# A PERSPECTIVE TO PLANET SUSTAINABILITY

Reynaldo França Lins de Mello

*Doctor of Science at Universidade de São Paulo.*

**ABSTRACT**

The principle of sustainability emerges as a major principle of a new social organization and is starting to be claimed necessary for human survival. The purpose of this work is the concept analysis on sustainable development as a new strategy to planet sustainability.

***Key words*:** development; sustainability; global society.

## INTRODUCTION: A BRIEF DIAGNOSIS[i]

The relentless exploitation of nature, seen only as a set of natural resources to be used by *Homo sapiens*, undergoes an infinite chain of demands and compromises the web of life on Earth.

Humanity is facing an unprecedented challenge: in several instances of civilian society it is undeniable that the Earth ecosystems can no longer sustain the current levels of economic activity and of consumption of natural resources. Global economic activities are growing 4% a year – measured as Gross Global Product (GGP) they have gone from U$ 3.8 trillion in 1950 to U$ 19.3 trillion in 1993. That means that the GGP doubles every 18 years. World population, from 2.5 billion in 1950, reached six billion at the turn of the century and that growth was overtaken by energy consumption *per capita*, which led to a collision in the paths of the economic system and the environment, bringing further political and social conflicts. (BROWN, 2000).

Such a race towards consumption could only have resulted in profound inequality. Whereas 20% of the global population enjoy unprecedented material welfare and consume up to 60 times more than the poorer population, the gap between rich and poor widens, giving space to social, political, economic and ecological unsustainability. (BROWN, 2000). One might argue that the planet's natural productivity tends to lessen, however conservative practices may be; after all, is not its economy subject to laws of entropy according to which the very notion of sustainable development would be unsustainable? In the same way that live species cannot grow relentlessly over one another without consequences unless there is either regulation or chaos.

The corollary of this crisis can be found in cities where people easily forget their links with nature. Food is bought at supermarkets (always well stocked), then consumed, and its waste disposed in garbage deposits and sewers or ditches, which act as "magical disappearing acts", for waste rejects "disappear", taken away by piping in which water is always available and abundant. Likewise electricity and gas (each process has its own peculiarity though all share the same "magic" result of immediate availability and inconsequential disposing).

The metabolized megaconsumption in industrial capitalist society is conveniently hidden from the eyes of its population, except from those miserably poor who live off leftovers and who are authentic human devourers of detritus (among which are litter pickers from dumps, population living in poor suburban areas, co-inhabiting dumps).

Despite efforts to render the citizens of our world more aware of environmental issues, the numerous reports of socioenvironmental diagnosis, issued by several NGO's acting in that segment, still converge to the same point: changes are yet shy and insufficient to make a substantial alteration in the route towards freeing the human race from a possible *desadaptation* in the near future.

Tools developed to forge changes in several spheres of the society – such as environmental awareness, legislation and licensing, impact assessment, protected areas, environmental certification and governance, public institutions concerned with that theme, social civilian movements, granting funds for environmental and social projects – have scarce results to show against the devastating socioenvironmental alterations brought on by global capitalism in the contemporary society (with some few exceptions). Even the most recent progress of civilian society, represented by Agenda 21[3] and its "offspring", the local drafts (a document resulting from the United Nations Conference for Environment and Development – UNCED, held in Rio de Janeiro in 1992) will face serious difficulties to be implemented.

How can one assess, then, the human use of nature, how the former occurs and how much of it we use? After all when the demand for a specific means of production from nature in human society increases its volume and pace (unlimited financial and industrial economic growth as a maximum expression of development), it threatens the regeneration of the biosphere and consequently the natural resources. To ensure environmental capability to regenerate is to warrant its sustainability and that of the biosphere and the ecosphere.

The pursuit for new methods and the enhancing of those current ones is ongoing. Among such efforts, we highlight a model for analysis that objectively establishes the consequences of interrelations between human beings, their activities and the natural

resources necessary to their maintenance: meaning the Ecological Footprint Analysis developed by Wackernagel and Rees (1996)[ii].

Its purpose is to calculate, measure and assess the overall socioenvironmental impact caused by a particular society or community, as to the quantity of nature used up (unveiling how and why it is used) and the quantity of area of ecosystems exploited for the demands of production means. Thus it is a tool to estimate the necessary requirements of natural resources to support a particular social formation and its production means: the sociobiophysical metabolism.

This methodological and theoretical formulation on sustainability is in accordance with the current fragility of the concept of sustainable development, frequently deemed deceitful as its definition seems to vary according to different areas and points of view and – worse still- to “market convenience”.

Thus, “the analysis of the supporting and regenerating capability of natural and antropic ecosystems, allows one to quantify biophysical resources, to detect limiting features and to supply the basis for public policies for sustainable societies”[iii], leading the concept of sustainability to anchor on the sociobiophysical reality of mankind”.

There are two initial advantages to this new position: a) scientific possibility to check or refute the concept: b) the building of scientific models of sustainability.

The importance of shaping models is in that they are *clues* to a basis to reflect whether or not it is possible to build globally sustainable societies, according to a particular means of production. Moreover, in widening such a methodology, to enhance one to estimate how far human beings have reached to appropriating the biosphere’s productive capability, and to what purpose and to whose benefit. After all, life is the most complex phenomenon ever known.

## WHAT IS LIFE?

The art of living is historically complex, as we live off death and die from life - meaning that, since living matter first appeared on Earth living has always been an incessant process of destruction and creation of organisms in which the organizational transformation of living matter is everlasting (including non-living matter as the substrata of this process).

Life is "something" enigmatic and hard to define. The polemic surrounding its concept is widespread in spite of some advances (MARGULIS; SAGAN, 2002;MURPHY; O'NEILL, 1997; SCHRÖDINGER, 1997). Preliminarily one may consider a "living being" every form of organization of energy and matter presenting metabolisms (internal/external processing of energy, matter and information) and that reproduces "living beings".

Within this complex art of living three fundamental aspects can be brought to attention: adaptation, survival and sustainability. A schematic representation of this process as *the existence of living organization* is as follows:

- birth ➔ adaptation ➔ survival ➔ sustainability ➔ death ➔ (***re***) birth...

The fundamental idea here is that "life reorders matter. Life appears from non-life, from abiotic matter, but no sooner than it acquires the *status* of self-reproducing matter does it gain the capacity to reorder – within certain limits – the remaining abiotic matter" (FOLADORI, 2001, p. 34). One may speculate that life is a special geochemical process from which biochemistry is born and with which it interacts.

This movement has been ongoing for around 3.9 billion years on our planet and may reach its climax (we do not know when) and extinguish – or move on to new sidereal environments due to the human capability to evolve. All will depend on which kinds of adaptational strategy human beings will conceive and use during their adventure on Earth.

### Adaptation

The Human adaptation to a natural environment has traditionally been a slow and often painful process throughout the existence of our species. Not always have we been aware of this process; in fact human adaptation has often been unaware of the relations of

cause and effect that it undergoes, whether from a linear assessing point of view or from an approach towards the complexity of sociobiophysical relations with its environment.

According to Lewin "adaptation is the process by which a species changes through natural selection becoming well suited to that environment"(1999, p.509). Within that same goal, Moran defines evolutionary or genetic adaptation as "changes in population standards due to changes in the frequency of genes offering reproductive advantages to the population in a particular environment" (1994, p.391). Lima, in turn, says that adaptation "is every organic process favoring an individual's reproduction or survival: its nature might be morphological, physiological, behavioral, etc." (1994, p. 87).

One may take it from these three definitions that natural selection "enhances the structure of populations, improves their relations with the environment and diversifies them in time and in space" (MOSCOVICI, 1975, p.38). Thus, the species that best adapts to its environment is the one that most reproduces itself and generates a population surplus for the supporting capacity of the environment in which it lives, leaving the success of survival up to the individuals that best relate to the environment; hence, the best genes will be passed on to new generations and the process will be repeated indefinitely.

That, in general terms, is how the adaptation process (of natural selection at full steam) works as a response to the current need for conciliating for conflicting solutions during the existence of any species interacting with the environment.

Is it licit, however, in the case of the human species, to follow such a theoretical scientific model, as it is applied to other living beings from all kingdoms known and qualified?

The human species is singular (at least as far as we know) in its interaction with the environment: thus, we need to enrich the current theoretical concept so that it may portrait more faithfully the particularity featured by human society that is its relation towards the environment through *culture*.

**SURVIVAL**

Survival and sustainability are similar concepts though not identical. Survival is a punctual action in time and space: it determines the strategy for an individual or a group to be perpetuated for another moment – it is the extra "quantity" of life for each moment and at any cost, no matter what the consequences of their actions, as long as they survive...

Sustainability is a bunch of events aiming to maintain biogeochemical cycles and, with the appearing of human beings and their singular societies, to maintain sociobiogeochemical cycles.

Human sustainability implies in a set of actions regarding cultural, informational, material and energetic standards, revealed as intricate combinations of anthroposociological events. Seen in that light, sustainability includes survival

The singularity of the human species lies first in that its relation with the environment (nature), from which it emerged and in which it lives, comes from tools produced from social relationships with other human beings, that produce yet more tools (mediation); secondly it lies in that the human society does not face its environment as a "living block" (as do other species of living beings), as a unique species, "but as a divided society, complex and separated into classes" (FOLADORI, 2001, p.207).

These two particularities are responsible for our singularity. We survive by planning the transformation and creation of environments through our social relations, which produce concrete and abstract goods to mediate intervention and human relationships with the natural world. The best example of this that we have are cities, where space, time, energy and matter are shaped by mental antropic standards (MUNFORD, 1998).

Under that context, we are at once both *products* and *producers* of nature. Although all other living organisms also have their portion of modification and interaction with the environment, they are still prone to immediate and exclusively genetic relations (natural selection). The human species, however, produces culture (social relations): hence the "quantic leap" into and by nature itself!

## SUSTAINABILITY

In 1987, the World Committee for Development and the Environment at the United Nations published the Bruntland Report, presenting a notion of sustainable development – "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" – which, more than a concept, transmits the desire to go from a paradigm to a style of development that is not socially excluding or harmful to the environment.

Sustainable development, therefore, should mean balanced economical and social development, that have the means to distribute generated wealth and to consider how fragile and interdependent are the proper and specific scales of time for natural resources.

Visualizing this concept in practical terms implies in a change of personal and social behavior, as well as changes in consumption and production processes. For that to come about it is necessary to bring on a process for discussion and the commitment of the entire society. These are the features that make sustainable development, until today, a process to be performed.

Enabling the environment to regenerate is to ensure its sustainability. Thus it is necessary to know how much "nature" we use up, how much of it we return (and with which standards), how much is available for continuing to be used and how so. It is necessary to measure and lend it values (energetic and symbolic) to measure the human use of nature (DIAS, 2002).

We face, however, an issue of antinomy when referring to the term *sustainable development.* The concept of development comes from the logic of unlimited economical and financial growth; whereas that of sustainability is inserted in the notion of dynamic equilibrium, with limited and interdependent cycles of energy and matter.

It is as though one tried to fit a square frame into a spherical one – maybe even discovering squareness in a circle!

The least preposterous possibility would be to propose a sustainable human society (actually, several kinds of sustainable communities and societies), where the term *development* would take on a whole new meaning within a new socioecological “niche” with privilege for the several meanings within its concept, as the ones below:

(*des* = outward) + (*em* = inward) + (*volver* = change) + ( *mento* = process)

Thus we have a process undergoing constant inward and outward change, lending a perspective to sustainability through a continuous redistribution and *network* of all the elements for the megasystem composed by the sociosphere, biosphere and ecosphere (MELLO, 2000).

The difficulty for this to happen lies not in the field of technical relations, but in that of social relations. An example is that, while many social actors were discussing whether or not “environmental issues” were pertinent (around four decades ago), capitalism incorporated them in their production logic – expressing its attempt to survive. Therefore, today we have ecological capitalism, which regards pollution, for instance, a source of profitable business through the production of filters and further technological goods, not made to eliminate the problem, but to live with it “in harmony”! (DUPUY, 1980).

To really achieve the social sustainability of human organization one must find political mechanisms to enable one to reconfigure social relations, both in microscale and macroscale.

In this peculiar way, for the human species to survive we begin to see the need to sustain our survival, with the expectation that the survival of sustainability supplies the best means for human adaptation, accounting for both human biodiversity and sociodiversity.

**Socioenvironmental challenges**

Concerning economical, political and social relations, the scenery for contemporary human civilization can be viewed from some events that happen to indicate trends and possible directions (always with *n* amount of possible branches), such as:

*Globalization* caused by the progress of the technological revolution, featuring production internationalization and expansion of financial flux; *regionalization* featuring the formation of economic blocks; *fragmentation* dividing globalized and globalizers, central and peripheral, those who die of hunger and those who die of excessive food consumption, regional rivalries, political, ethnical and confessional confrontation, terrorism (GADOTTI, 2000, p. 34)

Such a context places us facing a socioenvironmental dilemma as may be synthesized by Braun in this comment:

Currently, for instance, an average European town uses approximately 40 times more than its medieval counterpart when referring to energy consumption and that of water, and several goods and materials to keep up the modern standards of living. If we extrapolate this data to a global level, we will, according to Robert Goodland, an ecologist from the World Bank, see that the residents from wealthy countries require around six hectares per inhabitant to support their levels of consumption. Therefore, we may conclude that we would need approximately 36 billion hectares if all the population of the Earth, estimated at six billion inhabitants, were to have those same levels of consumption. The difficult equation, however, is in the fact that the Earth has only 13 billion hectares! Which means that we would need another two planets Earth to satisfy those proportions (BRAUN, 2000, p. 8).

As a reinforcement of this rationale – where there is an explicit relationship between production and specific consumption with an approach to production, also specific (of industrial capitalism), that brings on socioenvironmental changes at small, medium and large scales around the globe with immense jeopardy for civilian society and for the environment- we may mention an argument by Sahtouris:

> The building of dams to generate electricity, the burning and bulldozing of forests for monoculture crops or grazing cattle, the use of chemical fertilizers and pesticides, the manufacture of fuels and metals from fossil and ore deposits, are all financially profitable to those who own or rule the land. But they are so ecologically destructive that the life of ordinary people may become intolerable or non-viable.

> Nature works not for profits but for balance, recycling everything. Humans cannot much longer run their profit-oriented growth economies at the expense of planetary economics (SAHTOURIS, 1998, p. 233).

Or that "we must ecologize economy, pedagogy, education, culture, science, etc. Nowadays the ecological issue has become eminently social, or as affirmed by Elmar Altvater (1995, p. 18), "today's social issues can be adequately elaborated only as ecological issues"(GADOTTI, 2000, p. 31). Likewise ecological issues can only be adequately elaborated while social. In fact social and environmental issues and problems have become socioenvironmental issues and problems: they are interdependent and co-generate new situations and contexts of and for human life in society.

Therefore we must ecologize and socialize economy, pedagogy, education, culture, science and the environment: then, perhaps we may avoid going through the *Extermination Age*, which Gadotti (2000) claims to feature the passage from "production means" to "destruction means".

After all the "destructive potential generated by capitalist development has placed it in a negative position towards nature" (GADOTTI, 2000, p. 31) – as a consequence of the model for social and economical growth/ development preached and practiced (with some variation) around the four cardinal points of the planet, including the model for actual socialism.

One should preview that:

Local scales should be compatible with planet scales. Thus the importance of articulating with public governance. People, the civilian society, as partners of the State, should contribute their share so as to make cities and fields that are healthy and sustainable, i.e. that have quality of life. *Quality of life* is a concept that differs from the concept of "standards of living". One may speak of standards to express meeting a part of human needs, in particular economic needs. Quality of life refers to meeting the whole set of human needs: education, culture, leisure. Quality of life means having the possibility to make an autonomous decision over one's destiny. (GADOTTI, 2000, p. 62).

Issues raised are, therefore: can human social organization be sustainable? Can we create sustainable societies? How can social actors create this new social reality -and if so what new features will its production take on?

Due to what is being reflected here, we can present the following scenery for social-environmental challenges presented to current global issues[6].

I. Population and demographic growth, with consequent pressure on food, water and space consumption, causing degradation of agricultural land and of the reserves of drinking water:

- The current world population is six billion, over twice what it was in 1950. Estimations are that it will reach 11 billion around the year 2050 and might bring world thirst and famine.

II. Global environmental changes due to the means of production since the First Industrial Revolution, altering global biogeochemical cycles that regulate key processes of ecosystems and therefore of the biosphere:

- Alteration of the cycles for nitrogen and phosphorus, both important regulators of vegetal growth. Alteration of carbon cycles as a result of emissions from the combustion of fossils, raising the atmospheric concentration of carbon dioxide. Some unpredictable effects: a new ice age? Human extinction? Greenhouse effect? Destruction of the ozone layer?

III. The socioenvironmental metabolism altered due to the increasing production of garbage and toxic products; unleashed pollution:

- The capacity to follow the trail made by the materials pervading cities is very superficial, giving us only a vague idea of the chemical offense we are inflicting on the biosphere and on our own health, causing bio-accumulation of toxic products: contaminating living beings at an ever increasing concentration within the trophic chain.

IV. Bio- invasion: the world is liable, at unprecedented levels ever before in the evolution history of the planet Earth, to a biotic mixture, because of shifts in the global trade system, which works as “free transportation” for several animal and vegetal species:

- When an exotic species can find nothing in its new home to keep its population under control it might undergo a reproductive lark. The invasive species might deprive the native species from some natural resource, propagating an epidemic or attacking the native species directly, altering the local food chain and its ecological niche.

V. The lack of global bio-diversity from massive and continuing exploitation of living and non-living resources, leading to an increasing ecological decline.

- We currently are undergoing the homogenization of the fauna and flora with mass extinction of the diversity of living beings caused by antropic action.

VI. Globalization versus sustainability: environmental preservation and industrial development are systemized in the notion of sustainable development that preaches a system for social-economical development with social justice and in harmony with the supporting systems for life on Earth, meeting the needs of present generations without compromising those of the future generations.

Presented with the proposed scenery (an intertwining of antagonistic and complementary forces) at both a local and a global level, there is a hypothesis as a directive to this reflection and it is the one supported on the discussion proposed by Karl Polanyi in his *The Great Transformation*: the origin of our day, on regulating society through the market – as opposed to regulating the market through society – since the formation of capitalism until the present day; i.e. the attempt to create a self-regulating market system to manage the whole society – a utopian proposal of liberalism which might still be active at the front of globalizing social organizations, at times more remarkable and other times less....

Development, progress, growth, are seen as accomplishments to be achieved, the ultimate goal; that, in the way society is organized, means the production of material goods (even those symbolic ones use a material “platform” to flow) of all possibly imaginable

kinds. Many a product may be useful and have noble purposes, but the issue at the last instance is: who determines *what, when, how and why* something is produced? The answer is: the market does. And who are the actors retaining the market?

To answer that we formulated a hypothesis for discussion: there will only be sustainable societies if social institutions regulate the market; in case the latter is what regulates social institutions, societies will be unsustainable, as those will follow the logic for unlimited and self-justified growth.

The relationship towards the production means of current society, therefore, is direct; seeing as the means of industrial capitalist production strives to feed the market - that would wish to be proclaimed a self regulated market- whereas the means of production feeding the market is caught up in a vicious circle that shows itself to be ever more destructive towards nature and social relations.

With that context, analysis should address the question of the relationship between survival and sustainability; after all, what is at stake is human adaptation in and towards the earthly biosphere – global and local adaptation as the flowing of sociocultural and socioenvironmental events.

**Sociobiophysical Metabolism**

A scientific assessment of ecological and physioenergetic essence for the social model of production is basic for a balanced socioenvironmental relationship, as the lack of scientific knowledge is usually the foundation for poor procedures in the political environment and outdated cultural performance that end up contradicting, as if they were mythological truth, explanations offered by scientific research on such an intricate network as are relations between Human Beings  Nature.

It is important to point out that scientific studies do not have the intention of being dogmatic truth however strongly the most varied media channels may, by vulgarizing science, portrait scientific performance as the ultimate knowledge or truth.

Another delicate spot is that the human being – both as a biological specimen and as a social and cultural being – is not really a pole opposing the natural world, but a specimen contained in it, in which it takes part and to which it contributes. However, ideologically, our civilization has expressed itself throughout history as if it were something else, a *"not* too natural" kind of nature placing itself in a position opposing the natural world.

This *subtle* perception that we are nature makes all the difference for understanding that the concept of sustainability must be anchored in a sociobiophysical dimension, as sustainability postulates the very existence of life on our planet. That means that life on Earth only exists because it is self-sustainable: once there no longer is sustainability there will no longer be life.

Sustainability is the means to support something or a quality to keep it. That *something* actually means "us", our way of life while as a biological species with individual psyches, and as social beings. Obviously the principles of sustainability also include the environment and the other forms of life on the planet – after all, although human beings have autonomy, they are not independent towards nature. As much as we may strive to be sociocultural beings we will still also be biological beings (MELLO, 2000).

Our peculiar human society needs to perceive, therefore, that our sustainability comes from this intricate network. It will not be a sustainable development in massively cultural terms that will take our society towards a balanced shape according to bio-geo-chemical cycles of the planet, for we are not a pole set apart from the natural world, but a complex product from it.

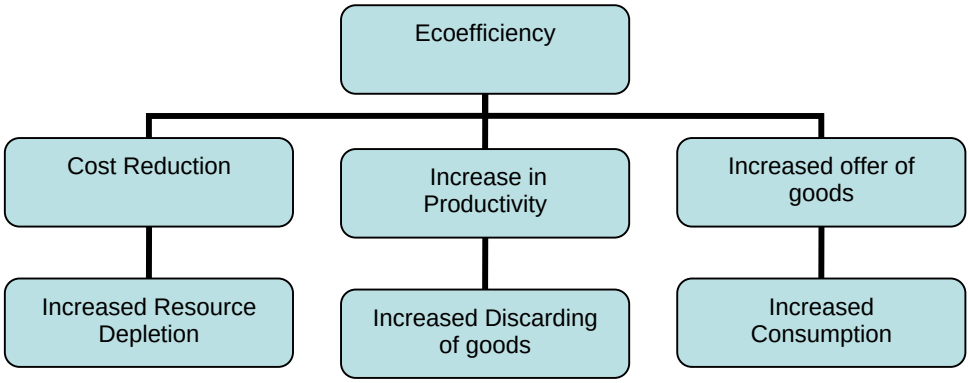
Thus the need to *retrieve* the concept of sustainability towards a sociobiophysical dimension, in which an assessment of the ecosystems' cycles of production and reproduction might show us how to build a sustainable society within the Earthly System.

An issue that often goes unseen is that the increasing efficiency of processes and products and of energy tends to enhance their use and so results in intensifying the extraction of natural resources and the processing flow and in boosting product offer and consumption, and as a consequence increases the emission of waste from fabrication

processes as well as the discarding of the final product at the end of its use (Organogram1).

*Organogram 1*

*Effects of Ecoefficiency of Productive Processes*




What if one thought of a solution to make good use of all the waste generated from the fabrication process of a product and from its discarding process after its use and if that solution was close to 100%, reaching a closed cycle? Could we then expand production and consumption standards of the so-called first world to the remaining populations on the planet without any difficulties (FULLER; ALLEN, 1997)?

Unfortunately, the issue would remain. Even reaching a re-utilization close to perfection we would have to, at first, increase the extraction of raw materials at an astounding rate which might lead to the exhaustion of resources and yet we still would have no kind of guarantee to cease the extraction of new raw materials; especially because most of the materials that would be re-used and/or recycled would be fatigued, not to mention the Second Law of Thermodynamics.

Would that mean that ecoefficiency is inefficient due exactly to its being extremely efficient within its means, so becoming inefficient in its end (to save natural resources and to reduce pollution and waste)? That depends on the position taken by social actors: if the search for ecoefficiency is isolated behavior, then the answer is *it would*; if eco-efficiency is a behavior that is part of interdependence of the sociobiophysical dimension, then the answer is *it would not.* Nature, therefore, is still a primary paradigm for the sociobiophysical metabolism that claims to be sustainable.

**Perspective to a Sustainable Society**

All the attention we can gain from this intricate game that is the human life within its survival, adaptation and possible sustainability, should undergo constant self-criticism (of our species); particularly as we are a little bit like “chameleons” when it comes to adaptation issues. Explaining, we are extremely versatile in different environments as we adapt basically using *mediation* processes, and so we often adapt to deadly situations, such as the Antropic microecosystems of garbage compound dumps – typical products of urban and industrial societies that have found no solution until the present date (the solution to sanitary embankments is merely a mitigating measure that, literally, pushes the problem of garbage under the ground).

What that means is that if one mistakes adaptation for conforming or for accommodating, there may be unpleasant consequences for our species and for our civilizing process – which is starting a critical phase of environmental change at a large scale and at unpredicted concentration, caused by human technology and that will also reflect on our species (SNYDER, 1983).

Nature – the abiotic and biotic world- is in a constant adaptational reconfiguration; and, without starting a theological discussion on the human species or nature in particular, one would show some collective intelligence by taking on the same strategy instead of always insisting on procedures of individual genius (ROSNAY, 1997). Cooperation is becoming a fundamental part of social relations for the attainment of anthroposociological sustainability – and, alas, we are not yet ready to take on this new social and environmental pact.

Within the concept that anthroposociological organizations are complex adaptative systems (GELL-MANN, 1996) and that the human species is hyperdominating, for it exploits not only one ecosystem but all the ecosystems on the planet (and is starting to take its first steps towards the exploitation of new orbs), the concept of *bioeconomy* (ROSNAY, 1997) – where there prevails the logic of co-evolution of ecosystems with their immense range of interdependent animal and vegetal species with and towards biogeochemical cycles – it is ethnically suitable to support the analysis of the supporting capacity of socioecosystems and to redirect the current adaptation process that focuses

on domination towards one focusing on cooperation so as to gain a perspective of the appearing of sustainable human societies.

The concept of sustainability has lacked a sociobiophysical founding – as we have mentioned here. Usually the emphasis has been towards economic, social and environmental dimensions, in a very vague way, although it should have been clearer about the importance of sustaining biogeochemical cycles that are part of several ecosystems and are fundamental for the production and reproduction processes of human culture within the biosphere, including industrial processes. That is because human social organization acquires from the natural world all the matter and energy to produce its goods: a simple stone ax, a movie production, a nuclear plant...

Thus, the organizations of civilian society, both private and public, of all sectors, must define new priorities based on the principle of sustainability, adding to it theissues on economic growth, social development, and culture; and not the opposite as has always been – and it is paramount that this be understood.

Sustainability is a force-idea that requires scientific foundation (as a scientific methodology to be used for that task we suggested, among others, the Analysis of the Ecological Footprint) and the awareness of a purpose, meaning that only a science that is aware of its know-how-being will be able to really provide scientific value to that concept.

Founding the concept of sustainability on a sociobiophysical basis brings the urgent call for an action of collective intelligence priming for the ecological literacy of the human species so that the latter might in fact create a sustainable society within the Gaia self-organization (LOVELOCK, 1991).

After all,

The sooner we recognize and respect Gaia as an incredibly complex self-organized living being, the sooner we will become sufficiently humble to stop believing that we know how to administer the Earth. If we keep on our present track, clinging to the belief in our capacity of controlling the Earth while knowing so little about it, our disastrously

stupid interference in earthly affairs will end up, not killing the planet as many people believe, but, in all probability, killing us as a species. (SAHTOURIS, 1998, p. 75)

Every end is a new beginning and here we recall the thoughts of the astronomer Johannes Kepler: I wish for a mistake to always be fertile, full of seeds, bursting with its own corrections.

So be it!

**BIBLIOGRAPHICAL REFERENCES**

ALTVATER, Elmar. **O preço da riqueza**. São Paulo, Unesp, 1995.

BRAUN, Ricardo. **Desenvolvimento ao ponto sustentável**. Petrópolis, Vozes, 2001.

BRIGHT, Chris. Uma história do nosso futuro. In: BRIGHT, Chris *et al.* **Estado do mundo 2003**: a impossível revolução ambiental está acontecendo. Salvador, UMA Ed., 2003.

BROWN, Lester R. **Sinais vitais, 2000**: as tendências ambientais que determinarão nosso futuro. Salvador, UMA Ed., 2000.

DIAS, Genebaldo Freire. **Pegada ecológica e sustentabilidade humana**. São Paulo, Gaia, 2002.

DUPUY, Jean-Pierre. **Introdução à crítica da ecologia política**. Rio de Janeiro, Ed. Civilização Brasileira, 1980.

FOLADORI, Guillermo. **Limites do desenvolvimento sustentável**. São Paulo, Imprensa Oficial, 2001.

FULLER, A. Donald; ALLEN, Jeff. A typology of reverse channel systems for post-consumer recyclables. In: POLONSKY, Michael Jay; MINTU-WIMSATT, Alma T. (Ed.). **Environmental marketing**: strategies, practice, theory and research. Binghamton, The Haworth Press, 1997.

GADOTTI, Moacir. **Pedagogia da terra**. São Paulo, Peirópolis, 2000.

GELL-MANN, Murray. **O *quark* e o jaguar**: as aventuras no simples e no complexo. Rio de Janeiro, Rocco, 1996.

LEWIN, Roger. **Evolução humana**. São Paulo, Atheneu Editora, 1999.

LIMA, Celso Piedemonte de. **Evolução humana**. São Paulo, Ed. Ática, 1994.

LOVELOCK, James. **As eras de gaia**: biografia da nossa terra viva. Rio de Janeiro, Campus, 1991.

MARGULIS, Lynn; SAGAN, Dorion. **O que é vida?** Rio de Janeiro, Jorge Zahar Editor, 2002.

MELLO, R. F. L. de. Complexidade e sustentabilidade. **Revista de Estudos Ambientais**. Blumenau, , v. 2, n. 2/3, pp. 103-8, mai./dez. 2000.

_____. **Em busca da sustentabilidade da organização antropossocial através da reciclagem e do conceito de auto-eco-organização**. 1999. Dissertação (Mestrado em Sociologia) – Universidade Federal do Paraná. Curitiba, 1999.

MORAN, Emílio F. **Adaptabilidade humana**: uma introdução à antropologia ecológica. São Paulo, Edusp, 1994.

MOSCOVICI, Serge. **Sociedade contra natureza**. Petrópolis, Ed. Vozes, 1975.

MUNFORD, Lewis. **A cidade na história**: suas origens, transformações e perspectivas. São Paulo, Martins Fontes, 1998.

MURPHY, Michael; O'NEILL, Luke (Orgs.). ***O que é vida?* 50 anos depois**. São Paulo, Ed da Unesp, 1997.

POLANYI, Karl**. A grande transformação**: as origens da nossa época. Rio de Janeiro, Campus, 2000.

ROSNAY, Joel de. **O homem simbiótico**: perspectivas para o terceiro milênio. Petrópolis, Vozes, 1997.

SAHTOURIS, Elisabet. **A dança da terra**: sistemas vivos em evolução. Uma nova visão da biologia. Rio de Janeiro, Rosa dos Tempos, 1998.

SCHRÖDINGER, Erwin. **O que é vida?** São Paulo, Ed. da Unesp, 1997.

SNYDER, Ernest Elwood. **Parem de matar-me**: o planeta em perigo. São Paulo, Ed. Nacional, 1983.

UNCED. **Our common future**. Oxford/New York, Oxford University Press, 1997.

WACKERNAGEL, Mathis *et al*. **Ecological footprint of nations**. Centro de Estúdios para la sustentabilidad, Universidad Anáhuac de Xalapa, México, 1998.

WACKERNAGEL, Mathis; REES, William. **Our ecological footprint**: the new catalyst bioregional series. New Society Publishers. Gasbriola Island, B. C,. Canadá, 1996.

Article received on 30.01.2006. Approved on 24.04.2006.

[i] For further information and detail we suggest to find on the Internet the page by the Worldwatch Institute, and to find the books published in Brazil by Editora da Universidade Livre da Mata Atlântica (UMA). See: <https://www.wwiuma.org.br> .

[3] It is not the intention of this text to further discuss the methodology of the Ecological Footprint,as there is wide information on the Internet. In Brazil, the Researcher Prof. Dr. Genibaldo Freire Dias has vast experience and many books on this theme, books we reccomend

4 *Fluxos de energia na ecologia e na economia*. ( The Flow of Energy in Ecology and Economy),International Seminar on Progress on Studies regarding Energy,Porto Venere, Itália, 26 May, 1998. Available at: <http://www.unicamp.br/fea/curso/pv-port.htm. pp3>.