TIME TO ACT: UNDERSTANDING EARTH SYSTEM GOVERNANCE AND THE CRISIS OF MODERNITY

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ABSTRACT

Despite the frequent calls for action, decisions and agreements made at successive international conferences, the levels of socio-environmental unsustainability have increased considerably over the past decades. The changes in the global environment have reached a point at which they seriously threaten human security and the ecological and social pillars of modern civilization. In short, the globalization of the environmental crisis compels us to acknowledge that the history of humankind is in fact inexorably entwined with the history of its relationships with nature. We, therefore, analyzed the human dimensions associated with global environmental change in order to propose a new paradigm for the current society. We also demonstrate the main factors described by Jared Diamond (2006) that the past societies used to overcome the negative tendencies and threats that had put these communities' very survival at risk. After this, we associate them with the new ethical-political challenges that the financial crisis in the first decade of the 21st century has brought to the international agenda and its relationship with the institutions' inability to act regarding global environmental change.

KEY WORDS

global environmental change, modernity, human dimensions, new paradigm, financial crisis

SERIES FOREWORD

This working paper was written as part of the Earth System Governance Project, a ten-year research initiative launched in October 2008 by the International Human Dimensions Programme on Global Environmental Change under the overall auspices of the Earth System Science Partnership.

Earth system governance is defined in this Project as the system of formal and informal rules, rule-making mechanisms and actor-networks at all levels of human society (from local to global) that are set up to prevent, mitigate and adapt to environmental change and earth system transformation. The science plan of the Project focusses on five analytical problems: the problems of the overall *architecture* of earth system governance, of *agency* of and beyond the state, of the *adaptiveness* of governance mechanisms and processes, of their *accountability* and legitimacy, and of modes of *allocation and access* in earth system governance. In addition, the Project emphasizes four crosscutting research themes that are crucial for the study of each analytical problem: the role of power, of knowledge, of norms, and of scale. Finally, the Earth System Governance Project advances the integrated analysis of case study domains in which researchers combine analysis of the analytical problems and crosscutting themes. The main case study domains are at present the global water system, global food systems, the global climate system, and the global economic system.

The Earth System Governance Project is designed as the nodal point within the global change research programmes to guide, organize and evaluate research on these questions. The Project is implemented through a Global Alliance of Earth System Governance Research Centres, a network of lead faculty members and research fellows, a global conference series, and various research projects undertaken at multiple levels (see www.earthsystemgovernance.org).

Earth System Governance Working Papers are peer-reviewed online publications that broadly address questions raised by the Project's Science and Implementation Plan. The series is open to all colleagues who seek to contribute to this research agenda, and submissions are welcome at any time at workingpapers@earthsystemgovernance.org. While most members of our network publish their research in the English language, we accept also submissions in other major languages. The Earth System Governance Project does not assume the copyright for working papers, and we expect that most working papers will eventually find their way into scientific journals or become chapters in edited volumes compiled by the Project and its members.

Comments on this working paper, as well as on the other activities of the Earth System Governance Project, are highly welcome. We believe that understanding earth system governance is only feasible through joint effort of colleagues from various backgrounds and from all regions of the world. We look forward to your response.

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1. INTRODUCTION

The environment is the origin and destiny of all that characterizes us and makes us human. Indeed, it is from the natural environment that we incorporate all the materials, products and environmental services that allow for the development of necessary activities associated with the material, aesthetic and spiritual wellbeing of human beings. It is also indispensable to maintaining life on the planet. It is in this same environment that we store the byproducts, waste and surpluses of our activities.

Notwithstanding this reality, for a long time changes that have taken place on our planet followed the vectors, tempo and characteristics of natural cycles. However, this has changed dramatically since the Agricultural and Industrial Revolutions. There is already a scientific consensus that current global environmental changes – which are setting off alarm bells across the planet – are due, in a great extent, to human activities. This human intervention in nature started since the Ecological Transition more than 9,000 years ago with benefits and failures in a social, ecological and political perspective.

Considering the full impact of global environmental change on the international agenda and the changes in a more complex society, we provide a new paradigm for a better understanding of the current modernity. Moreover, we demonstrate how brilliant Jared Diamond (2006) was when he stated that the societies that had disappeared in the past, among other factors, were not able to (1) anticipate, (2) perceive, (3) communicate and (4) act in order to face the negative tendencies and overcome the threats that had put these communities' very survival at risk. Taking this literature into account, we demonstrate that the main problem of the global environmental change is the inability of the institutions to act. We do this by using the case of the financial crisis that assailed the world in mid 2008.

2. ECOLOGICAL TRANSITION: THE HUMAN DIMENSIONS OF GLOBAL ENVIRONMENTAL CHANGE

The history of the relationship between human beings and nature indicates that gradually and inexorably humans have become independent from the natural resource base as a determining factor for their wellbeing. Humans in effect estranged from nature largely due to the incorporation of different environments for commercial reasons, conquests or the occupation and settlement of new territories and environments. This evolution, which has been initially and for a long time beneficial for humankind – without it civilization as we know it would not exist – led to undermining the eco-political (i.e. political-institutional) foundations of Western civilization. In other words, contemporary global environmental changes, which have

led to an unprecedented crisis in development in the history of humankind, have been unfolding over a period of many centuries. They began more than 9,000 years ago with the domestication of animals and cultivation of crops, giving rise to what John Bennett (1976) appropriately characterized as the ***Ecological Transition***.

In *technological* terms, the Ecological Transition involves the tendency to use ever-increasing amounts of energy, with a concomitant rise in entropy. This happens to the extent that any new technology introduced today uses more energy than at any earlier stage of development. This is just to meet the ecological necessities of human needs, which has not been modified in terms of their basic dimensions since the period before the Agricultural Revolution. *Ecologically*, the Ecological Transition is characterized by the incorporation of Nature into Culture, as well as a rupture in the relationship between local subsistence and the environment. This does not just mean an accumulation of goods increasingly less related to biological survival, but also the possibility of attaining ecological sufficiency by means of incorporating natural environments that are increasingly further apart from the local community. *Sociologically*, the transition represents the increase and greater complexity of social organization and the existing communication networks to sustain the expansion of human occupation of the planet. In terms of its *philosophical* dimensions, it presupposes the substitution of behavior such as contemplation, respect and even the almost religious worship of nature, by the simple instrumental and material use of natural resources.. Finally, the transition manifests itself *politically* as well, to the extent that in order to attain a given level of consumption, and therefore production, societies are compelled to make increasingly intensive use of political power to adjust to the ever-expanding requirements dictated by new technologies and social organization. Once a new level of development has been attained, adjustments to the existing levels of political power become necessary and the entire cycle restarts.

Therefore it is important to emphasize the most relevant characteristics of the transition in order to get a glimpse of the distant origins of the current crisis. First, the emergence of the Agricultural Revolution, by defining the premises of what can be considered the first "territorial pattern" of occupation of the planet in history, enabled the population to depend increasingly less on its immediate surroundings for survival. This led to the development of patterns for occupying the planet that favored and benefited from the "economies of scale" associated with human groups, first in settlements, then in villages and cities, to the current metropolises and metropolitan regions. This is a clear indication that the "Ecological Transition" has run its course.

After all, the same pattern of incorporation of nature that gave rise to more permanent human settlements and considerably increased the population's wellbeing has now hit many limits, with the advent of unsustainable metropolises from an energetic, ecological, environmental and social perspective. On the other hand populations could adopt standards of consumption increasingly removed from their biological necessities of survival after and due to the Agricultural Revolution.

Finally, as a result of the two preceding dynamics, it has been possible for society as a whole to become progressively more independent from its immediate natural environment, allowing it to expand and consolidate new consumer trends that are

gradually and increasingly superfluous. Although these stages of development were increasingly unsustainable in ecological and environmental terms, they guaranteed their sustainability in the short-to-medium terms largely thanks to the incorporation of "new" environments taken over through warfare, commerce and technology. Another clear indication of the end of the *Ecological Transition* is the fact that there are no longer enough "virgin" territories to sustain an unlimited expansion of the population in the foreseeable future. Concomitantly, every new expansion involves modifying the environment, which carries a technological, energetic, ecological and environmental cost that outweighs the benefits for society to an extent that the almost tangible physical limits become more apparent.

As if the results of the processes analyzed above were not enough, and centered exclusively on the long-term consequences of the Agricultural Revolution, humankind continued on its path of increasingly intensive, and now globalized, anthropogenic aggression. The most important qualitative leap was undoubtedly the Industrial Revolution in the 19th century, together with the Energy and Information Technology Revolutions of the 20th century. Two aspects are worthy of special mention in these more recent stages of the *Ecological Transition*.

Firstly, it is important to underline the ***speed*** and ***magnitude*** of transformations. If several hundred centuries unfolded between the Agricultural and Industrial Revolutions, which inverted the proportion between natural and modified products (representing 80 and 20 percent, respectively, to the inverse nowadays), there was only a hundred year distance between the Industrial Revolution and the revolutions sparked off by the appearance of fossil fuels and automation. However, this is enough time for them to become the predominant inputs of energy and knowledge. Among the various consequences of these two processes, it should be remembered that the recovery time of natural systems is exponentially slower than the pace of the previously mentioned transformations that, among other things, led to the global environmental crisis of our time.

Secondly, the ***direction*** and ***contents*** of the changes have been equally revolutionary, as shown by the technological and ecological developments during the transition. The technological advances during this "great cycle", which began nine thousand years ago, indicate that despite the increasing sophistication of successive human civilizations we require more energy. This is produced with rising levels of inefficiency (i.e. entropy). Paradoxically, the solution to overcome current global environmental change and ensuring the survival of the human race is to recognize the ecological component inherent in the transition. In strictly *ecological* terms, the agricultural and grazing practices related to society's territorial base, by promoting the cultivation and rearing of specific flora and fauna, defies the fundamental laws of nature such as those of diversity, resilience, carrying capacity and many others. However, despite the current environmental consequences, no one is politically inclined to suggest that the processes initiated during the agricultural revolution should be reversed. As already indicated, if it is not even possible to imagine a civilized society if this evolution in terms of occupation of the planet had not taken place. Now it is the planet itself that, as Gaia, adopts the role of an actor demanding that society fully recognizes the mess it has gotten itself into. As strongly warned by Margaret Mead,

> "We can recognize that the ways of our forebears are ways to which we can never return, but that the more we can recapture of this earlier wisdom, in a form we can understand, the better we can understand what is happening today, when a generation almost innocent of a sense of history has to learn how to cope with an unknown future, one for which they were not reared." (MEAD, 1970, P. 70).

The described evolution is crucial for the acknowledgement of the human dimensions of the global environmental changes. If it is true that these changes do not represent anything new from the ecological standpoint for the planet – whether related to climate change or desertification – never before have they taken place in such a short period of time, whether provoked or, at the least, exacerbated by human actions. It is also true that the human pillars of sustainable development on the planet increasingly outweigh many natural cycles. After all, what determines the quality of life of a population, and consequently its sustainability, is not solely its natural surroundings, but rather the *web of relationships* that configure a given standard of territorial occupation. This determines in return the way in which human beings incorporate nature into society. Making use of an image originally suggested by Otis Duncan (1961), even for purposes other than those in this analysis, the sustainability of a community depends on the interrelationships between:

Population (size, composition and demographic dynamics);

Social **O**rganization (production patterns, conflict resolution and social stratification) and aspiration (consumer patterns, values, culture);

Environment (natural and built-up environments, natural resources and environmental services);

Technology (innovation, technical progress, energy use);

The **POET** equation elaborated by Guimarães (1991A) allows us to understand, for example, why a country such as Japan should be included in the ranking of the poorest countries on the planet from a strictly ecological and demographic standpoint. It is densely populated for its size and has very little in terms of natural resources and traditional energy sources. However, Japan is near the top of the pyramid of developed countries and has a high quality of life, mainly to its social fabric and technological organization. The pattern of consumption in Japan accounts for, and even determines, the existence of production patterns based on the social aspirations of its population. It also adapts to (and indeed surpasses) the country's environmental and territorial limitations. It is the perfect convergence between production and consumption that ensures Japan's sustainability, even though not so autonomous based. In other words, it was the (successful) possibility of incorporating very remote territories that bestows a sign of apparently *strong* sustainability upon a "style of development" (PINTO, 1976) that would otherwise be extremely *weak* and *fragile* (PEARCE AND ATKINSON, 1993; for a critical view, see MARTINEZ-ALLIER, 1995).

In short, the evolution of the practices for occupying the planet, which occurred after the Agricultural Revolution, led to a real revolution in production and consumption

patterns. These same patterns allowed for the emergence of civilization as we know it. However it meant as well that humans were increasingly less in tune with their biological needs, and became more alienated from themselves and from their partners in nature. In addition there is a need to use increasing resources of power to guarantee the incorporation (and often subsequent destruction) of extra-national environments and effective satisfaction of progressively less sustainable patterns of consumption. As suggested by Guimarães and Maia (1997), the sustainability of a given territory in environmental terms hinges on its level of dependence in relation to extra-local environments, and in socio-environmental terms on the gap between satisfying the basic needs of its inhabitants and the conspicuous consumption of its elites.

Based on this more adequate understanding of the historical evolution of the relationship between humans and nature, it should come as no surprise that there are no ecological and environmental arguments in traditional sociological, political and economic thought. It is no great surprise that there is a great degree of "dysfunctionality" in most contemporary political institutions in their ability to adequately face the challenges inherent in the exhaustion of the *Ecological Transition* that is revealed in the environmental changes we have been experiencing in the past decades.

Created in a world in which natural abundance and vast tracts of available territory predominated, political institutions have been incapable of offering effective answers to face the crisis of ecological (i.e. natural resources) and environmental (i.e. environmental services) scarcity. Lastly, it comes as no surprise that there is a tendency to insist on ingenuous, partial and market-oriented solutions dependent on technological gimmicks (among others) to overcome the current crisis of sustainability. Solutions such as these are designed to deal with environmental change from a social-organizational standpoint that, as well as being fragmented and technocratic, also assumes that there is a balanced relationship between Human Beings and Nature. For this reason, these answers only represent approximations and partial solutions, such as the incorporation of the environmental "variable" in economic decisions, methods of evaluating environmental impacts, economic stimulus packages and other palliative social engineering proposals.

Reality appears to have overcome the illusion that conceals the progressive alienation of human beings in relation to nature and that even led to alienation amongst humans. The crisis of global environmental change appears to have resulted in a tsunami that has swept away the "certainties" of both economic technocrats and environmental conservationists. Before attempting to imagine what the new technologies will be, or even how any restoration of the natural environment would permit us to choose a suitable way out of the impasse provoked by the death throes of ecological transition, first and foremost we have to acknowledge that environmental change does not obey natural laws. On the contrary, they represent the result of the cumulative effect of human actions that are increasingly unsynchronized with the earth's natural life cycles.

Hence, we have to recognize that global environmental change reveals dysfunctions of a social and a political nature (the standards of relationships between human beings

and the way in which society as a whole is organized). Moreover, the current predicament represents the result of both economic and productive structural distortions and failures. In other words: society's consumer-needs and the way in which society organizes itself to satisfy them.

3. THE CRISIS OF MODERN CIVILIZATION, GLOBALIZATION AND GLOBAL ENVIRONMENTAL CHANGE

> "There are people whose sole aspiration is to buy an imported car, but a Volkswagen Beetle will suffice for me. After all, cars are mere machines used to get people around. Thus, I want love to have the **power** to buy an imported car, just to have the **pleasure** of not buying it."
>
> Rui Lopes Viana Filho, Gold Medal winner at the 39th International Mathematics Olympiad, 1998

To grasp the full impact of global environmental change on the international agenda, it is necessary to reexamine the context of these changes within today's *modernity* (GUIMARÃES, 1998). Modernity should be understood as a social project seeking to address or provide answers to processes involving profound societal change. It is precisely for this reason that societies evolve by means of successive modernity shifts throughout their process of civilization. Contrary to what the curators of "post-modernity" attempt to convince us of, an approximation to the complexity and values that characterize society today does not require sophisticated knowledge or analytical skills. Maybe this is the reason that it only took a few words for the young mathematician quoted above to sum up the current crisis and to take a stand on it.

The relationships between modernity and the environment constitute the real *tensions* provoked by the trajectory of Western civilization since the previously mentioned ecological transition, in the sense used by Kuhn (1977) to designate the need for converging knowledge to overcome scientific reason and transcend existing paradigms. In reality, modernity and the environment represent the result of the same dynamic, that of human beings progressively becoming the main protagonists in relation to the superstructures and, at the same time, placing increased importance on the current need to redefine the relationships between man and nature. Consequently, the concern about global environmental change questions the roots of our existing modernity in such a way that it takes us back to the specific *ethical* foundations of a new paradigm for development.

If the environment and modernity could be nurtured from the same civilizing source to be able to establish today, the real dilemmas or challenges of the new millennium, it is precisely the ethical nature of this questioning that would act as the catalyzing agent or amalgam to give meaning and direction to the tension cited by Kuhn. Just as socialism represented anti-systemic resistance to the hegemonic "industrial" modernity constructed by England in the mid-19th century, the drawing up of an

international environmental agenda, together with social movements that foster it, represents resistance to the modernity "of consumption" that emerged a hundred years later and is now constructed under the hegemony of the United States (TAYLOR, 1997).

Both these dynamics of resistance only manage to overcome modernity as paradigms of knowledge and public action to the extent that they guarantee a central role for the value options in response to the evolution of social processes and their interaction with the environment. The words of Rui Lopes indicate that being able to specify the true dimension of an automobile in society (i.e. irrespective of the added *status* of being "imported") is in itself an act of extreme lucidity. Thus, exercising one's free will to choose an alternative to satisfy one's needs, besides the social *power* (the currency of the modernity of consumption), provides humans with *pleasure* as individuals (measure of wellbeing and the currency of the modernity of sustainable development).

These comments about the relationship between modernity and global environmental change requires further clarification about the adjective "global" to qualify environmental change. Actually, the genuine character of globalization has been precisely the transformation of environmental change into a global challenge.

Globalization, a concept that has gained ground since the closing decades of the 20th century, appears to have transformed itself into a mystical *mantra* of contemporary modernity, the chapter of a sacred (and unknown) book about secular society. It is a chapter including almost everything imaginable: demography, economy, international politics, technology, ecology, health, etc. This is just as the real *mantras* of the Vedas (sacred Hindu books) contain prayers, poetry, oracles, music, choreography, recipes, and so forth. As aptly suggested by Sérgio Boisier, globalization has become the maxim for modern capitalism, i.e. technological capitalism, as it is no longer commercial, industrial or financial (BOISIER, 1999).

To complicate matters further, most of the current scenarios emphasize the process of ***globalization*** without shedding any light or clarifying underlying questions (GUIMARÃES, 2001A). Globalization includes differentiated phenomena that frequently lead to contradicting interpretations. Some authors define the process in exclusively *economic* terms (growing homogenization and internationalization of production and consumption patterns), *financial* terms (the magnitude and interdependence of international capital movements), or *commercial* terms (increase in external exposure and opening up of national economies). Others prefer to emphasize the character of globalization in terms of its *political* dimensions (predominance and diffusion of liberal democracy and civil liberties, also as new forms of social participation and public responsibility – "*accountability*") and *institutional* dimensions (predominance of market forces, convergence of mechanisms and instruments used to regulate labor markets and make them more flexible, etc.). There are even others who focus on the speed of *technological change* (their impact on production apparatuses on labor markets and on the structures and relationships involving power in all its forms), and the impressive revolution in the *means of mass communication* (the "massification" of access, transmission and dissemination of information and the possible erosion of cultural identities).

Using a distinct approximation to analyze multi-faceted phenomena - clearly focusing on globalization as a *process* rather than as a series of specific *vectors,* some researchers prefer to analyze the process from the perspective of *international relations* and the emergence of new alliances and economic, commercial and political blocks. Therefore, many people, including the authors of this work, consider it more pertinent to unveil globalization from the perspective of *sustainability*. They thus question, for example, the global economic rationale vis-à-vis the logic and pace of natural processes. In other words, even if capital flows may well have become "global", the same trend is not evident in the relation to labor or natural resources.

One can also seriously question the possibilities of a globalization process based on a model of rising and seemingly boundless economic growth. This is especially due to the reality of the exhaustion of many natural resources (for example, fauna, flora and non-renewable energy sources), coupled with the deterioration of natural processes that are crucial to life on earth (the ozone layer, climate, etc.). As one of the pioneers of sustainability, Kenneth Boulding, poignantly remarked, "anybody who believes that exponential economic growth is possible in a finite world is either crazy (...) or an economist" (BOULDING, 1966). Finally, those that subscribe to these and other criticisms point to the increasing social unsustainability of the current style of development. This is a reality of globalization in the midst of inequality and exclusion, which undoubtedly precedes it, but which was undoubtedly exacerbated by the process of globalization itself (SEN, 1989, STIGLITZ, 2002, GUIMARÃES, 2008).

Environmental challenges reveal the most genuine and central aspect of the concept of "globalization" (GUIMARÃES, 2001B). On the one hand, many environmental problems only attract international attention and concern once they have a global impact. On the other hand, local processes, such as burning fossil fuels, alter global dynamics. This happens in such a way that it changes the greenhouse effect and causes climate change. These two affect the whole world, including the vast majority that suffers from its most significant impacts, namely low-lying insular countries. This happens even if they do not contribute to global warming. There is growing scientific evidence that the rise in average ocean temperatures, as a result of climate change, leads to the extinction of coral reefs. Until recently, the degradation of these reefs was due to local processes like plundering, predatory tourism, marine pollution, the destruction of mangrove swamps, etc. Whereas the predominant cause of the degradation today is the process of global warming.

Even more important is the evidence that even if no country is immune to the consequences of global environmental change that seriously disrupt natural life cycles, the solutions to the crisis of global sustainability depend on coordinated action by *all* countries. In short, globalization came about due precisely to global environmental changes. These changes reveal local dynamics that require international attention as result of their impacts globally, which in return can only be solved globally. This was the main reason why the central theme of "think globally, act locally" emerged at the Earth Summit 1992 in Rio. In fact, global challenges increasingly depend on local sustainability, as recognized by one of the bastions of still dominant development styles, the World Bank (2000).

In this respect, one should go into more detail with respect to the socio-environmental aspect of these issues, keeping in mind that the character of globalization or at least the neo-conservative ideology that legitimizes the hegemonic modernity – only appears to admit two alternatives for developing countries. Either they integrate fully into the world market (even if in a subordinated and dependent mode), or there will be nothing more for these countries than a reality of backwardness masked by the illusion of autonomous development.

Contrarily, the position defended here presupposes that the crux of the matter is not the inevitable situation of *interdependence* in an increasingly globalized world, but the pattern of insertion that suits developing nations. A pattern that only makes sense insofar as the current patterns of insertion in the world system allow these countries to maintain national control of their growth, as well as to foster alternatives that guarantee social cohesion, cultural identity and environmenal integrity. Octávio Paz (1990, p.57) was right when he said that true freedom and autonomy is defined by the abilty to opt for distinct alternatives: "Freedom is not a philosophy, nor is it even an idea. It is a movement of consciousness that leads us, at certain moments, to utter one of two monosyllables: Yes or No." As Alfredo Calcagno, father and son, indicated in their brillant book desmystifying neoliberalism:

> We are told that we must all board the modernity train (as if there were only one), even though we do not know where it will take us, we do not know whether we will be allowed to board it as full-fare passengers or service personnel who are sent back to their origin once the trip is over, or whether we will become immigrant labor once we reach the final destination. In short, we are being counseled, as sovereign countries, to adopt a behavior that no liberal (as a matter of fact, not even a sane person) would embrace at a railroad station. (CALCAGNO AND CALCAGNO, 1995, P. 265).

In short, the crisis of the current paradigms of development provoked by global environmental change hinges on the exhaustion of a particular style of ecologically predatory development, which is also socially perverse, politically unjust, culturally alienated and ethically repulsive. At stake is overcoming the paradigms of modernity that have defined and guided the development process. They've done this by substituting them with a paradigm for sustainable development that puts human beings at the center of the development process. Economic growth is then considered as a mean and not an end in itself. It therefore protects life opportunities for current and future generations, which respects the integrity of the planet's life support systems. It finally guarantees a quality of life that reflects the dignity necessary for all living beings.

4. ETHICS AND POLITICS: THE MAIN CHALLENGES POSED BY THE CRISIS OF SUSTAINABILITY

One of the myths, laid to rest by the scientific community, is that all global environmental change –climate change in particular– responds to "natural" planetary

cycles. Nowadays, there is no longer any question that most of these changes have been provoked by human actions. However, we still have to correct one unfounded belief. It is adequate to state that most of the difficulties in adequately facing the environmental crisis are caused by institutions and international regimes created for a world which is virtually and literally in extinction. Yet, the fact is that both individual and collective human action has led to the current lack of sustainability. This happened directly through decisions made about production and consumption or indirectly through institutions. Therefore it is the result of either individual and/or collective human actions and decisions. In brief, we have to accept that global environmental change is not driven by institutions but by the concrete actions and decisions adopted by human beings throughout history.

As a result, what the world faces today is neither a *deficit* in terms of science nor an institutional *deficit*. Although a great deal of scientific uncertainty still exists. It is no longer about the causes, but regarding the consequences of global change. As long as institutional difficulties persist, the current *deficit* is clearly a political one, and involves the implementation of decisions already repeatedly taken. As stated by the Ambassador of Granada, Dessima Williams (2009), who presides over the Alliance of Small Island States: *"We came here as ambassadors for our planet to warn Western societies that we need to take action, NOW."*

The greatest challenge today tends to be less of an institutional nature or a question of governance. As stressed at the beginning of this analysis, the core challenge is essentially ***political*** in nature, and relates to concrete actions taken by specific and clearly identifiable ***players***. It is therefore pertinent to refer to the seminal analyses made by one of the leading political scientists of the 20th century, namely Aaron Wildavsky (1979), who even indicated in the title of what is today a classic in the analysis of public policies, that we should "Speak *truth to power*." Unfortunately, the current reality of world power appears to be responding negatively to Wildavsky's warnings. In a more recent discussion among some of the most preeminent political scientists about the current environmental challenges, Immanuel Wallerstein (2002) cited Wildavsky, but arrived at a rather negative conclusion: "*Is power ready to listen?*"

These difficulties about "speaking truth to power" immediately brings to mind the work of Jared Diamond (2006), the study of societies that failed in the past, some of which are now extinct, and comparing them with existing societies. Diamond shows us the inability of these societies to: (1) ***anticipate***, (2) ***perceive***, (3) ***communicate*** and (4) ***act*** in order to correct the directions they were heading in view of the negative tendencies, and to overcome the threats that put the community's very survival at risk.

Undoubtedly, humankind has reacted adequately to the first three challenges cited by Diamond. It tackled the most serious threats associated with global environmental change, namely that represented by the rise in mean temperatures in the earth's atmosphere. The aim of setting up the IPCC (Intergovernmental Panel on Climate Change) was precisely to respond to the political interests of powerful players who insisted in discrediting the scientific warnings on global warming. Created in 1988, with scientists from over 130 countries, the IPCC published in 2007 the first report that showed scientific evidence that actions taken by mankind were the main non-

natural causes of climate change today. In other words, ever since that moment no one can suggest that the world has not shown the capacity to ***anticipate*** the threat of the greenhouse effect.

On the other hand, even though the IPCC reports are revised and approved by experts and official government representatives (thus representing both Science and Power), there are innumerous international organizations dedicated to the study and diffusion of scientific initiatives on the topic of global environmental change. Among these is the IHDP – International Human Dimensions Program on Global Environmental Change, the ESSP - Earth System Science Partnership, the IGBP - International Geosphere-Biosphere Program, DIVERSITAS, the integrated international program for the science of biodiversity, the WCRP – World Climate Research Program, among many other national and international initiatives. Thus, it would be equally erroneous to fail to acknowledge that the world has already sufficiently displayed evidence to have ***perceived*** current environmental threats.

Finally, global environmental change issues, previously restricted to a relatively small circle of environmentalists and scientists, are now an integral part of the international agenda, and one of the most frequent concerns voiced by individuals. Global warming has already been the main subject at various summit meetings around the world. The UN Security Council and the so-called G-8 and G-20 nations have even discussed it. They gather representatives from the richest and most powerful countries on the planet.

When one of the authors of this paper had the privilege of working as the Technical Coordinator of the National Report submitted by Brazil to the Earth Summit 1992 in Rio, issues such as biodiversity, the greenhouse effect, the ozone layer, among others, were relatively unheard. At any meeting, a brief introduction was always needed to explain the significance of each of these issues. Nowadays, less than two decades later, they are a part of our daily life, the subject of special articles and reports in the media. Indeed, it is very difficult to find someone who does not have an opinion on each aspect of global environmental change, whatever his or her occupation is, social position or interests as a citizen. In other words, the scientific and political community has similarly not failed to ***communicate*** the increasingly imminent dangers to humankind.

Consequently, the key issue is to try to reverse the flagrant failures to ***act*** shown by key players with decision-making powers. To do this with a view to remove the causes of the scientifically proven threats, as well as the disastrous consequences that have been equally scientifically proven. Furthermore, until very recently, science was really only concerned about simply proving the consequences of global environmental change. Today, with every new study and every new report, the scientific community is obliged to acknowledge that its predictions have not turned out as they originally thought or indicated. The scenarios for the future are getting successively worse, both in terms of the magnitude of the changes and in the timeline in which humankind will begin to feel their negative effects.

In light of this reality, it can be argued that there is no lack of knowledge or public awareness to act. Neither is there some sort of blindness, typically shown by powerful players. Powerful players that in general only see and act based upon short-term objectives, such as those working in the economic and financial markets. What persists today is not a lack of political will, but an excessive political will ***not*** to act in the required direction.

The financial crisis that assailed the world in mid 2008 should be sufficient to silence the voices that still insist on justifying inaction despite the seriousness of the situation, by referring to interests of an economic nature that "prevent" the adoption of the necessary measures to avoid the collapse. In this case, no one can say that science did not ***anticipate***, ***perceive*** and ***communicate*** the seriousness of the situation. Economists like Nouriel Roubiny from the University of New York, Robert Schiller from Yale and Paul Krugman from Princeton all alerted us, amongst others, on several occasions in the two years preceding the crisis about the iceberg approaching: the speculative and devastating Titanic of Wall Street. In fact, proving the accuracy of the analyses of Jared Diamond, the financial crisis clearly demonstrated that, despite the initial (and politically-motivated) blindness to the warnings, immediately after the crisis struck, a large number of political players decided to ***act,*** and act ***immediately.*** Indeed, they decided to ***act*** in a historically decisive and unprecedented way.

A mere couple of weeks after the crisis broke loose, the powers finally decided to "listen" to what (economic) science had to say. Naturally, this did not happen due to the strength of the arguments or irrefutable "scientific" facts, but as a result of the domino effect of successive "financial collapses". During this period the world discovered that the funds that remained unavailable until now to reverse poverty, ensure compliance with the Millennium Development Goals (MDGs), or to adopt the most urgent measures required to reverse global warming, suddenly appeared "out of nowhere" to deal with the financial crisis. Despite the discrepancy between the estimated volumes of financial resources offered by governments to deal with the crisis – between six and eleven trillion US dollars – this represents over two-and-a-half times the total cost set aside to rebuild Europe after the Second World War in what became known as the Marshall Plan.

To illustrate the strength of this "political will" to act, suffice it to stress that the volume of capital resources provided to the financial sector until the end of 2009 was equivalent to more than 130 times the total volume of Official Development Assistance (approximately US$80 billion in December 2008), or 55 times more than the volume of Net Foreign Direct Investments (approximately US$200 billion in the period between 2000 and 2007). If, instead of handing this bailout to financial institutions that collapsed due to their own faulty (often crooked) actions, the funds were distributed directly to those in debt, the result could have been truly impressive, and the crisis would undoubtedly have had a different outcome. Even computing the total population of North America, Western Europe and Japan (the regions that sparked off – and suffered most from – the effects of the "global warming" of financial speculation), this would have been equivalent to giving US$50,000 to each household in these countries. This is however a seriously overestimated figure as the population affected was infinitely smaller. The U.S. for instance, indicated that the population

affected was likely to have been 1.5 million. Undoubtedly, the outcome would have been different and the repercussions on the "real" economy would have been radically different.

Whatever the case, since an analysis of the Political Economy of the current world power structure or the financial crisis per se is outside the scope of this study, the important aspect is to emphasize that the financial crisis, by confirming the words of Jared Diamond, reveals that that crisis provoked by environmental change seems to obey the same trajectory of societies that collapsed in the past. Fortunately there are enough favorable examples of the relationship between Science and Power that may offer past hints on how to avoid impending disasters.

The decline of the nuclear energy generation industry in the 1970s and 1980s provides us with a clear illustration of the results of the alliance between scientists and social movements, which cannot be explained by alluding solely to institutions or governance. It was society as a whole that, to a certain extent, took the issue "to the streets" and ended up prevailing, despite the barriers of institutions and governance. Perhaps the best (and most successful) example of this dynamic has been also the anti-smoking policies. In this case the alliance between Science and Society was strong enough to prevail over the interests of one the most economically powerful players in the world, the tobacco industry, and forced political elites to act and place heavy restrictions on smoking.

What is obvious from this analysis is that the challenges mentioned reveal the central role of an ***ethical*** and ***political*** discussion on global environmental change. As summed up by Klaus Schwab, founder of the Davos Economic Forum, a few weeks after the financial crisis emerged:

> "Although they are crucial for the future of the global economy, the regulations are insufficient [...] the management of a company should be directed at all the agents linked to it. The principles of the theory require administration beyond the exclusive interests of shareholders, and should be founded on the trust of all the interested parties to guarantee the prosperity of the business [...] We need a philosophy of ***business administration based on professional ethics rather than on the maximization of profits***." (SCHWAB, 2009, P. 6, *emphasis added*).

A necessary warning seems appropriate at this point. A warning that to a certain extent summarizes the lessons of what has been analyzed so far. It is (scientifically) crystal clear that the "iceberg" of the consequences of environmental change can already be seen on the horizon. It is also scientifically and socially well known that it is difficult to alter the course of a "Titanic" such as the global society of today. This leads us to raise the following two points that may serve as suggestions for future research.

It is necessary to assign priority to *transversal* issues, particularly those related to ethical aspects related to distributive factors in terms of environmental change and the types of relationships that exist between the scientific community, the *polis* and civil society. After all, the scientific community both in natural sciences and particularly social sciences, has shown itself to be one of the best and most accurate binoculars that society has to scan the horizon. It was this very eyepiece that initially detected the

presence of the climate change iceberg and, more recently, the speed in which it is getting closer.

On the other hand, new modes of action should also be created. It is on record that the crew of the Titanic ***anticipated, predicted and communicated*** the imminent collision well ahead of time. It would have been disastrous, at that particular juncture, to begin a scientific debate about the *governance* of the Titanic, or even about the *institutions* of the naval industry. As a typical example of what we might classify as part of the "*Jared Diamond syndrome*," the absence of timely ***action*** by those with the decision-making power to alter the course of the Titanic. If ***action*** were undertaken it would have avoided the collision and sinking without much difficulty. Unfortunately, the reasons for not acting were strikingly similar to those used by those in power today. They believed the Titanic was simply "unsinkable." Worse still, they refused to take preventive measures *under the assumption* that, if they were wrong, the results would indeed be disastrous, as they proved to be.

The captains of our current Titanic cannot hide behind this subterfuge. After all, we live in an era that has accepted the *principle of precaution*, a basic tenet for international concerted action. It teaches us that in situations of scientific uncertainty (which is no longer the case), this in itself does not justify inaction. This is so for the simple fact that, if the negative hypothesis is confirmed, the consequences could be tragic, and it will probably be too late to avoid a collapse.

Unlike the normal disclaimer in work of fiction, any similarity between the current crisis and the metaphor proposed here and today's reality are ***no*** mere coincidence.

5. FINAL CONSIDERATIONS

After the analysis above, we realize that the relationship between human dimensions and global environmental change proposes a new paradigm for the current society, which involves the awareness, that globalization has a central role in the current environmental hazards. It is an issue, which requires the existence of actors, culture and values, as well as the availability of knowledge and of material, human and psychosocial resources – i.e. new modes of action should be created on the governance system.

In short, it is already too late to reduce the crisis of development caused by global environmental change to a question of ensuring that the air we breathe, the water we drink and the soil from which we produce our food are all clean. To acknowledge that we are indeed all passengers on the same Earth "space ship" is indeed sober, as we all suffer from the same effects of the ill health of our planet's vital systems. Yet, our current predicament cannot be resolved with simplistic solutions, barely disguising the political interests of each passenger or crew member. When all countries, rich and poor, are reminded of their common responsibilities as far as current and future generations are concerned, it should be recalled that there also exists a reality of

domination that governs both the diachronic relationships between different generations and those of a synchronous type between human beings and nature.

Before looking for technical or scientific arguments to back up and offer legitimacy to the necessary decisions to overcome the socio-environmental crisis, we have to foster adequate political alliances. The "rationality" is defined according to the interests of the players involved. We can no longer repeat the catch-all phrase that there is a "lack of political will." As suggested already, what exists now is an "excess of political will" ***not*** to adopt the necessary decisions required to correct the extant course of civilization.

The time for the rhetoric of the conservative elites is running out faster than the melting of the glaciers. It is a fact that the laws of society take time to mature and depend fundamentally on human volition to change them, but the laws of operation of natural systems obey their own set of rules and do not wait for human action to show signs of their degradation, as the human, social and economic effects of global environmental change dramatically indicate.

The study of past civilizations provides us with sufficient evidence of societies that, despite their economic, social, technological and even military strength, disappeared as a result of their inability to recognize the socio-environmental limits of their style of development. For the same reason, no single human being should be condemned to a brief or miserable life just because they were born "into the wrong class, in the wrong country or into the wrong gender" (PNUD, 1994).

For development to exist and become sustainable, it is necessary to have more than the pure and simple accumulation of wealth, as improvements in the quality of life and the happiness of people are also needed. Changes must transcend the mercantile expressions of market transactions to include social, cultural and ethical dimensions. A generation dominated by poverty, exclusion and the degradation of the environment, as well as an increase in the predatory use of resources, the alienation and loss of human identity, is in fact the best guarantee that there will be no future generation at all, at least not a generation that will be worth being a member of.

Dwight Eisenhower had good reasons to voice his concerns when he left the Presidency of the United States, denouncing the dangers of an emerging industrial-military complex, particularly in view of the fact that peoples all over the world were already tired of war and the consequent militarization of society. The desire for peace was felt so intensely that Eisenhower forcefully warned in his now famous Farewell Address: "one of these days the governments should step aside and let them [the people] enjoy it" (LYON, 1974, P. 845). The moment has arrived now when social and political institutions should remove themselves from the way so as not to prevent the transition into a more sustainable future.

The time has come when modern institutions should pave the way for our societies to learn how to tackle the unequal distribution of resources and the vulnerability of our natural systems in a sustainable manner. Technocratic criteria of economic efficiency and innovation, exclusively guided by market forces are not conducive to redress social

inequalities, and even less to ensure the rational use of natural resources. History shows us that the intensive mobilization of productive factors leads to the predatory use of environmental services and tends to reproduce pre-existing social conditions. Sooner rather than later we will all have to pay the price for this environmental and social irresponsibility. The resurgence of violence and international terrorism represents perhaps nothing more than the tip of the iceberg waiting to sink the ship of unsustainable globalization.

The reality of relationships between human beings and nature manifested in modern society immediately renders the words of C. S. Lewis: "Man's power over Nature turns out to be a power exercised by some men over other men with Nature as its instrument" (LEWIS, 1947, P. 69). This being the case, the possible solutions to global environmental change via sustainable development will have to be found in the social system itself, and not in any technological or market-based delusions. The position asserted by Brazil at the 1992 Earth Summit in Rio reflects Lewis lessons: "in situations of extreme poverty, the individual marginalized by society and the national economy has no commitment whatsoever to avoid environmental degradation, insofar as society is able to not prevent one's own degradation as a person" (GUIMARÃES, 1991B, P. 17).

Similarly, if we project the realities of power among human beings over the long term, and the implications established by historical patterns of incorporating nature, the current situation reveals itself to be even more cumbersome. As previously mentioned, the relationships of power are synchronic, but also reveal a diachronic asymmetry of power between successive generations. In other words, each generation exercises power (the way in which it intervenes in nature) over the generations that follow. This happens while these, by modifying and attempting to restore their inherited natural heritage, resist and try to limit the power of their predecessors. Repeated indefinitely, rather than achieving more power over the natural world, this process ends up producing a far more precarious balance in society.

By definition, the further in the future a generation is the more it will live through a period closer to the extinction of the species, and the less power it will have over nature and other human beings. In his conclusion C. S. Lewis stated (at a time when sustainability nor sustainable development was not yet in fashion), "*Human* nature will be the last part of Nature to surrender to Man [...] and those submitted to its power will not be men at all: they will be artifacts. Man's final conquest will prove to be the abolition of Man" (LEWIS, 1947, PP. 72-77).

Jared Diamond has good reason to reproduce the question a student posed to him: " *What did the Easter Islander who cut down the last palm tree thought while he was doing it*?" (DIAMOND, 2006, P.114). Unfortunately, globalization, with all the beneficial effects it has produced, has made us all the inhabitants of a global "Easter Island," which has become Earth itself. The most significant difference between our society today and past civilizations is precisely that. If and when our collapse does effectively occur, for the first time in history it will be the collapse of all societies, in a globalized domino effect, with everyone suffering and, eventually, all life forms withering away.

Faced with this prospect, it is better to be optimistic and believe in the human capacity to reinvent itself, and thus heed the advice of Dennis Gabor (1964), winner of the Nobel Prize for Physics in 1970, when he suggested that: "the future cannot be predicted, but futures can be invented. It was man's ability to invent which has made human society what it is" (1964, p.161). As similarly suggested by Einstein, "there are only two ways to live; either believing that there are no miracles or accepting that life is a miracle".

We do not need any more science about global environmental change to make our decisions. In fact, they have already been stated many times, but have never been acted upon or advanced beyond the realms of intention or rhetoric. One way of avoiding a collapse is to follow the example set in the 1970s, 1980s and 1990s, particularly after the 1972 UN Conference on the Human Environment in Stockholm, as it was society that put the environment on the public agenda of international concerns, based precisely on research carried out by the scientific community.

Unfortunately, due to its ego science turned its back on society. The natural and social scientists who conduct research into global environmental change will have to leave their Ivory Towers and, emulating the example of the medical community regarding smoking, engage in debates with decision-makers and social movements. As was suggested above, one of the high points during the last century was when the scientific health community teamed up with society in an ethically correct project in all its aspects. As President Eisenhower suggested in his farewell speech, in a situation such as this, the "political leaders" end up being forced to accept the leadership of society.

Future generations will not forgive us if we act like the orchestra on the Titanic in the final moments before it sank. It is no longer the time to debate the science, governance, the institutions or players involved in change. It is time to *act*.

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