The Necessary Contribution to the Decade of Education for a Sustainable Future: an Ethical Commitment*

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Abstract

The United Nations General Assembly, given the serious and urgent problems humanity has to face nowadays, has adopted a resolution establishing a Decade of Education for Sustainable Development (2005-2014). This constitutes a new urgent call to educators of all levels and areas to contribute to citizens' awareness and understanding of the state of the world in order to enable them to participate in well-founded decision-making. Our aim in this paper is to analyse the obstacles that could explain the poor response to previous calls, in order to overcome them and make it possible to assume an ethical commitment on behalf of the community of educators and researchers in science education.

Introduction

We will begin by remembering the surprise some of us received when in 1992, during the first Summit of Earth held in Rio, the United Nations asked educators of all levels and subjects to contribute to citizens' awareness and understanding of the situation of planetary emergency in order to enable them to participate in well-founded decision-making. The use of the expression "*planetary emergency*" (Bybee, 1991) gave the state of the world a dramatic overtone that we were not aware of.

Our surprise grew when a rapid inquiry revealed that such calls to educators had been made repeatedly since long before: for instance, as early as 1972 at the United Nations Conference on Human Environment, held in Stockholm. So why have most of these calls together with the contributions from many environmental educators and some researchers in the STS (science-technology-society) domain of science education been ignored?

The Rio Conference, in spite of having a great echo in the media, failed to involve educators in the incorporation of the state of the world as a priority problem in their teaching and research (Vilches et al., 2003).

For this reason the necessity of a quite long and intense campaign became clear and 10 years later, in the Second Earth Summit (Johannesburg, 2002), a Decade of Education for a Sustainable Development (2005-2014) was proposed with the purpose of creating a social climate oriented towards involving all educators in making citizens aware of the current situation of planetary emergency and capable of participating in the necessary decision-making to stop degradation (Resolution 57/254, approved by the United Nations' General Assembly on December 20, 2002).

But, how can this climate be created? The minimal success of previous calls obliges us to conceive the existence of serious obstacles that, if not taken into account, may obstruct the new and ambitious initiative of the Decade. In other words, it is necessary to study what obstacles may exist and understand why the situation of planetary emergency has not received the attention of most educators up to now; because this lack of attention to the Earth's situation and its future affects all societies and includes most scientists, political leaders and educators.

In particular, research in science education has shown that the problem of the state of the world and education for sustainability have been absent until very recently in most curricula, even in those focusing on environmental education (Fien, 1995). The statement of Orr (1995), denouncing that we still educate the young for the most part as if there were no planetary

emergency continues to be valid, as well as the lamentation of the scarce attention given to planning for the future by our educational systems (Hicks & Holden, 1995; Anderson, 1999). Most materials on environmental education focus exclusively on local problems without paying attention to the global situation (González & De Alba, 1994; Hicks & Holden, 1995). Moreover, they show a reductionist approach that concentrates almost exclusively on natural resources, ignoring the strong connections between the natural environment and social, cultural, political and economic factors (Fien, 1995; Tilbury 1995; García, 1999). Summing up, the attention science education teachers *and researchers* pay to the state of the world is still minimal and constitutes a serious *missing dimension* in science education research and innovation (Vilches et al., 2003).

On the other hand, research has also shown that when a relatively in-depth collective discussion is promoted, most teachers correctly perceive the seriousness of the situation, conceive possible solutions and understand the necessity of contributing to citizens' education for a sustainable future (Gil Pérez et al., 2003). We will now describe how this discussion is organised and summarize the general results obtained.

1. Eliciting science teachers' perceptions of the state of the world

We have organized numerous workshops for science teachers in service and in training - grouped in teams of about five members - to discuss "the problems and challenges which humankind will have to face in the near future, in order to construct a view as complete and correct as possible of the current situation and of the measures that should be taken". In all these workshops, the ensemble of contributions usually covers most of the aspects studied by experts:

Practically all the teams signal, among the main problems humanity has to face:

- Environmental pollution and its consequences (acid rain, ozone layer depletion, increment of the greenhouse effect, global climatic change…),
- Depletion of natural resources (fossil energy resources, fertile soil, drinking water…),
- Ecosystem degradation, destruction of biological diversity and desertification…

We reinforce these contributions with texts from many expert analyses (World Commission on Environment and Development, 1987; Worldwatch Institute, 1984-2007; Mayor Zaragoza, 2000; McNeill, 2003; Lynas, 2004; Gore, 2006; IPCC, 2007).

A smaller number of teams make references to other *related* problems such as:

- Increasingly disordered and speculative urbanisation (Girardet, 2001; Vilches & Gil-Pérez, 2003, chapter 2) or
- The destruction of *cultural* diversity (Folch, 1998; Maaluf, 1999; Vilches & Gil-Pérez, 2003, chapter 5; United Nations Development Programme, 2004).

Nevertheless, there is general agreement throughout the discussion over the importance of such problems *and its strong connections*.

The same happens in relation to the possible causes (that can be contemplated as new problems) of the planetary emergency. Teams make reference to:

- Economic growth guided by private short term interests (Meadows et al., 1972; Brown, 1998; Giddens, 1999)
- over-consumption in "developed" societies and dominant groups as if the Earth's resources were infinite (Brown & Mitchell, 1998; Folch, 1998; United Nations Development Programme, 1998, 2003 and 2005; Diamond, 2005)
- Demographic explosion on a limited planet; this aspect initially generates some controversy, but agreement is attained when some well established data are presented: since the second half of the 20th century, more human beings have been born than in the whole of humanity's history (World Commission on Environment and Development, 1987; Orr, 1994; Hubbert, 1993; Ehrlich and Ehrlich, 1990 and 1993; Brown and Mitchell, 1998; Folch, 1998; Vilches & Gil-Pérez, 2003, chapter 9; Sartori & Mazzoleni, 2003) and the *present* population would need the resources of three Earths to generalise the standard of living of developed countries (United Nations, 1997)
- Social inequalities, with billions of fellow humans scarcely able to survive in undeveloped countries and the exclusion of broad segments of the "first world"… while a fifth of the human population follow the high-consumption model (World Commission on Environment and Development, 1987; Vilches & Gil-Pérez, 2003, chapter 10; Sachs, 2005)
- Conflicts and violence associated with these inequalities and the imposition of private interests and values (economic, ethnic, gender, cultural…) through military conflicts, mafia activities, speculation of transnational enterprises that escape any democratic control, terrorism, mass migration… (Mayor Zaragoza, 2000; Vilches & Gil-Pérez, 2003, chapter 11; Diamond, 2005)

Most of these problems, we insist, are pointed out by science teachers at all levels in every workshop when they have the opportunity to freely discuss issues that demand global reflexion, such as:

- *Enumerate the problems and challenges which, in your opinion, humankind will have to face in the near future, in order to construct a view as complete and correct as possible of the current situation and of the measures that should be taken.*
- *Explore more deeply the problem of pollution, enumerating its different forms and their consequences.*
- *Point out the resources whose deplition may be most concerning.*
- *Consider possible reasons why city growth may prove to be a great concern.*
- *Discuss which may be the most troubling aspects of the degradation of the environment.*
- *Try to identify the causes of the growing degradation of our planet.*
- *…*

We must therefore conclude that it is not difficult for them to understand that we are in a serious situation of planetary emergency, characterized by an ensemble of intimately related problems that demand global treatment (Morin, 1999; Vilches & Gil Pérez, 2003). Why then, is this problem absent in most curricula, teaching and research? What could the "hidden" obstacles be?

2. What obstacles could difficult teachers' treatment of the situation of planetary emergency?

A first and serious obstacle for the incorporation of the state of the world into the curricula, teaching and research lies in the ***lack of tradition of education as regards approaching global problems of this nature***, which demand systemic treatment (Morin, 1999). This is a serious obstacle, because, although each problem has a particular importance and deserves individual attention, none of them can be understood or treated without taking into account the whole ensemble (World Commission on Environment and Development, 1987; United Nations, 1992; Fien, 1995; Tilbury, 1995; Mayor Zaragoza, 2000; Vilches & Gil-Pérez, 2003).

But, as we have already mentioned, an explicit demand to analyze the Earth's situation globally makes it possible to understand the close connection between the different problems, as well as their local and global repercussions. Consequently, it is necessary to keep in mind the necessity of holistic approaches if we want to avoid the "natural" tendency towards local and isolated treatment and causal reductionism.

This tendency is reinforced by another tradition: ***the consideration of our planet as immense and limitless***, which implies that human activities would have only local effects (Fien, 1995). In fact, until the second half of the 20th Century, while the earth's population was much smaller than nowadays and technological development had not globalized the planet, the effects of human activities remained locally compartmentalized. However, these compartments have begun to dissolve over the last few decades and many problems (the increment of the greenhouse effect, ozone layer depletion, migrations…) have acquired a global dimension and the state of the planet has thus become subject to growing concern (Bybee, 1991; Fien, 1995; Colborn, Myers and Dumanoski, 1997; Lewin, 1997; Broswimmer, 2002; Diamond, 2005).

Another deep-rooted tradition that hinders global approaches to the planetary emergency is the ***defence of "ourselves"*** (our family, our clan, our ethnic group, our country, our species…) ***against "the others"***, seen as enemies to defeat, following a "them or us" strategy. This results in limiting the attention paid to "our" problems, without considering the consequences for others or future generations (surely including our sons' generation and probably our own generation). We have to understand that a sustainable future is incompatible with simplistic and Manichean "explanations" that attribute any difficulty to "foreign enemies", and also with the promotion of competitiveness, understood as a contest to achieve something *at the expense* of others who are pursuing the same objective (Mayor Zaragoza, 2000; Vilches & Gil-Pérez, 2003).

We must also take into account certain ***ideological and religious barriers*** that make it difficult to comprehend the seriousness of problems such as the demographic explosion and the need of promoting responsible family planning.

One marked obstacle stems from the ***tendency to consider that individual actions have only negligible effects*** on huge problems such as resource depletion or environmental degradation. But it is easy to demonstrate (very simple calculations are needed) that although, for instance, an individual can only save a very small quantity of energy or materials, when these quantities are multiplied by millions of people, the amount that can be saved becomes quite large, with the consequent reduction in environmental pollution and degradation. In fact, the ensemble of individual actions have, in many cases, a larger effect than industry as a whole. This is what happens, for instance, with the increment of the greenhouse effect: personal cars produce more CO_2 than industries… despite only a fith of human population having acces to them (Vilches & Gil Pérez, 2003).

We are not denying the responsibility of those who impose a certain model of development oriented towards satisfying private interests, regardless of what may happen to others or to the future. But it is necessary to avoid simplistic explanations, more interested in searching for culprits than in understanding the causes and possible solutions. What we need is a sound comprehension of the situation to be able to participate in well founded decision-making.

We need to analyse these and other barriers and pseudo-explanations that hinder the treatment of the situation of planetary emergency. However, maybe one of the most serious difficulties derives from ***giving more attention to problems than to the possible solutions***: merely studying the problems provokes at best indignation and at worst despair (Hicks and Holden, 1995). It is also necessary to study the possible solutions to the planetary crisis described, to explore alternative approaches and to participate in actions aimed at favouring a sustainable future. In this sense, the ***difficulty of understanding the meaning of sustainability*** becomes another important obstacle.

The concept of sustainability emerges negatively, as a result of the analysis of the state of the world that displays an unsustainable situation of planetary emergency (Bybee, 1991) that seriously menaces the future of humankind.

"A threatened future" is, precisely, the title of the first chapter of *Our Common Future*, the report compiled by the World Commission on Environment and Development (WCED, 1987), where we find one of the first attempts to introduce the concept of sustainability through the definition of *Sustainable Development* as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

This classical definition from the WCED has obtained widespread consensus (although sometimes this consensus is purely formal and hides serious misunderstandings, such as ***interpreting 'sustainable development' as 'sustained growth'***, which is, of course, the opposite), and also many criticisms. It is necessary, for this reason, to dig into de meaning of the concept of sustainability that, as Bybee (1991) affirms, constitutes "*the central unifying idea society most needs at this point in human history*".

One initial criticism of the many that the WCED definition has received is that ***sustainability just expresses a commonsense idea,*** more o less explicitly present in many primitive cultures: that of preserving our resources for future generations.

This criticism must be rejected and it must be made clear that sustainability is an absolutely new concept: it implies accepting that the Earth is not as large and limitless as we believed and cannot indefinitely bear the effects of many human predator activities. This

knowledge about the unsustainability of current socioeconomic development is recent and has been a real surprise even for experts (Meadows et al., 1972 and 1992).

This knowledge is also new in another and even deeper sense: sustainability has been understood to be only possible on a planetary scale and demands the consideration of the ensemble of interconnected Earth's problems: a sustainable city or country has no meaning, because problems have a planetary dimension: there are no borders for pollution or for ocean degradation. A country or a city can (and must!) *contribute* to sustainability, but cannot aspire to be sustainable by itself, regardless of the rest of the world. As Brazilian Theologist Leonardo Boff says, this time there will not be a Noah's Ark to preserve some human beings: this time salvation will be for all of us or for none of us. People will not be "chosen".

Sustainability undoubtedly implies a new knowledge that increases with great difficulty, because the signs of degradation have not been sufficiently visible until very recently and because in certain parts of the world human beings have notoriously improved their quality of life. Subordination of nature to the necessities and wishes of human beings has always been considered as a distinctive sign of advanced societies, explains the ex General Director of UNESCO Mayor Zaragoza (2000) in *The World Ahead: Our Future on the Making*. In fact, it was not even seen as subordination: nature was considered practically unlimited and people could focus their attention on their own necessities without bothering about environmental consequences. Experts' alarm and international studies (Meadows et al., 1972 & 1992; World Commission on Environment and Development, 1987; Worldwatch Institute, 1984-2007) are abundant, but most citizens are not yet aware, not even techno-scientific, economical or political leaders… or educators.

We have to recognize the fact that the recent preoccupation for the preservation of our planet's conditions of life constitutes an authentic and difficult mental revolution (Mayor Zaragoza, 2000): emerging in just one or two generations, this cultural, scientific and social metamorphosis breaks a long tradition of indifference towards the environment. It is not a question of considering development and environment as contradictory (the first "attacking" the second and the second "limiting" the first), but of recognizing that both are intimately associated and cannot be treated separately: after the Copernican revolution that unified Heaven and Earth, after the Theory of Evolution, that shows the relationship between humankind and the rest of living beings, we are presently witnessing the integration of environment and development in a new paradigm of ecologic economy, based on the idea of sustainable development (Vilches & Gil-Pérez, 2003).

At this point we find another and quite serious obstacle for the acceptation of the new paradigm: ***to consider that the expression "sustainable development" associates two contradictory terms*** and that the new concept is a stratagem of supporters of a limitless economical growth that intend to make this compatible with ecological sustainability (Naredo, 1998; García, 2004). Nonetheless, the idea of sustainable development explicitly rejects the identification of development and growth. As Daly (1991) points out, we have to distinguish between growth and development: growth is a quantitative increase on a physical scale while development is the qualitative improvement or the unfolding of potentialities. In view of the fact that the human economy is a subsystem of a global ecosystem which does not grow, although it develops, it is clear that economic growth is not sustainable over a long period.

In other words, growth cannot continue indefinitely in a limited world, but development is possible. Possible and *necessary*, because the current ways of life must undergo profound qualitative changes, both for those that live precariously (the majority) and for the minority that exercise a predator-like over-consumption. These necessary qualitative changes constitute development (not growth) that is naturally necessary to design carefully, to avoid ambiguities and inappropriate uses of the expression "sustainable development".

Sustainability can play, following these clarifications, the central unifying role that Bybee (1991) attributes to this concept. This central unifying role is based on the global study of problems, their causes and the adoption of suitable measures, which need to be contemplated globally, overcoming any simplistic expectations of finding simple solutions to the connected problems humanity has to face nowadays and in the near future.

It is essential to pay attention to these obstacles in order to overcome the poor response to the United Nations call to contribute to citizens' awareness and understanding of the state of the world on behalf of science teachers and researchers in order to enable them to participate in well-founded decision-making.

Bearing these obstacles in mind, we are convinced that if we promote a global discussion in some depth, based on founded documentation, we may obtain more correct perceptions and more favourable attitudes from teachers for the inclusion of this issue in education. This can be, attending to our experience, an effective way of overcoming the current lack of implication on behalf of educators in the treatment of the state of the world; an effective way of making clear that there is a situation of planetary emergency and that each of us has the ethical commitment *and the privilege* of contributing towards reverting it.

3. What can be done to incorporate education for sustainability as an ethical commitment?

As mentioned previously, one of the obstacles to the incorporation of education for sustainability stems from ***paying more attention to the problems than to the possible solutions***: it is particularly necessary to explore alternative approaches and to participate in actions aimed at favouring a sustainable future. With this aim, we propose questions such as these:

- *What measures would need to be adopted to confront the situation of planetary emergency?*
- *Discuss what can be understood by sustainable development*
- *What characteristics should technological measures have in order to favour sustainable development?*
- *What educational proposals may contribute to sustainable development?*
- *What political measures should be promoted?*

This discussion, with the help of founded information, makes it understood that it is possible to reverse the current process of planetary degradation, being necessary to implement *together, and as soon as possible,* an ensemble of Techno-scientific, educational and political measures. It is this understanding that encourages *knowledge-based activism*, that is to say, a positive answer to the United Nations call to incorporate education for sustainability in our teaching *and research* as a collective ethical commitment. We shall discuss this ensemble of measures in some detail.

3.1. Techno-scientific measures

There is general agreement over the need for technologies that favour sustainable development (Gore, 1992; Daly, 1991; Daly and Cobb, 1989; Flavin and Dunn, 1999; United Nations Development Programme, 2001). The proposed measures range from the search for new energy resources, the improvement of efficiency in food production, the prevention of illnesses and catastrophes or the reduction and recycling of waste to the attainment of a responsible family planning (Vilches and Gil-Pérez, 2003, chapter 12).

However, it is necessary to carefully analyze the technologies conceived, because an apparent solution might well generate more serious problems than it solves. Daly (1991) suggests two principles that must characterize technology in order to be compatible with sustainable development:

- The rate at which resources are gathered must not exceed regeneration rates (or, for resources that are not renewable, the creation of renewable substitutes).
- Waste production rates must be lower than the assimilation capacities of the planet's ecosystems.

Additionally, Daly insists on the fact that we are moving from an economy of an *empty world* (where technology was the limiting factor for taking profit from the exploitation of natural resources) towards an economy of a *full world,* where natural capital will increasingly become the limiting factor. This imposes a third principle or characteristic:

- The aim of technology for sustainable development must be to increase the efficiency of resources, rather than raise their extraction rate. This means, for instance, that we need to produce more efficient lamps instead of constructing more electrical power stations.

These essentially technical criteria must be accompanied by others of an ethical nature (Vilches and Gil-Pérez, 2003, chapter 12) such as:

- Priority must be given to technologies oriented towards satisfying basic needs and reducing social inequalities.
- A *Principle of Precaution* has to be systematically applied to avoid the hasty application of a certain technology when possible negative effects have not been sufficiently discarded by research.

These two principles are oriented towards overcoming the search of individual interests in the short term that has usually characterized techno-scientific development, and they proceed to question the widespread and erroneous idea that the solution to the serious problems humanity has to face today depends solely on a better knowledge and on more advanced technologies: options and dilemmas are essentially matters of ethics (Aikenhead, 1985; Tilbury, 1995; Delors, 1996; Mayor Zaragoza, 2000) and demand the consideration of educational and political measures.

3.3. Educational measures

The importance given by experts to the role of education is shown clearly by the numerous appeals of the United Nations and other international institutions to educators of any subject and level, both formal (school curricula) and informal (press, museums…) and, particularly, in the recent proclamation of the Decade of Education for a Sustainable Future (2005-2014).

The educational measures proposed to contribute to a sustainable society emphasize global analyses and the search for global and joint solutions (Delors, 1996; Morin, 1999; Vilches &

Gil-Pérez, 2003). Such measures are aimed at overcoming the usual tendency to satisfy individual interests in the short term (or to follow habits that correspond to an 'empty' world of isolated compartments). We need an education that contributes to a correct perception of the state of the world and prepares citizens for decision-making (Aikenhead 1985 and 1996), generating responsible attitudes and behaviours (Bybee, 1991; Fien, 1995; Tilbury, 1995; Mayor Zaragoza, 2000) oriented towards the achievement of culturally plural and physically sustainable development.

Questions like "What energy policy should be promoted?" or "What role should be given to genetic engineering in the food industry?" and "What controls on GM food production should be introduced?" demand informed decision-making and the adoption of suitable policies. We need an education that promotes responsible behaviour, not just favourable opinions and attitudes (Almenar, Bono and García, 1998; Vilches and Gil-Pérez, 2003, chapter 13).

Some authors have signalled that these responsible attitudes and behaviours cannot be attained without overcoming the usual anthropocentric stance that gives priority to human beings over the rest of nature (García, 1999). But in our opinion, it is not necessary to abandon an anthropocentric point of view in order to understand the necessity of protecting the environment and bio-diversity. Who could continue to promote the unsustainable exploitation of Nature after becoming aware of the serious dangers this entails for his or her *own* children?

We believe that an education for a sustainable society should be based on what can be reasonably understood by most people, even if their ethical values are more or less anthropocentric. In other words, the borderline should be one that separates people who have a sound perception of problems and an inclination to contribute to the necessary decision-making and actions, from people who lack such preparation.

It is necessary for such education to promote the analysis of conceptions that are presented as "obvious" and "unquestionable" without alternatives, thus obstructing the possibility of making choices. This is particularly the case with *competitiveness*. Everybody speaks of competitiveness as something that is absolutely necessary, without realising that this type of behaviour is incompatible with the aim of sustainable development, because the success of one person or group in, lets say, a commercial competition, implies the failure of others… whose future is not taken into account. This contradicts, we insist, the characteristics of sustainable development, which must necessarily be global and embrace the whole planet.

Instead of promoting competitiveness, we need education that helps students and teachers to analyse the efficiency of our actions *from a global viewpoint*, taking into account its repercussions in the short, medium and long term, both for ourselves and for the whole of humanity. We need education that helps to transform the current competitive economic globalisation into a democratic and sustainable project (Delors, 1996) that enhances the richness of biological and cultural diversity. In fact, appeals to individual responsibility are multiplying; they include detailed lists of possible specific action in different fields, ranging from water and food supply to traffic; from cleaning, heating and lighting to family planning (Button and Friends of the Earth, 1990; Silver and Vallely, 1998; The Earth Works Group, 2000; Riechmann, 2003).

These educational aims need to be incorporated into an appropriate educational framework: research and innovation are needed to conceive and implement the incorporation of education for sustainability in the various educational activities, both formal and informal, including teacher training.

To finish with these considerations on the role of education in promoting sustainability, it is necessary to stress that individual contributions can and must go beyond the private domain and be extended to professional, social and political activities. Citizens can support, for instance, non-governmental organizations and political parties that promote solidarity and environmental protection; they can also demand positive action on behalf of public institutions (town councils, parliaments). On the other hand, it is particularly necessary for these individual and collective citizen actions to avoid local or partial approaches and contemplate many-sided environmental questions (pollution, resources depletion…), and other related problems such as social inequalities and conflicts, from a planetary perspective. The ecologist slogan "to think globally and to act locally" has its limitations; we now know that it is also necessary to *act globally* as well (O'Connor, 1992), by adopting *political measures on a planetary scale*, capable of avoiding the imposition of individual interests and values that are harmful for other people or for future generations. We comment on these in the next section.

3.4. Political measures

To begin with, we have to remember that we are facing problems that have a planetary dimension and cannot be tackled with just local approaches: political measures on a local, regional *and planetary* scale are required.

The discussion about the political measures that could promote sustainable development usually produces heated debates, and demands careful analysis. The adoption of planetary political measures is contemplated by most science teachers and citizens with scepticism and with certain reluctance, because there is a strong tendency, as we have already commented, to limit our attention to "ourselves" (our country…) and to forget "the others" or even to look upon them as a danger. Nevertheless, radioactivity, which knows no borders, reminds us that we are living - for the first time in human history - in an interconnected civilisation that embraces the whole planet (Havel, 1997). We can therefore understand the absolute necessity, also for the first time in human history, for political integration to put the environment, as the common substratum of life, above the individual interests of any country, region or trans-national enterprise.

We might think that the danger of employing only local approaches is disappearing because of the current vertiginous process of economic *globalisation*. Paradoxically, this process is not global at all when it concerns the survival of life on our planet. In spite of so much talk about globalisation, most approaches continue to be partial, sectorial and one-dimensional (Naredo, 1997). They do not consider environmental destruction specifically… instead, they take it into account, but not in order to avoid it: economic globalisation irresistibly pushes to displace production centres towards countries where ecological norms are less restrictive (Cassen, 1997).

Economic globalisation thus appears to be quite one-dimensional. For this reason, planetary norms are necessary in order to avoid the general degradation of the environment and its tremendous economic cost, which has only just begun to be evaluated (Constanza et al., 1997). In this sense, political integration on a planetary scale is deemed absolutely necessary and *urgent*; this integration must be capable of promoting and controlling the measures to protect our social and physical environments, before the degradation process becomes irreversible.

In short, a new world order is required, based on co-operation and solidarity, with institutions capable of avoiding the imposition of short-sighted individual interests, harmful to other people, to future generations and, actually, harmful also to the predators' future (French, 1992; Renner, 1999; Cassen, 1997; Folch, 1998; Giddens, 1999; Sen, 1999; United Nations Development Programme, 2002; Vilches and Gil-Pérez, 2003, chapter 14).

However, this planetary political integration, that our survival seems to depend on, also generates the fear of cultural homogenisation which is already in progress: that is to say, *the fear of cultural impoverishment*. But this destruction of cultures cannot be attributed to a

process of political integration which has not yet occurred. It is just another consequence of purely commercial integration. A democratic order on a planetary scale could contemplate the protection of the environment and the defence of biological and cultural diversity, promoting intercultural exchanges to take advantage of this diversity (Vilches and Gil-Pérez, 2003, chapter 14).

A fully democratic worldwide political integration constitutes, therefore, a prerequisite to:

- Stop the current physical and cultural planetary degradation;
- Put an end to unsustainable social inequalities;
- Stop unilateralist actions, world terrorism, traffic of arms, drugs, capitals and persons…
- Attain world security and sustainability.

Our survival, our basic *right to life*, depends on it; to the extent that the hypothesis of an imminent "Sixth Global Extinction of Species", with humankind being the principal agent and victim, has been seriously advanced and justified (Lewin, 1997). This is connected to the fundamental question of human rights, which is closely linked, as we will attempt to demonstrate, to the attainment of sustainability. The next section is dedicated to clarifying this relationship.

3.5. Sustainability and human rights

It may seem strange to establish such a direct relationship between human rights and sustainability. For this reason, we shall try to clarify what is understood nowadays by *human rights*, a concept that has grown and now contemplates three "generations" of rights (Vercher, 1998) and how they are related to the attainment of a sustainable future.

We can refer, firstly, to *democratic civil rights (opinion, association…) for everybody, without social, ethnic or gender limitations*. They constitute a condition *sine qua non* for citizens' decision-making about current and future environmental and social problems (Folch, 1998). They are known nowadays as "first generation human rights", because they were the first rights to be demanded and obtained (not without conflicts) in a growing number of countries. In this respect, we must not forget that the 'Droits de l'Homme' from the French Revolution (to quote a well known example) excluded women explicitly; women only achieved the right to vote in France after the Second World War. Nor must we forget that such basic rights are nowadays systematically violated every day in many countries.

Amartya Sen (1999) has concluded that the expansion of liberties is, at the same time, a basic aim of social development and its principal instrument in order to make sustainability possible. But a sustainable future demands the recognition of other rights, besides these civil

rights. We are referring to *economic, social and cultural rights* or "second generation human rights" (Vercher, 1998; United Nations Development Programme, 2000) such as:

- The universal right to a satisfying job, overcoming insecure situations to which hundreds of millions of human beings (including more than 250 million children) are submitted;
- The universal right to an adequate dwelling in an appropriate physical and cultural milieu;
- The universal right to appropriate nourishment, both quantitatively (avoiding under-nourishment of billions of fellow humans) and qualitatively (avoiding unbalanced diets);
- The universal right to health. This requires resources, research and education in order to fight infectious illnesses (cholera, malaria…, that are still ravaging many third-world countries) and the new 'industrial' and behavioural illnesses (such as tumours, depressions, AIDS…). It is necessary, above all, to promote healthy milieus and habits as well as solidarity with handicapped people;
- The universal right to family planning and free enjoyment of sexuality (always respecting the freedom of others) overcoming the cultural and religious barriers that condemn millions of women to submission;
- The universal right to an education of quality, *throughout* one's life, without social, ethnic or gender limitations;
- The universal right to culture, in its broadest sense, as a supporting axis for personal and collective enrichment and development;
- The universal right to investigate any kind of subject (life's origin, genetic manipulation…) without ideological limitations, but with a suitable degree of social control that takes into consideration social and environmental consequences and prevents the hasty application of insufficiently tested technologies.

Finally, we refer to third-generation human rights, known as *solidarity rights* because they tend to preserve the integrity of the whole population (Vercher, 1998). They incorporate the right to life in a suitable environment, the right to peace and the right to sustainable development for all people and future generations:

- *The right of all human beings to an environment appropriate to their health and welfare.* As Vercher (1998) states, the incorporation of this right as a fundamental human right derives from an unquestionable fact: if degradation of the environment continues at the current rate, maintaining it will soon be the most fundamental survival issue for everybody, everywhere… The later we recognise this situation, the greater the sacrifices and difficulties that will need to be overcome to achieve an appropriate recovery.

- *The right to peace,* which implies the capacity of the International Community to preventing the imposition of particular interests (economic, ethnic, cultural…) over general interests and values.
- *The right to sustainable economic and cultural development* of all peoples. This involves, on the one hand, the questioning of the present marked economic inequalities between different human groups and, on the other hand, the defence of cultural diversity and cultural crossbreeding (against racism and ethnic or social barriers).

Vercher insists on the fact that these third generation rights can only be achieved by the harmonious effort of all actors of the social scene. We can therefore understand the link we have established between sustainable development and the universalisation of human rights. And we can also understand the need to proceed towards real globalisation, with democratic institutions on a planetary scale that are capable of guaranteeing this ensemble of rights.

The *ensemble* of these rights appears to be a requisite (and, at the same time, an objective) of a sustainable society, as *they are all interconnected*. We cannot expect, for instance, that some people not contribute to the depletion of a fishing bank… when this is their only resource to nourish their family. And we cannot conceive, to give another example, the interruption of the demographic explosion without the recognition of the right to family planning and free enjoyment of sexuality… and this is connected also to the right to education: as Mayor Zaragoza (2000) states, only education for all can reduce the continuous growth of population in any religious or ideological context.

In short, achieving sustainable development is synonymous with universalising human rights in their widest sense (Vilches & Gil-Pérez, 2003, chapter 15). This requires:

- Creating democratic institutions, on a *planetary scale*, that are capable of preventing the imposition of individual interests that are harmful to other people or future generations;
- Orientating scientific-technological development towards the attainment of technologies that favour sustainable development;
- Promoting education that is capable of countering the usual tendency to behave according to individual interests in the short term.

4. Promoting the Decade of Education for a Sustainable Future: an ethical commitment

We are at the beginning of a decade that will be decisive in one sense or another:

Sadly decisive if we continue anchored in our routines and we do not take conscience of the need to revert a degradation process that is constantly sending us unequivocal signals in form of global heating, unnatural catastrophes, loss of biological and cultural diversity, millions of deaths by inanition and wars -consequence of suicidal short-sighted interests and fundamentalisms-, dramatic migrations… and a long etcetera.

Happily decisive if we are capable of generating a universal trend for a sustainable future that has to begin right now.

This is the aim that we can and must incorporate into science education, teaching and research, conscious of the difficulties, but determined to contribute, as educators, scientists and citizens, to build up the conditions of a sustainable future.

And even though research in science education has shown that the state of the world and education for sustainability are absent in most curricula, in fact there are many opportunities to introduce them in scientific and technological education. For instance, studying energy constitutes an excellent opportunity to deal with the world's situation and to contribute to a better understanding of the problems and possible action to be taken in the light of the current situation of planetary emergency (López Alcantud et al., 2004; Furió et al., 2005).

Innovation and research are needed: innovation to implement changes in the curricula; research to analyze and overcome obstacles to face the current situation of planetary emergency.

This should be a very important ethical commitment for all us, both educators and researchers.

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