materials such as food, paper, wood and fiber and how this consumption “alters the composition of the atmosphere, levels of biodiversity, energy flows within food webs, and the provision of important ecosystem services” (SEDAC n.d.), indicates increasing pressure on biodiversity (Vitousek, et al. 1986; Haberl, et al. 2009). Biodiversity loss is sometimes seen (as in the TEEB [The Economics of Ecosystems and Biodiversity] reports) as a market failure to be corrected by suitable pricing. At other times bad governance, unsuitable institutions, and neoliberal policies that promote trade and guarantee foreign investments are also (rightly) blamed. However, the main underlying cause of the disappearance of biodiversity is the increased social metabolism of the human economy. This driving force would be similar

under social-democratic Keynesian policies—or indeed under the failed communist economic systems of the 20th century—if the technologies and per capita consumption we see today remained under those systems.

Thus, the production of the main greenhouse gases continues to grow because of the increased metabolic flows in the economy. Until 2007 emissions of CO₂ were increasing by 3 percent per year. After a halt in the increase in 2008-09 due to the global economic recession, they are now bound to increase again. Yet, according to the UN's Intergovernmental Panel on Climate Change (IPCC), greenhouse gases should *decrease* as soon as possible by 50 or 60 percent. Cementing the failure of the Kyoto Protocol, which was initiated in 1997 and called for countries to agree to binding cuts in greenhouse gas emissions, the UN climate talks in Copenhagen in December 2009 resulted in no agreement. The United States never ratified the Kyoto Protocol, and President Obama has not succeeded in getting the U.S. Senate to agree to carbon caps or taxes—measures that would result in emission reductions. Instead, Obama is focussing blame for global climate destabilization on China, which has surpassed the U.S. in CO₂ emissions, although its per capita emissions are still four times less than the United States.

CO₂ concentration in the atmosphere was about 300 ppm when Swedish scientist Svante Arrhenius (1896) first conceptualized the enhanced greenhouse effect in 1895. Now it is nearly 400 ppm and increasing 2 ppm each year. As is well known, CO₂ emissions by the human economy primarily result from burning fossil fuels. Since peak oil is now very near, or perhaps already reached, and peak extraction of natural gas will likely occur in 20 or 30 years, a substantial amount of CO₂ emissions will continue to come from coal and “unconventional” sources of oil and natural gas, which are much dirtier and more energy-intensive to extract (Charman 2010).

Therefore, taking into account other negative trends or events like the drop in the availability of many edible species of fish, the accidents at Fukushima in 2011 and the risks of nuclear military proliferation, the local scarcities of water, and the approaching “peak phosphorous,” it is time to go back to the debates of the 1970s on the desirability in rich countries of a steady-state economy and, indeed, of a period of degrowth in the use of energy and materials in the economy (Schneider, et al. 2010). Degrowth in rich economies should lead to a steady state economy (Daly 1973), which in turn raises the issue of which variables should remain steady. Daly would be the first to acknowledge that the economy cannot be properly described by one single unit of measurement. Ecological economics rests on the notion of incommensurability of values (Martínez-Alier, et al. 1998, 1999).

The small movement for degrowth in the North focuses on both physical variables and new social institutions. It breaks with the unquestioned assumption that the economy should grow forever. The proliferation of environmental justice movements of the South complaining against ecologically unequal exchange and environmental liabilities attest to the need for degrowth (Bunker 1984, 1985, 2007; Hornborg 1998, 2009; Hornborg, et al. 2007, 2010; Muradian and Martínez-Alier 2001; Muradian, et al. 2002; Rice 2007; Roberts and Parks 2007).

Peak Population: Love One Another More, and Do Not Multiply

Among all the alarming trends and impending “peaks” signalling distributional conflicts, one welcome trend is the rapid decrease in the rate of growth of the human population, also known as the world demographic transition. Peak population might be

reached around 2045 at perhaps 8.5 billion people. As population stabilizes or declines slightly, the proportion of old people increases. Hence, European women are exhorted to produce more children who will become workers who will pay for the pensions of so many old people. This is ridiculous (Latouche 2007), since the workers would also become pensioners in due course. The pyramid of population (still taught at schools) should be drawn as a rectangle (admittedly with a little pyramid on top). The debates between Malthusians and Marxists, and Malthusians and some economists who favor population growth, are still relevant today, as are the doctrines of the feminist Neo-Malthusians of 1880-1920, e.g., Emma Goldman, Madaleine Pelletier, Nelly Roussel, Margaret Sanger, and Maria Lacerda de Moura (Ronsin 1980; Martínez-Alier and Masjuan 2005).

The world demographic transition is expected to help usher in a socio-ecological transition defined by lower usage of energy and materials, especially if after peaking, the global population goes down to 6 billion, as some projections expect (Lutz, et al. 2001). During the 20th century, global population increased four times from 1.5 billion to 6 billion. The importance of population growth in environmental impacts was recognized in Paul Ehrlich's equation $I = PAT$ (Impacts = Population x Affluence x Technology).

Environmental awareness is now influencing birth rates. There was a large difference between the original Malthusianism of T.R. Malthus and the neo-Malthusianism of 1900 that in France took the name of *la grève des ventres*, focusing on what today is called "women's reproductive rights." Between 1880 and 1914, an international network of Neo-Malthusian activists engaged in strong debates, including on the question of how many people the Earth could feed. Much later, Françoise d'Eaubonne (1974) when introducing the word "eco-feminism," again made the link between women's freedom and the need to stop population growth for environmental reasons. In the current context, it is useful to revisit the different varieties of Malthusianism, which are summarized below.

- **MALTHUSIANISM** of Malthus posited that population undergoes exponential growth unless checked by war and pestilence, or by chastity and late marriages. Food grows less than proportionately to the labor input because of decreasing returns. Hence, subsistence crises result. Helping the poor is useless because they immediately would have more children.
- **NEO-MALTHUSIANISM OF 1900** held that human populations could regulate their own growth through contraception. Women's freedom was required for this, and desirable for its own sake. Poverty was explained by social inequality, but "conscious procreation" was needed to prevent low wages and the pressure on natural resources. This was a successful bottom-up movement in Europe and America against States (which wanted more soldiers) and Churches.
- **NEO-MALTHUSIANISM AFTER 1970** was a doctrine and practice sponsored by international organizations and some governments. Population growth is seen as a main cause of poverty and environmental degradation. Therefore it advocates States introduce contraceptive methods, even without women's prior consent.
- **ANTI-MALTHUSIANISM** is a view that assumes that human population growth is no major threat to the natural environment and that it is conducive to economic growth. Esther Boserup (1965) and other economists promoted this argument.

The Environmentalism of the Poor

Recognizing the need to halt the increase in global population (and the impact of population on ecosystems and biodiversity) and the growth of environmentalism are both

positive trends. The growing environmentalism of the poor and of indigenous peoples (Guha and Martínez-Alier 1997; Dunlap and York 2008) is a particularly important development. Activists and communities at the commodity frontiers are sometimes able, together with the EJOs, to stop the extraction of minerals and destruction of habitats and human livelihoods. One celebrated victory took place in August 2010 when citizens succeeded in defeating the plans of transnational mining giant, Vedanta Resources, to mine bauxite at Niyamgiri Hill in Odisha (Padel and Das 2010). Initiatives of the environmentalism of the poor include exercising the right to previous consent under Convention 169 of the ILO, which applies to indigenous communities (when they are recognized as such) (Urkidi 2010b), introducing measures such as local referendums against mining in Latin America (as in the gold mining conflicts of Esquel in Argentina and Tambogrande in Peru; Walter and Martínez-Alier 2010; Muradian, et al. 2003; Haarstad and Floysand 2007), and developing new plans for leaving fossil fuels in the ground, as occurred in the Yasuní ITT oilfields in Amazon territory in Ecuador (Martínez-Alier and Temper 2007; Finer, et al. 2010; Larrea and Warnars 2009). Successful attempts have been made to prosecute companies like Shell for its activities in the Niger Delta, or Chevron-Texaco for the damage it caused in Ecuador (Clapp and Utting 2009). Women are often in the lead in such movements (Veuthey and Gerber 2010).

The EJOs of the South defend local identities and territories (Escobar 2001); however, their growth is explained not only by the strength of identity politics but also by the conflicts erupting from the social metabolism of the world economy now reaching the last frontiers. The EJOs and their networks are, then, a main force working to make the world economy less unsustainable. They are more trustworthy than the old conservationist movement (represented by organizations like the WWF [World Wildlife Fund] and the IUCN [International Union for Conservation of Nature]), which is compromised under its present leadership by the substantial financial support it gets from the extractive industries in exchange for its complicity in “greenwashing.” For instance, the IUCN booklet *Transition to Sustainability*, written by Bill Adams and Sally Jeanrenaud and launched at the World Conservation Congress in Barcelona in October 2008, proposed a link between the conservationist movement and the environmentalism of the poor. This went nowhere because of the very visible cooperation of Shell and Rio Tinto with the IUCN. John Muir would have been horrified.

Meanwhile, the traditional Left still sees environmentalism as a luxury of the rich rather than a necessity for everybody—particularly for the poor and the indigenous, as illustrated by victims such as Chico Mendes in 1988 and Ken Saro-Wiwa in 1995. New green politics are gaining fertile ground in some Southern countries. Brazil’s former Environment Minister, Marina Silva, a longtime labor, environmental, and indigenous rights activist, ran for president in 2010, and the Peruvian human rights and environmental activist and former Catholic priest, Marco Arana, also tried to make a bid for president of that country in 2011.

The environmental justice movements are fighting a wide variety of abuses over their land, air, and water in traditional indigenous territory to urban environments. These include the unsustainable extraction of biomass (e.g., deforestation, defending mangrove forests, the imposition of monoculture tree plantations, agro-fuels, land grabbing, overfishing); mining (for gold, bauxite, iron ore, copper, uranium, and other minerals); oil and gas exploration and extraction; and the appropriation of water, such as the construction of dams, the diversion of rivers, and the pollution of aquifers, to name the most important causes of conflicts (Carrere and Lohman 1996; McCully 1996; OCMAL

2010; Bebbington, et al. 2007; Bridge 2004; Martínez-Alier 2001a, 2001b; GRAIN 2007; Gerber 2011; De Echave, et al. 2009; Svampa and Antonelli 2009; Urkidi 2010a; Urkidi and Walter 2011; Orta-Martínez et al. 2008; Orta-Martínez and Finer 2010). There are also conflicts over transport and the infrastructures required for transport. Conflicts on waste disposal in cities, the countryside, or overseas include fights over waste dumps or incinerators, air and soil pollution, electronic waste exports, and ship-breaking (Demaria 2010). The largest waste disposal conflict is over the property rights to the oceans and atmosphere to dump the excessive amounts of CO₂ generated by burning fossil fuels. There are also many conflicts on the application of new technologies (cyanide in open pit gold mining, genetically modified organisms [GMOs,] nuclear energy) that distribute uncertain risks unfairly (EEA 2002; Pengue 2005; Pereira and Funtowicz 2009).

Against Cheap Exports and in Favor of Renewable Energy and Local People

Movements in countries or regions that are net exporters of raw materials are calling for taxes on those exports to help address the environmental damage associated with extracting them (Giljum and Eisenmenger 2004; Muñoz, et al. 2009). For example, in Ghana, Pará in Brazil, Surinam, and Orissa in India, the aluminium export industry has profited from incredibly cheap rates for electricity from dams that have harmed both the environment and the people (Padel and Das 2010). The demand to do away with subsidies for fossil fuels and metal exports would make these activities much less attractive to the exporters.

One current case in South Africa arose from opposition to a World Bank loan of US\$3.75 billion to the electricity company Eskom for the Medupi power plant, slated to be the world's fourth largest (Bond 2011, [tk]). South African EJOs articulate the problem:

[W]e see renewable energy, not coal-fired power stations (or nuclear power), as the optimal development path for Southern economies, creating more jobs, building local manufacturing capacity, and avoiding the environmental mistakes of Northern countries. As in South Africa, most World Bank coal power projects are designed to supply industry, not people. They do not necessarily increase per capita access to energy. The industries in turn are mostly geared for export in line with the World Bank's promotion of export-oriented production. The goods are then consumed primarily in developed countries. Further, many industries are established with foreign direct investments. In the process, much of the heavy industry in developed countries has relocated to developing countries in search of cheaper energy and cheaper labor... (SA and African Civil Society 2010).

The South African EJOs propose instead a demand-side management alternative, beginning by phasing out cheap electricity to “enclave” smelters that have little linkage with the economy and that are capital- rather than jobs-intensive. They contend that the freed-up energy should be redistributed to provide for a much larger “lifeline” supply of universal Free Basic Electricity to consumers, with a rising block tariff to encourage conservation and help the switch into renewable energy technologies.

Controversies on Climate Justice

Energy cannot be recycled, therefore even a non-growing economy that uses large amounts of fossil fuels would need “fresh” supplies coming from the commodity frontiers. The same applies to materials, which in practice can be recycled only partially. For example, only 40 to 60 percent of commodities like copper, aluminium, steel, and paper can be salvaged for use in recycling. When the economy grows, the search for materials and energy sources is even greater. This vast search for resources results in “accumulation by

dispossession” (Harvey 2003) or *Raubwirtschaft* (a phrase used by some geographers, meaning “plunder economy”). There is also “accumulation through contamination,” meaning that capitalist profits increase by the ability to dispose of the “effluents of affluence” and other waste at zero or low cost. This does not indicate so much a market failure as a (provisional) cost-shifting success (Kapp 1950).

In addition to Climate Justice activists (Bond 2010a), many governments of relatively poor countries now call for the repayment of the ecological debt, a slogan first raised in Latin America among EJOs in 1991 (Robledo and Marcelo 1992; Smith 1996; Simms 2005; Peralta 2009). The United States, the European Union, and Japan refuse to acknowledge this debt. However, in Copenhagen in December 2009 at least 20 heads of government or ministers explicitly mentioned the ecological debt (or climate debt) in their speeches, and some used the loaded word “reparations.”

According to Pablo Solón, then Bolivia’s ambassador to the United Nations,

admitting responsibility for the climate crisis without taking necessary actions to address it is like someone burning your house and then refusing to pay for it. Even if the fire was not started on purpose, the industrialized countries, through their inaction, have continued to add fuel to the fire... It is entirely unjustifiable that countries like Bolivia are now forced to pay for the crisis. This creates a huge draw on our limited resources to protect our people from a crisis created by the rich and their over-consumption... Our glaciers dwindle, droughts become ever more common, and water supplies are drying up. Who should address this? To us it seems only right that the polluter should pay, and not the poor. We are not assigning guilt, merely responsibility. As they say in the U.S., if you break it, you buy it.

The background to Solón’s speech was Todd Stern’s statement (as U.S. negotiator) at a press conference in Copenhagen on December 10, 2009: “We absolutely recognize our historic role in putting emissions in the atmosphere up there... But the sense of guilt or culpability or reparations—I just categorically reject that.” (Bond 2010b, also in <http://www.climate-justice-now.org/bolivia-responds-to-us-on-climate-debt-if-you-break-it-you-buy-it/>).

A rejoinder to this controversy came from an unexpected author, economist Jagdish Bhagwati (2010). Apparently unaware of the activist and academic debate on the ecological debt since 1991, he wrote that the U.S. in addressing domestic pollution created the Superfund legislation in 1980 after the Love Canal accident that requires hazardous waste to be eliminated by the offending company.

This tort liability is also “strict,” such that it exists even if the material discharged was not known at the time to be hazardous (as carbon emissions were until recently). In addition, the people hurt can make their own tort claims. Rejecting this legal tradition in U.S. domestic pollution, Todd Stern, the principal U.S. negotiator, refused to concede any liability for past emissions (...) Evidently, the U.S. needs to reverse this stand. Each of the rich countries needs to accept a tort liability which can be pro rata to the Intergovernmental Panel on Climate Change-estimated share of historic world carbon emissions. Since the payment would be on the tort principle, the idea that the funds would substitute for normal aid would be outrageous: you do not take away the pension of a person who has won a tort settlement.

In the E.U., the Environmental Liability Directive entered into force in April 2004, though not all countries have yet enacted the corresponding internal legislation. It is meant for application inside the E.U. only, and moreover does not apply to the climate debt. However, the claims for compensation for such climate debts 20 years after Rio 1992 are now audible to anybody witnessing the international negotiations. At the UN climate talks

in Copenhagen in December 2009, Fándor Falconí, then Foreign Relations Minister of Ecuador, likened poor countries to “passive smokers,” while explicitly pointing out the failure to apply the “polluter pays principle” to the climate problem. He also asked for repayment of the climate debt due to the historical liabilities for climate change. Parikh (1995) calculated the climate debt owed from Northern to Southern countries at about US\$75 billion per year. She counted the costs saved by the rich by not carrying out the necessary reductions in emissions. Srinivasan, et al. (2008) quantified the accumulated ecological debt—a large part of which is climate debt—from North to South at US\$2 trillion. This study was published in *Proceedings of the National Academy of Sciences*, signalling the academic credibility of the concept of “ecological debt.” In other publications, Paredis, et al. (2008) and Goemmine and Paredis (2009) provide a conceptual discussion and quantification of the ecological debt, a grassroots concept that, as they say, has “matured.”

Vía Campesina: Peasant Agriculture Cools Down the Earth

In the early 1970s, taking up H.T. Odum’s view of modern agriculture as “farming with petroleum” (Odum 1971), several researchers did accounts of the output-input ratio of agricultural systems. The best-known calculations were by Pimentel (Pimentel, et al. 1973) published in *Science* (also Pimentel 1979). It was striking to realize that the energy output-input ratio of corn production in Iowa or Illinois was lower than that for the traditional *milpa* corn production system of rural Mexico or Guatemala. From an economic point of view, modern agriculture increased productivity per unit of labor and to some extent per hectare, but from a physical point of view, it lowered the energy efficiency (Leach 1975; Naredo and Campos 1980). The energy accounts were a challenge to conventional economic accounting, and they helped give birth to ecological economics.

Vía Campesina, a peasant and small farmer international coalition (Desmarais 2007; Borras, 2008; Martínez-Torres and Rosett 2010), is now very much present in the climate change debate with its thesis that “sustainable peasant agriculture cools down the earth” (WRM 2008), an argument partly based on the fact that modern industrial agriculture is “no longer a producer of energy but a consumer of energy.” Studies calculating the EROI (the energy return on energy input) in agriculture since the 1970s back this position. Ecological agrarianism or ecological neo-Narodnism (as I called it in 1987) is growing (Martínez-Alier 2011).

Socially Sustainable Economic Degrowth

A small social movement for sustainable economic degrowth appeared around 2002 in some rich countries of the North. It emanated from civil society groups, but it also has support from some academics. So far, two conferences, one in Paris in April 2008 and one in Barcelona in March 2010, have been devoted to the movement (see www.degrowth.eu) and another conference is planned in Montreal in May 2012. In Italy it is called the *decrescita* movement and in France the *décroissance* movement.

Socially sustainable economic degrowth (Martínez-Alier 2009; Martínez-Alier, et al. 2010) is both a concept and a small social grassroots movement (particularly in France and Italy) with its origins in the fields of ecological economics, social ecology, economic anthropology, and in environmental and social activist groups. It was born out of the critiques of uniform economic development and the imposition of market values linked to Karl Polanyi’s critique in *The Great Transformation* (1944) and, later, in economic anthropology where Polanyi’s school (Polanyi, et al. 1957) explored the forms of exchange

in different economic systems (reciprocity, redistribution, peripheral markets, and the generalized market system).

In the same spirit, ecological economists have regularly referred back to the distinction by Aristotle in *Politics* between *oikonomia* and *chrematistics*, between human ecology (how to provision the *oikos*) and the study of market prices. Daly and Cobb (1989) wrote that a shift was needed from economics conceived as chrematistics (the study of price formation in markets with the aim of maximizing monetary gain) back to the sort of economics that Aristotle called *oikonomia* (management of a household—or a community—aimed at maintaining or sustainably increasing use values over the long run). Ecological economists recall Otto Neurath’s defense of incommensurability of values against Von Mises and Hayek in the Socialist Calculation Debate of the 1920s and 1930s (Martínez-Alier and Schlüpmann 1987; O’Neill 1993, 2007). Commensuration means the imposition of a common metric, and it requires an exercise of power (Espeland and Stevens 1998).

In France, the MAUSS school was influential on the degrowth movement. This was a group of scholars against utilitarianism in the social sciences that made its acronym coincide with the name of the anthropologist who authored *The Gift* (Mauss’ book explicitly considered different economic systems: *Essai sur le don. Forme et raison de l’échange dans les sociétés archaïques*). The degrowth movement thus implies a cultural critique of the generalized market system and the “economicism” imposed by capitalism (Latouche 2007); it also claims other ancestors from the 1970s, particularly the anthropologist Marshall Sahlins (1972).² The economist Nicholas Georgescu-Roegen (1906-1994), a founding father of ecological economics, published *The Entropy Law and the Economic Process* (1971); a selection of his writings was translated into French by Grinevald and Rens in 1979 with the title *Démain la décroissance* (Grinevald and Rens 1995). Other influences on the degrowth movement came from Schumacher’s *Small is Beautiful* (1973), and indirectly from Gandhian economics (as developed by Kumarappa in *Economics of Permanence*).

Not surprisingly, degrowth activists in France and Italy are keen on one concept of industrial ecology and ecological economics: the Jevons’ paradox or “rebound effect” (Jevons 1865; Polimeni, et al. 2007). They have read economic anthropologists such as Latouche (2007), and they are inspired by environmental thinkers of the 1970s such as André Gorz and Ivan Illich. They also could have read *A Prosperous Way Down* by H.T. and E. Odum (2001), but they probably have not. Regardless, the European degrowth movement is not based on iconic writings. It is a small social movement born from experiences of co-housing, squatting, neo-ruralism, reclaiming the streets, alternative energies, waste prevention, and recycling. Besides being a new movement, it has become a new research area that could be called “economic degrowth studies” and is closely related to “socio-ecological transition studies” (Fischer-Kowalski and Haberl, eds. 2007; Krausmann, et al. 2008; Krausmann, et al. 2009). The keyword term “economic degrowth” has been introduced in academic journals in English since the Paris conference of 2008, and special issues have been published or are forthcoming in 2011-12 in the *Journal of Cleaner Production*, *Ecological Economics*, *Environmental Values*, and in this issue of *Capitalism Nature Socialism*. Research is needed on the environmental, technological, demographic, social and socio-psychological aspects of socially sustainable economic degrowth that

² Sahlins made two main points. The first, in primitive stateless societies (based on the “domestic mode of production”), material and ritual needs can be satisfied with few hours of work. Second, and in the same direction, peasant societies (if left alone) function according to Chayanov’s rule, i.e., the higher the ratio of workers to consumers in families, the less the workers need to work. Sahlins’ ideas were immediately influential in France because of his 1968 article in *Le Temps Modernes* (Sahlins 1968).

would lead to a steady-state economy (Kerschner 2010), in alliance with the environmental justice movements of the South.

Beyond GDP lies Economic Degrowth

For poor rural people involved in resource extraction conflicts, the threat to their livelihood in the form of water pollution and land grabbing is obvious. They draw environmental resources and services directly from nature, outside the market. When displaced, they cannot afford to buy a house and land. They cannot even pay for water in plastic bottles when their rivers and aquifers are polluted by mining. This fact has given rise to the notion of the “GDP of the poor.” These lost amounts of welfare are not subtracted from the economic accounts. This is one of the reasons why we should mistrust national macroeconomic accounting and go “Beyond GDP.”

Moreover, GDP growth goes together with increasing pressure on biodiversity, climate change, and the undermining of human livelihoods at the commodity frontiers. Excessive consumption by rich and middle-class people is not only a menace for other species and for future generations of humans. It deprives poor people a fair share of resources and environmental space now (Spangenberg 1995). Environmental activists appreciate the academic critiques of GDP. Actually, feminist activists and academics (Waring 1988) long ago made a convincing argument against GDP because it “forgot” not only to count nature’s services but also unpaid domestic work. Another critique of GDP accounting, the so-called Easterlin Paradox, is updated by work by social psychologists. According to the Easterlin Paradox, increases in happiness correlate with increases in income only below a certain level of per capita income.

The expression, Beyond GDP, recently became fashionable in Brussels among some European civil servants and politicians (<http://www.beyond-gdp.eu/news.html>) 40 years after European Commission President Sicco Mansholt, in 1972, criticized GDP and proposed an end to economic growth in rich countries. A sad lack of scholarship hampers the debate. Authors (dead or alive) who thoroughly criticized GDP from environmental and feminist perspectives since the 1970s are expurgated. The cheerful slogan in Brussels is “the greening of the economy: beyond GDP.”

The criticisms against the methods and relevance of GDP accounting should go far beyond introducing complementary measurements of social performance such as the HDI (human development index), which correlates very closely with GDP per capita. They should also go beyond the idea of simply “greening the GDP” or introducing satellite accounts.

Among the physical indices of sustainability, the best known is the Ecological Footprint (EF), which made its debut in 1992 at an ecological economics conference (Rees and Wackernagel 1994). The WWF publishes the EF results regularly. The EF translates into a single number in hectares measuring the use per capita of land for food, fiber, wood, plus the built environment (paved space for houses and roads), plus the hypothetical land that would absorb the carbon dioxide produced by burning fossil fuels. For rich industrial economies, the total comes to 4 or more hectares per capita, of which over half is the hypothetical carbon dioxide absorption land. The representation in hectares is easy to understand, and many people like it. However, we know that the carbon dioxide produced by human beings goes to the oceans (about one third, resulting in the acidification of the oceans), and that half the amount produced remains in the atmosphere where it causes the

enhanced greenhouse effect. The EF calculations also assume that humans have a right to use most of the planet.

Going beyond GDP accounting means something different from “greening the GDP,” or at the other extreme, genuflecting before one single environmental index such as the EF. It should mean to go into a participatory and deliberative multi-criteria assessment of the economy, working with ten or twelve indicators of socio-cultural, environmental, and economic performance (Shmelev and Rodriguez-Labajos 2009; Zografos and Howarth 2008). The inclusion or exclusion of various indicators will reflect the social and political strength of different interests and social values. Perhaps all indicators improve together in some period, or, more likely, some improve while some deteriorate. “Beyond GDP” should mean to set objectives for the reduction in the use of energy and materials and going beyond the single imperative of economic growth, even when this means to leave some financial debts unpaid.

Conclusion: An Obvious Alliance

National debts can be paid by squeezing citizens (to a certain extent only) through taxes and wage reductions, by inflation, or by economic growth. But economic growth, especially in the high-consumption countries of the North, is not compatible with environmental sustainability. The continuing effort to boost the rate of economic growth in OECD countries in order to be able to repay private and public financial debts (in the United States, in Japan, in several European countries) is in direct conflict with the availability of exhaustible resources and the capacity of waste sinks. Ecological economists rightly refer on this point to Frederick Soddy, who 90 years ago, pointed out that economic growth could not be permanently “fuelled” by debts because in fact it was literally fuelled by the fossil fuels (Daly 1980; Kallis, et al. 2009).

Instead of becoming obsessed with economic growth in order to repay the accumulated financial debt and supposedly bring happiness to all, rich countries should (at the very least) change their behavior so as not to add to their ever-increasing ecological debt. A program of moderate economic degrowth (implying a lower social metabolism) in the rich industrial economies is a plausible objective to meet this goal. Furthermore, degrowth activists in the North would likely find willing allies in the EJOs and their networks in the South that are fighting in ecological distribution conflicts against ecologically unequal exchange and the ecological debt.

Marx was not an agronomist, but he used the word “metabolism” to describe how capitalist agriculture promoted exports that deprived the soil of nutrients. He had read Liebig’s agricultural chemistry. The solution that Liebig proposed for the day when guano from Peru would run out was industrial fertilizers. In the 1980s, the word “metabolism” was re-introduced into economics by Robert Ayres and Marina Fischer-Kowalski. Accounts of material flows show that an average citizen of the European Union uses (not counting water) about 15 tons of materials—biomass, material for metals, materials for building, and fossil fuels—per year. The average in India is still under 4 tons. What comes in accumulates as stock (in buildings, for instance) or comes out as exports or waste. Exports of materials from the E.U. amount per capita to about one ton per year, while imports are four tons or more. This is in contrast to regions or countries specializing in the exports of raw materials. In many Latin American countries, exports exceed imports (in tonnage) by six times. In South and Western Africa, in Odisha and other mining states in India, they follow what some Colombians call “the rule of San Garabato, *compre caro y venda*

barato”—buy expensive and sell cheap. Saint Garabato did not care about declining terms of trade, the resource curse, or the depletion of natural capital.

The planet is being plundered because of economic growth, the search for profits, and the high levels of consumption by parts of the population using current technologies. This has been coupled with nearly a five-fold increase in population since 1900. Population growth is fortunately now rapidly slowing down, and “peak population” will be likely reached by 2045 at less than 9 billion, after which it may decline a bit. Nevertheless, the frontiers of resource extraction and waste disposal are reaching the farthest corners of the planet. The movement to impose market values and increase profits by expanding the frontiers of capitalism is resisted by a countermovement (Polanyi 1944) to protect nature and humans. The protagonists are sometimes labor unions (caring for workers’ health and safety at the work place) or nature conservation societies (caring about wilderness). They are more often the EJOs, or indigenous groups, citizens and peasant groups, and women activists. They deploy their own values against the logic of profit making. Sometimes they merely ask for monetary compensation for damages (“externalities,” in the language of economics), but at another times they demand respect for human rights to life and health, they insist on indigenous territorial rights, and they claim that rivers or mountains and certain trees are sacred and cannot be traded-off.

Industrialists, economists, and governments defend strategies (that go back to Uslar Pietri’s 1936 recommendation in Venezuela of “sowing the oil,” *sembrar el petróleo*) based on “weak sustainability”—that is, money compensation for damages and substitution of the lost environment by manufactured capital. World Bank and Oxford University economist Paul Collier is a new arrival to this tradition of thought. In Collier’s view (2010), energy and material exports from the South should not slow down so long as local inhabitants receive generous compensation for unavoidable environmental damage so that receipts can be invested in domestic development. He argues that the capacity to invest in the exporting countries or regions should be increased. Collier convincingly emphasizes the existence of corruption and ill governance in the current squandering of revenues, but he shows no serious consideration for limits to growth or irreversible socio-ecological damages that cannot be compensated for.

The defining element in Political Ecology is the presence of power in the ecology of humans. Humans have modified ecosystems by their technological ability to increase the availability and exosomatic use of energy and materials including biomass and water. Such changes, we realize now, are not sustainable in the long run. They change the climate (as announced by Arrhenius in 1895), and they are destroying biodiversity at a rapid pace. The increase in the flows of energy and materials (the social metabolism of advanced economies) has been achieved at heavy social and environmental costs, not only for future generations but for those living now. There are enormous inequities in the world, both between North and South, but also within the South and within the North. Some people annually use 300 GJ (gigajoules) of energy, most of which comes from oil and gas, while other people manage with less than 20 GJ, including their food energy and some wood or dried dung for cooking. To maintain such unequal ecological distribution of access to resources and the inequities of waste disposal (including unequal access to the carbon dioxide sinks), the powerful have effectively exercised their power by disguising it within market relations and unjust property rights. Power is at other times brute force. Sometimes it is the ability to set the agenda (e.g., “let’s go at least for a green economy and weak sustainability”) and to impose decision-making procedures that exclude whole classes of

people, as has been the case in the international negotiations on biodiversity and climate change.

The optimistic views regarding ecological modernization, absolute “dematerialization” of the economy, and the downward slopes in the Kuznets environmental curves run headlong into the reality of increased inputs of energy and materials into the world economy, increasing production of waste including carbon dioxide, and increased displacement of environmental costs. The EJOs of the South are one main force fighting against socio-environmental injustices and moving the world economy towards sustainability. They do their own research and produce the most comprehensive available data on environmental conflicts over mining, tree plantations, fossil fuel extraction, water use, and illegal waste disposal. They are active at scales from local to global, but they do not have a position against economic growth in their own countries, which would be very unpopular and indeed untenable in Latin America, Africa, or the poor countries of Asia. Nevertheless, they are helping to introduce new concepts such as the *Buen Vivir*, “Good Living” (*Sumaq Kamsay* in Quechua), which (together with the Rights of Nature) was put into the 2008 constitution of Ecuador, moving that country away from a fixation on growth. They criticize the notion of a uniform transition from underdevelopment to development.

The Southern EJOs’ potential alliance with the small degrowth movement in Europe cannot mandate an agreement to stop economic growth everywhere. Rather, the alliance must be based on a common perspective against “debt-fuelled” economic growth and the hegemony of economic accounting in favor of a pluralism of values (as recommended by ecological economics; Martínez-Alier, et al. 1998, 1999), the acceptance and support of bottom-up feminist neo-Malthusianism, the defense of human rights and indigenous territorial rights along with the rights of nature, the recognition of the ecological debt, and the critique of ecologically unequal exchange. The export trade in commodities is not seen as virtuous. On the contrary, it is linked with increased social metabolism, and therefore, environmental damage. Against the thesis that even Oxfam regularly puts forward (open borders to exports from the South), the alliance between the environmental justice and degrowth movements is based on what Latin American economists and politicians such as Alberto Acosta in Ecuador call “post-extractivism,” a rejection of both “enclave economies and the resource curse” and “redistributive extractivism” (Gudynas 2010). The demand that the North repay the climate debt to the South and that this debt should increase no further reinforces the degrowth movements in the rich countries.

References

- Agarwal, B. 2001. Participatory exclusions, community forests and gender: An analysis for South Asia and a conceptual framework. *World Development* 29 (10): 1623-1648.
- Agyeman, J., R. Bullard, and B. Evans, eds. 2003. *Just sustainabilities: Development in an unequal world*. Cambridge, MA: MIT Press.
- Arrhenius, S., 1896. On the influence of carbonic acid in the air upon the temperature of the ground. *Philosophical Magazine and Journal of Science* 5 (41). April: 237-276.
- Bandy, J. and J. Smith. 2005. *Coalitions across borders: Transnational protest and the neoliberal order*. Lanham, MD and Oxford: Rowman and Littlefield.
- Bebbington, A., D.H. Bebbington, J. Bury, J. Lingan, J.P. Muñoz. 2007. Mining and social movements: Struggles over livelihood and rural territorial development in the Andes. *World Development* 36 (12): 2888-2905.
- Bhagwati, J. 2010. A new approach to tackling climate change. *Financial Times*. February 22.
- Blaikie, P. and H. Brookfield. 1987. *Land degradation and society*. London: Methuen.
- Bond, P., 2010a. Copenhagen inside out. <http://www.counterpunch.org/bond01122010.html>.

- . 2010b Maintaining momentum after Copenhagen's collapse: "Seal the deal" or "Seattle" the deal? *Capitalism Nature Socialism* 21 (1): 14-27.———. 2011. Carbon Capital's Trial, the Kyoto Protocol's Demise, and Openings for Climate Justice. *Capitalism Nature Socialism* 22 (4).Borras Jr., S. 2008. La Via Campesina and its global campaign for agrarian reform. *Journal of Agrarian Change* 8 (2/3): 258-289.
- Boserup, E. 1965. *The conditions of agricultural growth: The economics of agrarian change under population pressure*. Chicago: Aldine; London: G. Allen and Unwin.
- Boulding, K. 1966. The economics of the coming Spaceship Earth. In *Environmental quality in a growing economy*, H. Jarret, et al., eds. Baltimore: John Hopkins Press.
- Bridge, G., 2004. Mapping the bonanza: Geographies of mining investment in an era of neoliberal reform. *The Professional Geographer* 56 (3): 406-421.
- Bryant, R.L. and S. Bailey. 1997. *Third World political ecology*. London: Routledge.
- Bullard, R.D. 1990. *Dumping in Dixie: Race, class, and environmental quality*. Boulder: Westview Press.
- . 2005. *The quest for environmental justice: Human rights and the politics of pollution*. San Francisco: Sierra Club Books.
- Bunker, S. 1984. Modes of extraction, unequal exchange, and the progressive underdevelopment of an extreme periphery. The Brazilian Amazon. *American Journal of Sociology* 89: 1017-1064.
- . 1985. *Underdeveloping the Amazon: Extraction, unequal exchange, and the failure of the modern state*. Chicago: Univ. of Chicago Press.
- . 2007. The poverty of resource extraction. In *Rethinking environmental history: World-system history and global environmental change*, A. Hornborg, et al., eds. Lanham: Altamira Press.
- Camacho, D. 1998. The environmental justice movement. In *Environmental injustices, political struggles: Race, class, and the environment*, D. Camacho, ed. Durham, NC: Duke Univ. Press.
- Carmin, J.A. and J. Ageyman, eds. 2010. *Environmental inequalities beyond borders: Local perspectives on global injustices*. Cambridge: MIT Press.
- Carrere, R. and L. Lohman. 1996. *Pulping the South. Industrial tree plantation and the world paper economy*. London: Zed Books.
- Carruthers, D.V. 2008. *Environmental justice in Latin America: Problems, promise, and practice*. Cambridge, MA: MIT Press.
- Charman, K. 2010. Trashing the planet for natural gas: Shale gas development threatens freshwater sources, likely escalates climate destabilization. *Capitalism Nature Socialism* 21 (4): 72-82.
- Clapp, J. and P. Utting, eds. 2009. *Corporate accountability and sustainable development*. Delhi: Oxford Univ. Press.
- Cleveland, C.J. 2008a. Biophysical economics. *Encyclopedia of Earth* (online). November.
- . 2008b. Energy return on investment (EROI). *Encyclopedia of Earth* (online). April.
- Cole L.W. and S.R. Foster. 2001. *From the ground up: Environmental racism and the rise of the environmental justice movement*. London: New York Univ. Press.
- Collier, P. 2010. *The plundered planet: Why we must and how we can manage nature for global prosperity*. New York: Oxford Univ. Press.
- Costanza, R., ed. 1991 *Ecological economics: The science and management of sustainability*. New York: Columbia Univ. Press.
- Costanza, R., Segura, O., Martínez-Alier, J., eds. 1996. *Getting down to earth: Practical applications of ecological economics*. Washington, D.C.: Island Press.
- Cottrell, F. 1955. *Energy and society: the relations between energy, social change and economic development*. New York: McGraw Hill.
- Daly, H. 1968. On economics as a life science. *Journal of Political Economy* 76 (3): 392-406.
- . 1973. *Toward a steady-state economy*. San Francisco: WH Freeman and Company.
- . 1980. The economic thought of Frederick Soddy. *History of Political Economy* 12 (4): 469-488.
- . 2007. *Ecological economics and sustainable development, selected essays*. Cheltenham: Edward Elgar.
- Daly, H., and Cobb, J. 1989. *For the common good: Redirecting the economy toward community, the environment, and a sustainable future*. Boston: Beacon Press.
- De Echave, J., A. Diez, L. Huber, B. Revesz, X.R. Lanata, and M. Tanaka. 2009. *Minería y conflicto social*. Lima: Instituto de Estudios Peruanos.
- Debeir, J.C., D. Hemery, and J.P. Déleage. 1991. *In the servitude of power: Energy and civilization through the ages*. London: Zed Books.
- Desmarais, A.A. 2007. *La Via Campesina: Globalization and the power of the peasant*. Halifax: Fernwood Publishing.
- Demaria, F. 2010. Shipbreaking at Alang-Sosiya (India): An ecological distribution conflict. *Ecological Economics* 70 (2): 250-260.
- Dunlap, R.E. and R. York. 2008. The globalization of environmental concern and the limits of the postmaterialist explanation: Evidence from four cross-national surveys. *Sociological Quarterly* 49: 529-563.

- Escobar, A., 2001. Culture sits in places: Reflections on globalism and subaltern strategies of localization. *Political Geography* 20: 139-174.
- Espeland, W.N. and M.L. Stevens. 1998. Commensuration as a social process. *Annual Review of Sociology* 24: 313-343.
- Financial Times*. 2010. Toxic sludge tests Brussels pollution law. October 14.
- Finer, M., R. Moncel, and C.N. Jenkins. 2010. Leaving the oil under the Amazon: Ecuador's Yasuní-ITT Initiative. *Biotropica* 42: 63-66.
- Fischer-Kowalski, F. and H. Haberl, eds. 2007. *Socioecological transitions and global change: Trajectories of social metabolism and land use*. Preface by J. Martínez-Alier. Cheltenham: Edward Elgar.
- Georgescu-Roegen, N. 1966. *Analytical economics*. Cambridge, MA: Harvard Univ. Press.
- . 1971. *The entropy law and the economic process*. Cambridge, MA: Harvard Univ. Press.
- Gerber, J.F. 2011. Conflicts over industrial tree plantations in the South: Who, how and why? *Global Environmental Change* 21 (1) February: 165-176.
- Giljum, S. and N. Eisenmenger. 2004. International trade and the distribution of environmental goods and burdens: A biophysical perspective. *Journal of Environment and Development* 13 (1): 73-100.
- Goeminne, G. and E. Paredis. 2009. The concept of ecological debt: Challenging established science-policy frameworks in the transition to sustainable development. In *Frontiers of environment and citizenship*, E. Techera, ed. Oxford: Inter-Disciplinary Press.
- GRAIN. 2007. Stop the agrofuel craze. *Seedling: Biodiversity, rights and livelihood. Agrofuels Special Issue*. July: 2-9.
- Grinevald, J., and I. Rens, eds. 1995. *La décroissance: Entropie, écologie, économie*. Paris: Sang de la Terre.
- Gudynas, E. 2010. *El buen vivir más allá del extractivismo. Preface to Alberto Acosta: La maldición de la abundancia*. Quito: Abya Yala.
- Guha, R., and J. Martínez-Alier. 1997. *Varieties of environmentalism: Essays north and south*. London: Earthscan.
- Haarstad, H. and A. Floysand. 2007. Globalization and the power of rescaled narratives: A case of opposition to mining in Tambogrande, Perú. *Political Geography* 26: 289-308.
- Haberl, H. 2001a. The energetic metabolism of societies, Part I: Accounting concepts. *Journal of Industrial Ecology* 5 (1): 11-33.
- . 2001b. The energetic metabolism of societies, Part II: Empirical examples. *Journal of Industrial Ecology* 5 (2): 71-88.
- Haberl, H., K.H. Erb, F. Krausmann, S. Berecz, N. Ludwiczek, J. Martínez-Alier, A. Musel, and A. Schaffartzik. 2009. Using embodied HANPP to analyze teleconnections in the global land system: Conceptual considerations. *Danish Journal of Geography* 109 (2): 119-130.
- Hall, C., C. Cutler, C. Cleveland, and R. Kaufmann. 1986. *Energy and resource quality: The ecology of the economic process*. New York: Wiley-Interscience.
- Harvey, D. 2003. *The new imperialism*. Oxford: Oxford Univ. Press.
- Hornborg, A. 1998. Toward an ecological theory of unequal exchange: Articulating world system theory and ecological economics. *Ecological Economics* 25 (1): 127-136.
- . 2009. Zero-sum world: Challenges in conceptualizing environmental load displacement and ecologically unequal exchange in the world system. *International Journal of Comparative Sociology* 50 (3): 237-262.
- Hornborg, A., J. McNeill, and J. Martínez-Alier, eds. 2007. *Rethinking environmental history: Worldsystem history and global environmental change*. Lanham: Altamira Press.
- Hornborg, A., and A.K. Jorgensen, eds. 2010. *International trade and environmental justice: Toward a global political ecology*. Hauppauge, NY: Nova Science.
- Jansson, A.M., ed. 1984. *Integration of economy and ecology: An outlook for the eighties*. Proceedings from the Wallenberg Symposium, Univ. of Stockholm, Askö Laboratory.
- Jevons, W.S. 1865. *The coal question*. London: Macmillan.
- Kallis G., J. Martínez-Alier, and R.B. Norgaard. 2009. Paper assets, real debts: An ecological-economic exploration of the global economic crisis. *Critical Perspectives on International Business* 5 (1/2): 14-25.
- Kapp, K.W. 1950. *Social costs of business enterprise*. London: Asia Publishing House.
- Kerschner, C. 2010. Economic de-growth vs. steady-state economy. *Journal of Cleaner Production* 18 (6): 544-551.
- Kneese, A. and R.U. Ayres. 1969. Production, consumption and externalities. *American Economic Review* 59: 282-297.
- Krausmann, F., M. Fischer-Kowalski, H. Schandl, and N. Eisenmenger. 2008. The global socio-metabolic transition: Past and present metabolic profiles and their future trajectories. *Journal of Industrial Ecology* 12 (5): 637-657.
- , S. Gingrich, N. Eisenmenger, K.H. Erb, H. Haberl and M. Fischer-Kowalski. 2009. Growth in global materials use, GDP and population during the 20th century. *Ecological Economics* 68 (10): 2696-2705.
- Larrea, C. and L. Warnars. 2009. Ecuador's Yasuní-ITT initiative: Avoiding emissions by keeping petroleum underground. *Energy for Sustainable Development* 13: 219-223.

- Latouche, S. 2007. *Le pari de la décroissance*. Paris: Fayard.
- Leach, G. 1975. *Energy and food production*. Guildford: IPC Science and Technology Press.
- Lutz, W., W.C. Sanderson, and S. Scherbov. 2001. *The end of world population growth in the 21st century: New challenges for human capital formation and sustainable development*. London: Earthscan.
- Martínez-Alier, J. 2001a. Ecological conflicts and valuation: Mangroves vs. shrimp in the late 1990s. *Environment and Planning C* 19: 713-728.
- . 2001b. Mining conflicts, environmental justice, and valuation. *Journal of Hazardous Materials* 86 (1): 153-170.
- . 2002. *The environmentalism of the poor: A study of ecological conflicts and valuation*. Cheltenham: Edward Elgar Publishing.
- . 2007. Marxism, social metabolism and international trade. In *Rethinking environmental history: World-system history and global environmental change*, eds. A. Hornborg, et al. Lanham: Altamira.
- . 2009. Socially sustainable economic de-growth. *Development and Change* 40 (6): 1099–1119.
- . 2011. The EROI of agriculture and the *Vía Campesina*. *Journal of Peasant Studies* 38 (1): 145-160.
- Martínez-Alier, J. and E. Masjuan. 2005. *Neo-Malthusianism in the early 20th century*. Encyclopedia of Ecological Economics. <http://www.ecoeco.org/pdf/Neo-malthusianism.pdf>
- Martínez-Alier, J., G. Munda, and J. O'Neill. 1998. Weak comparability of values as a foundation for ecological economics. *Ecological Economics* 26 (3): 277-286.
- . 1999. Commensurability and compensability in ecological economics. In *Valuation and environment: Principles and practices*, eds. C. Spash and M. O'Connor. Cheltenham: Edward Elgar Publishing.
- Martínez-Alier, J., U. Pacual, F.D. Vivien, and E. Zaccai. 2010. Sustainable de-growth: Mapping the context, criticisms and future prospects of an emerging paradigm. *Ecological Economics* 69 (9): 1741-1747.
- Martínez-Alier, J. and I. Ropke, eds. 2008. *Recent developments in ecological economics*. Cheltenham: Edward Elgar Publishing.
- Martínez-Alier, J. and K. Schlüpmann. 1987. *Ecological economics: Energy, environment and society*. Oxford: Blackwell.
- Martínez-Alier, J., and L. Temper. 2007. Oil and climate change: Voices from the south. *Economic and Political Weekly*, December 15.
- Martínez-Torres, M.E. and P. Rosset. 2010. La *Vía Campesina*: The birth and evolution of a transnational social movement. *Journal of Peasant Studies* 37 (1): 149-175.
- McCully, P. 1996. *Silenced rivers: The ecology and politics of large dams*. London: Zed Books.
- Moore, J.W. 2000. Sugar and the expansion of the early modern world-economy: Commodity frontiers, ecological transformation, and industrialization. *Review: A Journal of the Fernand Braudel Center* 23 (3): 409-433.
- Munda, G. 2008. *Social multi-criteria evaluation for a sustainable economy*. Berlin: Springer.
- Muñoz, P., S. Giljum, and J. Roca. 2009. The raw material equivalents of international trade: Empirical evidence for Latin America. *Journal of Industrial Ecology* 13 (6): 881-897.
- Muradian, R., and J. Martínez-Alier. 2001. Trade and the environment from a “Southern” perspective. *Ecological Economics* 36: 281-297.
- Muradian, R., M. O'Connor, and J. Martínez-Alier. 2002. Embodied pollution in trade: Estimating the environmental load displacement of industrialized countries. *Ecological Economics* 41: 51-67.
- Muradian, R., J. Martínez-Alier, and H. Correa. 2003. International capital vs. local population: The environmental conflict of the Tambogrande mining project, Peru. *Society and Natural Resources* 16 (9): 775 -792.
- Naredo, J.M. and P. Campos. 1980. Los balances energéticos de la agricultura española. *Agricultura y Sociedad* 15: 163-205.
- OCMAL. 2010. Observatorio de conflictos mineros de América Latina. www.conflictosmineros.net
- Odum, H.T. 1971. *Environment, power and society*. New York: John Wiley & Sons.
- Odum, H.T. and E.C. Odum. 2001. *A prosperous way down*. Boulder: Univ. Press of Colorado.
- O'Neill, J. 1993. *Ecology, policy and politics: Human well-being and the natural world*. London: Routledge.
- . 2007. Pluralism and economic institutions. In *Economics in context*, eds. E. Nemeth, S. Schmitz and T. Uebel. Dordrecht: Neurath's.
- Orta-Martínez, M. and M. Finer. 2010. Oil frontiers and indigenous resistance in the Peruvian Amazon. *Ecological Economics* 70 (2): 207-218.
- Orta-Martínez, M., D.A. Napolitano, G.J. MacLennan, C. O'Callaghan, S. Ciborowski, and X. Fabregas. 2008. Impacts of petroleum activities for the Achuar people of the Peruvian Amazon: Summary of existing evidence and research gaps. *Environmental Research Letters* 2 (4).
- Padel, F. and S. Das. 2010. *Out of this earth: East India Adivasis and the aluminium cartel*. New Delhi: Orient Black Swan.
- Paredis, E., G. Goeminne, W. Vanhove, F. Maes, and J. Lambrecht. 2008. *The concept of ecological debt: Its meaning and applicability in international policy*. Gent: Academia Press.

- Parikh, J.K. 1995. Joint implementation and the North and South cooperation for climate change. *International Environmental Affairs* 7 (1): 22-41.
- Peet, R. and M. Watts, eds. 1996. *Liberation ecologies: Environment, development and social movements*. London: Routledge.
- Pellow, D.N. 2007. *Resisting global toxics: Transnational movements for environmental justice*. Cambridge, MA: MIT Press.
- Pellow, D.N. and R. J. Brulle. 2005. *Power, justice, and the environment: A critical appraisal of the environmental justice movement*. Cambridge, MA: Massachusetts Institute of Technology Press.
- Pengue, W. 2005. Transgenic crops in Argentina: The ecological and social debt. *Bulletin of Science, Technology and Society* 25 (4): 314-322.
- Peralta, A.K, ed. 2009. *Ecological debt: The peoples of the South are the creditors. Cases from Ecuador, Mozambique, Brazil and India*. World Council of Churches, Geneva.
- Pereira, Â.G. and S. Funtowicz. 2009. *Science for policy: New challenges, new opportunities*. Oxford: Oxford Univ. Press.
- Perez-Rincon, M.A. 2006. Colombian international trade from a physical perspective: Towards an ecological Prebisch thesis. *Ecological Economics* 59 (4): 519-529.
- . 2007. *Comercio internacional y medio ambiente en Colombia: Una mirada desde la economía ecológica*. Cali: Programa Editorial Universidad del Valle.
- Pimentel, D., et al. 1973. Food production and the energy crisis. *Science* 182 (4111): 443-449.
- Pimentel, D. and M. Pimentel. 1979. *Food, energy and society*. London: Arnold.
- Polanyi, K. 1944. *The great transformation: The political and economic origins of our time*. New York: Rinehart.
- Polanyi, K., C.M. Arensberg, C.M. and H.W. Pearson, eds. 1957. *Trade and market in the early empires*. Glencoe, IL: Free Press.
- Polimeni, J., K. Mayumi, M. Giampietro, and B. Alcott. 2007. *The Jevons' Paradox and the myth of resource efficiency improvements*. London: Earthscan.
- Pulido, L. 1996. *Environmentalism and social justice: Two Chicano struggles in the southwest*. Tucson, AZ: Univ. of Arizona Press.
- Rees, W. and M. Wackernagel. 1994. Ecological footprints and appropriated carrying capacity. In *Investing in natural capital: The ecological economics approach to sustainability*, eds. A.M. Jansson, et al. Washington DC: Island Press.
- Rice, J. 2007. Ecological unequal exchange: International trade and uneven utilization of environmental space in the world system. *Social Forces* 85 (3): 1369-1392.
- Robbins, P. 2004. *Political ecology*. Oxford: Blackwell.
- Roberts, J.T. 2007. Globalizing environmental justice: Trend and imperative. In *Environmental justice and environmentalism: The social justice challenge to the environmental movement*, eds. R. Sandler and P. Pezzullo, 285-308. Cambridge, MA: MIT Press.
- Roberts, J.T. and B.C. Parks. 2007. Fueling injustice: Globalization, ecologically unequal exchange and climate change. *Globalizations* 4 (2): 193-210.
- Robledo, M.L. and W. Marcelo. 1992. *Deuda ecológica*. Santiago: Instituto de Ecología Política.
- Rocheleau, D., et al., eds. 1996. *Feminist political ecology*. London: Routledge.
- Ronsin, F. 1980. *La grève des ventres: Propaganda néo-malthusienne et baisse de la natalité en France, XIXe-XXe siècles*. Paris: Aubier.
- Ropke, I. 2004. The early history of modern ecological economics. *Ecological Economics* 50 (3-4): 293-314.
- Russi, D., A.C. Gonzalez, J.C. Silva-Macher, S. Giljum, J. Martínez-Alier, and M.C. Vallejo. 2008. Material flows in Latin America: A comparative analysis of Chile, Ecuador, Mexico, and Peru, 1980-2000. *Journal of Industrial Ecology* 12 (5-6): 704-720.
- S.A. and South African Civil Society. 2010. Annex two: Statement from SA and African civil society on Eskom's proposed \$3.75 billion World Bank loan. www.groundwork.org.za/.../EskomFinalDocs/CivilSocietyCritique.pdf.
- Sahlins, M. 1968. La première société d'abondance. *Les Temps Modernes* 268: 641-680.
- . 1972. *Stone age economics*. Chicago: Aldine.
- Schlosberg, D. 2007. *Defining environmental justice: Theories, movements, and nature*. Oxford and New York: Oxford Univ. Press.
- Schneider, F., G. Kallis, and J. Martínez-Alier. 2010. Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. *Journal of Cleaner Production* 18 (6): 511-518.
- SEDAC (Socioeconomic Data and Applications Center). n.d. Environmental Sustainability. Human Appropriation of Net Primary Productivity (HANPP). <http://sedac.ciesin.org/es/hanpp.html>.
- Shmelev, S. and B. Rodriguez-Labajos. 2009. Dynamic multidimensional assessment of sustainability at the macro level: The case of Austria. *Ecological Economics* 68 (10): 2560-2573.
- Sieferle, R. 2001. *The subterranean forest: Energy systems and the Industrial Revolution*. Cambridge: White Horse Press.
- Simms, A. 2005. *Ecological debt: The health of the planet and the wealth of nations*. London: Pluto Press.

- Smith, K.R. 1996. The natural debt: North and South. In *Climate change: Developing southern hemisphere perspectives*, eds. T.W. Giambelluc and A. Henderson-Sellers. New York: John Wiley and Sons.
- Spangenberg, J.H., ed. 1995. *Towards sustainable Europe: A study from the Wuppertal Institute for Friends of the Earth Europe*. Bedfordshire: Luton.
- Spash, C., ed. 2009. *Ecological economics: Critical concepts on the environment*. London: Routledge.
- Srinivasan, U.T., S. Carey, E. Hallsteind, P. Higgins, A.C. Kerr, L. Koteen, A.B. Smith, R. Watson, J. Harte, and R.B. Norgaard. 2008. The debt of nations and the distribution of ecological impacts from human activities. *Proceedings of the National Academy of Sciences of the USA* 105: 1773–1786.
- Svampa, M. and A. Antonelli. 2009. *Minería transnacional, narrativas del desarrollo y resistencias sociales*. Buenos Aires: Biblos.
- Urkidi, L., 2010a. A global environmental movement against gold mining: Pascua-Lama in Chile. *Ecological Economics* 70 (2): 219-227.
- . 2010b. The defense of community in the anti-mining movement of Guatemala. *Journal of Agrarian Change* 11 (4): 556-580.
- .Urkidi, L. and M. Walter. 2011. Dimensions of environmental justice in anti-gold mining movements in Latin America. *Geoforum* 42 (6): 683-695.
- Vallejo, M.C. 2010. Biophysical structure of the Ecuadorian economy, foreign trade and policy implications. *Ecological Economics* 70 (2): 159-169.
- Vallejo, M.C., M.A. Perez-Rincon, and J. Martínez-Alier. 2010. Metabolic profile of the Colombian economy from 1970 to 2007. *Journal of Industrial Ecology* 15 (2): 245-267
- Veuthey, S. and J.F. Gerber. 2010. Logging conflicts in southern Cameroon: A feminist ecological economics perspective. *Ecological Economics* 70 (2): 170-177.
- Vitousek, P., P. Ehrlich, A. Ehrlich, and P. Matson. 1986. Human appropriation of the products of photosynthesis. *Bioscience* 34: 368-373.
- Walker, G. 2009. Globalizing environmental justice. *Global Social Policy* 9 (3): 355-382.
- Walter, M. and J. Martínez-Alier. 2010. How to be heard when nobody wants to listen: The Esquel mining conflict. *Canadian Journal of Development Studies* 30 (1-2): 281-303.
- Waring, M. 1988. *If women counted: A new feminist economics*. San Francisco: Harper and Row.
- Warr, B., R. Ayres, N. Eisenmenger, F. Krausmann, and H. Schandl. 2010. Energy use and economic development: A comparative analysis of useful work supply in Austria, Japan, the United Kingdom and the USA during 100 years of economic growth. *Ecological Economics* 69 (10): 1904-1917.
- WRM (World Rainforest Movement). 2008. *Vía Campesina: Food sovereignty as the peoples' alternative to destructive agribusiness*. *Bulletin* 135.
- Zografos, C. and R.B. Howarth, eds. 2008. *Deliberative ecological economics*. New Delhi: Oxford Univ. Press.