# A Methodological Proposal for Environmental Education

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***Abstract***

*This paper discusses methodological criteria for environmental education. The place of environmental education in the curriculum has led to its being considered as a dimension that should cut across different disciplines, instead of offering a corpus of contents by itself. Nevertheless, experience has shown that ecology has systematically filled up the contents of environmental education. In the following pages I try to explain: (a) the reasons why ecology has gained hegemony, as well as the limitations that this approach represents; (b) the place and evolution of the concept of Sustainable Development in relation to the ecological approach; and (c) the methodological importance of the distinction between technical and social relations as a way to improve on the ecological approach.*

***Résumé***

*Cet article vise à discuter de critères méthodologiques pour une éducation écologique. Le débat sur la place de l'éducation écologique dans les programmes d'études a mené à ce que ce soit considéré comme une dimension qui devrait être recoupée dans différentes disciplines, au lieu d'offrir un corpus de contenu en soi. Pourtant, l'expérience fait apparaître que l'écologie a systématiquement rempli les supposés contenus de l'éducation écologique. Dans les pages suivantes, je tente d'expliquer : a) les raisons pourquoi on confère l'hégémonie à l'écologie dans les discussions sur l'environnement, aussi bien que les restrictions que cette approche représente; b) la place et l'évolution du concept du développement durable en relation avec l'approche écologique; et c) l'importance méthodologique de la distinction entre les relations techniques et les relations sociales comme une façon d'améliorer l'approche écologique.*

The discussion on the place of environmental education in the curriculum has led to its being considered as a dimension that should cut across different disciplines, instead of offering a corpus of contents by itself (González, 2002). Other proposals suggest the need for spaces—e.g. the environment—for the "integration" of contents that could have a formal place within the curriculum (Nieto-Caraveo, 1999). But what should the content be? What should be discussed on a cross-cutting basis? What discussion should take place in the arena in which they meet? Ultimately, the problem of how to determine what environmental education should be remains a question answered differently in each case.

Experience indicates that ecology has systematically filled up the supposed contents of environmental education. At the same time, little has been said about methodological elements. The aim of this article is to provide elements for discussing methodological contributions for analyzing the range of environmental problems that exist.

In the following pages I attempt to explain:

- the reasons why ecology has attained hegemony in environmental debate, and the limitations that this approach imposes;
- the place and evolution of the concept of sustainable development vis-à-vis the ecological approach; and
- the methodological importance of the distinction between technical relations and social relations in overcoming and empowering the ecological vision.

## Relative Autonomy of the Role of Environmental Education

It is commonly said that concern over environmental issues is valid in societies that have overcome, at least to some extent, the more immediate problems of work or health. This idea that environmental awareness is hierarchically inferior to other spheres of everyday life is not supported by historical analysis, which shows practices of environmental concern in a wide range of societies with different levels of material development, or by everyday analysis, which shows that environmental awareness can be an important element in raising living standards even in poor societies and countries.

I am going to illustrate this with three examples that indicate individual behaviour, group or community behaviour, and class behaviour. In the city of Montevideo, Uruguay, more than 10 years ago, there was a street trader who used to open the plastic bags he filled with peanuts by blowing into them. He had tuberculosis, and the practice created an epidemic among his customers. Correcting a habit like that does not require material improvements, just awareness. The second example comes from a small-scale irrigation project in the State of Oaxaca, Mexico, in the early 1990s. Using hosepipes, the peasants would collect water at its source, in the high areas, transport it down, and spread it around the cultivated fields. In many communities, as an unexpected side effect, there was a significant drop in infant mortality. Previously, they obtained their water for domestic consumption from rivers and streams, unaware that it was polluted; they then started to use the water taken from the source, which was not contaminated (Foladori, 1990). The increase in the standard of living represented by this bore no relation at all to the minimal costs of installing a 300 or 400 meter stretch of surface pipe. This is an example, at the community level, of the environmental awareness possibilities capable of greatly impacting living standards without implying major material modifications. The final example deals with the relationship between less

polluting technologies and market forces. One of the first European reports on the relationship between environmental policy, competitiveness, and employment (Ekins, 1998) refuted the argument that environmental policies represented higher costs for companies. The report's conclusions pointed to ambiguous results. In many cases, well managed companies could implement less polluting technologies at the same cost levels or even more cheaply, thus ensuring win-win situations.

The conclusion to be drawn from these examples is that material progress is a prerequisite if humanity as a whole is to adopt a less degrading approach to the environment. But poorer societies or communities can use that knowledge or those techniques as a relative advantage and thus raise their living standards. Contradicting examples also exist: in April 2004, the press reported that Zambia's Minister of Education had banned condom posters in schools because they encouraged premarital sexual relations, in a country where some 120,000 are killed by AIDS every year (British Broadcasting Corporation, 2004). Beyond the examples, it is clear that without the necessary resources, most environmental education programs are not viable or subject to restrictions.

But if awareness of and action regarding environmental problems have a certain level of autonomy, what should the content of efforts to develop environmental awareness or perceptions be? How can environmental problems be incorporated into teaching?

## The Possibilities of an Object of Study in Environmental Education

Environmental education-related study programs or projects are not standardized. There are many socially critical environmental education approaches, but the ecological or bio-physical framework dominates at different teaching levels, in most countries, and at both the formal and informal levels. The Intergovernmental Environmental Education Conference held in Tbilisi in 1977 criticized the conservationist approach and proposed addressing environmental education as a dimension with a cross cutting presence in the curriculum; nevertheless, ecology remains the dominant science (González, 2002). It must, however, be acknowledged that ecology has achieved that hegemonic position by offering at least three elements that are of importance to critical thought about the role of human society vis-à-vis external nature:

- Ecology teaches us how to think in terms of the *life cycle*; an idea that was not present, on a systematic basis, either in productive practice or in economic theory prior to the emergence of the contemporary environmental crisis. All living creatures perceive and make use of the environment according to the usefulness it offers them. Human beings are not outside this rule. Nature

is perceived and used solely as a useful resource. Neither is the disposal of waste a matter of interest. Conventional economic theory reflects this perception and holds the productive cycle to be closed, not heeding the role that could be played by the predatory use of resources or the pollution caused by effluents or waste in the dynamics of ecosystems. It was on the basis of the life cycle, imported from ecology, that economics incorporated into its currents of ecological and environmental economics the notion that the productive cycle was part of a broader context and open, in terms of materials and energy, to the ecosystem of Earth (see Figure 1).

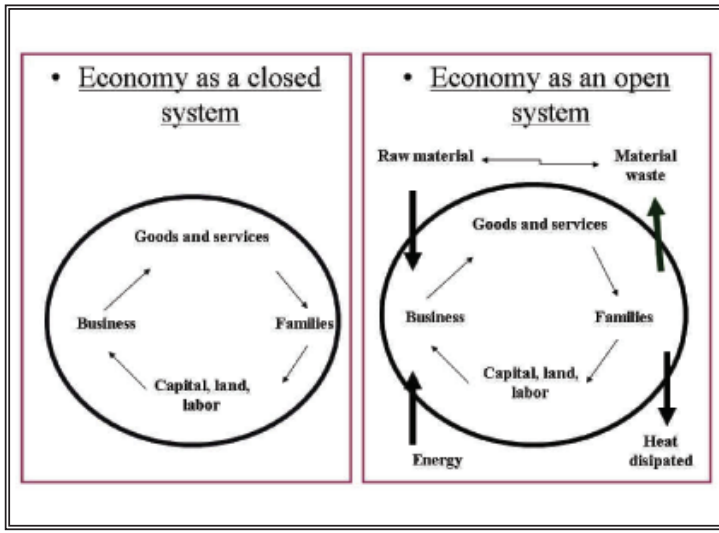


Figure 1. Two Visions of the Economy.

- Ecology offers information that represents, ideologically, interests that are common to all human beings. Ecology is concerned with the transfer of materials and energy between species and with their abiotic surroundings. It deals with the relationships of the species as a whole. When humans are put in the place of the monarch butterfly or the ant, they are considered a species, an undifferentiated unit that has a relationship with its environment. The concept of anthropic action on the environment is generic to the species. We are all responsible for environmental decay. We must all show concern regarding environmental health.
- Ecology deals with elements and relationships that can be quantified by physical and chemical science. The pollution of a river is measured in terms of the particles and elements it contains; global warming is measured according to the particle count of carbon dioxide and other substances. Erosion is measured according to the components of the soil. Lost biodiversity or the existence of a number of specimens of a given species is estimated. This gives environmental problems an aura of scientific validity. Environment and science

are brought together. Science, which appears as something neutral and advantageous to everyone, is charged with determining how sick the nature that surrounds us is.

An eloquent example of the weight of these three elements (concept of environment, shared interests, and technical neutrality) in environmental discussions is climate change. Prior to the mid-1980s, environmental problems were national, regional, or local; they were separate, dealing with pollution in rivers, deforestation, environmental pollution in cities, depredation of species, the effects of chemicals on health, etc. As of the mid-1980s, climate change became the common denominator of all environmental problems, and global warming the chief suspect (Sarewitz & Pielke, 2000). Climate has to do with everything, and reducing global warming became the goal of international environmental policy. Climate represents the relationship of each aspect with the whole. It has an influence on biodiversity, it impacts and is impacted by the world's forests, it affects human productive activities, it is related to many infectious diseases, etc. Climate unifies the environment in a planetary set of surroundings. Climate perfectly reflects the idea of interrelating phenomena and life cycles that is so important in ecology. Moreover, no one is unaffected by changes in the climate. Climate change is a concern shared by everyone; it ideologically unites the human race. In accordance with the precepts of ecology, climate change represents a challenge to the society of humankind as a species. Finally, climate change is the subject of scientific study. Only a select group of scientists with sophisticated technical equipment can take atmospheric measurements, conduct monitoring, and alert us as to whether the world is heating up and about the influence that will have on each region of the planet. Climate change has given science the task of evaluating its impact (Tommasino & Foladori, 2001).

These three contributions of ecology to environmentalist thought—the idea of life cycles and the environment, the unification of human interests vis-à-vis external nature, and the role of science as a neutral activity in analyzing the dynamics of nature—explain its domination of environmental teaching and its major presence in proposals for environmental policy and for theoretical thought in numerous sciences and disciplines, particularly the social sciences.

But all scientific advances, in becoming paradigms, become their own stumbling blocks. While it does cast light on the way to analyze the environment, ecology also leads to the behaviour of human society being considered as if it were an anthill, failing to perceive that human society differs from that of other living creatures in terms of its relations with its external surroundings. The social division of labour and the distribution of material wealth—two historically and socially determined characteristics—are a precondition for, and regulate how, human beings behave vis-à-vis external nature. This occurs with no other living species, whose

behaviour in connection with external nature is regulated genetically and where each generation starts from zero.

In human society, social relations of production determine relations with external nature. If a company pollutes the air, that is because it benefits economically, while others suffer. A company that produces automobiles fueled by oil derivatives does so to earn a profit, while purchasers of those cars obtain an object that is useful, for personal consumption in most instances; the two social groups do not share the same responsibility in the impact this has on global warming. The movement of the materials created by mining activities and that cause such harm to ecosystems could ultimately be intended to satisfy human needs, but the decision on what type of technology to use, determining what to do with the waste products, and the economic benefits all fall to the owners. The ecological viewpoint sees everyone alike, all consumers, losing sight of the fact that in human society, the distinction between production, distribution, and consumption obeys social regulations that are determined historically, not biologically. The ecological viewpoint loses sight of the motivation, the ultimate cause, and the social consequences of environmental problems.

## Role and Evolution of the Concept of Sustainable Development

The concept of sustainable development has, since its inception, implied the social dimension. It could be no other way in an international discussion in which the players represent countries with different levels of development and economic interests. *Ecological*, *economic*, and *social sustainability* represented the spectrum of interests at play, and so the concept of sustainable development was always a multifaceted one (World Commission on Environment and Development, 1987).

Ecological sustainability and economic sustainability never led to major controversies. Ecological sustainability always had a point of reference: pristine nature. In the understanding that the current environmental crisis is mankind's responsibility, more human intervention means less ecological sustainability, while nature that is untouched and pristine means more ecological sustainability (Pimentel, Westra, & Noss, 2000). Economic sustainability underwent minor discussion, whereby some authors spoke out in favour of zero material growth while the majority saw the need for sustained economic growth that was careful with regard to environmental degradation. By the early 1990s, it was clear that social sustainability was the cause of most of the disagreements (Lélé, 1991). But how was social sustainability conceived? First of all, separating the social issue from the ecological one was not easy. Lélé said that soil erosion could be seen as a problem of ecological unsustainability, but if it were caused by poor, resource-strapped communities growing crops on marginal land, it would simultaneously be a problem of

social unsustainability. Secondly, until the 1990s, two issues dominated discussions regarding social sustainability: poverty and population increase (Angelsen, 1997). In this context, the social unsustainability of poverty arises because the poor lack the resources necessary to guarantee the sustained use of their resources. In the angst of their everyday existence, they must overexploit them. They thus act as environmental predators and erode the soil. The important element is not the poverty itself, but rather the ecological unsustainability—the depredation and the soil erosion—to which it lead. The social unsustainability of population growth means that the poor reproduce more quickly than other sectors of the population, which brings increased pressure to bear on resources and increases the production of waste. Also of concern in this case is social unsustainability, in the manner that it affects ecological sustainability—increased waste and heightened pressure on natural resources. As illustrated in this example, it is clear that the concept of social sustainability was used in a restrictive fashion and was associated with ecological sustainability.

Toward the end of the 1990s, several authors, speaking independently, denounced the use, in international discourse, of social sustainability as a bridge or as a means to guarantee ecological sustainability (Foladori & Tommasino, 2000; Anand & Sen, 2000). In other words: for international agencies like the United Nations, the World Bank, and others, poverty and/or population increase were not seen as problems of unsustainability in and of themselves, but only in terms of the ecological unsustainability they caused. Anand & Sen (2000) spoke of this line of discourse from the World Bank with the following words:

> … this argument provides an instrumental justification for poverty alleviation, as a means of protecting the environment. (p. 2038)

It is therefore necessary not to confuse words such as poverty, migrations, hunger, etc., with social sustainability since, in many instances, those words are used to conceal the true interest: namely, natural resources. From another perspective, it has been said that they do not discuss the relations that generate poverty or unemployment, but only their technical consequences in terms of ecosystem pollution or degradation. As an alternative to this restricted view of social sustainability, the economist Stiglitz (1999) refers to the role of *social participation* as an end in itself, thereby criticizing the use of the social arena as a means to obtain economic or environmental improvements.

The international organizations are now reviewing their discourse and their projects, with a view to incorporating social participation, empowerment, and governance as defining elements in their policies. If up until the end of the 20th century the axis of the sustainable development concept was on leaving an improved environment—at least a similar one—to the coming generations,

the focus of the sustainable development concept has now changed toward improving the current generations, to make them less vulnerable to face the future (Foladori, 2002).

But although recent statements suggest a major change in the role of social sustainability and, consequently, in the sustainable development concept, both the old and new voices alike consider human society as a unit that relates to its environment. They have not abandoned the ecological and technical approach.

## Returning to the Content of Environmental Education in Light of the Above Context

The challenge of overcoming the limitations imposed by ecology, but retaining its contributions, entails incorporating human specificity in its relationship with external nature. *The distinction between technical and social relations* is the methodological basis that will allow that advance. I shall now examine what that distinction entails and to what extent it represents a methodological advance.

Human beings simultaneously establish two types of relations in their transformations of nature. On the one hand are the *technical relations* between people and things, between people and the external environment. These technical relations are what allow any work process to result in a useful product. They also allow reflection about the activity, awareness of the internal mechanisms (technology), and the permanent correction of the process and of the tools used to improve the final product. All of these relations that human beings establish with the external environment are technical relations; and they are the object of study of physical and natural science. Faced with the pollution of a river by industrial effluent, chemical analysis can identify the elements; biology can identify the impact on life; geology, the possibility of filtrations; and so on. In all instances, these are technical analyses of the anthropic pollution and its impact on the ecosystem and on the human species itself.

In addition, at the same time as these technical relations, human beings establish *social relations of production*, since the means with which they work—be they instruments, machinery, or the actual physical spaces within which activities are carried out—are distributed according to rules of ownership or appropriation prior to the activity and they serve to determine the distribution of the product, the rhythm, and occasionally even the kind of technique used. While technical relations are studied by physical and natural sciences, social relations are studied by social sciences. Understanding that distinction and the connection between the type of relations and the sciences that study them forms the basis of interdisciplinary work (Foladori & González, 2001).

Perhaps this distinction between technical and social relations can be visualized more easily by means of a fictitious comparison. Let us assume that

a hunter who belongs to a tribe of hunter-gatherers kills a boar with his bow and arrow. According to the traditions of the society in which he lives, that boar must be distributed in accordance with pre-established criteria: perhaps the hunter may keep the loin but is required to surrender the front quarters to his wife's family, the hind quarters to his own family, and so on.

Now, let us imagine a yuppie with a private hunting reserve and who is so eccentric that he has learned to hunt using the same gear and techniques as the hunter in the tribe described above. In this case also, the yuppie kills a boar, except that he can do with it whatever he likes. On one occasion he might store it in his refrigerator, on another he could give it to his dogs, on a third he might give it away, etc.

Comparing the two examples, we see that the technical relations are exactly the same: a man, with a bow and arrow, hunting a wild boar. However, the rules that determine how the product is to be distributed vary substantially from one case to the other. Why? Because in the first case external nature belongs to the tribe, even before the hunter kills his boar. Wild animals are part of the environment that the tribe, collectively, appropriates. Any person who extracts a part of that environment must distribute it. In the second instance, the yuppie hunts on his own private property and can thus freely dispose of the boar as he pleases. Although the technical relations are the same, the social relations—collective property and private property, respectively—regulate and determine the ultimate disposal of the product before the activity itself takes place.

The following example will illustrate the distinction between technical and social relations with a case involving depredation or pollution. It could be said that the agricultural techniques of poor peasant farmers are the reason behind soil erosion in certain areas. Indeed, this could be the immediate cause, responding to the technical relations that the peasants establish in their farm work. But we must not lose sight of the fact that these peasants compete, on a disadvantaged footing, in a market with producers who use sophisticated tools and machinery, are closer to the market, or whose land is more fertile. In any event, the peasants must offset the disadvantages of their labour productivity by overexploiting their lands and their families. Now, in addition to agricultural techniques, the peasants are subject to commercial competition wherein can be seen the social relations of production that are the ultimate cause of the soil degradation. By modifying their technical relations, introducing agro-ecological or agro-organic practices, the peasant farmers would no doubt manage to reduce the erosion of their land. But even successfully attacking the technical causes behind the erosion would not completely resolve the social causes or their competitively disadvantageous position. Progress would have been made with ecological sustainability, although the social unsustainability would be left pending and might, perhaps after some time, make itself evident in heightened poverty or migration.

The next case involves the deforestation of tropical forests. Let us assume that in a given area, the immediate or direct cause lies in the activities of logging companies. These companies establish technical relations with the forest, implying awareness of tree varieties, visiting and selecting those that are to be felled, constructing pathways for moving the lumber, using machinery, transporting equipment, combining these activities with the seasons of the year when the rains do not prevent access, etc. That immediate cause of deforestation can be avoided or reduced technically. Certification is a technical mechanism intended to identify product origins. The classification mark, the identification records of the sawmill, the scientific name, species identification, moisture content, and drying method: these are all technical criteria that help identify the origin and quality of a load of timber. Based on these technical criteria, policies to control and defend the forests are drawn up and national and international regulations are issued. But all that neither avoids nor conceals the social relations of production. The company is working on public or common land, cutting down centuries-old trees and thus appropriating accumulated natural fertility for itself. In any event, they appropriate for themselves the rent of the land in the shape of extraordinary profits that motivate them to flout the regulations. That is the ultimate cause of the depredation of the tropical forests.

With this type of example we can see how the social relations of production determine relationships between these productive sectors and external nature. The tools of ecology do not permit this level of analysis. On the contrary, by considering human society generically it conceals the ultimate causes and overstates the immediate causes that respond to technical concerns.

The usefulness and practicality of distinguishing technical and social relations in analyzing environmental issues can be seen in at least two ways:

- It allows the ultimate causes, which obey social relations, to be distinguished from the apparent or immediate causes, which obey technical relations. It thus becomes an instrument for predicting the consequences of human activity on the environment, the structural limits that technical modifications imply, and long-term trends in degradation. It also facilitates awareness of social metabolism with external nature—not just in the ecological terms of the transfer of energy and materials between human society and ecosystems, but also in light of the repercussions of the ecosystems' impact on social relations themselves, redesigning the structures of class and power. This understanding of the natural metabolism and the social metabolism is the basis for devising environmental policies that are aware of the parties who stand be to responsible for, benefit from, or be harmed thereby.
- It facilitates interdisciplinary dialogue. The complexity of any environmental problem requires the participation of scientists from different disciplines. But how are the partial contributions that respond to specialized knowledge to be

overcome, or ordered into a hierarchy? On the one hand, those responsible for physical and natural analyses study the effects of technical relations on the external environment and the human species. They detect the immediate causes that lead to depredation and pollution. They identify technical alternatives, or steps to mitigate the problem. On the other, those responsible for social analysis detect the interests and motivations because of which given groups or sectors depredate or pollute their surroundings. But devising policies and proposing alternatives requires an awareness of the dynamics of the processes, which is the result of the convergence of the long-term trends determined by social relations but also of the immediate causes, as explained technically. The search for the relationship between technical activity and consequences on the one hand, and those responsible, those benefited, and those harmed on the otherhand, is the meeting point: it is there that dialogue between disciplines can exceed the sum of partial (multidisciplinary) knowledge and give rise to new (interdisciplinary) knowledge (see Figure 2).

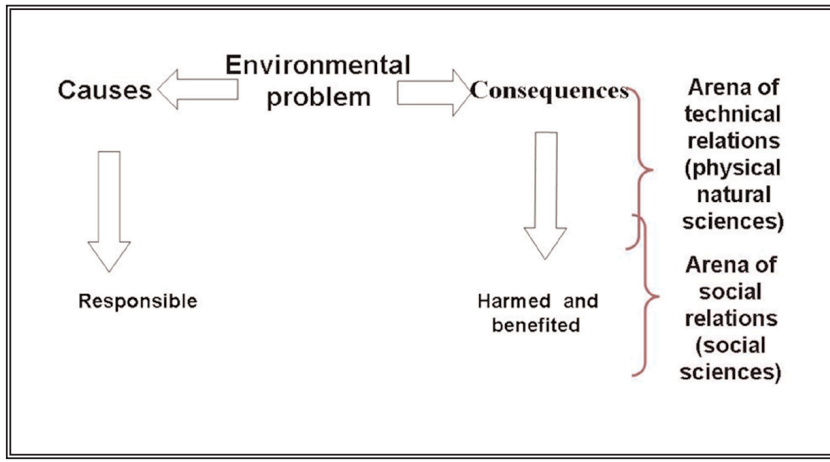


Figure 2. Technical and Social Level of Environmental Problems.

Some commentators will say that the distinction between social and technical relations is useless, since the only way to correct problems of environmental depredation or pollution is through technical changes. That is a mistaken claim, because the difference does not reside in making or not making technical changes, but rather in whether the approach used to analyze reality embraces the implications of social relations and those contained within them, or whether it is restricted to a technical analysis. This distinction in the approach permits different criteria in selecting what environmental policies and what technical changes to propose or pursue.

Let us see an example of this choice of technical alternatives, both with awareness of social relations and without knowledge thereof. Take, for example, urban environmental problems. Depending on the city, these can

be caused by motor vehicle transport, which generates pollution, noise, and traffic jams. They can arise from the population concentration itself, creating problems in the drinking-water supply, problems with the accumulation of solid waste, epidemics, and wasted time spent in travel and transportation by people and merchandise alike. Finally, they can derive from construction on specific types of soils and topographies characterized by inadequate rainwater drainage, causing landslides and fragility at times of extreme weather. Many of these problems can come together and combine. In any event, these are matters that can be approached technically. Without an awareness of the effects of social relations of production, the proposals would stop here. But in most cities in our countries, these are only the apparent causes. The underlying causes, associated with the social relations of production, reside in the rapid process of migration to the cities from rural areas. This distinction is important because, in economic terms, it is normally cheaper to subsidize rural activities in towns and small cities than to attack, with technical tools, the problems of urban unsustainability.

Until the 1980s, Uruguay had a railroad system for transporting passengers and cargo that served a large rural area and a number of small towns. During the 1980s, and as a result of increased maintenance costs for the railroad and competition from road transport, the train was reduced to a few cargo lines. Many of the towns and cities through which it passed had significant infrastructure: many saw their activities reduced to minimal levels, many became ghost towns, and many saw their inhabitants migrate and the landscape deserted. This provides a clear example of the difference between a technical approach and a social one. The technical approach is expressed in the individual productivity of the railroad company and its cost-to-benefit ratio, which, at a given moment, ceased to be profitable. But if studied from the perspective of social productivity, it is an economic waste, since the consequences in terms of the decay of rural towns and the expansion and urban unsustainability of the capital and its surrounding area are, to all appearances, more costly than subsidizing rural activities and maintaining the railroad.

Another example has to do with the emergence and resurgence of infectious diseases throughout the world over the past twenty years (Foladori, 2005). In poor, tropical countries, reference is made to diseases that are neglected by biomedical research. Pharmaceutical corporations are accused of conducting research only into the diseases of rich countries, where there are markets for the drugs they produce. With respect to this problem, what is the global public health alternative? Since the early 1990s, the World Health Organization has embarked on Public-Private Partnerships with pharmaceutical companies and charitable institutions, in order to provide those companies with funding so they can conduct research into vaccinations and drugs for the Third World. This is a technical alternative that combines an economic phase (subsidizing and creating a market) and a scientific phase (research agreements). But this approach ignores the deep-rooted

causes that underlie the expansion of contagious disease and that obey the social relations of production, such as the productive transformation of ecosystems, increases in poverty and population growth, speedier and more intense transportation of people and goods, etc. In conditions of extreme poverty, such as in sub-Saharan Africa, and where most of the Public Private Partnerships operate, it is feasible for an eradicated disease to be replaced by another. In addition, this alternative—which depends on the expertise of the pharmaceutical companies—reproduces an expensive and highly debatable technological path, in light of the growing expansion of microbes that can resist multiple drugs and the loss of human immunity caused by the consumption of antibiotics. However, the technical approach is not the only alternative for dealing with the reemergence of infectious diseases. There are many examples that record substantial reductions in epidemics at low cost, based on social mobilizations and/or the use of alternative medical paradigms. The report on a research project carried out in Uganda and neighboring countries, published in *Science*, describes the success of an AIDS campaign that reduced the positive presence of the virus to 70% of its previous level in less than a decade. This was equivalent to a vaccine with an 80% rate of effectiveness (Stoneburner & Low-Beer, 2004). But this is not the only case. In China's Henan province, malaria was reduced by 99% between 1965 and 1990 through social mobilization policies, supported by fumigation efforts, mosquito nets, and the native product *artemisinin* (Jackson et al., 2002). Vietnam reduced its malaria deaths by 97% between 1992 and 1997 by means of a combination of grassroots organization, mosquito nets, insecticides, and *artemisinin* (World Health Organization, n.d.). During one of Cuba's fiercest dengue epidemics in the early 1980s, population organization turned out to be the most efficient control mechanism, and this provided one of the few success stories in controlling dengue (Gubler & Clark, 1996). There are countless examples of different alternatives based on social approaches instead of technical ones.

This analysis methodology based on technical and social relations is of great use both for environmental impact studies, for interdisciplinary postgraduate courses in environmental science, and for multidisciplinary teams charged with drawing up environmental policy (Foladori, 1996).

## Conclusions

In recent decades there has been a debate as to whether environmental education should have an explicit corpus of contents, or whether it should be a dimension guided by principles and criteria that cut across the different disciplines of the curriculum, or whether it should offer an arena for interdisciplinary dialogue. This could well be an endless discussion. This is first because, irrespective of the discussion, environmental education must have

topics that identify it and distinguish it from other disciplines and/or subject areas; otherwise, it would not exist. Second, because each group or course has different concerns vis-à-vis the environment, so the topics must be flexible enough so as to have little to do with each other. Concern about climate change, for example, is distant in terms of its information, analysis methods, and impact from concern for the pollution of a river by factory effluent. It is thus a paradox that environmental education has to be identifiable as something but, at the same time, cannot be identified with anything.

This is where ecology comes into the equation. Ecology resolved, in practice, this paradox. It gave environmental education a corpus of contents: laws that govern transfers of energy and materials; laws that explain biological, geological, and chemical cycles. It gave environmental education a perspective: global, holistic analysis; the concept of the life cycle. Consequently, the hegemony of ecology comes at a price. There are weighty reasons why it attained that position. But at the same time as it represents progress, ecology has become the paradigmatic science in environmental debate and has placed an obstacle on the construction of a critical theory regarding the metabolism of human society vis-à-vis the external environment.

What is the obstacle that ecology places before environmental education? Considering human society in an undifferentiated way in its relationship with the environment; centering environmental debate on pollution and depredation, on results of human activity that can be corrected technically, or by the effects of new set of ethics or of determination. But ecology cannot explain the relationship between pollution or depredation and social contradictions. It cannot explain the limitations of the technique.

Because of these limitations of ecology it has been proposed that environmental education be a dimension, or an arena for interdisciplinary convergence, instead of a set of contents. But something is still missing. There is a need for methodological elements at the core of environmental education, to give it meaning in and of itself and, at the same time, to empower the ecological approach, by freeing it from its technical and generic anchoring.

The sustainable development concept has not managed to overcome that. First, because it has reflected a keener interest in external nature than in human society. Second, because the most recent reconsiderations of the concept that placed the reduction of human vulnerability at the center of the discussion, have not evolved beyond a technical approach. With this, they again reduce the environmental problem to a generic issue of humankind vis-à-vis the external environment.

That impasse can and must be overcome. Environmental education can enjoy both an identity and strength. The category of technical and social relations can be of great usefulness in distinguishing practical and technical action regarding the environment from the motivations, interests, and strengths of the groups and classes involved. The distinction between technical and social relations allows the ecological approach to be empowered by

placing it in its historical context, among the social contradictions. Pollution and depredation can be analyzed not only as a consequence of human techniques, but also as a result of economic forces and political expressions that show human society in its contradictory relations with the external environment. The transformation of external nature is the product of the way in which human society relates to itself. The effects of human activity on external nature redefine, at the same time, their internal nature.

Finally, the distinction between technical and social relations offers a useful methodological tool for professional work, policy making, and interdisciplinary teaching about environmental affairs.

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## Notes on Contributor

**Guillermo Foladori** is author of several articles and books on environmental issues (*Limites do desenvolvimento sustentável* [The Limits of Sustainablility], São Paulo, 2001; *¿Sustentabilidad? Desacuerdos sobre el Desarrollo Sustentable* [Sustainability? Disagreement on Sustainable Development], México D.F., 2005).

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