Human race at the crossroads

T. N. Khosshoo

History of the Earth is replete with examples of cataclysmic changes leading to the rise and the fall of entire floras and faunas. Ever since the human being arrived on Earth, the planet is facing twin burden: one on account of natural changes, and the other as a result of human activities. Being a thinking species, the human being has been living in contrived environment. A question arises: will the human being continue to successfully circumvent nature and natural laws for its own benefit? In order to ensure its survival, there is a need to rethink about the developmental pathway(s) that it must follow: avoiding unnecessary greed of the rich but ensuring necessary needs of the poor. There has to be a basic qualitative change from the present philosophy, to what we may call as ecophilosophy so as to usher a pattern of development that is ecologically secure and sound, and developmentally sustainable. Methodology for anticipatory strategies is one area that the human being needs to learn and think seriously.

At present the human race is living in a totally contrived environment, avoiding, to a very large extent, the harsh realities of natural environment that other species face in the world. This has raised some basic questions about the very future of the human kind on this planet, e.g. is humanity destined to self-destruct?

Accompanying the change from nomadic to settled life style(s), the human being became largely a son-of-the-soil (bhoomiputra). It got attached to land as there was need for assured food supply as against an uncertain nomadic life of hunters and gatheringers. With this change there was a need felt for enhanced and assured food production. This in turn ultimately led to increasing population pressure, and to a change from the traditional low input and low output, to commercial agriculture with high inputs and high outputs. Such a change accompanied other two changes: firstly, the original stock of economic plants and animals was genetically highly diverse and was with low productivity per unit of area and per unit of time. Secondly, the rapidly growing human numbers made demands for higher and more assured productivity. There was a need felt for high-yielding varieties. Therefore, while biodiversity in general is the gift of nature, the agri-biodiversity is the result of human genius and effort. Initially this effort was subconscious but later it was deliberate and goal-oriented on account of the application of genetics, breeding and other allied disciplines. This has enabled transition from low productivity to high productivity in both quantitative and qualitative terms.

How natural is today’s human being?

Nature is tremendously benign, yet it is very harsh and ruthless because the basic rule in nature is ‘survival of the fittest’. But the human being through its contrived environment has consistently avoided the harsh realities of natural selection. Peeping in the past, one finds that there have been three major revolutions in human history. The Stone Tool Revolution was followed by Agricultural Revolution and finally, some 288 years ago (in AD 1712), there was the Industrial Revolution in Great Britain when steam engine was invented and coal became the source of energy. The industrial revolution has been a mixed blessing inasmuch as it has helped to enhance the standard of living, but it has degraded the quality of environment on account of progressive pollution and ecodegradation. The result of the industrial revolution has been progressive ecological degradation of the planet so much so that it is today a major issue threatening the very future of human kind and the planet. The ultimate result is that human genotypes that would have no survival value under natural conditions continue to live on account of human genius. This has helped in creating an environment of its own which among other things includes better food and living conditions, better and increasingly effective medicines, etc. The underlying thought is: survival anyhow and somehow. Looking at this problem in another way, one finds that there are long-term costs involved in the type of life we live, away from the harsh realities that other organisms face in nature. The basic question arises: can human species survive in time and space by continuously avoiding natural selection? Is human species destined to continue to remain and act differently than other species?
It is high time that the human race makes a long-term assessment of what has been achieved and what needs to be achieved. Then think whether these achievements are in consonance, or, are at cross purposes with the Natural Order? Are we jeopardizing our own future by following paths we have followed so far? In fact the fundamental question is: should humans behave as though they are co-creators and masters of Mother Earth? There is a mis-match between the way humans have ‘developed’ by ignoring the natural laws/regimes that most of the other species face. Is it justifiable? What is our defence against any cataclysmic and other changes emanating from deforestation, ozone hole, CO₂ build-up, climate change, species loss, etc. Most of these changes are the result of human interference. The basic fact is that humans always manage environment to their own advantage at the expense of other species. The fundamental question is whether the future of human species is guaranteed for under the climatic and other changes whose beginnings we now see on the horizon? As a result of this, will there be any long-term disadvantage to human species to be far removed from all other species existing on the Earth? How can we have long-range security in the present situation which is largely artificial and totally contrived with very little natural environmentalism! These are indeed questions with serious implications. When one raises such questions, one is not necessarily a doomsayer.

In this context, let us remind ourselves that the six flourishing civilizations, namely the Nile Valley, the Babylonian, the Mediterranean-European, the Indus Valley, the Huang Ho and the Mayan fell like a house of cards on one count: not being environment-friendly. The reason was deforestation and elaborate irrigation channels, leading to climate change, drought and failure of agriculture, followed by wars. Their fall is a testimony to the destructive environmental role humans have played. All this is well known, but humans must draw lessons from past events.

In view of the foregoing, why do we think that human being in its present form is there to stay permanently? How long, is the question? Does this species, bereft of genetic and technological support, have the total genetic wherewithal to face adverse climatic change(s) in future? Individuals here and there may have, but not the species as a whole. Further, history teaches us that un-fettered growth and development have never been long-lasting.

Lone voices are heard today, about halting the march of human beings set on such a destructive path. One such voice is that of Caldwell. Therefore, there is a need to rethink and ponder seriously over the pattern of development that needs to be followed in future so that we warranty and guarantee the survival of the system on a long-term basis. There is also a need to think deeply and evolve a strategy so that the human species is saved in space and time. This is also the lesson one can draw from the story of life on Earth. Time has come to pool all the intellectual resources and think collectively and draw a set of short- and long-term strategies at local, district, country, regional and global levels.

The impeding crises

During the last 50–75 years considerable advances have been made in the area of agriculture, medicine, health, sciences, engineering, etc. which have enabled population growth to take place virtually to explosive limits, together with degradation of air, water, land, flora and fauna and accumulation of hazardous wastes. In our race to develop, we did not foresee the negative aspects of the pattern of our development. We thus have a legacy of outstanding economic successes but at substantial ecological costs which we did not anticipate.

Today we are faced with both positive and negative impacts of past development which should put us on guard for the future with regard to the limits of growth and development. Many warning bells have been sounded ever since Club of Rome (1972) raised the first alarm. The lessons to be learnt from the past are that we need to broaden our understanding of the real-life situations as also make in-depth analyses of the natural systems. Methodologies for anticipatory strategies is one area that the human being needs to learn and think seriously.

Although the human being has evolved as a part of the biosphere, our innate level of understanding of the dynamics of the biosphere itself is not much. Computer modelling is now being used for solutions to our real-life problems. One is not sure about the level of computer intelligence and its independent thinking because a computer is dependent on what we feed it with. The choice of policies, therefore, will remain an area within the human ambit which has many dimensions: population, material consumption, availability of resources, effect on environment, infrastructure development, job creation, commerce, etc.

Growth cannot continue forever although there may be considerable emotional resistance to this idea. Many environmental problems can be traced to behaviour of the humankind, since most environmental disasters have been, in reality, accidents that happened due to human failure and total defiance of nature. Although the extent and nature of energy use is a sign of prosperity and advancement, most of the forms of energy have their innate ecological and economic advantages and disadvantages. The goal of using a low cost (affordable by the poor), non-polluting, low risk and abundant form of energy is still a distant dream. One of the outcomes of the present-day abuse of the environment is the global climate change which affects atmosphere, oceans, freshwater, soil, forests and biodiversity.
The next question arises as to whether human being can make environmental predictions (regarding, say climate change, etc.) with certainty. Since there are underlying uncertainties, one may only paint general scenarios because the human being is endowed with the capability to recall and foresee. Based on this, can human species evolve a portfolio of anticipatory strategies to lessen the brunt, or altogether avoid the ill-effects of the impeding dangers? For avoiding catastrophes or at least lessening their ill-effects, definitive skills have to be developed in measurable terms.

The dominant concerns in future

One cannot hazard a guess for the world at large or even a country as complex and as diverse as India, where ages and epochs still co-exist in different parts of the country and sections of the Indian society. We have a large and powerless subsistent India with not much worthwhile assets being controlled by it, and a small but powerful India controlling much of the assets. It is a continuum from stark subsistence to vulgar abundance and show of wealth. This is so notwithstanding the fact that India is a functional democracy. The country has to go a long way to have genuine equity with social justice. Today this poor country is harbouring a large population of essentially poor people. Yet it is a democracy, tending to take to market economy. To make such a transition, it has to be very careful. As a species, the future of human race is primarily in its own hands. It has many advantages over other species and it can accomplish some of the challenging tasks enumerated below.

While population control and its stabilization remains the prime environmental concern for most developing countries, we fail to recognize the basic fact that for the poor, a child is two working hands but only one mouth to feed. Very few of us talk about the unlimited desires of the rich among us which results in driving us towards expanding material economy that ultimately puts our environment under stress. Human race is overshooting the sustainable state both on account of the unnecessary greed of the rich individuals and nations, and the dire need of the poor. This has social, economic and environmental impacts. Though a socially vexing problem, it is no doubt resolvable. Under the present circumstances, the population in the developing world will continue to grow because the prospective mothers and fathers are already with us. Land degradation and deforestation have caused considerable damage and affected water regimes. Human settlements are unsustainable for a variety of reasons. No longer can we afford to dump wastes in land fills and in water bodies. These are a source of pollution and have become health hazards. Human settlements, especially slums, have not attracted the attention of environmental engineers so as to make these environmentally benign. It is not possible to altogether remove slums, any such attempts will become counter-productive.

The developing world has not taken adequate measures to control pollution of air, water and land. Air quality and water quality and quantity are progressively falling. Serious programmes to rehabilitate rivers like Ganga, Yamuna and Kaveri were taken up in India. Regrettably no worthwhile results have been achieved so far. Associated with this is the pollution of air. There has been much talk, but no tangible results have emerged from the control measures and the air and water quality is still below the acceptable levels.

Waste generation remains one of the very potent sources of pollution of water, land and even air. But it is also a source of small-time vocations for the poor in the developing countries by recycling good part of it. Even so, waste is a potential health hazard. Recycling wastes and residues for energy and other products has not received the attention that it deserves. Waste can in reality be converted into wealth.

Environmental education, although receiving considerable attention, is still in infancy. There is scope for academia to evolve education programmes for various sections of our society, including the illiterate majority.

To ensure climate stabilization and water availability for agriculture and drinking purposes, there is a need for a good and permanent forest cover. At the same time there is a need to meet increasing demand for wood from plantations so as to leave the natural forests for ecological security by keeping our permanent forest cover intact.

Some of the developing countries like India are important mega-biodiversity centres. It is most imperative to take long-range measures to conserve the biodiversity, particularly when these countries are the centers of origin of several important crop plants and have considerable genetically important germplasm growing wild.

The mainstay for energy in the developing countries is wood and biomass of sorts together with coal, electricity and gas. The alternative sources of non-polluting energy (including solar), have as yet not been tapped meaningfully to meet the energy crisis. At present energy sector continues to be one of the most polluting sectors of human activity.

Technology is the result of the human genius, which can be benign, beneficial and constructive, or could even be harmful and destructive. Today there is tremendous inflow of information, but there is no method to sift which one will prove to be for the good, the benefit and the well-being of the biosphere and all its components, including human beings, particularly the poor of the developing world.
National security is one issue which people in the developing world look at only militarily. This may be understandable and justifiable taking into account their particular geo-political location. But long-range ecological security is now an integral part of the national security. This is being undermined all the time. There is need to recognize that national security is no longer confined to threats across borders but also emanates from environmental degradation which happens all the time. Initially, such insecurity starts as scarcities of natural resources (both living and non-living) and then ends up in economic stresses (like inflation, unemployment, etc.) which convert into social unrest and sometimes even lead to political instability. Therefore, the new dimensions of national security are not confined only to what is happening on the borders, but also include the long-range ecological security which is being undermined unwittingly all the time by the people, either on account of dire need or greed. Consciously and unconsciously, we all degrade environment in one way or the other. Therefore, the enemy of the environment is within each one of us.

The human species has proved to be a very adaptable species as can be seen from its distribution from northern Arctic circle (eskimos) to the equator to the southern hemisphere (Figure 1), and now involving even the Antarctica. Thus given the genius, humans may avoid rigours of climate change, and build their own world even in the harshest climates. Even so, there are people who take a dismal view and feel convinced about the fact that human race is set on a wrong course. They feel demographic, environmental, economic, social and political problems will surely overtake humans. The fact is that such changes may happen imperceptibly and creep in slowly but surely. One may not be overtly conscious of such changes while these are taking place.

**How rosy is our future?**

Time and again, many warning bells have been sounded about the future of the human being, particularly because its actions have been largely insensitive to environment and towards generations that will follow. Although some thinkers before Rachel Carson talked of the impeding environmental dangers, she has been generally credited with ringing warning bells worldwide against the ill-treatment meted out to Mother Earth by the human species. Her book *Silent Spring* created ecological ripples around the world, and, it is for the first time, that the world as a whole took note of the impeding dangers that the deteriorating environment posed to humanity at large. In fact this book has been regarded as a watershed in environmental history, even though warning bells were rung as early as 1864 by George Perkins Marsh and several others. In addition, there have been

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**Figure 1.** Origin and spread of the genus *Homo*. 
many papers presented in conferences wherein modern society has been blamed for environmental degradation. Some authors even set specific time tables for the impeding catastrophes and destruction, which did not prove to be right. The result was that whatever was written, was taken as over-statement regarding the impeding dangers. There then followed many books for and against the impeding catastrophes.

It was soon realized that the environment by itself is very complex. Climate change is an example. If humanity as a whole takes to rectification of the damage done to the environment and makes the present economic system environment friendly, then a fair chance exists for humanity to defer the doomsday.

There are definite signs of the impeding danger, and long-term future of humanity is at risk. There may be disagreements regarding the calendar and intensity of future events, but the general conclusion is that present humanity as a whole is not on a proper path, and there is need for change. What then is the way out? The answer lies in ethics.

Ecological ethics

There are two views about the relationship between humankind and nature: one is of arrogance with an underlying co-creator attitude. The result of this has been conflict with nature. The other view is of reverence and an underlying partnership, leading to harmony with nature. In the coming years it is certain that ecological ethics will get added importance because it offers the way out from the present mess in which the human race has landed itself over the past decades/centuries.

A lot of useful literature is now emanating, particularly from the western world about the ethics of resource use because, more than the East, the West has realized that their present-day pattern of development is not sustainable. The West is eager to hear the views of orientalists about the environment, because this subject has been a part of ethos of the latter from time immemorial.

Following are some basic principles underlying the ecological ethics which were discussed earlier by Khoshoo: protecting and augmenting the regenerability of life-support system; fair sharing of the resources, and means and products of development between and within nations of the world; reducing the disparity in resource-use; promoting awareness regarding the hidden social, economic and environmental costs of consumerism and overuse of resources with particular reference to its impact on the developing countries; adopting willingly, sustainability as a way of life by encouraging frugality (i.e. getting more from less), and fraternity (i.e. getting it in association with others); meeting genuine societal needs and legitimate aspirations of the people by blending economic and environmental imperatives so as to alleviate poverty; and halting and then reversing the overuse of resources and armament build-up for ensuring sustainable environment, peace and security.

Connected with the subject of ecological ethics is the fact that the human race has had a common origin in Africa, followed by a common past. Then there was divergence, and the human being colonized all the continents (Figure 1) because it was the first intelligent, inquisitive and thinking animal. In course of time, there followed population explosion, multiplication of needs, undue demands on and progressive destruction of components of the Earth system (namely atmo-, hydro-, litho- and biospheres, including biodiversity). The net result has been that the Earth system as a whole became progressively endangered: some of its parts more than the other parts.

There began a global realization about the impending dangers associated with serious environmental deterioration. Then came the Stockholm Conference (1972), followed by the Rio Conference (1992), and a plethora of other conferences. In this process, the humanity as a whole jumped from the Common Origin to the concept of Common Future. There has been talk of globality of environment, and connectivity between local and global environments. Yet there are no worthwhile global or regional strategies or even national strategies for achieving sustainability. Therefore, while Common Origin is a fact, Common Future is still a myth, because, as M. S. Swaminathan has said, humanity has yet to reconcile about a common present? The latter is still an open question and an enigma! Practical steps need to be taken in this direction.

The only way left is that the human race has not only to work out solutions to local problems, but also has to rise above the local issues and think about the repercussions of its action at national, regional and global levels. Furthermore, it has to work over-time to give all such strategies a practical shape. It is indeed a two-way traffic: local to global and vice versa. Understanding the dynamics of this two-way traffic will actually lead us towards real sustainability in development. The important elements are: that: Earth is a finite system, both in resources and in its carrying capacity; future economic growth cannot be sustained if it is at the expense of long-range ecological security; environmental insecurity ultimately leads to economic, social and political insecurity; sustainable development for intra- and inter-generational human well-being has now to be an integral part of the future composite world culture; and sustainability in development is a global concept and every living being, as a member of the Global Family (Vasudhaivakutumakam), has a role to play.

There is an urgent need to translate these lessons into reality. There is also a need to understand scientific and technical complexities of nature, and develop a good
measure of reverence for nature for the vast bounties it provides. In this connection, we must also learn from the tribal societies, which have developed an approach of harmony with nature. This can still be seen in the interiors of the Andaman and Nicobar Islands and Amazonian forests. As stated earlier, it is the common threat to our long-range ecological security that will bring the human race closer despite diversities of sorts. Thus, for our sustainable future, we have to move towards globality on the one hand, so as to correct the past environmental follies, particularly of the industrial countries and on the other hand, we need to meet common local threats. There is a need to develop a culture/ethics/code for Ecological Dharma at all levels, starting from the individual up to a country or region and the entire Globe, so as to practice the cult of sustainability in development. It is only then that we will have a situation, as put by René Dubos: “think globally but act locally”.

A basic question arises: are we ready to move towards a sustainable society? This indeed is a major challenge as also an opportunity before the entire human race. Regrettably, if we go on the way we have been so far, centuries will continue to co-exist. We will continue to have a subsistent India of a large number of poor and dispossessed toilers and plodders who live in medieval times; and an affluent India of a small number of people who are jet-set, powerful and wealthy. The latter may be poised to enter the 21st century with a bang. How soon we take even the preliminary steps to bridge the vast gap between the large but powerless subsistence India, and its small but powerful affluent section, will actually determine whether we can make it to a sustainable society, where we have environmental harmony, economic efficiency, resource conservation, gender equality, equity with social justice, and local self-reliance. To practice this, we need to draw inspiration from Mahatma Gandhi who basically was a social, economic and an ecological Apostle. Keeping this in mind, earlier the present author discussed the relationship between welfare ecology and welfare economy as backed by ecological and technological assets, which are mutually supportive and reinforcing. Furthermore, a survey of the important religions of the world from an environmental point of view reveals a measure of divide (Khoshoo, unpublished). The western religions give an impression that the human being is a kind of a sovereign, while the Eastern religions regard human being as a constitutional partner with underlying reverence and harmony. The latter believe in the Holy Trinity: the creation, the preservation and the destruction, or should we say birth, development and death. In the Hindu tradition, these three elemental processes are assigned to Brahma, Vishnu and Mahesh, respectively. These underlie the origin, evolution and extinction, which in turn are backed by mutation, recombination and selec-

tion. The key to sustainable development is based on knowledge, information, understanding, ethics and morality. Therefore, a qualitative change from the present value system to a new value system is needed, where we make a transition from disharmony to harmony, illiteracy to literacy, poverty to economic independence, large family to small family, ill health to good health, inequity to equity (including gender), social injustice to justice, cultural irrelevance to relevance, resource wastage to conservation, blind faith to self-reliance, etc. Science and technology has to play a major role in such transitions.

All in all, a transition from the present-day philosophy to what we may call as ecophišosophy is needed, some elements of which are depicted in Figure 2. The humanity needs to adopt ecophišosophy which must be wise both economically and ecologically. Such a transition has become necessary if the human race has to move towards sustainability in the real sense of this much-abused word. It is obvious that there has to be a strong under-current for change based on science and technology.

**Concluding remarks**

The foregoing account is a general survey of environmental problems of countries (like India) that are developing and developed at the same time. Such countries are developing compared to industrial countries, but are developed when compared to under-developed countries. This sounds paradoxical but is nevertheless true.

![Figure 2. Transition to ecophišosophy.](image-url)
Given the good S&T base that a country like India has, it is possible that it can come out of the serious environmental vortex if it follows a sustainable pathway where we combine our age-old environmental ethics with modern S&T. But the biggest problem is resistance to change. There is a need to come out of the present morass of poverty in which large sections of the society are deeply immersed. The choice has to be made now because almost all the elements (particularly intellectual) are in place. All that is needed is to put the human and other resources to proper use with a major thrust on population stabilization and then its control, which is the one single-most environmental, social and economic problem of the developing world, particularly of India.

Nature can be very benign, but it can also be very ruthless. Response of the genetic system of a species to environment is what counts: if unfavourable, the species is destined to be on its way to extinction. Natural systems are ruthless and do not tolerate inefficiencies.

In the past, nature evoked awe and respect in the human mind, but today that attitude is gone. Regrettably, human beings often believe that nature is for their wanton use, because human being happens to be on the ‘top of the evolutionary ladder’. The question is, does human being want to be a super-species above natural laws, where natural selection is not allowed to operate on account of contrived environment? Or, does the human race want to be a species which understands and respects nature and natural laws and aims at need but not greed, at comfort but not luxury and is not unnecessarily wasteful. If the human race sticks to the latter, many of the environmental problems will resolve by themselves. There are isolated sane voices all over the world which say, halt and ponder about the reckless path that the human race is following.

One would like to hazard a guess as to how different citizens of tomorrow should be from citizens of today (Figure 3). A major qualitative change in our present value system is needed. The new value system has to be based on knowledge, information, understanding, ethics, economics and morality. Unless there is a qualitative change, there is no hope for ushering a development which may be sustainable in space and time. Today’s human being is caged (Figure 3). The new value system is likely to free the human race from the shackles in which it is bound and confined. This would help usher sustainability (Figure 3).

At the end of the 20th century, the human race is at the crossroads. The species has to think seriously about shape of things to come. The scenario is not too optimistic, but at the same time all is not lost. The situation can be retrieved and life on Earth will continue.
unaffected. What distinguishes humans from all other life, is ethics, morality and spirituality. This is so because it is a thinking species. These are not values of the bygone eras, but today there is a far greater need to ponder on these issues which are relevant. Abandon greed and take to need. This is going to be the biggest mantra for the 21st century. If we all stick to this, the next century would be different. It would become environmentaly liveable, economically sustainable and socially benign.

A society is an extension of individuals; if individuals are ‘greenned’ then, in course of time, the society as a whole will follow suite. Therefore, the human race has to make a firm resolve in this direction at the individual level, only then the battle can be won.


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Monitoring and mitigation of nitrous oxide emissions from agricultural fields of India: Relevance, problems, research and policy needs

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The farming community should be made aware of the harmful effects of N₂O emission from agriculture and should feel the need to mitigate its emission through optimum crop management practices. Inexpensive soil and plant tissue testing facilities should be made available to farmers.

EMISSION of nitrous oxide (N₂O) from agricultural ecosystems and its loading in the atmosphere are of considerable environmental importance. N₂O is a greenhouse gas and leads to global warming (it is 30 and 200 times more potent than CH₄ and CO₂, respectively, as a greenhouse gas)¹, apart from taking part in atmospheric reactions to destroy ozone, allowing more solar UV-B radiation to penetrate². Its emission from soil is a loss of resource, as it removes nitrogen from the soil to the atmosphere, rendering it unavailable for plants. Importance of N₂O as a greenhouse gas and as an ozone-depleting agent in atmosphere is further accentuated due to its long residence time in the atmosphere (166 ± 16 years, approximately)³. Presently, N₂O concentration in the atmosphere stands at 311 ppbv, which is increasing at a rate of 0.22% per year⁴. According to Intergovernmental Panel on Climate Change (IPCC)⁵, global mean annual atmospheric N₂O loading was 16.2 Tg in 1997, to which agricultural soils contributed about 3.3 Tg. Due to rapid increase in world population, humanity is striving to produce more and more food to sustain itself and in the process is putting more and more fertilizer nitrogen input to agriculture. Therefore, it seems more than probable that N₂O emission from agriculture will keep on increasing and its increased

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