

Ecological Economics and the global multi-dimensional crisis

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Introduction

Three years after the onset of the collapse of the US subprime mortgages market in the summer of 2007, which was to detonate the largest economic and financial catastrophe since the 1930s, few will doubt that we are now facing a crisis of great magnitude and complexity. There are, nonetheless, different perceptions as to the nature of the crisis. For some, we are fundamentally dealing with a financial sector liquidity crisis, which has been managed more or less successfully through the huge flow of funding from the public sector to the banks, some of which in fact have been repaying their loans to avoid public controls. The idea is that sooner rather than later the financial system will return to normality, though it may require “more and better regulation.” The nature and scope of such regulation is as yet uncertain, but it is already under fierce criticism from leading bankers, as was seen in Davos early this year.

Other observers refer to a systemic crisis dating from the 1970s, with the end of the regulation model of the “golden age” of modern capitalism (1945-1973, approximately). On this interpretation, there has been a profound transformation, from an economic system based on the productive sectors of the nation state, to one that is dependent on the speculative activities of the large transnational enterprise in the context of a globalised economy, which favours the creation of financial bubbles, on which hangs the system’s profitability. Thus, the economic history of the past forty years has been marked by a succession of crises that culminated in the present debacle, which differs from previous ones in its universality. Clearly then, any solutions that may be proposed will necessarily address the long term, rather than short-run liquidity conditions, derivative markets or banks’ balance sheets.

Finally, an important sector of opinion views the present crisis as multi-dimensional, encompassing economic, political, social, cultural, and especially, environmental dimensions. From this standpoint, one questions not only the economic, social, political and ecological structures that were put in place with the advent of the market economy, but also the very idea of progress as being identical with economic growth (Daly 2009, Meadows 2009).

This article is organised as follows. We first offer a brief review of the various dimensions of the present crisis (economic and financial, jobs, food, energy, politics, social and cultural aspects, and the ecological dimension) in order to underscore its multiple manifestations and universal character; for reasons of space, however, we concentrate on the economic and environmental aspects. We next introduce the basic postulates of ecological economics, which we illustrate through the interaction of the ecological footprint, bio-capacity and the human development index (HDI). This is done on three levels: a) with regard to income levels (high, middle, low); b) by geographical region (Africa, Asia-Pacific, Latin America), and c) for a few key countries. The results of this analysis are combined with certain works on ecological economics, including

selected texts from classical economics, so as to derive a series of recommendation that may, perhaps, bring to reality the slogan that “another world is possible”.

1. The dimensions of the crisis

The enormous amount of attention, analysis and commentary, both written and spoken, that the economic and financial aspects of the present crisis have attracted have obscured the fact that we are living through a multi-dimensional crisis (Bartra 2009; Naradayah 2010). Even though, as said, limitations on the length of an academic paper dictate that we concentrate on the economic, financial, and environmental aspects alone, and not the whole array, one can list a series of elements that reflect other manifestations of the crisis. Thus, a large number of people (well over “the bottom billion” by now), live a crisis of poverty; the poorest lack sufficient food (and dear, at that). Also in evidence is a crisis of energy sufficiency and security; and water scarcity (and misdistribution and ill-use of the resource); deep social, racial and class conflicts abound, co-existing with all sorts of overt and covert repression and the further erosion of human rights; a deficit of democracy and freedom is in evidence even in the most “advanced” nations, whilst in other places there is a steady process of militarisation, as the expression of social discontent becomes ever more a subject for the penal system or worse. Wars are fought in their dozens, their hundreds, and refugees overflow into neighbouring areas that can offer them not a lot, or will offer them nothing at all. And the war against the environment has brought about an ecological crisis that, quite apart from endangering the continuity of the present modes of economic spoliation of the environment, puts the whole planet in peril. In the meantime, the present systemic failure (economic and financial) adds a huge element of uncertainty; if the financial crisis affects mostly the investing (middle and upper) classes, the economic (jobs and mortgages) crisis affects the population at large and, disproportionately, what used to be called “the working class.” As said, in less developed countries such a crisis has dramatically increased the number of people in poverty. Finally, we are witnessing a crisis of conventional economic theory, which is given the lie by the massive intrusion of the unwelcome visitor, reality.

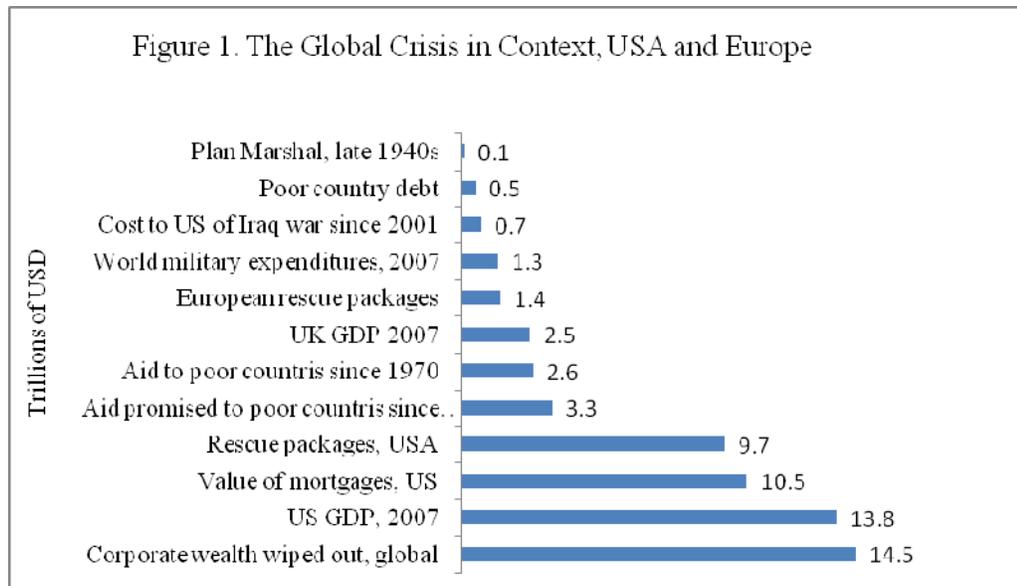
1.1 The economic-financial dimension

In mid-2008, when the subprime mortgage crisis was already one year old, and its effects were being felt both in core and peripheral countries, many analysts insisted that it was “merely” a financial crisis. In countries such as Mexico, authorities boasted of piloting a “dreadnought economy” meant for blue water, and that adversity – rough seas – just added spice to the captain’s enthusiasm. Moreover, “finances were healthy” and, at any rate, the crisis came from outside, so that the country would suffer, at most, a “mild cold.”¹ Clearly these declarations did not reflect the country’s reality, or that of the rest of the world. The banking crisis quickly spread to the “real” sectors of the economy, with strong negative repercussions on the level of aggregate demand, production, and employment. The banking sector breakdown became what Paul Krugman (2009) called the “Great Recession,” (not Depression, owing to enormous public funding interventions) or what *The Economist* (2009a) refers to as the “Great Stabilisation.” It should be mentioned that, from the evidence available, the “recession”

¹ For decades it was said that if the United States sneezed, Mexico suffered pneumonia. In 2008, then Mexican Minister of Finance (a former Deputy Managing Director at the IMF), turned the phrase round: this time the US would have pneumonia, and Mexico only sneeze (El Universal 2008). In 2009, GDP fell by 7%. Some sneeze!

has to do with incomes and jobs, and “stabilisation” means no real growth for years, but it does not mean a decline in banks’ profits, bonuses or golden hand-shakes.²

Thus, at end- 2009 world GDP had fallen about 3%, and the rich countries had lost round 4%,³ while developing countries decelerated to an annual rate of about 4%, but avoided negative numbers. Unemployment in OECD countries rose to 9%, while doubling in the United States, passing the 10% mark. There were, however, important exceptions to this trend: China grew at the rate of 17% during the second quarter of 2009, ending the year with an 8.6% growth rate; India finished at 6.5%. *Per contra*, the Mexican economy had the worst showing in Latin America (and one of the worst in the world), with a 7.1% reduction in GDP, the deepest fall since 1932. *The Economist*, a famous neoliberal publication, found signs of recovery in advanced economies as early as mid-2009 (except for England and Spain – and now Portugal and Greece). Nevertheless, the British newspaper sees nothing automatic or fortuitous in this incipient recovery; it is rather the result of an unprecedented economic activism by governments, who have injected billions of dollars to rescue the banking system, certain key industries, and in some cases, to help their embattled citizens (The Economist 2009a). The amounts in question are put in context in the figure below.⁴



Source: The Economist (2009a)

However, prospects at the global level are far from cheerful. Outside of the two Asian giants (and Brazil), *The Economist* sees mostly disappointment for the global

² In Mexico, for instance, banks’ profits increased by 30% in 2009, at the height of the crisis. Since the four largest banks are foreign-owned (1 US, 3 Spanish), they funneled enormous but unknown amount of US dollars to their troubled main offices. From October 2008 to February 2009, Mexico used 30 billion USD to shore up the currency, which at any rate depreciated by 30% between August 2008 and the present (albeit volatile) quotations.

³ USA, -2.5, Euro area - 3.8, Germany, -4.9, France, -2.1, UK, -4.5, Japan, -5.4 (*The Economist* 2010: 69).

⁴ See www.globalissues.org, data to February 2009.

economy in 2010 and the immediately following years, pointing out that the recovery will be a longer grind than many expect. China, India, and energy producing countries will show high rates of growth.⁵ For the rest, what is forecast is the aforementioned “Great Stabilisation,” by what is meant a rather long period of stagnation. The reason is that the global economy still depends on enormous demand-boosting public expenditure packages (already in danger in many places, owing to very high debt/GDP ratios), as well as on the behaviour of the Chinese economy, the world economy’s locomotive, and that country’s decisions regarding the exchange rate and its willingness to keep financing the USA’s double deficit (where Japan is also a key factor). All this may help to hide the weaknesses of advanced countries, where the recovery of the private economy is still most uncertain; particularly as regards consumption goods (and therefore investment), demand in the advanced world will remain feeble. On the other hand, the ghost of a speculative bubble is beginning to appear in some emerging countries, notably China, where excess liquidity (due to export earnings and a huge public investment programme), combined with an under-valued currency, are obstacles to a significant rise in domestic consumption. Unquestionably, the global economic crisis is quite complex, not least because of its geopolitical implications.

But if we accept that we face a multi-dimensional crisis, what of the underlying causes? It is by now a commonplace to blame subjective failings: corporate greed, financial sector irresponsibility, or errors of judgement and/or complicity on the part of regulatory authorities (particularly the US Federal Reserve Bank). Undoubtedly these were weighty factors but, in our view, such explanations fail to take into account the systemic logic wherein unbounded greed and complicit lack of oversight find their purview. Rather, we maintain that the present crisis is the result of a desperate effort to maintain an unsustainable global growth path based on the hitherto extraordinarily high levels of consumption, mainly in the USA, propped up by the declining but still dominant place of the United States in the global economy. In particular, the axis of global growth in the past few years has been the symbiotic relations between the USA and China, wherein one provides consumption goods and, the other, paper and promises to pay. This relationship (and China’s demand for fuel and raw materials) has promoted global growth, but has depended on a host of unsustainable conditions: the enormous double deficit (trade and fiscal) of the US, the high consumption-based American dream of suburban life in homes with multiple vehicles, the latest gadgets, and an excessively abundant diet, rich in quantity and calories, already accepted throughout most of the world, in large part owing to advertising.⁶

When the crisis came there were many “converts”: We are all Keynesians now, Nixon had proclaimed in the seventies. But such conversions were in large part opportunistic, meant to rescue the financial system from its own errors and irresponsible behaviour. Behind the acceptance of public funds by the banking system there was (and is) the attitude that profits must always be private, but losses need to be socialized. Thus the banks offer a Thatcher-Reagan markets-know-best economy, dressed-up in pseudo-Keynesian clothing. The emperor, nonetheless, is still naked, all over the world.

⁵ Qatar, 24.5%; Turkmenistan, 11%; Azerbaijan, 9.5%; Uzbekistan, 8%, Congo-Brazzaville, 8%; Angola, 7.5%. The BRIC economies are meant to be significant contributors to growth (*The Economist* 2010).

⁶ In December 2009, *The Economist* reported that in the United States 30% of all prepared food was not eaten, but ended up as rubbish.

Keynes, like Marx (and Malthus) gave the lie to Say's Law ("supply creates its own demand"), emphasising the reality of crises of overproduction, such as those observed in advanced economies since the seventies (Glyn et al.1988). In fact, one of the fundamental premises of the *General Theory* was the irrationality of *laissez-faire*, where a lack of effective demand and casino-like investment decisions make state intervention a necessity, and the "socialisation of investment" desirable, a premise never refuted by convincingly neo-liberalism. Such socialisation would of course require a national State ("finance must above all be national"), but the tendency of capital to ever-greater concentration and the global search for speculative gain (in conjunction with other factors), eroded Keynesianism from within.⁷ This was a key factor in the revival of what Joan Robinson called "pre-Keynesian economics after Keynes".⁸

Keynesian uncertainty is one of the main characteristics of the present crisis in economic and financial dimension. Uncertainty is different from the sort of probabilistic risk which the financial system thought it had overcome through mathematical formulae, and is to be found in all aspects of the global economy, from the nature of the eventual recovery (what shape will it have: U, L, W, or even an inverted square root symbol?), its strength, its effects on employment, the role of demand, both internal and external, the behaviour of the BRIC (Brazil, Russia, India and China) countries and of the rich economies, the future of the banking system, the nature of regulation, the enormous levels of debt in most OECD (Greece, Spain, Portugal, and Ireland, but also the USA, the UK, Italy, Japan, etc.) What few have pointed out is that the recovery, regardless of its shape and of whatever regulatory framework is put in place, will not be immune to new speculator bubbles (such as those which, at this the time of this writing, may be taking shape in the Chinese real estate sector, or – before the effects of the Greek debacle – in the world's stock markets), given that there has not been the merest shred of evidence that an effort will be made to the effect that growth will not infringe upon the physical limits of the planet, which brings us to the environmental crisis.

2. The environmental dimension and ecological economics (EE)

Martinez-Alier (2009) has remarked on the paradox that the neoliberal surge, which began in the 1970s and gained strength in the following decade, with the Reagan and Thatcher regimes, was to coincide with the rise of its opposite, the ecological critique of economics. This critique focuses on the assertion that markets do not (and cannot) guarantee that the economy will be compatible with the planet's ecological needs. Markets undervalue future needs, do not take into account anything other than economic transactions (i.e., "externalities"), and do not consider the laws of thermodynamics, which (it would seem) can merrily be ignored through the application of new technologies. One of many problems is that conventional GDP measures neither resource depletion nor environmental pollution; indeed it positively values pollution control and mitigation activities, as they result in increases in production and incomes.

Ecological economics (EE), "the science and management of sustainability" (Costanza 1991) differs from conventional economics (CE) in several key aspects. Its

⁷ In the 1970s it subsisted as Hicks's Neoclassical Synthesis, quite apart from the Cambridge School; it morphed into neo-liberalism once the basic monetarist tenets were accepted, and were enshrined as the Washington Consensus.

⁸ Amongst these factors were: 1) the fall in the share of profits in national income, noted since the early 1970s, 2) the fall in the rate of growth of productivity, 3) large increases in the price of oil and raw materials, 4) the decline of the Fordist model, and 5) the simultaneous problem of inflation and stagnation (Glyn et al. 1988).

Weltanschauung is dynamic, systemic and evolutionary (compared with the static, mechanical, and atomistic character of CE), and it considers a much wider spatial and temporal framework. Whilst CE has in mind only the welfare of the human species, EE takes into account the ecosystem, of course including humans within it. Where CE has the macro objective of promoting economic growth, EE seeks the sustainability of the economy-ecology system, and where – at the micro level – CE looks for the maximisation of profits and utility, EE posits the need to establish a steady state, a decrease in global population and resource use, and a significant redistribution of global income and wealth (Costanza 1991: 3-7). From an EE perspective, sustained, long-term growth in production and consumption would be feasible if and only if one or more of the following conditions could be met (Daly 2009):

- If the economy were not a subsystem within a finite (non-growing) system,
- If the economy could grow in such a way as to not involve the physical system, or
- If the laws of thermodynamics were repealed.

With regard to the first condition, most neoclassical economists think of the economy as the whole and of the environment as a mere provider of energy and raw materials, or a sink that absorbs wastes. Were the environmental functions be in danger of falling short of the economy's needs, the market would provide the necessary solution, be it through the price mechanism, or through technological change. In this way, there are no limits to economic expansion, since the sources of raw materials and energy are (or can be made to be) infinite by the application of the market mechanism.

The second condition is much relied on owing to the fact that many economies, rich and middling, have been orientated towards the services sector and, lately, towards the “knowledge economy.” Both phenomena result in economic systems that – it is thought – will in future require much smaller amounts of energy and resources, and will pollute less. The problem is that the economy, like nature, operates at different trophic levels, and grows in a holistic way. Manufacturing and services require for their sustenance the pre-existence of an adequate biotic, material, and energy resource base; and no society can orientate itself wholly to the information economy if its subsistence needs have not been met. In developed economies, the transition to services has depended on the intensification of agricultural production and the extraction of greater amounts of all sorts of minerals, both at home and abroad. Economic development, in the sense of delivering a higher level of welfare and a better quality of life from the use of a given quantity of resources, is clearly desirable; but economic growth, that is, the increase in the scale of production and consumption in physical terms through ever-greater amounts of resource use and waste generation is both objectionable and unsustainable.

In the third place, if resources could be made out of nothing, there would be no limits to growth (other than the waste and pollution-absorptive capacity of the Earth). But the first law of thermodynamics insists that neither energy nor matter can be created or destroyed, just transformed; the second law (the entropy law) implies existence of irreversible processes (from high to low entropy): in a manner similar to human ageing, which reduces an individual's vitality, entropy – ever increasing – reduces the vitality of the universe itself (Guillen 1995, Atkins 1996).

The manifestations of the ecological crisis are many. Climate change is clearly one of the most attention-gathering aspects. In the Earth Summit of Río de Janeiro (1992),

the United Nations established the Framework Convention on Climate Change (UNFCCC), whose brief is to “stabilize the concentrations of greenhouse effect gases at a level that could avoid a dangerous anthropogenic interference with the climate system.” This was followed by the Kyoto Protocol (1997, in effect from 2005 - 2012), the objective of which is to put the Rio accord into operation. Nonetheless, the Intergovernmental Panel for Climate Change (IPCC), whose mission is to establish a scientific consensus over climate change (and what should be done about it), reports that over the last decades the frequency and intensity of heat waves, droughts, floods, and hurricanes have increased. The IPCC has concluded that these trends “probably or very probably” were caused by human activity, and will likely continue. By the end of the century, global temperatures could increase between 1.1 and 6.4 degrees Celsius (2.8 degrees being the temperature rise with the greatest probability). It should be noted that CO₂ emissions are 30% larger than 18 years ago, and that the concentration of that gas is now over 430 parts per million, compared with 280 ppm before the industrial revolution:⁹ Were this trend to continue, there would be a 50% risk that average temperature would increase by 5 degrees. If we consider that current world temperature is only 5 degrees higher than in the last Ice Age, such an increase could lead to a rapid melting of the ice caps, drought, the collapse of agriculture in many areas (especially in poorer countries), the flooding of coastal areas and the disappearance on many small island states, and massive migration. Considering those data, *The Economist* (2009b: 3-4) concludes that “in reality, no one knows (what the effects will be), and no one wants to know”.

Global warming is only one of the manifestations of the environmental crisis. Another, of similar importance, is the ever-growing appropriation of the resources of the biosphere; undoubtedly a necessary (though not sufficient) condition for sustainability is that biological resources not be consumed at a rate greater than regeneration makes possible.¹⁰ A way of measuring this condition has been put forward by proponents (see www.footprintnetwork.org) of the “ecological footprint” (EF), which is meant to measure the amount of (biologically productive) land and water that a person, a town, a country, a region or, indeed, the planet, use to produce the goods and services that they consume, and to absorb the wastes that they generate, given the technology and management methods available. Typically the EF is measured in “global hectares” as that unit of measurement being given by the amount of biologically productive space which, on average, is used globally. Another way of measuring the EF, with perhaps more dramatic effect, is to compute the number of planets that would be needed to sustain a given level of production and consumption (Wackernagel et al. 2007). For each region or locality, the EF includes the resources incorporated in the goods and services consumed by its residents; export goods are added to the importing country. Concretely the EF considers the area that is required by every country in the world with a population over one million, for the following ends:¹¹

⁹ In per capita terms, the emissions data are as follows: Australia (25 ton.), US (23), Japan (10), E U 27 (10), China (5), Brazil (5), and India (2). In absolute terms, China recently surpassed the US (7.3 and 7.1 million tons of CO₂ equivalents, respectively). Australia in third place; none of these countries signed the Kyoto Protocol.

¹⁰ Space limitations do not allow the inclusion of many important issues, such as the loss of biodiversity, the depletion of non-renewable resources, the viability of renewable resources, etc.

¹¹ Resource and waste flows that cannot be measured are excluded, so that the EF underestimates total impacts. The EF should be complemented with an analysis of energy flows and intensities, so as to give a more complete picture of what is going on.

- Agriculture and related activities
- Timber, pulp, and paper production
- Use of forests to absorb the CO₂ generated by energy consumption
- Urbanisation, factories, office buildings
- Fisheries
- Waste disposal

In addition to dealing with the effects of green-house gasses, the 1992 Rio Earth Summit sought to give operational meaning to the concept of sustainable development (SD), which had been agreed on by the Brundtland Commission in 1987. Sustainable development represents a commitment to advance human welfare, with the restriction that development must take place within the physical limits of the Earth. So the EF can be combined with the United Nations' Human Development Index (HDI), so as to enable us to measure welfare gains and biosphere effects in combination (Moran, Wackernagel, Kitzes, Goldfinger & Boutaud 2008).

The HDI is a measurement and analytical tool now widely available, having been developed by the United Nations in the early 1990s to compare welfare levels at the global scale (UNDP, various dates). As development indicators, the Index uses four sub-indices: life expectancy at birth, adult alphabetisation rates, school attendance, and per capita income at PPP.¹² An analysis of sustainability grounded on the use of the HDI and the EF underscores the planet's limited carrying capacity. This powerful restriction is not evident (for example) in the United Nations' Millennium Objectives (UNDP 1990), which were designed as an attempt significantly to raise the quality of life in poor countries; neither is it present in neo-classical accounts of economy-environment relations (Lomborg 2001). Both think of natural resources as (somehow) unlimited, and both offer a version of "weak sustainability," *i.e.*, the belief that human-made capital and technology are (at least nearly) perfect substitutes for the environmental services that nature provides. Figure 2 shows the Ecological Footprint and the Human Development Index by region and income level, as well as for a few key economies (World Bank 2003). The relevant data are shown in table 1.

World	Population (millions)	Ecological footprint (Global has. per person)	Bio-capacity (global has./person)	Deficit or Surplus (Global has/person)	EF/world bio-capacity ratio	HDI
World	6,301.5	2.3	1.8	-0.5	1.28	0.741
High income countries	955.6	6.4	3.3	-3.1	3.56	0.910

¹² An HDI level of 1.0 implies that the maximum level has been reached on all four indicators; a zero value signifies a minimum. An HDI value of 0.8 is the borderline between medium and high development; below 0.4, development is "very low."

Middle income countries	3,011.7	1.9	2.1	0.2	1.06	0.774
Low income countries	2,303.4	0.8	0.7	-0.1	0.44	0.593
Africa	846.8	1.1	1.3	0.2	0.61	0.650
Latin America	535.2	2.0	5.4	-3.4	1.11	0.797
Asia Pacific	3,489.4	1.3	0.8	-0.5	0.72	0.768
United States	294.0	9.6	4.7	-4.9	5.33	0.944
Mexico	103.5	2.6	1.7	-0.9	1.44	0.814
Norway	4.5	5.8	6.8	1.0	3.22	0.963
Australia	19.7	6.6	12.8	5.9	3.67	0.955
Canada	31.5	7.6	14.5	6.9	4.22	0.949
Brazil	179.5	2.1	9.9	7.8	1.17	0.792
Rusia	143.2	4.4	6.9	2.5	2.44	0.795
Russia	1,065.5	0.8	0.4	-0.4	0.44	0.602
China	1,311.7	1.6	0.8	-0.8	0.89	0.755

Source: World Bank (2003); Global Footprint Network (2006).

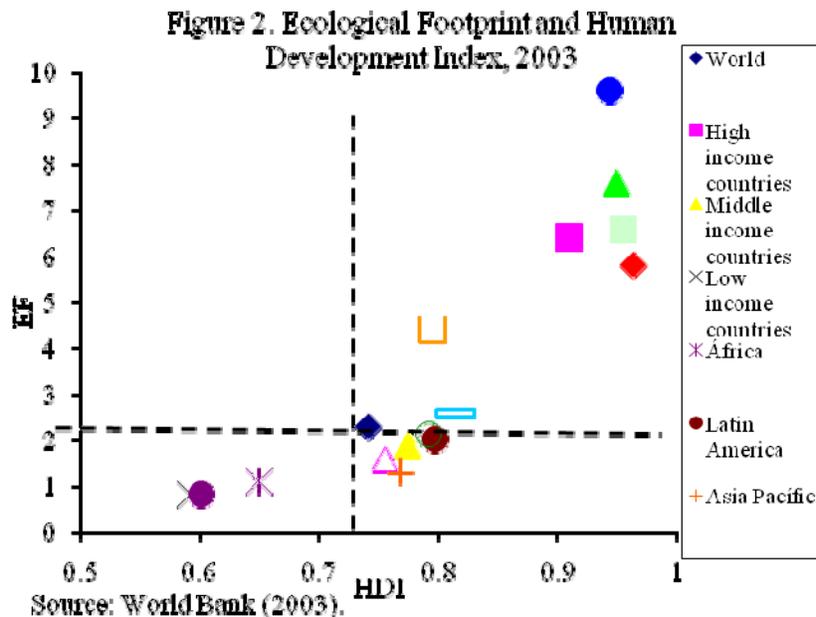
As shown on the table, in 2003 (year which is used in version 6 of the EF, adopted in this article) world population was 6,301.5; and the global EF was 2.3 global hectares (has.)/per person. This figure, compared with global bio-capacity of 1.8 has/person, resulted in a global deficit of 0.5 has/person, whilst world HDI was estimated at 0.741. High income countries, with a population of 957 million (15.2% of the world total) and showing an HDI value of 0.910, registered an EF of 6.4 global has./person which, compared to their average bio-capacity (3.3 has.), resulted in a large deficit: (3.1) has/person. Medium-sized economies held 3,011.7 million inhabitants (47.8% of the total) and, with an EF of 1.9 has/person, registered a surplus of 0.2 has/person. Low income countries, in addition to enduring a low HDI (0.593), showed a bio-capacity deficit of 0.1 has/person, as their available productive territory measured only 0.8 has/person. Thus, and as a first approximation, being of middling size favours a given country's sustainability.

Looking at the situation from a regional stand-point, Africa, with 846.8 million people, had an EF of 1.1 has/person, for a surplus of 0.2, but its HDI was only 0.650. Latin America and the Caribbean, with population of 535.2 million (8.5% of the total), registered an important bio-capacity surplus, of 3.4 has/person. In the Asia Pacific region, which held a population of 3,489.4 million, there was a deficit of 0.5 has/person, the result of both population size and high levels/rates of economic growth (the region includes Australia, China, Japan, Southeast Asia and Korea, each of which has a strong impact on the EF, albeit for different reasons).

Table 1 also provides with information on some individual economies. The United States, the world's largest single economy, had a population of 294 million, with an EF of 9.6 global has/person (a figure exceeded only by the Emirates, with 11.9), for a deficit of (4.9) has./person; meanwhile, the US was ranked tenth in terms of human development, with a HDI of 0.944. Immediately to the south, Mexico (population: 103

million), showed an EF of 2.6 and deficit of 0.9 has./per person; its HDI was 0.814. Some of the countries with the highest levels of the HDI (and with more than a million inhabitants), like Norway, and Canada, showed important surpluses in the EF to bio-capacity relation: 1.0, 5.9, y 6.0 has/person, respectively. This is also the case for two of the four members of the BRIC group, Brazil and Russia, which had surpluses of 7.8 y 2.5 has/person, albeit with HDI values of 0.792 and 0.795, respectively. India, with a population of 1,005.5 million (15.6% of world total), registered a deficit of 0.4 has/person (IDH, 0.602), whilst China, with 20.8% world population (1,311.7 million) had a deficit of 0.8 has/person, and its HDI was 0.755.

Several conclusions may be derived from these observations: 1) contrary to what many believe, sustainable development is not an intangible or immeasurable concept. Although we are doubtlessly dealing with approximations that are constantly being improved upon, existing indicators allow us to measure the minimum conditions required by SD; 2) in general, it is clear to us that the challenge of sustainability as measured by those necessary but no sufficient minimum conditions is not being met; rather, 3) regional and national trends point to even greater unsustainability. In particular, many rich countries have become quite distanced from sustainability, especially the USA: if all countries in the world had the same production structures and consumption patterns as the US, we would need 5 planets to support them; seen in another way the US, with only 4% of the world's population, uses 20% of the total global hectares available (Table 2, statistical annex). Brazil, Russia, Australia y Norway, which show surpluses in the EF to bio-capacity relation at the national level, show quite different results when we compare the country EF with the world's bio-capacity average. Thus, if we were to replicate the Brazilian production structure and consumption patterns globally, we would demand 2.6 global hectares/person: that is to say, the world would use about 17% more territory per person than is the case now. If Russia were the standard, the amount of productive land required would rise to 4.3 global hectares per inhabitant (about two planets). Australia requires 3.67 planets; Norway, 3.22; Canada, 4.22. But if China (with enormous population and extraordinary rate of economic growth) were the unit of measure, we would require only 0.89 global has/person (less than one planet): in the case of India, the figure would be less than half.



Another aspect of the analysis emerges when we combine the data for the EF and the HDI, as is done in Figure 2 (and in table 2, in the statistical annex), where we use as reference points the global EF of 2.3 has/person, and the HDI value of 0.8, the borderline between medium and high income countries. Figure 2 is divided into quadrants, such that the NW quadrant is empty, as it would include cases of economies with low levels of development and high values for the EF. The NE quadrant contains all high income, high HDI countries, but also others with intensive use of resources but relatively low HDI levels (such as Russia). As mentioned before, this group of countries shares the characteristic of exerting very strong, though differentiated, pressures on the biosphere. The SW quadrant includes countries with low impact on the ecology but low levels of development, whilst the NE quadrants contains middle income countries with medium HDI values, whose EF is equal to the world average or below it. Asia Pacific, Latin America, Brazil, Mexico and China are to be found here. This revision of the data neatly exposes another main conclusion of this paper: if we accept the metric proposed, which would imply embracing sustainable development, then it would follow that we also need to eschew very high levels of consumption, adopting instead what one could call “republican moderation”.

Thus, our general conclusion is that SD requires a strong push on the developmental side, to rid countries of poverty, but that this needs to be combined with equally strong efforts on behalf of the environment, together with a significant reduction of ecological pressure rich countries exert. The problem is how to achieve this. On the one hand, it is hard – if not impossible – to believe that the populations of the rich world would agree to accept lower HDI levels, below the 0.9 or more than they are used to. This would probably be true even in the case of a global state of emergency, which we have already reached but of which there is there is no real awareness, or even widespread interest (The Economist 2009c, 2009d). On the other hand, it is neither possible nor desirable to forestall the growth of the BRIC countries (on which in any event any kind of world recovery would seem to depend), nor is it either just or desirable to tolerate the poverty – even misery – of two billion people or more.

Ecological economics proposes that we leave behind the logic of the “growth economy,” and adopt a development strategy based on the steady-state economy. This concept is associated mainly with the work of Herman Daly, but has its roots in classical economics, especially the chapter on the stationary state which JS Mill included in his *Principles of Political Economy* (1848). Mill posits the stationary state as an alternative to the “progressive state” of Smith y McCulloch, which depends “on the progress of capital, population, and the productive arts,” a state of events that he (following Ricardo, but for different reasons) supposes to be of limited duration), for industrialisation and its world vision, although constituting a necessary stage in order to improve living standards, do not amount to social perfection. Mill puts it as follows:

(The way) to prosperity should be available to all, without favouritism or partiality. But the best state for human nature is that in which, where no one is poor, no one wishes to be richer, nor does anyone have reason to fear that his station be lowered, nor do they strive to be richer...I do not know of a reason why it should be a matter of congratulation that persons who are already richer than anyone need to be, should have doubled their means of consuming things ... It is only in the backward countries of the world that increased production is still an important subject: in those most advanced, what is economically needed is a better distribution...if the earth must lose that great pleasantness which it owes to things that growing population and wealth would

extricate from it...I sincerely hope, for the sake of posterity, that they will be content to be stationary, long before necessity compels them to it. (Mill 1848).

To that effect, Mill proposes:

A better distribution of property, through the combined effect of greater individual prudence and frugality, and a system of law that favours the equality of fortunes, insofar as that may be consistent with the just claims of the individual to the fruits of his industry. We can suppose ... a limitation on the amount that any person could acquire, by gift or inheritance, the amount necessary to have a moderate Independence (Mill 1848).

The result would be that:

Under this twofold influence, society would exhibit these leading features: a well-pail and affluent body of labourers; no enormous fortunes, except where earned and accumulated within a single lifetime; but a much larger body of persons, not only exempt from the coarser toils, but with sufficient leisure, both physical and mental, to cultivate the graces of life...This condition of society, so greatly preferable to the present, is not only perfectly compatible with the stationary state, but, it would seem, more naturally allied with it than with any other. (Mill 1848).

Thus:

Even the Industrial Arts could be successfully cultivated, with this sole difference, that. Instead of serving no purpose but the increase of wealth, industrial improvements would produce their legitimate effects that of abridging labour. Hitherto, it is questionable if all mechanical discoveries yet made have lightened the day's daily toil of any human being. They have enabled a greater population to live the same life of drudgery and imprisonment. They have enabled increased the comforts of the middle classes. But they have not yet begun to effect those great changes in human destiny, which is in their nature and in their futurity to accomplish. Only when, in addition to just institutions, the increase in mankind shall be under the deliberate guidance of judicious foresight, can the conquests made from the powers of nature by the intellect and power of scientific discovers, become the common property of the species, and the means of improving and elevating the universal lot. (Mill 1848).

At a distance of more than a century and a half, the timeliness and relevance of Mill still surprise: more than that, his work forms the basis of the concept of the “steady - state economy” of ecological economics. To understand this concept one needs to be clear on the definition of economic growth (“the progress of capital, population, and the industrial arts”). By economic growth one means a prolonged and sustained increase in the production and consumption of goods and services, nowadays generally measured by increases in the gross domestic product (GDP), or by population increase multiplied by per capita income. Growth requires significant increases in the use of energy and materials, and a growing ecological footprint. The concept of economic growth differs from that of economic development, which speaks to the qualitative rather than the quantitative: whilst size matters, quality matters more. As Daly (2009) reminds us, the economy has two possible trends. It either grows or stagnates. Otherwise, we are dealing with a steady-state economy, with zero growth. For a limited time, this type of economy can have a growing population with decreasing income per head, or vice versa, but neither of these situations is sustainable in the long run. Therefore, a steady-state economy implies the long-run constancy of in population, the level of activity, the use of energy and materials (*throughput*), and waste generation. Development will of course still be possible, by means of income distribution, or in response to new technologies or changes in the patterns of consumption.

Thus, Mill's vision is not far from today's ecological economics; rather, the latter is the former's heir. In a recent ten-point statement, Daly insists that neither continuous

growth (because of its depredation of nature, peoples, and cultures) nor the “Great Stabilisation” (because of the fall in living standards and the impoverishment that it signifies) can be sustainable. That leaves the steady state as the only alternative. Significantly, Daly adds that “the level of physical wealth that the biosphere can support may well be much smaller than its present level: the fact that growth has produced so many bubbles suggests that this is the case” (Daly 2009, Czech and Tietenberg 2007). To opponents of the steady-state economy, Daly answers thusly:

If we have been unable to solve our problems through growth, ... why do neoclassical economists refuse to accept common sense and reconsider the ideas of the classical economists? I think that the answer is sadly clear. Without growth, the only way to alleviate poverty is through sharing. But redistribution is anathema. Without the growth that brings about the desired demographic transition, the only way to cure over-population is by controlling its growth. A second anathema. Without growth, the only way to increase the funds available to invest in repairing the environment is by reducing consumption. Anathema number three. And, without growth, how to build arsenals to protect democracy (and the remaining oil reserves? Without growth we would need to find another god to adore, and build a new tower of Babel, with obsfusatory terms such as “sub-prime mortgages,” “derivatives,” “securitised obligations,” “swap agreements,” and the so-called “*dead cat bounce*” (“if you drop it from enough height from the tower of Babel, even a dead cat will bounce high enough to make us a profit.”)

Do not let us do that. Do let us ignore the anathemas and think about policies that can bring us to the steady state. This is the message.

3. Final Comments

The manifestations of the crisis that we endure are many, although the economic and financial components have been the most remarked upon. We thoroughly recognise the enormous cost of the economic crisis, and its on-going consequences in terms of unemployment, increased poverty, and the traditional transfer of liabilities from the elites to the public at large. That in itself lies at the very centre of the problem. But it in our opinion, ignoring the holistic nature of the crisis has repeatedly fostered its recurrence. In particular, the over-exploitation of natural and environmental resources and the inequality of wealth and income distribution are factors that have not been properly examined, even though the social and environmental effects are quite visible. The economic growth paradigm, dependent as it is on the intensive use of resources, has been combined with a high degree of speculation, such that the behaviour and stability of the economy depends less on its real component, than on its financial counterpart: for the last 30 years or so, the tail has wagged the dog. Thus, the link between the cult of growth and the economic, financial and environmental crisis is understandable. The implementation of the policies proposed by ecological economics, firmly grounded on the classics – the steady state economy – is not hindered by strictly economic or technological reasons, but rather by political problems (The Economist 2009b: 6-8) or, as Meadows (2009) has declared, it is a problem of attitude, but also one of private interests and power relations.

As shown by our joint analysis of the ecological footprint and the human development index, in this paper we propose that, even though the current economic crisis may eventually be overcome, the ecological crisis will require a series of profound transformations in several spheres. Amongst these one should underscore those related to the scale of production and consumption, a significant redistribution of wealth and

income, and an important reduction in world population, among other things. If these changes do not take place, and the present growth model is allowed to continue (both in its speculative and real aspects), without respecting the physical limits of the planet, economic and financial crises will undoubtedly continue to appear, perhaps with even greater force, as signals of the ever-growing danger of an environmental catastrophe.

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