

ENVIRONMENTAL EDUCATION (EE)

Michaël Atchia

Past Chairman and Member of Commission for Biological Education of the International Union of Biological Sciences

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Summary

The main challenge of human society today is to find ways of living within the carrying capacity of the Earth and with full respect to its natural rules and processes. The first and most important way in which to do so is to commit ourselves to it by incorporating “environmental sensitivity” into all decision-making processes for the management of planet Earth at all levels. Education about the environment is the key in making this happen: the awareness, the commitment, the solutions, the management of implementation, the evaluation of results, leading to the birth of a new discipline. Developed around the results of the Stockholm (1972) and Belgrade (1975) meetings, Environmental Education is not just an academic subject for study; it is, by definition, a core discipline with a crucial mission. This article examines successively the scientific, conceptual, and pedagogical foundations of Environmental Education.

1. Historical Perspective and Definition

Planet Earth is the only place in the solar system and indeed in the universe known to sustain life.

Starting from the “primeval soup” of organic molecules and one-celled organisms some 4000 million years ago, evolution has produced, through mutation and natural selection, a bewildering diversity of life on Earth.

Humanity as part and parcel of this biodiversity has brought “consciousness” and conscious thinking to the biosphere. Armed with these “superior powers,” but unfortunately still reacting in the old ways of the “survival of the fittest,” humanity has ended in laying waste the planet and seriously modifying its natural regenerative cycles of climate, freshwater, temperature, currents, reproductions and migrations. The effect of human action and impact has been further multiplied by an exponential human population explosion and by a changing individual human life-style, which makes increasing demands from the earth for energy, material, space, plus producing mountains of increasingly toxic, non-biodegradable waste.

Man’s relationship with the biosphere will stabilize only when new lifestyles and new socioeconomic and political orders are established. The history of environmental thinking dates back from early civilizations in Greece, India, China, Mesopotamia, and later Aztecs and Incas to mention but a few. The themes of “respect for nature” and “nature conservation” were provided by a minority of philosophers and thinkers but did not carry the day; the well documented disappearance of civilizations in Mesopotamia and the Indus valley due to climate change and the over-exploitation of water resources is well known. The Renaissance period in Europe similarly brought in renewed concerns about nature reflected in the painting, poetry, prose and architecture of the day. The industrial revolution of the eighteenth- and nineteenth centuries, culminating in a century of war and technology (the twentieth century) has left planet Earth and even its protective outer space shield (the ozone layer) with quasi-permanent damage.

It is noteworthy how many indigenous cultures possess knowledge of their environment far in advance of those who visited or colonized them. For example, the Native Americans, the Aborigines of Australia and the Ituri or forest people of the Congo basin developed enlightened attitudes towards the environment, which allow both man and environment to co-exist harmoniously. The destruction of such cultures and civilizations when they occurred were a tremendous loss for humanity, fortunately compensated today by the search and recognition of indigenous environmental knowledge and its incorporation into school curricula. A case in point is the renewed interest in the practice of herbal and traditional medicine in India, China, Amazonia and West Africa, side by side with modern (western) medicine.

The history of the environmental movement can be traced in two ways. The first is through writers whose publications have been influential. No list can do justice to everyone; however from this author’s perspective the following modern writers and documents have contributed significantly to the growth of environmental thought:

Aldo Leopold, (1949). *A Sand County Almanac*. Jean Dorst, (1970). *Before Nature Dies*. Donella Meadows et al. (1972). *The Limits to Growth*. E. P. Odum, (1963). *Ecology*. Vance Packard, (1963). *The Waste Makers*. Rachel Carson, (1970). *Silent Spring*. Oliver Goldsmith et al. (1972). *A Blueprint for Survival*. Barry Commoner, (1966). *Science and Survival*. R. E. Roth, (1969). *Fundamentals concepts for*

Environmental Management Education. UNESCO–UNEP, (1975). *Belgrade Charter*. UNESCO-UNEP, (1977). *Tbilisi Declaration*.

A second way to trace environmental history starts with the United Nations Conference on the Human Environment, in Stockholm, 1972 and the subsequent events, many of which were UN initiated. At Stockholm the plight of planet Earth was revealed as well as a rift between developed and developing countries, the latter taking the stand that the call for nature protection would prevent their development (i.e. modification of the biosphere and the utilization of human, economic living and non-living resources to satisfy human needs and improve the quality of human life). Adopting a narrow, nationalistic perspective some participants at the Stockholm Conference remarked that those who called for the protection of forests in Amazonia, Congo and the East Indies had already devastated a large part of their own forests, be it in North-West Europe, Japan, or the USA. It took nearly twenty years to the UN Conference on Environment and Development in Rio de Janeiro in 1992 (the so-called Stockholm +20 or Earth Summit) for a measure of agreement to be reached universally on co-existing these two concepts of environment and development.

Planet Earth and its biological diversity had suffered enough. It was time to start a healing process. The main output from Rio was *Agenda 21*, a blueprint, signed by 182 nations of the world, which aimed at guiding nations towards environmental sanity while pursuing rational economic growth. The Rio +5 evaluation meeting held in New York in 1997 did not, by and large, reflect any tremendous change in national environmental approach.

Other landmark environmental events were:

- World Population Conference, 1974
- UN Conference on Human Settlements, Vancouver, 1976
- UN Conference on Desertification, 1977
- World Climate Conference, 1979
- UN Conference on Environment and Development, 1992
- The UN Population Conference, Cairo, 1994

Environmental Education itself was the main theme of the first World Conference on Environmental Education held in Tbilisi, Georgia (USSR) in 1977, and the follow up Tbilisi +10 Congress organized by UNEP and UNESCO in Moscow in 1987.

At this point it is useful to summarize some of the major man-made environmental accidents of the last quarter of last century. More than anything else these have raised awareness of our fragility and that of the biosphere. Corrective measures have followed after Hiroshima and Nagasaki; after Bhopal; after Agent Orange on Vietnam; after Seveso, Three Mile Island, and Tchernobyl; after the oil spills caused by the sinking of the Torrey Canyon and more recently the Exxon Valdez. Preventive measures are being taken and in many areas, catastrophe readiness drills are performed but still a sustainable future is not assured for our children and us.

The World Commission on Environment and Development summarized succinctly the

existing dichotomy between ecology and economy thus:

The Earth is one but the World is not.

The main challenge of human society is thus to find ways of living within the carrying capacity of the Earth and in full respect of its natural rules and processes.

The first and most important way in which to do so is to commit ourselves to it by incorporating “environmental sensitivity” into all decision making processes of management of planet Earth, at all levels.

Education about the environment is the key in making all this happen: the awareness, the commitment, the solutions, the management of implementation, the evaluation of the results. Developed around the results of the Stockholm (1972) and Belgrade (1975) meetings, Environmental Education is not just an academic subject for study; it is, by definition, a core discipline with a crucial mission.

The next sections will examine successively the scientific (section 2), conceptual (section 3) and pedagogical (section 4) foundations of this core discipline.

2. Scientific, Technical, and Socioeconomic Foundations of EE

The pedagogical goals, principles, focus, audience, and mechanism of EE are detailed later under section 4. Besides the obvious awareness element of EE and its key contribution to general education and understanding, it is an operative and practically-oriented discipline. Its main concerns are the teaching and learning of the theory and practice of

- Environmental monitoring
- Environmental protection
- Environmental resources development and management
- Environmental enhancement
- Developing sustainable futures.

The main scientific, technical, and social issues, which would normally become the key topics of a practically oriented EE course are discussed below.

2.1 Natural Resources

2.1.1 Freshwater

- Lack of water is the greatest threat to life—human, animal and vegetal;
- Dirty polluted waters are the world’s major cause of disease. More than a third of the world does not have safe drinking water. Out of a world population of 6000 million (6 billion) in 2000, about:
 - 1900 million lack safe drinking water,
 - 1400 million lack sanitation,

- 1000 million cases of diarrhoeal disease occur annually,
 - 200 million cases of schistosomiasis occur annually
 - while up to nine million people die annually as a result.
- More than 97 percent of the water on Earth is sea water.
 - Less than 1 percent of the supply of fresh water is available for human use: the rest is locked away in glaciers and polar ice-caps.
 - Industry uses less water than agriculture, but pollutes it to a far greater extent.
 - The number of thirsty, dirty cities around the world is increasing: the number of garden towns decreasing.
 - An International Drinking Water Supply and Sanitation Decade was launched by WHO in 1981 with a view to providing safe drinking water and sanitation for all by the year 1990. This has not happened.

2.1.2 Atmosphere and Climate

It is a common misconception that air pollution simply disperses over time into the atmosphere. Some pollutants are trapped at low altitude and end up affecting cities and countryside enormously. The burning of fossil fuel by motor vehicles as well as industrial activity has serious impact on human health and the survival of natural ecosystems. The main culprits are the nitrogen oxides, sulphur dioxide and in particular carbon dioxide, to a less extent the chlorofluorocarbons (CFCs). One of the most harmful effects of air pollution by these gases is acidification and acid rain. CFCs are the ozone depleting substances. They have no direct impact on human health; the indirect impact can however, be enormous. For example, in southern Chile during the summer of year 2000 the ozone hole over Antarctica extended to that region; people who remained in direct sunlight for over 30 minutes between the hours of 10 am and 2 pm were likely to receive mild to severe skin burns. However, a program of public information succeeded in preventing harm to people. Harm to animals and vegetation could not be prevented.

Human beings and indeed the entire biosphere need good air quality twenty-four hours a day in order to survive.

The above, in particular the burning of fossil fuel and the “greenhouse effect,” are modifying world climate. The average temperature on the earth’s surface has remained relatively stable for 10 000 years. During the last two centuries the altered composition of the atmosphere and the release of extra energy have raised average temperature on the surface of the Earth. The repercussions of global warming are difficult to predict but current evidence suggest that it may have a huge effect on natural climate patterns, on sea level and in particular on rainfall (more severe droughts and more severe flooding). These repercussions would cause disruption of ecosystems and human activities such as agriculture.

Amongst the measures proposed and/or being presently implemented to combat climate change and atmospheric pollution are the following:

- National programs to reduce CO₂ emissions.

- Restriction on use of fossil fuel and development of renewable energy.
- Alternative transport patterns.
- Drastic reduction in the production and use of CFCs (chlorofluorocarbons) so as to protect the ozone layer.
- The development of new clean technologies and a major program of technology transfer.

2.1.3 Oceans and Coastal Areas

The intent is to protect, develop and enhance—primarily through intergovernmental cooperation—the coastal and marine environments upon which large numbers of people depend directly; while at the same time, through international cooperation, to protect the open seas and their inhabitants (e.g. marine mammals).

Some specific issues

- Most of the wastes produced by industry, agriculture, and homes end up in the seas, threatening marine life.
- Some very sensitive and important marine organisms, such as coral reefs and algal plankton, are particularly affected by pollution.
- The oil industry, with its marine-drilling operations, transport of oil by tankers and use of oil-driven engines at sea, is contributing substantially to polluting the ocean.
- For centuries, marine life has provided a considerable proportion of human needs for food and other useful material; overexploitation of certain species (whales, tuna, crustacea), coupled with pollution, is threatening the supply of food from the sea and the survival of many species, in particular certain whales and other marine mammals.
- The capacity of the oceans' natural system to absorb man-made chemical wastes has definite limits though these are not as yet measured.. Mass tourism in certain coastal areas, over-fishing, and the prospecting and transport of oil are probably the major threats to oceans.
- Global warming, more specifically increases in temperature of oceans, would destabilize many marine ecosystems. Corals for example and many associated species are highly sensitive to changes in temperature, salinity and clarity of seawater.

2.1.4 Soil and Agriculture

What exactly is soil? In what way is it a critically important resource? Soil is far more than an inanimate base on which human beings can develop their economic activities. It is a complete ecosystem in itself. The inhabitants of this dark world range from bacteria to fungus and from worms, insects and spiders to small mammals. The making of soil is a long-term process. It takes between 1000 and 10 000 years to develop a layer of soil half a meter deep.

Some specific issues affecting soil:

- Pollution and contamination in particular from heavy metals such as lead, from

persistent pesticides and in some cases by radioactive wastes as has been the case for example for large tracks of Ukraine, around Tchernobyl; these contaminants affect every level of food chains, hence do not spare any produce from agriculture.

- Soil erosion is a natural phenomenon caused by water and wind but which can be accelerated by deforestation and inappropriate agricultural practices. The cost of restoring plant cover and fertility of the soil is huge and slow; in many cases total denudation of mountain slopes, exposing the underlying rock, is practically irreversible.

2.1.5 Wildlife and Biodiversity

For ethical, social, economic, scientific and technical reasons, the conservation and utilization of biological diversity is more essential than ever for environmentally sound and sustainable development and for the continued functioning of the biosphere. The United Nations and other multilateral agencies are rightly emphasizing the need to help countries achieve the sustainable management of their forest lands, savannas, mountain areas, coasts, lakes and rivers, as well as protect endangered species.

The development and adoption of international Conventions and Action Plans on different aspects of biodiversity are the essential tools of action in that area. Examples of such legal instruments are the: *Convention on Biological Diversity* itself, the *Antarctic Treaty* of 1959, the *Convention on International Trade in Endangered Species (CITES)* of 1973, the *UN Convention on the Law of the Sea* (1982), the *Ramsar Convention on Wetlands of International Importance* of 1990. Equally effective are regional agreements such as the *Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region* (Nairobi, 1985). Other actions in the field of biodiversity go through interagency programs such as the *Tropical Forestry Action Plan* of 1985, a joint program of the World Resources Institute, FAO, World Bank, and UNDP. General strategies such as the *Tbilisi Declaration on Environmental Education* (UNESCO/UNEP) of 1977, the *World Conservation Strategy* of 1980, the *World Soils Charter* of 1981 and *Agenda 21* itself have had beneficial effects on the conservation of wildlife and biodiversity.

Forests are considered below as an example of a habitat in danger, with obvious implications for the wildlife they harbor.

- Tropical forests cover 2970 million hectares of the Earth's surface, but have been undergoing rapid depletion over the past century.
- According to one estimate, at least 225 million more hectares of tropical forest will be cleared or degraded by the end of the century; the rate of depletion is about 21 ha. per minute.
- Forests are a major habitat for wildlife and their degradation a major threat to it.
- The main cause of deforestation is the need to expand agricultural land (though logging often leads indirectly to deforestation by opening up previously inaccessible areas).
- High though the cost of prevention may be—as is so often the case—it is trivial compared to that of continued inaction.
- The destruction or degradation of forests has widespread implications for human

society. Forests are useful, amongst other things, as a supplier of fuel, fibre, food, building material, shelter, medicine and as a source of genetic material. Furthermore, forests protect soils and watersheds, retain water and prevent floods, provide carbon sinks against atmospheric pollution.

- Forests are the homes of numerous indigenous peoples who often have invaluable knowledge of their forest environment and whose lifestyles stand to be negatively affected if forests are depleted.
- Although 33 developing countries are currently net exporters of forest products, only 10 are expected to be in 2010.
- Deforestation also threatens the natural balance of upland watersheds and deprives the world of the genetic diversity on which it ultimately depends.
- Local attempts to protect and manage forests, as well as to establish new plantations, have been successful in many countries—though not yet on a significant global scale.
- Rural women, many of whose families depend heavily on forest or tree products, have proved powerful allies in conservation programs; non-governmental organizations have proved most effective in implementing projects at the grassroots level.

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Biographical Sketch

Dr Michaël Atchia is a member and past Chairman of the Commission for Biological Education of the International Union of Biological Sciences. From 1986 to 1996 he was Chief of the Environmental Education and Training Unit, United Nation Environment Programme. He is presently a director of Education, Mauritius.