

## ENVIRONMENTAL EDUCATION AND AWARENESS

**Bhaskar Nath**

*European Centre for Pollution Research, London, UK*

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## Summary

The subject-matter of this chapter is environmental education and awareness for achieving global sustainable development and global environmental sustainability that are now at the top of international environmental agenda. It is argued that the pervasive and quintessentially Western attitude to nature and the natural environment has evolved through the ages from a profoundly anthropocentric, utilitarian and grossly exploitative world-view that denies the intrinsic values of nature and all non-human things within it — a grossly mistaken view based on the geocentric cosmology of old that laid the foundation of modern science, technology and economics and shaped the attitude of Europeans to nature and the natural environment. Indeed, it is this world-view that has also brought about the mounting environmental predicament confronting the world community today.

It is demonstrated that science and technology alone cannot deliver sustainable development. They can only assist the process, albeit to a limited extent. This is because in the final analysis how we treat nature and the natural environment is fundamentally determined by our attitude to them, and our attitude in turn is shaped by the moral and ethical values we hold. It is argued, therefore, that if we are at all serious about achieving global environmental sustainability and sustainable development, we must adopt an entirely different set of moral values that genuinely respect nature and her abundant benediction that sustains us and makes life on earth possible. In order for this to happen, it is argued that such genuinely environment-respecting moral values must be engendered through the formal educational curricula — from preschool through primary and secondary levels to the university level. Formal curricula (contents and pedagogy) for these levels are outlined, giving equal emphasis in each case to both “end-of-the-pipe” and “before-the-pipe” methods and strategies.

A number of important and germane issues are also discussed, including the following:

- Objective and scope of environmental education and research;
- Importance of and approaches to early childhood education;
- Human limitations;
- The “Enlightenment Fallacy”, and

- Development of formal environmental curricula for children with learning disability.

## 1. Introduction

This chapter discusses the global situation in the context of sustainable development and establishes the need for appropriate education for environmental awareness and sustainability.

In Section 2 discussion begins with a panoramic view of how anthropogenic pollution has been causing all kinds of environment-degrading problems, the impacts of climate change in particular that have potentially catastrophic consequences for life on earth. Man is supposed to be paramount in earthly creation, made by God Himself in His Own image, and most intelligent too. And yet he has been destroying his life-sustaining environmental capital knowingly, willingly and with gusto. It is hard to find an animal of lower species that behaves in quite the same way. Section 3 is devoted to a discussion of the evolution of this grossly unintelligent and incomprehensible behavior of the humankind and its genesis. In Section 4 it is argued that the “deep malaise” causing all kinds of environmental problems is apparently open-ended consumption, profligacy and insatiable lust of the affluent within and between nations for increasingly hedonistic life-styles. It is argued that if the international community is serious about achieving even a modest degree of global environmental sustainability and sustainable development, then serious efforts must be made to treat the “deep malaise” itself. Piece-meal, band-aid treatment of its individual symptoms, as at present, is only likely to exacerbate that which is to be diminished.

In Section 5 discussion moves on to whether or not we could rely exclusively on science and technology to alleviate the increasingly intractable global environmental problems they have created in the first place. A dispassionate analysis shows that the response to this question has to be in the negative, unless a dramatically less polluting or non-polluting source of energy, such as Nuclear Fusion Technology or Fuel-Cell technology is developed without delay to supply the exponentially rising demand for energy worldwide. The objective of environmental education at all levels (primary, secondary, undergraduate, Masters graduate level and research) is elaborated in Section 6 where a number of priority areas for graduate research are also identified. Section 7 is concerned with environmental education for children. From the psychological perspective children are most receptive to new ideas which they retain and which, unlike in adults, positively shapes their attitude and behavior to a significant extent in ways that endure throughout their adulthood. Therefore, it would make much economic sense to concentrate environmental education efforts on children. A generic environmental curriculum (contents only) is presented in Box 1 along with a discussion of the basic criteria for developing formal environmental curricula for children. A number of other germane issues are also discussed. Section 8 is devoted to the development of formal environmental curricula for children with learning disability, including the key guiding principles, pedagogic elements of formal curricula, and other related issues.

In Section 9 discussion is on the formal environmental education of undergraduate students, including identification of what is deemed important for them to know, and the

essential criteria and issues pertaining to the design of formal environmental curricula. It is argued that both “before-the-pipe” and “end-of-the-pipe” methods and strategies should be equally emphasized in formal curricula at this level. A generic curriculum (contents only) is presented in Box 2, from which an appropriate number of module (or subject) syllabuses are to be prepared as deemed necessary. Discussion in Section 10 is on how to instill environmental awareness in undergraduate (and graduate) students. A number of activities are suggested for this. Human beings have a number of limitations that are variously biological, psychological and social. It is argued that both undergraduate and graduate students ought to know about these limitations in order to avoid the arrogance of science and technology. A discussion on this topic is also given in this chapter.

Sections 11 and 12 are concerned with the environmental education of graduate students — both Masters degree students and those engaged in graduate research. Discussion begins with the unraveling of the global environment and the likely consequences of doing little or nothing to address the mounting environmental problems. Attention is then drawn to what graduate students need to know about the environment and to the very unsatisfactory current status of environmental education in many of the Masters degree programs, notably MBA programs, even in world-class management schools. Discussion then shifts to what ought to be the focus of Masters degree programs. Proposal for a generic syllabus, from which formal module or subject syllabuses are to be developed for different disciplines, is given in Box 3. A number of graduate research topics are also proposed.

## **2. The Problem in Context— Some of the Man-Made Environmental Problems with Potentially Catastrophic Consequences for Life on Earth**

“We waste what we have— our food, our fuel, our wealth, our gifts,  
Then we watch in surprise the destruction of our world.  
What we do not explore or gouge out of the earth, we pollute.  
What we do not pollute, we kill.  
We do not see, or wish to see, the damage we do.  
Later we regret”.

The above excerpt from an old Jewish scriptural text more or less sums up our destructive attitude to nature and her bountiful benediction that sustains us in our lives’ sojourn. Indeed, the adverse impacts of human activities on earth’s natural environmental capital have been and continue to be so profound and comprehensive that it is becoming increasingly hard to find a single human activity for economic development that is, or has been, benign or beneficial to the natural environment.

Although a multitude of environmental problems are being caused and/or exacerbated on all fronts by human activities for economic development in relentless pursuit of quintessentially western “civilized” life-styles that are increasingly wasteful and profligate, today unquestionably the environmental problems emanating from global warming are considered to be the most serious and menacing. Caused by greenhouse gas (GHG) emissions, mainly CO<sub>2</sub>, from human activities, these problems include climate change, ocean acidification, melting of polar ice, glacier retreat etc. which need

to be addressed as a matter of urgency (Hare, 2005; ISSC, 2005; McCarthy, 2005; Rapley, 2005; Royal Society, 2005; Turley *et al.*, 2005; Wilkinson, 2004; Yamada *et al.*, 1996). It is to be noted, however, that what is called “Global dimming” (see glossary) reduces the intensity of global warming. That is, the intensity of global warming (and of the environmental problems caused by it) would be greater than what it is today had there been no global dimming (Stanhill and Moreshet, 1992; Stanhill, 2001).

Burning of fossil fuels (coal, lignite, natural gas and petroleum) to generate electric and steam power for various human activities has mainly been responsible for the exponential rise in the concentration of CO<sub>2</sub> in the atmosphere (above the CO<sub>2</sub> concentration in pure air which is 0.03 percent by volume) causing global warming. Exacerbated by “positive feedback” (Bishop and Dorf, 2004), today (2007) atmospheric CO<sub>2</sub> concentration is 381 ppm by volume compared to 276 ppm by volume in the pre-industrial era (i.e. before 1750). Current rate of increase is more than 2 ppm by volume per annum. At this rate CO<sub>2</sub> concentration of 400 ppm by volume, which climate scientists consider to be the “danger threshold” or the “tipping off point”, will be reached in just 9-10 years from now triggering a number of environmental events and impacts with potentially catastrophic and largely unpredictable consequences. According to a recent, major study, “Carbon dioxide is accumulating in the atmosphere much faster than scientists expected, raising fears that humankind may have less time to tackle climate change than previously thought” (Adam, 2007). World temperature is already 0.8°C above the pre-industrial level caused mainly by man-made CO<sub>2</sub> emissions. According to experts, if current trends continue, temperature rise will reach 1°C in around 2030, 2°C by around 2050, and 3°C or higher by around 2070 (e.g. ISSC, 2005; McCarthy, 2005). Other apparently intractable global environmental problems to be addressed without delay include those of solid waste management especially in developing countries (Kocasoý, 2000), poverty eradication and deforestation.

A recent Report, commissioned by HM Treasury of the Government of the United Kingdom, draws attention in uncharacteristically strong language to the potentially catastrophic consequences of not addressing the climate change problem by urgently reducing GHG emissions (Stern, 2006). Another Report, by the Commission of the European Communities, has proposed a target to reduce EU’s GHG emissions by 20 percent by 2020 from 1990 levels (CEC, 2007). Failing to do so, the Report warns, would devastate EU’s environment with catastrophic economic consequences including the following. However, many consider this target too little and too late.

- Rising sea levels of up to a meter by the end of the century affecting all coastal areas of Europe;
- Frequent and even worse episodes of forest fires in countries such as Portugal;
- Devastating and more frequent flooding, such as that of the Danube, will become commonplace across Europe;
- Coldwater species of fish, such as cod, are likely to disappear from some of the regions. .

Yet another recent report warns that even if governments were able to slow down the pace of climate change, sea levels will keep rising for more than 1,000 years; and that

even if carbon dioxide levels were stabilized at about 45 percent above current levels, global temperature rise of 3°C is likely with potentially catastrophic environmental, economic and health consequences (IPCC, 2007).

Indeed, due to the mounting environmental predicament which man has so diligently and knowingly created for himself — a predicament which has now put a sizeable and growing question mark against his very survival on earth in the long-term — serious consideration is now being given to colonizing other habitable planets (and presumably to destroying their environments too in due course). The following concentrates the mind:

“Man has wiped out a third of the natural world in the last thirty years and soon will have to start looking for a new planet to live on....The scale of devastation is so great that man will have used up all the Earth’s natural resources by 2075.....If every human alive today continues to consume resources and produce carbon dioxide at the same rate as the average Briton, we will need to colonize at least two Earths to survive....Our current rate of consumption is eroding the very fabric of our planet and will ultimately threaten our long-term survival.”

(*The Living Planet Report*, WWF-2000)

It is sobering to consider the implication of the above. If we fail to colonize at least two earths by around 2075 — and despite tremendous advances in science, technology and space exploration we have yet to find even one in the unimaginable vastness of the Cosmos let alone colonize two — humankind remains at serious risk of extermination in due course by its own actions.

Man is said to be paramount in nature, made by God Himself in His own image. Indeed, according to the so-called *Anthropic Cosmological Principles* man is so paramount in creation that the Universe had to evolve in the way it has so that he could observe and understand it (Barrow and Tipler, 1986). Yet, it is hard to find an animal of lower species that knowingly and willingly destroys its life-sustaining environment with such gusto as man.

“What a piece of work is man!  
How noble the reason!  
How infinite in faculty, in form, in moving! How  
Express and admirable!  
In action how like an angel!  
In appreciation how like a god!  
The beauty of the world! The paragon of animals!  
And yet, to me, what is this quintessence of dust?  
Man delights not me, no, nor woman neither.  
Though, by your smiling, you seem to say so.”

(Shakespeare’s *Hamlet*, Act 2, Scene 2)

“Man is not a privileged inhabitant of the universe, but a passing species which will leave only a few faint traces of its passage when it becomes extinct.”

(Claude Levi-Strauss, 1999)

### **3. How did we get here? Evolution of Human Attitude to Nature and the Natural Environment**

It would be both instructive and helpful to examine how human attitude to nature and the natural environment has evolved through the ages in both Eastern and Western philosophical traditions.

#### **3.1. In the Ancient and Older Civilizations**

Whether out of awe, love or respect, many of the older societies had successfully established and maintained a harmonious relationship with nature and their environments — notably those societies founded on the philosophical traditions of Buddhism and Daoism (Taoism), and the *Vedic* philosophy. The last, which flourished in ancient India, endures even today as the foundation of that country's culture and way of life. In that culture divine status is afforded to many of the natural and cosmic entities (e.g. The Sun, wind, oceans, the Universe, etc.) in human or terrestrial forms to which it is easy for humans to relate. The rationale for this is obvious to see. For example, the Sun God was (and still is) worshipped because without His benediction of heat and light the earth would be an icy, sterile wasteland. Even today planet earth is *always* referred to as *Dharitri Mata*, which in Sanskrit means Mother Earth, and venerated with deep respect for her abundant benediction without which life on earth cannot exist. Similarly, in ancient Greek culture *Gaia* was venerated as goddess of the Earth (Lovelock, 1995).

Such moral values, which engender genuine love and respect for nature, instills the consciousness in humans to take from nature only that which one needs to live, and no more. To do otherwise, and especially to exploit Mother Earth in any way, is considered a cardinal sin, just as it is in most societies for one to exploit or abuse his or her biological mother. It was recognized, however, that humans must kill in order to live. Even when we breathe, we kill countless micro-organisms through inhalation. It was understood, however, that in order to qualify as a kind, caring, compassionate and genuinely environment-respecting human being, one must minimize one's killing activities.

“Everything animate or inanimate that is within the Universe is controlled and owned by the Lord. One should therefore accept only those things necessary for himself, which are set as his quota, and one should not accept other things, knowing well to whom they belong.”

(Mantra One, *Sri Isopanishad* )

A common thread running through the classical philosophical texts of ancient India is that all things in creation, animate and inanimate, inhabit the same continuum of existence and are differentiated only by the level of consciousness of each as compared to those of the others; and that the consciousness of each, animate or inanimate, is inextricably linked to the *Universal Consciousness*, meaning the Divine (Nath, 2003). Interestingly, the concept of the *Universal Consciousness* is also to be found in the theory of Many Worlds in Quantum Physics (Rae, 1993; Nath and Talay, 1996). This concept of oneness engenders respect for all animate and inanimate things, and especially for planet earth always referred to and venerated as “Mother”.

“In the whole world there is no study so beneficial and so elevating as that of the *Upanishads*. They are destined sooner or later to become the faith of the people....It has been the joy of my life — it will be the solace of my death.”

(Arthur Schopenhauer (1788-1860))

Islam, which is a much younger religion by comparison, also teaches its followers to respect nature and the natural environment. In the Holy Koran there are many passages to this end of which the following is typical:

“Uncorrupted water is the sign of paradise. If one wants to improve his way of life to match the high quality of the Most Perfect, one should stop polluting water.”

(Verse 47, Chapter 15 of the Holy Koran)

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Nath, B. and Kazashka-Hristozova, K., (2005), “*Quo vadis* global environmental sustainability? A proposal for the environmental education of engineering students”, *Int. J. Env. Poll.*, Vol. 23. No.1, pp. 1-15 [In this paper the authors demonstrate the futility of exclusive reliance on science and technology to deliver sustainable development and argue that moral education is needed for this to change human attitude to nature and the natural environment — from one of gross exploitation as at present to that of genuine respect].

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Porritt, J., (1991), *Save the Earth*, Dorling Kindersley, London. [This excellent publication contains a large number of short contributions by eminent environmentalists and others concerned with the environment. Much to be recommended for children and adults alike].

Powrie, W. And Robinson, J P., (2000), “The sustainable landfill bioreactor a flexible approach to solid waste management”, in B. Nath, S.K. Stoyanov and Y. Pelovski (Eds.) *Sustainable Solid Waste Management in the Southern Black Sea Region*, Kluwer Academic Publishers, Dordrecht, the Netherlands, pp. 113-140. [In this contribution the authors describe the design and operation of a novel landfill, conceptually based on the process of controlled decomposition and managed as a large-scale bioreactor. Relevant and up-to-date EU directives on waste are also described].

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Rogoff, B., Mistry, J., Goncu, A. And Mosier, C., (1993), *Guided Participation in Cultural Activity by Toddlers and Care Givers*, Monograph of the Society for Research in Child Development, 58, serial number 236. [The behavior of toddlers and care givers is assessed in this study. The authors conclude that learning by the toddlers approximates more to the interactionist paradigm than that of nativism or empiricism].

Royal Society, (2005), *Ocean acidification due to increasing atmospheric carbon dioxide*, London, The Royal Society. Internet version available at [www.royalsoc.ac.uk](http://www.royalsoc.ac.uk) [This authoritative report by the prestigious Royal Society of London and based on the findings of the Royal Society Working Group on Ocean Acidification paints a gloomy picture of how delicately balanced oceanic ecosystems may be irreparably damaged by ocean acidification if current carbon dioxide emission trends continue. Draws attention to the urgent need to reduce current man-made CO<sub>2</sub> emissions before it is too late].

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Stanhill, G and Moreshet, S., (1992), “Global radiation climate changes: the world network”, *Climatic Change*, Vol. 21, pp.57-75. [Said to be the first publication reporting global dimming, in this paper the authors draw attention to how it is caused and its potential for climate change].

Stern, N., (2006), *Stern Review on the Economics of Climate Change* (Final Report), London, HM Treasury, Government of the United Kingdom [Some of the major conclusions of this authoritative Report are these: Climate change is a very serious issue to be addressed as a matter of urgency; although the problem is global in scope, its impacts will be unevenly felt throughout the world; the costs of the economic externalities of the problem will be felt throughout the world over a long period of time; the current pathway of emissions is unsustainable; and climate change itself may impede growth and development].

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Vygotsky, L.S, (1978), *Mind in Society: the Development of Higher Psychological Processes*, Harvard, Harvard University Press. [In this seminal paper the author argues that biological and cultural

developments do not occur independently of each other. Rather, they are shaped by social interaction which actually leads to cognitive development].

Ware, J. (ed.), (1996), *Educating Children with Profound and Multiple Learning Difficulties*, London, David Fulton. [This text presents the different aspects of the education of children with profound and multiple learning difficulties, including curriculum development].

WCED, (1987), *Our Common Future*, Oxford University Press, Oxford. [This remarkable document is the report of the Brundtland Commission established by the United Nations in the mid 1980s. It gives much useful data on the state of the global environment and urges nation states to adopt the modalities of sustainable development which, it argues, is the only kind of development that has potential for ensuring a sustainable quality of life for both present and future generations].

Wilkinson, C., (2004), “Executive Summary” of *Status of Coral Reefs of the World: 2004*, Vol. 1, pp. 7-50, Cape Ferguson, Chunda Bay, Australian Institute of Marine Science. Internet version available at [www.aims.gov.au/pages/research/](http://www.aims.gov.au/pages/research/) [Describes how the World’s coral reefs are being degraded and lost due to the acidification of the oceans caused by relentlessly increasing anthropogenic CO<sub>2</sub> emissions and other causes. Recommends further research as well as concerted actions to be taken to reverse the trend].

WWF, (2000), *The Living Planet Report 2000*, London, The World Wildlife Fund [This Report is on the state of the global environment in 2000. It paints a gloomy but plausible picture of environmental consequences if we continue with environment-degrading and unsustainable patterns of development].

Yamada, T., Shiraiwa, T., Kadota, T., Watanabe, B., Rana, B., Ageta, Y. and Fushimi, H., (1996), “Fluctuations of the glaciers from the 1970s to 1989 in the Khumbu, Shorong and Langtang regions”, *Bulletin of Glacier Research*, Vol. 10, pp. 11-19. [This study reports on the measured fluctuations and retreat of the glaciers in these regions from the 1970s to 1989].

### **Biographical Sketch**

**Professor Bhaskar Nath** received his Bachelor's degree in Civil Engineering from the Indian Institute of Technology, Kharagpur, India, in 1960, followed by the Ph.D. degree from the University of Wales, UK, in 1964. In 1983 he was awarded the D.Sc. degree by the University of London for his outstanding original research (according to citation) in numerical mathematics. In 2001 he was awarded the Doctor Honoris Causa (Dr.H.C.) by the University of Chemical Technology and Metallurgy, Sofia, Bulgaria, for his contribution to environmental education.

After having taught at the University of London for more than 27 years, currently Professor Nath is Director of the European Centre for Pollution Research, London; Executive Director of International Centre for Technical Research, London; Editor of *Environment, Development and Sustainability* published by Springer; visiting professor to several European universities, and consultant to a number of international companies and organizations. Professor Nath's research interests include Numerical Mathematics, Elasto-Hydrodynamics, Philosophy, Environmental Economics, Sustainable Development, and Environmental Education. He has more than 100 scientific publications in these and related areas including 13 books.