

*CARING FOR THE EARTH:
CONSERVING OUR ENVIRONMENT
WHILE MEETING OUR ECONOMIC
NEEDS*



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Sketch on the cover by Pratibha Pande

1 INTRODUCTION

Human beings are perhaps the only species on earth who have both the ability and the desire to drastically modify their external environment. Most other species gradually adapt themselves to their environment and their very survival depends on how well they can do this.

This ability to mould or influence the external environment has also made human beings the most successful of species, at least in evolutionary terms. They have colonised most of the earth and are now setting their sites on other planets. It has allowed them to live and survive in hostile environments, to grow and transport food where none was available, and to keep out the elements of nature far more successfully than most other creatures.

The human capacity to think and to transform thoughts into technologies, or ways of doing things, underlies the ability to change the environment. Undoubtedly, technology has progressively freed the human race from the limitations and shackles of nature - diseases can now be prevented or cured, body parts can be replaced, unimaginably large distances can be travelled in a very short time, human beings can fly into space or go deep under the oceans and there are no discernible limits to human achievements, as science fiction keeps reminding us!

However technology, that has so broadened some of the options available to human beings, has also significantly contributed to the depletion and degradation of nature and, thereby, significantly reduced many of the other options that were available to human beings. Thousands of species have disappeared, perhaps forever. Natural environments have been modified and destroyed and even while technology has opened up for human habitation many hostile environments, it has simultaneously polluted and poisoned many hospitable ones, making them unfit for human habitation. Even while medicines cure some diseases, human chemical and industrial wastes cause others. Technology enables us to get water or energy conveniently within our houses, but technological processes also destroy our watersheds and our forests. Though we grow more and more food, it is less and less nutritive and some of it is downright unsafe. We are on what can be described as a technological treadmill -

however fast we run, we do not seem to get anywhere substantive, at least in terms of universal human welfare.

The Indian Environmental Crisis

The current levels of the environmental crisis in India can be judged by the fact that:

- As against the requirement of a 33% forest cover, only a little over 10% of the land area of India is covered by closed forests.
- The industrial wood demand on the forests of India is almost three times their annual production rate.
- The load of livestock on India's forests is currently calculated to be about three times its carrying capacity.
- India's forests are among the least productive in Asia, their average annual productivity of less than 1 cu m per hectare being about a fourth of the Asian average.
- Fuel wood extraction from the forests is calculated to be almost thrice the sustainable levels.
- India has among the lowest per capita availability of forests in the world, less than 0.1 ha per head.
- The annual loss of topsoil, by erosion, is estimated to be over 6000 million tons.
- According to estimates, over a third of India's land is affected by soil erosion.
- The area prone to flooding has more than tripled in the last forty years, from 19 million hectares to over 60 million hectares. Ironically, nearly half the districts in India have suffered from both floods and droughts.
- There is rapid degradation and loss of grasslands, deserts, coasts, rivers, marine ecosystems, and the related species.
- Riverine and marine fisheries are being severely impacted because of the destruction of fish breeding (spawning) areas and high levels of water pollution.
- Recent data suggests that a third of the entire riverine length in the country (about 6000 kms) has moderate to severe pollution.

- According to the Central Pollution Control Board, over 5 million litres of liquid effluents flow untreated from polluting industries into our water bodies every day. Similarly, 17 million litres of untreated liquid effluents flow from urban areas into our water bodies every day.
- According to WHO estimates, over 20% of all communicable diseases in India are due to poor water quality. The proportion is much higher in terms of infant mortality.
- A large proportion of Indian cities have unhealthy levels of air pollution, especially in terms of total suspended particulates.
- A World Bank study of 36 major cities in India estimates that, annually, there are over 40,000 premature deaths and nearly 2 crore cases of hospital admissions and sickness requiring medical treatment, due to air pollution. The poorer inhabitants of these cities, given their lower standards of living, nutrition, and health, are more susceptible to negative health impacts from air pollution.

Social Conflicts and the Environment

Nature and natural resources are increasingly being cornered by the rich and powerful, for their wasteful lifestyles, just because they have the power and money to exclude others. The poor people, who desperately need access to nature and natural resources just to survive, are finding it increasingly difficult to meet even their basic needs. This is forcing the poor to commit ecological suicide by over using the few resources allowed to them. It is also allowing the rich to destroy the remaining resources as they seek increasingly opulent life styles. The inequitable access to nature has also resulted in significant social conflicts around the environment. These conflicts are making it increasingly difficult to conserve nature and to use natural resources in a sustainable manner.

Underlying these trends is the fact that nature is being commoditised. Nature and its elements are being increasingly looked at as an economic “resource” meant solely for human use and consumption, and subject to all the prevailing market forces. Therefore, the forces for conservation are being increasingly neutralised by those opposing forces that want to maximise profits and economic and financial returns. Interestingly, the

commoditising of nature is a recent trend and historically, in India and elsewhere, nature was looked at very differently and conserved for a variety of reasons and out of diverse motivations.

2 HISTORY OF CONSERVATION IN INDIA

Historically, nature was both revered and feared in India. Wilderness areas (forests, lakes, rivers, grasslands, coasts and deserts) were considered variously to be the abodes of the Gods, or abodes of the souls of ancestors or of evil demons and spirits. Similarly, species of plants and animals were considered sacred and worthy of respect and protection.

Sacred Sites

Across the country there were thousands of sacred sites and groves where nature was allowed to remain and evolve relatively undisturbed. Even today, after a hundred years of attack, some of the best-conserved areas in India are those that were protected by traditional communities as sacred sites. A common practice across much of India, and in fact in many parts of the world, was to recognise the sacredness of certain forests, water bodies or other wilderness areas and think of them as sacred groves or sites. Very elaborate and stringent rules were formulated to ensure that the sacred sites and groves were properly conserved, and these rules usually had some form of divine sanction.

Clearly there were great advantages in having divine support for unpopular policies. However, the interesting question is how this divine support, or perhaps the myth of divine support, was established and maintained.

Characteristically, where societies had less evolved structures of social administration, the intervention of human agents in enforcing the will of the Gods was minimal. In these "primitive" societies any misfortune or illness, of which there were many, was taken as a demonstration of supernatural wrath. In most cases the victim had, or believed that he or she had, already done something that was in violation of divine dictums. Therefore, there was little reason to doubt that the illness or loss was a swift and harsh retribution. In those few cases where the victims did not accept that they had done anything to deserve this, the fact that there was retribution from the Gods was considered better evidence than their denials. Consequently, they were branded as

having sinned twice, once when they disregarded divine edicts and again when they falsely protested their innocence. In some cases, actions of past lives were also invoked as *Karma*, to explain the basis of the misfortune.

Individual misfortunes were not the only types of evidence offered for establishing a belief in divine retributive power. Natural calamities like earthquakes, floods, droughts, storms, forest fires, landslides and many such, which affected the whole community, were also postulated as retribution of God or nature, on those who defied the law. Very often the ire of the whole community was focussed on those few who were seen as having brought such misfortunes on to the heads of everyone.

The setting up and maintenance of sacred groves and sites was perhaps the most effective way of conserving nature. Rules regarding sacred groves and sites differed from region to region and area to area. Therefore, on the one extreme were sacred sites like the ones in Meghalaya, where no human interference was allowed and even the inadvertent removal of a leaf, a flower or a twig attracted severe divine retribution. However, all sacred sites were not so strictly protected. For example, the *Kans* of Uttar Kannada, in Karnataka, were one such. Though no trees could be felled there, removal of non-timber forest produce was permitted under certain conditions. In the *Sarnas* of Bihar, even trees could be cut and the local priest could give permission for this. Similarly, in parts of Maharashtra, trees could be cut from sacred groves only for building schools and temples. Some sacred groves allowed limited extraction of resources during drought or other natural calamities.

Apart from groves, there were also sacred lakes, ponds and rivers. An interesting example is reported from Sikkim, where the Sikkim government was forced to abandon a Hydel project on Rathong Chu river, because this river is considered holy and sacred and the people of the state protested against the damming of their sacred river.

But how did these sites acquire their sacredness? Perhaps the most likely thesis is that traditional communities, or at least their

* A belief that the acts done in earlier lives determine what happens to them in this life.

leaders, recognised the need to conserve nature and yet saw the temptation that over exploitation held out. Realising that something stronger than just a social decree was required, if conservation principles were to be scrupulously followed, the need to conserve became part of religious dictums where disobedience inevitably meant displeasure of the gods or spirits, and the resultant misfortunes. For example Cipriani, commenting on the belief among the Onge tribals in Little Andaman that their spirits do not like tubers and other edible roots to be harvested or eaten, says:

This unconscious preservation may well be the result of a decree, in some remote past, by an Onge seer who realised the danger of killing off the entire plants and invented the guardian spirits as a deterrent..... The spirits select the Onges' food for them, in the sense that they regard everything as edible or poisonous, according to whether the guardian spirit is benign or malevolent. Given the curious adaptability of the spirits and the intensely practical way in which they operate, it is hardly surprising that their benevolence or malignity coincides remarkably well with those foods which tend to promote normal health! [Cipriani 1966]

The fact that many of these decrees actually promoted what now seems to be the most rational option, supports such an interpretation, for it seems too coincidental that through a random process such rational imperatives could have been arrived at in community after community. According to Ishwar Prakash:

*In India a variety of plant and animal species have been considered sacred by one or more communities and therefore never destroyed (Presler 1971). The most widely protected of such organisms is the peepal tree (*Ficus religiosa*), found depicted on a Mohanjodaro seal of around 2000 B.C. Other species of the genus *Ficus* are also considered sacred, and were not felled traditionally by all Hindu castes. It is notable that *Ficus* is now considered a genus of particular significance in the overall maintenance of tropical biological diversity - a keystone mutualist (Gilbert 1980). In particular, its preservation may have helped maintain high levels of populations of highly edible frugivorous birds, especially pigeons and doves [Prakash 1980, quoted in Gadgil 1985]*

Again, according to Madhav Gadgil:

In a similar fashion, no cobra is killed near certain temples and it is believed that no snake-bite will ever be fatal in the same locality (personal observations). These taboos may help to remove the fear of these very dangerous animals, and may have survival value as, for example, if many deaths from snake-bite are due to fear of death rather than from the poison. (personal observations). [Gadgil 1985]

On the other hand, there are also many seemingly irrational or sometimes even destructive “superstitions”, which cannot be explained by this theory.

Sacred Species

Tigers

One species that has benefited both from taboos and totemism, is the Indian tiger. The tiger is one of those species that was very widely respected and even worshipped in many parts of the country. This may possibly have been due to the magnificence of the animal, a magnificence that is evident even today in the attention that it commands worldwide. However, as there are many other equally magnificent species in the wild, this could not be the only reason. The tiger was also seen as embodying the qualities of courage, of strength and endurance, perseverance, speed and intelligence, qualities that human beings admire. There was also a certain mesmeric quality in the worship of the tiger as it was perhaps among the greatest predators of human beings and their livestock.

Traditional communities found themselves relatively helpless against the onslaught of the tiger, as do modern rural communities. Their only defence seemed to have been to try and establish a “spiritual link” with the tiger, such that their worship and sacrifice would give them protection and make them immune.

In the mangrove forests of Sunderbans, in West Bengal, the people living in and around the tiger territory have taken tiger worship to new heights. There is a belief that if a tiger eats a person then he or she goes straight to heaven. This has resulted in old men and women walking into the jungle and waiting for the

tiger to come and eat them. Understandably, this has created major problems for the forest department.

The Sema Nagas of Nagaland hold the tiger, along with the python and the hornbill, in awe and respect. In parts of Maharashtra, the tiger and the cobra are worshipped and temples are erected in their honour. For example, within a few kilometres around the Waghjal tiger goddess temple, no tiger or panther is hunted and it is believed that tigers and panthers will not kill human beings or domestic animals in that area. [Gadgil 1985]

Among the tribes of Vishakapatnam district, there is at least one clan, the Killo clan, who have the tiger as their totem. In Chota Nagpur area, Bhils bow down when they come across their totem, the tiger, and women veil their faces as a sign of respect [Elwin 1986]. Amongst the Dudh-bhaina Baiga, tigers are never killed. In fact, they believe that if they shoot at them they would inevitably miss. Some of the Baiga dislike being a part of a tiger hunt and believe that even if they are forced to be a part of such a hunt, the tiger would not be killed [Elwin 1986].

Snakes

Surprisingly, the snake, especially the cobra, even though it is much feared and responsible for many deaths, is another species that is revered and worshipped, and consequently protected.

The worship of the snake can perhaps be explained in terms of the fear that people have of it. Considering they find themselves by and large helpless against this deadly killer, they perhaps resorted to worshipping it in the hope that such worship might give them some protection. The snake is a totem of many clans and most of these clans do not kill their totemic animal and often try to feed it by offering milk.

In the Malabar Coast, there were various snake groves and a part of every house was supposed to be set apart for the snake as a household God. Snakes were considered a part of the property and when a snake was seen inside or near a house, great care was taken to catch it without hurting or injuring it. Killing a snake was considered a grave sin and even to see a snake which had a head injury was believed to be bad omen [Thurston 1909].

In Kerala, sacred groves dedicated to snakes, called *Naga Kavus*, were common. In the Ezhimala region there were hundreds of serpent groves attached to shrines and households. In Meghalaya, there is a famous sacred grove at Mawphlang, 25 km from Shillong, where all forms of wildlife, especially snakes, are protected. In some parts of the country it is believed that leprosy and leucoderma are caused by the anger of serpents. Snake gods are appeased on a birth and atonement is offered to them for wrong doing [Mitra et al. 1994].

Even in the Vedic Age, snake worship was widely prevalent in India and references are made to Abibuduya, the serpent of the deep. Also, as an inscription at Banavasi, in Kanara in South India, a stone cobra was erected in the middle of the 1st century AD. In Chamba district, in Himachal Pradesh, the "Golden Snake" is offered milk and in Bengal the snake goddess Manasa is worshipped widely. Such acts are supposed to protect the people from snakes. Among the Meithies of Manipur, the snake is believed to be a dead ancestor and is accordingly worshipped. Among the Khasis, in Meghalaya, a mythical snake called U Thien is worshipped and is supposed to have the powers of harming those who do not pay it adequate respect.

Trees

India shares with much of the world a tradition for respecting and worshipping trees. Trees, along with other plants, have been considered to have a special relationship with humans, variously being the abode of the gods, of ancestors and of relatives, and also saviours, possessors of wisdom, knowledge, potency, fertility, and of life itself.

Perhaps the most sacred of all trees is the pipal (*Ficus religiosa*).

"Long held by the Hindus to be the permanent abode of the gods, the pipal is considered to be not only the home of Krishna... but also home to the holy Hindu trinity, Brahma, Vishnu, and Shiva [Altman 1991]

Another widely worshipped tree in India is the Banyan tree (*Ficus bengalensis*). However, sacred status is not restricted to these few trees. Different communities, in different parts of the country, worship different species. In Tamil Nadu, more than 250

Sthala Vrikshas (sacred tree sites) have been recorded. They contain one or more tree of a single, venerated, species. Over 70 species of trees have been recorded from *Sthala Vrikshas*, the oldest of which date back to more than 500 years. Each of these species is associated with one or more deity. Believing a tree to be sacred means many things, but at the very least it means that that tree gets some protection.

Some trees are also associated with special rituals. The Khasis, for example, use the Khasi Oak for erecting sacred posts. The Jaintias also offer animal sacrifices near the Oak tree, and some consider it a phallic symbol! The Oraon perform a wedding ceremony when they plant a fruit tree, and until the tree is “married”, no fruit or flower is to be plucked or used. People living around the Sariska Sanctuary, in Rajasthan, tie *rakhis* on stems of trees, on *raksha bandhan*, to demonstrate the affinity between trees and human beings.

Some Limitations of Sacredness

However, all traditional practices were not necessarily good for the conservation of nature. For example, the submersion of ashes, and often of partially burned bodies, into a river, especially the Ganga, has caused much pollution. So has the practice of throwing flowers, statues and other substances, including coal, into rivers after worship and festivities. Even the mandatory burning of bodies in a wood pyre is not terribly friendly to trees or the atmosphere.

Of course, it must be remembered that when these activities and rituals started perhaps the load on the environment was much less and so they were not seen as a threat. Also, our understanding of pollution might not have been as well developed as it is today.

3 NATURE AS A DEVELOPMENT RESOURCE

Though elements of the traditional values regarding nature still survive in various parts of India, especially in rural areas and the tribal belts, the control of communities over nature has almost disappeared. Most of the forests and other wilderness areas now belong to the government. Therefore, new methods and safeguards have to be evolved to ensure that these areas are properly conserved.

Most governments around the world have “development” as a major objective, and the Indian government is no exception. The notion of development has had an interesting history. When it first began being used in the context of countries, it referred almost exclusively to the levels of economic development or growth that had been achieved. Therefore, countries were considered developed in direct proportion to how rich they were in economic terms. European countries, with many colonies and, consequently, with large revenues, were described as more developed than those which did not have colonies and, consequently, were economically poorer.

However, at the turn of the century and especially after the First World War (1914 -1918), many people began to question this understanding of “development”. It was felt that economic growth alone could not be considered development unless it promoted equity. Consequently, a country that had, as a part of its “empire”, colonies that were impoverished, could not be considered developed. Similarly, if within a country the wealthy were few and many were poor, then again such a country could not be considered developed, even if its financial wealth was very great.

In recent times, such thinking has been translated into what are known as social or human development indicators, which include education, health, sanitation, access to drinking water, nutritional levels, and civil rights. The United Nations Development Programme (UNDP) now brings out a Human Development Report that ranks countries on the basis of such social and human indicators.

In the 1960s, another concern started being expressed about the definition of development. With the growing realisation of what we were doing to our natural resources, people started questioning whether a country could be considered developed if its economic growth was based on the destruction of nature and natural resources. As natural resources were fundamental to growth, any strategy for growth that destroyed these was bound to fail in the medium to long run. Such a strategy would essentially be unsustainable. Out of this realisation has grown the notion of sustainable development.

Development, therefore, was redefined to mean only that economic and social growth that was equitable and that could be sustained over time. The term “sustainable development” began to be used to distinguish between the old understanding of development and the new one, which included sustainability. Sustainable development has thus been described as development which:

“...meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Our Common Future, 1987)

Carrying Capacity

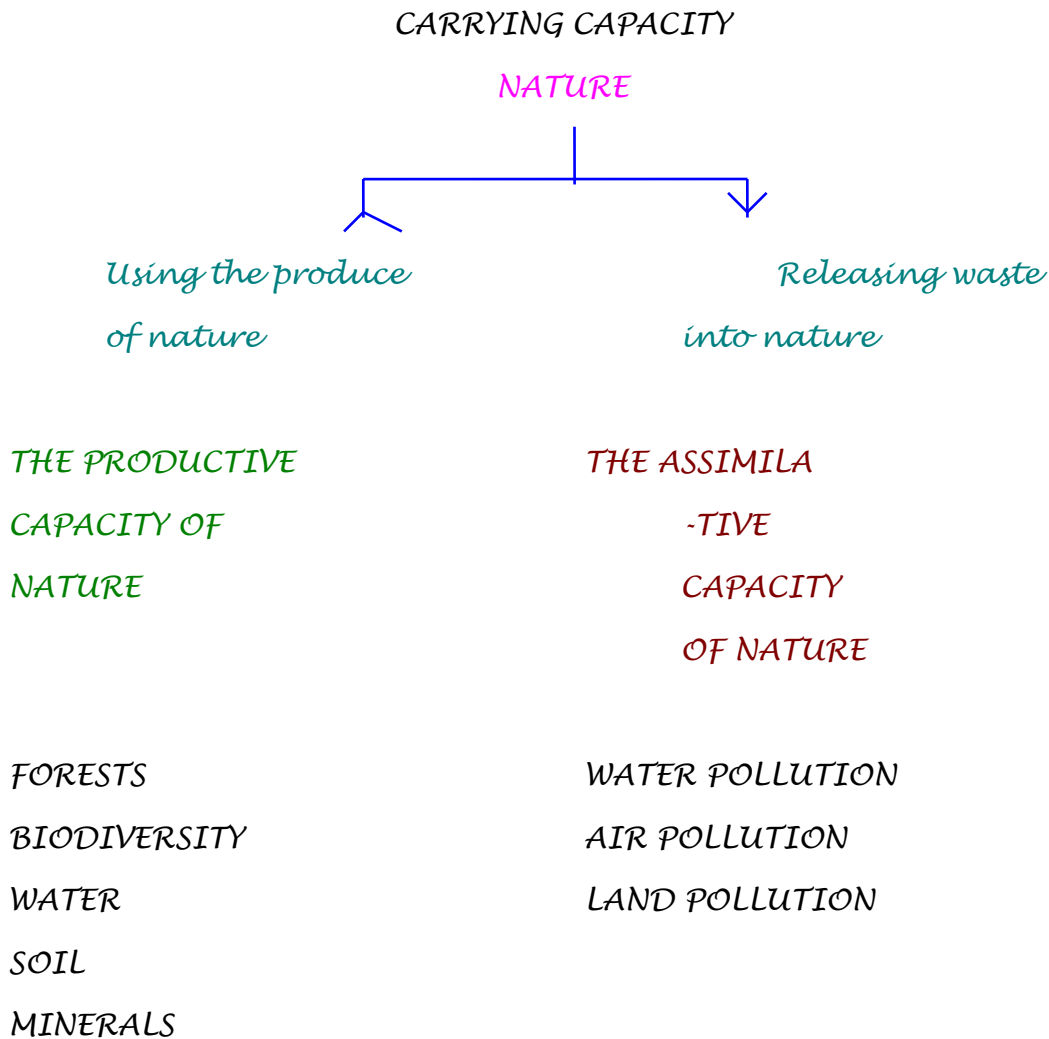
To fully understand what sustainable development means, we must first understand the notion of carrying capacity. The carrying capacity of an organism or a system is its capacity to meet demands and withstand pressures without doing damage to itself or compromising its capacity to meet future demands and withstand future pressures. For an ecosystem, this could mean its capacity to replace resources that have been extracted (its productive capacity) and assimilate pollutants (its assimilative capacity), without getting degraded.

To understand this better, consider that even human beings have a carrying capacity. We can safely donate only that amount of blood that our body can replace without harming our body. Similarly, we can be exposed to a certain amount of pollutants, without damaging our health. However, if our body was drained of blood or if we were exposed to the type and quantity of pollutants that were beyond our ability to assimilate, then we would not only seriously injure ourselves, but in extreme cases also die.

A similar thing happens in nature. For example, take a river. The river has an ability to function without permanent damage even if a certain amount of water is withdrawn from it and taken for human consumption. However, if we drain the river of most or all of its water, then the river, as an ecosystem, dies or gets permanently damaged. Also, a river has the ability to assimilate some pollutants and to biodegrade them so that they do not damage the ecosystem. However, if we dump the types or

quantities of pollutants that are beyond the assimilative ability of the river, then the river gets seriously damaged and even dies.

The diagram below shows how we interact with nature and challenge its carrying capacity.



Therefore, one way of ensuring sustainable development is to ensure that the process of economic growth does not take from nature more than it is able to regenerate, and does not pollute nature beyond its ability to assimilate these pollutants.

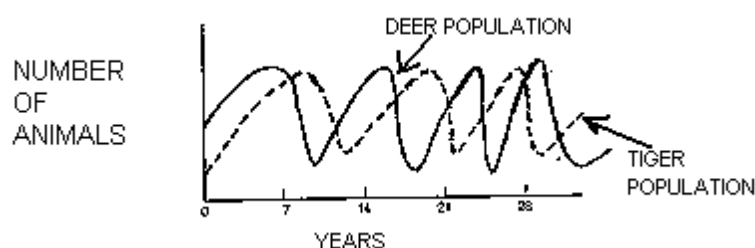
The Role of Technology

The carrying capacity of a resource is not finite. Through better management and technology, the carrying capacity of various natural ecosystems can be enhanced. For example, through the application of genetic engineering, mainly in the form of better seeds and faster growing strains of crops, the productivity of

cultivated plants and of the land on which they grow can be increased. The application of fertilisers and irrigation can also enhance the productivity of land. Similarly, the assimilative abilities of an ecosystem can also be enhanced. Recently there have been successful experiments with earthworms - called *wormiculture* - where the introduction of earthworms in compost pits can significantly enhance the ability of the ecosystem to break down the waste matter and assimilate the biodegradable substances, consequently enhancing the quality of the soil.

However, the ability to develop and apply technology has also made human beings perhaps the only species on earth that can degrade and destroy nature and survive to regret it. Nature seems to have the ability to regulate the consumption of all other species.

So, for example, if in a particular area the number of deer increase to a point where they start consuming more grass than can be regenerated, then the availability of grass goes down and this, in turn, results in the reduction of the deer population. Similarly, if in an area the population of tigers increases to a point where they eat up the deer faster than the deer can reproduce then, very soon, there is not enough food for these tigers and their population begins to decline. This mechanism ensures that the population, and consequently the consumption, of each species is kept within the carrying capacity of the ecosystem and that no one species can exterminate another. This cycle is endlessly repeated. The diagram below explains this relationship.



However, human beings have developed the technology by which they can destroy their own resources, and their immediate surrounds, and then tap the resources of other species and locations.

The Efficiency of Nature

In nature, nothing goes waste. The 'waste' of one creature is the resource of another and is finally an input to one part or another of the ecosystem. Therefore, a whole host of insects and microorganisms live in and off the excrement of various animals. These insects and microorganisms break down (biodegrade) this excrement to a point where it becomes nourishment for the soil. Similarly, dead plants and trees and even the carcasses of animals, become homes and food for other creatures who, in the process, help them to be assimilated by the ecosystem.

Only human beings, because of the rate at which they consume, the technologies that they have developed for facilitating consumption, and the nature and quantum of the waste they throw out, have a tendency of exceeding the carrying capacity of the ecosystems they depend on. The problem is aggravated by the fact that human beings have the ability to immunise themselves from the consequences of degrading their immediate environment by transferring their attentions to other, remote, ecosystems, once their immediate ones are destroyed. Therefore, it is important to devise ways and means by which the interaction of human beings with the rest of nature is kept at sustainable levels.

Achieving a Sustainable Process of Development

Sustainable development is not something that can be achieved overnight. The path to sustainability is through ensuring that every project, every activity, every scheme and every policy is progressively made environmentally friendly, till it itself becomes sustainable and promotes over all sustainability. Given below are some of the areas and issues that need to be focussed on in our search for sustainable development.

Forestry

Sustainable development within and through the forestry sector means that we should harvest from forests only that much of timber and non timber produce that it can regenerate. So, for example, if a forest grows at the rate of 2 % a year, our harvest should never be greater than the increment. This is similar to the principle of judicious financial management where people are expected to not eat into the capital of their savings but live off their interest.

How we work and harvest our forests is also important. For example, if we harvest the young and growing trees, then in the long term the forest will die. Similarly, if we concentrate on only one part of the forest, then even though overall we might not have extracted more than what is regenerated, the area from which we have over harvested might become barren.

Biodiversity

Biodiversity or biological diversity is defined as the variability of ecosystems, species and genes. It is now recognised that the maintenance of biodiversity is critical for human wellbeing and survival.

There are many types of ecosystems on earth. For example, there are the seas and oceans, rivers and lakes, forests, deserts, grasslands, islands, and mountains. Within these categories, there are sub-categories. In India, there are sixteen major types of forests and hundreds of subtypes. Similarly there are tropical oceans and temperate oceans; there are cold and hot deserts and various types of mountain ranges and grasslands. Biodiversity at the ecosystem level means the variability of ecosystems.

Within each ecosystem, there are various species. Human beings are one such species, but there are others like tigers, lions, elephants, peepal trees, deodar trees, gulmoḥar and neem trees, peacocks, crows, bees, flies, etc. etc. Biodiversity at the species level means the variability of species.

Within each species, each individual is different. Among human beings, for example, though we are all of one species, each one of us is physically and mentally different from the other. There are similar variations among individual members of all species.

Biodiversity at the genetic level means the variability of individuals of the same species.

Conservation of biodiversity implies ensuring that the variability among ecosystems, species and genes does not become less than what is natural and that, in any case, no ecosystem or species becomes extinct.

There are many reasons why it is important to conserve biodiversity. Some of the major ones are described below.

Medicine: a large proportion of the medicines that are used in the world, especially the non-allopathic ones, are derived from plants and animals. Yet, we have only investigated about one percent of the known species for their medicinal and other values. And of the species likely to exist on earth, perhaps only twenty percent have so far been discovered and identified. If a species that has either not yet even been identified, or whose medicinal and other uses have not yet been investigated, becomes extinct, then the cure to some of the diseases that are currently plaguing the world, like AIDS and cancer, might be lost for ever. Even if a species that we have already investigated and found to be of no use, becomes extinct, there are grave dangers. For, though this species might be of no use in curing the ailments we know about today, what is the guarantee that some new diseases might not appear in the future, just as AIDS did some years back. And then we might discover that its cure died with the extinction of the species that we thought was valueless. Therefore, in order to ensure that our options are not foreclosed, we need to ensure that each and every species is conserved. This is the option value of biodiversity.

Agriculture: All the plants we cultivate or the animals we domesticate, are derived from wild species. In order to keep open the option of developing new strains for cultivation and domestication, we have to ensure that wild species are conserved. Also, if cultivated or domestic strains have to be immunised against pests or diseases, then most often wild species have to be used to create such immune strains.

Biotechnology: This is a new area that, perhaps, offers the greatest promise, among all technologies, to provide answers to some of the major problems facing the world: those of poverty, hunger and

disease. However, the 'raw materials' of biotechnology are wild plants and animals. It is from the various plants and animals that genes can be found which, through genetic engineering, give new hope of solving many of the old problems. For example, the green revolution in India was a result of genetic engineering and, whatever might be the problems with it, has certainly raised the productivity of food grains in India. However, if species in the wild became extinct, then this 'raw material' of genetic engineering would no longer be available. We, therefore, must keep this option open also.

Web of life: All life is interconnected like the web of a spider. Each species is directly or indirectly dependent on all others. Therefore, if one species becomes extinct, then this affects all the species. The effect might not be felt immediately, but eventually the chain reaction starts.

For these and other reasons, it is important that biodiversity is conserved if development has to be sustained.

Agriculture

The soil and water resources, that are a basis for agriculture, also need to be sustainably used. Soils are susceptible to wind and water erosion and to degradation. When the vegetative cover on soils is destroyed, the binding that such a cover provides to the soil is removed. These exposed soils become prone to erosion. Further, with the removal of vegetative cover, the soils get exposed to the direct rays of the sun and dry up quickly. This also lowers their productivity and makes them susceptible to erosion. The leaf and vegetative litter that is generated by the green cover enriches the soil and provides it with humus. When the vegetative cover disappears, the soils also degrade.

Cultivation and ploughing on slopes, without adequate measures to prevent soil erosion, also aggravates the loss of soils. Another factor that degrades soil is unsuitable cropping patterns. If the soils are not allowed to rest adequately between crops, they lose their productivity. Also, if the nutrients of the soil are not replenished through natural fertilisers, the soil degrades.

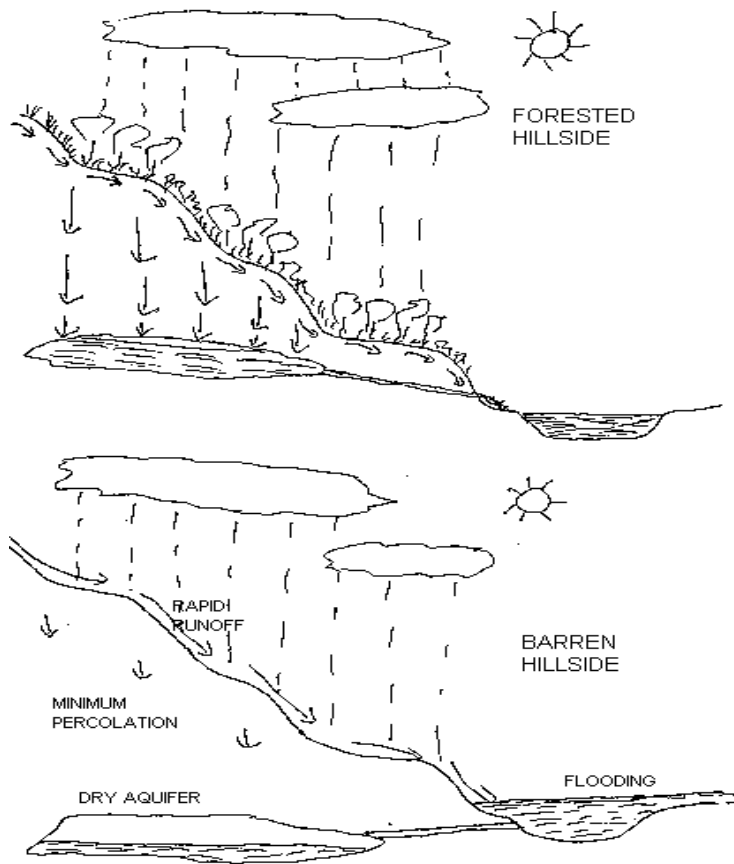
Though chemical fertilisers can, for a short time, enhance the productivity of soils, over a long period they are not able to

replenish all the trace elements in a soil and therefore cannot sustain long-term productivity. Eventually, more and more chemical fertilisers have to be applied to support a declining productivity. This not only reduces productivity but also significantly raises the financial costs of cultivation.

The over use of chemical pesticides, or the use of inappropriate pesticides, also degrades the soil. Such pesticides, apart from killing crop pests, also kill the various insects, birds and microorganisms needed for regenerating the soils. The residues of such pesticides find their way into the water and the atmosphere, significantly degrading the environment and adversely affecting human health. If applied carelessly, they also contaminate the crops and become an additional health hazard.

Water logging is another threat to soils. Whereas this problem would be discussed in detail in the section on irrigation, suffice it to say here that large tracts of productive lands have become fallow because of salts and alkali contamination caused by rising ground water tables.

Deforestation in the catchment areas also results in floods and droughts, further compromising the productivity of our soils. Where catchments are denuded of their forest and other vegetative cover, the soils become susceptible to wind and water erosion. The summer sun dries them and when the rains come they all flow down with the water. The lack of vegetative cover on the slopes also results in very rapid water runoff resulting in inadequate recharging of the underground aquifers. This means that where catchments are degraded there is much greater water in the streams and rivers in the rainy season than there was when the catchments were vegetated. In addition, the topsoil and other debris, which was stabilised on the hillsides by the vegetation also now flows off the barren landscape. The resulting volume of water and silt is too much for the riverbeds to contain and so there are floods.



Also, as this silt reaches the plains and the river slows down, the silt sinks to the bed of the river, silting it up. This results in the capacity of the riverbed becoming less so that even normal flows of water cannot be contained and there are again floods.

Conversely, in the dry season, as the aquifers have not been properly recharged, there is little water in the streams and a drought occurs. Initially floods might enhance the quality of land in the flood plains, as they bring down the topsoil from the catchments. However, in a few years, all the topsoil has been eroded and only rubble is deposited. This significantly lowers the productivity of soils (see figure on next page).

Another threat to sustainable agriculture is the destruction of wild biodiversity. All the plants we cultivate today are derived from the wild. In the case of hybrid varieties, like the green revolution varieties, the cultivated strains are derived from the genes of wild plants. In order to ensure food security and to keep open the options of developing new strains of cultivable plants, we need to ensure that wild plant varieties are conserved. We also

need the wild varieties to meet threats to our existing cultivable varieties (for details see section on biodiversity).

Water resources

Water is, after air, perhaps the most critical human resource. The location of human settlements, throughout history, has more often been determined by the location of water sources than by any other single factor. And historically many societies and cultures have perished because they could not manage their water resources properly.

Water is essentially a renewable resource, much of it subject to yearly or half yearly cycles. The water (or hydrological) cycle moves water from one place to another and changes some of it from one form to another. The monsoon winds pick up moisture from the Indian Ocean and distribute it, as precipitation, throughout the country. In this process, they also convert salt water into fresh water. There is also the melting of snows and glaciers, in the Himalayas, which feed many of our rivers.

To ensure that water is sustainably used it has to be ensured that the hydrological cycle does not go awry. This involves, to start with, ensuring that rainfall patterns do not get disrupted. Though the relationship between deforestation and macro climatic changes is not yet well understood, there is good evidence to believe that deforestation can cause serious disruption in micro rainfall patterns.

But, more important, the degradation of vegetative cover in the catchments seriously disrupts, as already described, the water cycle and causes floods and droughts. Deforestation and degradation of the upper reaches of the Himalayas also causes micro climatic changes which affect the ice and snow melt regimes, thereby disrupting the hydrological cycle.

So, the first task is to ensure that water is available where required, in the right quantity and at the right time. The second task is to ensure that this water is clean and wholesome. Ordinarily, the water that comes down as rain or through ice or snow melt is pure and not polluted. However, certain types of air pollutants can contaminate rainwater even before it reaches the ground. A common result of such pollution is called 'acid rain'. Acid rain occurs when the atmosphere is polluted with sulphur

dioxide and nitrogen oxides which mix with rainwater to form sulphuric acid and nitric acid. Such rain, instead of nourishing the soil and vegetation, destroys them. Thousands of hectares of forests in Europe and North America have been 'burnt' by acid rain. The soil there has become acidic and lost much of its productivity and the lakes and rivers have been polluted, resulting in extensive fish kills.

Apart from atmospheric pollution, water is also subjected to pollution on the ground. Silt, domestic wastes, agricultural run off and industrial wastes pollute our lakes, streams, rivers and even the ocean. Such polluted waters become unfit for most human uses. Due to rampant water pollution in India, most of the surface water is unfit for human consumption. Much of it is also unfit for bathing and some of it even for agricultural use. When polluted water is fed into industries, there is a danger that it would damage the machinery or otherwise adversely affect the industrial process. Polluted water also degrades the environment, particularly affecting the fauna and flora that either live in that water or partake of it.

Water is stored or conveyed on the surface of the earth in or through various water bodies. These natural bodies have an ecological process of their own and include lakes, ponds, seas, oceans, springs, streams and rivers. These are not mere receptacles or passages of water but also habitats for hundreds of living creatures: fish, insects, plants, snakes, reptiles and crustaceans. These water bodies also energise the water, just as they are energised by it. Water, as it rests in or passes through them, is oxygenated, cleaned and mineralised. If there are pollutants in the water, the ecological processes act to biodegrade them and to clean up the water again. Rocks and rapids in the streams and rivers help mix oxygen in the water, which the fish and other creatures living in the water then breathe for their survival.

When the water is polluted beyond its capacity to assimilate the pollutants, then these various functions of the aquatic and marine ecosystems get compromised. Similarly, if large quantities of water are extracted from such water bodies, then again the ecosystem gets affected and cannot perform normally. Where excessive pollution or extraction continues over time, the ecosystem gets irretrievably damaged, sometimes becoming

incapable of supporting even the most basic life forms. Apart from the loss of fish and other life forms, this means that the water body is no longer able to cleanse the water and the water either becomes useless for human use. It has to be subjected to an expensive process of artificial cleansing before it can again be used.

Polluted water also poses a threat to its users. The threat to the environment has already been explained. It also threatens human health and it is estimated that 10,000 children die every day in India due to water related diseases. Also, water that contains large quantities of silt does damage to human made structures, silting up dams and tanks and damaging hydroelectric turbines.

Given the growing human population and the consequent increase in the demand for water, controlling the use and wastage of water, especially 'treated' water, is a high priority. What is required is 'demand side management' of water. The current patterns of water use are not only inequitable but also wasteful and unsustainable. While the well to do in a city throw away 12 to 16 litres of 'treated' water every time they flush their cistern, the poor in the same city have to line up for hours to get even one bucket of water. Our houses and industries are not designed to be water efficient and millions of litres of water are wasted because of leaking taps or outdated industrial processes.

Industry

Industrial growth is seen as central to economic development. However, in order for industry to be environmentally sustainable and for it to contribute to overall sustainable development, it must be environmentally friendly, or 'green', from 'cradle to grave'. This means that right from the setting up of the industry and the extraction of raw material and the generation of energy, through its production process and the nature of the produce, to the decommissioning of each plant and the final disposal of each product, the sector must be green.

If the Industrial sector is not environmentally friendly, it puts unsustainable pressures on the environment, both by using more natural resources than can be replaced and discharging more waste than can be assimilated. By using natural resources

inefficiently and by polluting needlessly, an industry takes away the opportunity for additional production out of the same natural resources and the consequent additional discharge of pollutants. So, industries that are green not only negatively affect the environment but also take away the opportunity for additional industrial production.

In India, both water and electricity are subsidised, in the sense that their true cost, especially if you include the environmental costs, are not recovered from the consumers. Water and electricity are also two of the resources that are most often wastefully used. It is therefore imperative to conduct environmental audits of industries and of the industrial sector. To make such audits meaningful, standards must be prescribed for the quantity of water and electricity to be used in the production of various types of goods and the provision of various services.

It is preferable to prevent pollution, rather than to try and control it once it has happened. In order to prevent pollution, it is important that production technologies must also be green. The use of green technologies is not only good for the environment but also economically beneficial. Environmentally friendly technologies consume less water and electricity per unit of production and produce less waste. The costs of raw materials and of waste disposal are also, therefore, minimised, along with the expenditure on electricity and water. Besides, many green processes link up production processes in a way that the wastes of one process become the raw materials of another. Therefore, industries can be located and designed in ways such that the quantity of waste is minimised and the cost of purchasing raw materials is cut down.

Another area of concern is that of packaging. Again, because garbage collection and disposal is done at public cost, not chargeable to the industry, many industries pack their products in an environmentally unfriendly manner. The use of plastics and other toxic or non-biodegradable materials as packaging material, needs to be controlled. The products themselves must be such that they or the materials they are made of could be recycled once their life was over. This would not only

save on raw materials but also lessen the problem of garbage control.

Energy

Power projects have historically had significant social and environmental costs associated with them. The two most common types of such projects in India are hydro and thermal power projects.

Hydroelectric projects: Hydroelectric projects, especially those involving large dams, usually have the more significant environmental and social impacts. Some of the main impacts are listed below:

Upstream of the dam

1. Degradation of the catchment. This can be due to the project, partly because of project activities and partly because of increased pressures on the remaining catchment, once a part has been submerged under the reservoir. Apart from the adverse impacts this has on the biodiversity of the region, it also often has critical implications on the livelihood needs of the local people.
2. Of course, degraded catchments, whatever be the cause of degradation, can also have significant impacts on the dam project itself by, among other things
 - Increasing the silt load
 - Causing erratic water runoffs
 - Posing a possible threat of surplussing due to sudden increase in water flow
3. There is the threat of backwater build-ups and consequent floods and destruction
4. There is also the threat of reduced water availability upstream, as the water is required to fill the reservoir

At the reservoir and project site:

5. Dust Pollution
6. The threat to rim stability

7. *The potential for breeding vectors*
8. *Adverse impact on the aquatic ecosystem and biodiversity*
9. *Possible adverse Impact on fisheries*
10. *Impact on the water quality including potential for mineral contamination of water*
11. *Submergence and destruction of flora and fauna*
12. *Submergence of agricultural land*
13. *Submergence of grazing land*
14. *Submergence of sources of local fuel wood and other non timber forest produce*
15. *Reservoir induced seismicity*
16. *Adverse micro climatic changes*
17. *Human Displacement*

Downstream

18. *Adverse impacts on aquatic ecosystem and biodiversity downstream*
19. *Adverse impact on fisheries downstream*
20. *Adverse impact on water availability downstream*
21. *Adverse impact on water pollution levels downstream, especially due to reduced river flow*
22. *Possible salt water ingress*
23. *Threat from sudden releases of water*
24. *Threat from dam failure*

Command Area (in multipurpose projects)

25. *Threat of water logging and salinity*
26. *Threat of vector breeding*

Unfortunately, there are many projects in India and in other parts of the world, which manifest one or more of these adverse impacts.

Hydroelectric projects in India are often not investigated properly for their environmental and social impacts. Their environmental and social viability is, therefore, not clearly

established. Besides, the measures to mitigate the social and environmental impacts are often inadequate. Also, activities related to the assessment and mitigation of environmental and social costs are often started very late and then hurried along so as not to delay project implementation.

Rehabilitation: Hydroelectric projects also take a heavy toll of the human beings living in the submergence areas, who are made homeless in the thousands. Till recently, there were very inhumane rehabilitation policies, where by and large the “oustees” were handed a small amount of money in lieu of their homes, livelihood and heritage, and asked to fend for themselves. Recently, there has been a serious effort to change all this. Some of the newer projects, notably the Sardar Sarovar Project in Gujarat, offer land for land and other facilities to the “project affected people”.

Despite this, the cost paid by the project affected people, mostly poor villagers and tribals, is horrific. And the benefits of the electricity generated goes mostly to the rural rich and to the urban populations.

Coal Based Thermal Power Projects: Though the adverse environmental and social impacts of thermal power projects are not as dramatic as that of dams, they are still significant. This is especially so if one assesses the impacts from “cradle to grave”, i.e., including the impact of mining the coal and of its transportation to the power plant.

The major environmental and social impacts of thermal power stations are listed below.

Construction phase

1. Displacement of people
2. Dust pollution
3. Local level disturbance
4. Destruction of fauna and flora

Operational phase

5. Air pollution
6. Water pollution

7. *Withdrawal of water*
8. *Land pollution, mainly through fly ash*
9. *Noise pollution*
10. *Micro climatic changes*

Unfortunately, thermal power plants are often not properly assessed for their environmental and social impacts, and alternative sites and technologies are rarely explored.

Perhaps the three most critical issues concerning thermal power stations, in terms of their social and environmental impacts are:

1. *The location of the plant. Inappropriate locations imply heavy environmental and social costs and an inability to adequately mitigate these costs without making the project economically nonviable.*
2. *The use and discharge of water. As water is a scarce commodity in most parts of the country, the use of water by power stations results in greater, sometimes critical, deprivations for the local populations.*
3. *The dumping of fly ash. Fly ash is perhaps the single greatest hazard to the environment, to land and to human health.*

Transport

The contribution to air pollution levels, especially urban air pollution levels, of the transport sector is significant. This is primarily because of the concentration of vehicles in urban areas, the technology prevalent, the poor state of maintenance of vehicles, the poor quality of fuel and, sometimes, local climatic conditions.

Air pollution levels in most of our cities are much above the prescribed limits, especially for suspended particulate matter (SPM).

In the last few years, the government has taken some important steps in tackling this problem. They have notified motor vehicle emission standards and introduced a system by which motor vehicles need to have pollution checks regularly. They have banned the sale of cars, which are not fitted with catalytic

converters, in the metropolitan cities. They have introduced lead free petrol. Efforts are also on to improve the quality of fuel being supplied, to upgrade motor vehicle technology, to ban the sale of loose oil at petrol pumps and to phase out of Delhi, for example, public vehicles which are over fifteen years old.

However, as long as the number of vehicles on the road keep increasing, the problem will only get worse. The only sustainable answer lies in improved public transport, which makes the use of private vehicles, or of individual public transport like taxis and three wheelers, less popular. Along with these, the other options like better and different fuels, and greener technologies, must be pursued.

For travel and transportation between towns and cities and across the country, some of the greenest options are no longer available. River transportation, if properly managed, can be a very environmentally friendly method of travel. Unfortunately, many of our rivers have now become too silted to be able to allow this option. However, if the earlier discussed methods of catchment area treatment and afforestation are implemented, then it might again become viable to desilt our rivers and other water ways and make them navigable for transporting people and goods.

Rail transport is also preferable to road transport. However, in the last few decades there has been a much greater focus in developing the roadways sector rather than the railways. This strategy also needs to be reconsidered.

4 STRATEGIES FOR SUSTAINABLE DEVELOPMENT

The strategy for making the development process greener and environmentally sustainable involves ensuring that each sector and, within a sector, each project, scheme or activity, is environmentally friendly and contributes to a development process which is sustainable.

There are various methods and instruments available to assess the environmental impact of such projects and activities and to ensure that they are environmentally viable. Two of these are environmental impact assessments and natural resource budgeting and accounting.

Environmental Impact Assessment (EIA)

Conducting an EIA of a project or an activity involves developing an environmental impact statement and then assessing the expected impacts of the project or activity.

An environmental impact statement (EIS) usually contains a list of the activities and processes that might have an adverse impact on the environment. These are then described in terms of the nature and severity of impact on the various elements of the environment. So, for example, an EIS of a proposed power station may look something like this:

ENVIRONMENTAL PARAMETERS

<i>Activities</i>	<i>Air quality</i>	<i>Water availability</i>	<i>Water quality</i>	<i>Land</i>	<i>Soil</i>	<i>Groundwater</i>	<i>Local inhabitants</i>
<i>Clearing of site</i>	L	L	L	H	H	L	H
<i>Land filling</i>	L	L	M	H	H	L	M
<i>Transportation of building materials</i>	H						M
<i>Construction of buildings</i>	H			M	M		
<i>Withdrawal of water</i>		H	H			H	H
<i>Discharge of water</i>		M	H			M	H
<i>Discharge of flyash</i>	H	H	H	H	H	H	H
<i>Discharge of SO₂</i>	H		M		M		H

Transportation of coal	H			H	H		H
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H = high impact, M = medium, L = low, Blank = no impact

An assessment of the impacts, as laid out in the statement, is based on various factors. The purpose is to determine whether the proposed activity or project is environmentally viable and, as such, deserves environmental clearance. To decide this, various questions are considered. These include whether it is possible to prevent or mitigate the anticipated adverse impacts? How severe are the final impacts? How valuable or unique is the affected ecosystem? And whether the benefits from the proposed activity or project justify such impacts?

Natural Resource Accounting and Budgeting

Till recently, environmental costs were rarely taken into consideration in the national planning exercises. This is because financial and economic experts do the planning and they do it in primarily a financial and economic context. However, natural resources are the most fundamental of human resources, certainly more fundamental than financial and economic resources.

Given the rapid environmental degradation, the world over, in the last few decades, many countries have begun to realise that unless environmental costs are incorporated into their national accounting system, a true picture of the health of their economy would not emerge. Perhaps motivated by this, the Government of India, in its policy statement on sustainable development, has undertaken to present before Parliament, each year, a natural resources budget.

In countries of the North, environmental economics is now a popular and fast growing discipline. Unfortunately, the models developed in these countries are not always appropriate to India. Despite this, there has been a concerted effort by various countries of the North and many international agencies to persuade India and other countries to accept their model of natural resources accounting.

The imperative for natural resource accounting seems, on the face of it, to flow from an urge to integrate natural resource

parameters into the national accounting systems. This means that the GNP calculations of a country would reflect, each year, the use and accrual of natural resources. For specific projects and activities, a system of natural resource accounting would mean that the financial and economic costs of natural resources will be reflected in the cost benefit analysis carried out to assess the viability of the project.

Unfortunately, the methods currently being used by many countries of the North for generating natural resource accounts, have many problems. Some of them are outlined below:

Classification of Nature: The first problem relates to classification of nature into that which has economic value or, as economists sometimes describe it, has alternate uses, and that which has no economic value for it has no alternate use. The belief that some elements of nature have no alternate use and therefore no economic or financial value seems misplaced. Perhaps, if one takes a very narrow definition of "value" and "use", then one could argue this. However, it is well established that each individual living organism represents a unique element of biodiversity. Therefore, it is difficult to imagine even a single plant or creature that has no use.

Attaching Value: Even more difficult is the method by which economic and financial value is attached to elements of nature. Unfortunately, economics as a science can only put a replacement value to those goods and services, which are inputs into, or outputs of, an economic process. Much of nature, critical as it is to human survival, is not an input or an output of an economic process. Therefore, for economists, it is either invaluable or valueless. As economics cannot handle the notion of invaluable, it tends to consider much of nature as valueless.

As an example, how can economics ascribe a realistic financial or economic value to the last surviving pair of a species of a bird, which currently might have no known economic function? Given the present methodology, such a pair would ordinarily be considered without economic value. Yet, this very species might, if it survives, become of very great economic value in the future. Nevertheless, as there is no way of predicting with

any certainty whether this would happen or not, ascribing value becomes an impossible task.

The North-South Divide: Though the difficulties in ascribing economic value to elements of nature are common all over the world, their implications are far greater for countries of the South. Whereas in countries of the North most people have enough surpluses after meeting their immediate basic needs, to be willing to pay for recreation and long term needs like environmental conservation, this is not so in countries of the South. Therefore, if the economic value of the environment was to be determined through market forces, as is envisaged in many of the prevailing methodologies, it is unlikely that in countries like India the poor people would be in a position to choose long term needs over their immediate ones. Market forces would, consequently, make it difficult to conserve and protect anything.

Also, given the vast differences in the buying power of different segments of society in countries of the South, and between the North and the South, it is difficult to ensure socially just utilisation of natural resources. This is especially so if decisions were to be made solely or primarily on an economic basis.

Undervaluing Nature: There is also a tendency of governments, dominated by imperatives for economic growth, to systematically undervalue the contributions of natural ecosystems to the economy and to human welfare in general. For example, a forest can be contrasted with a human made industry. Whereas the human made industry requires inputs of capital, energy, raw materials, maintenance, replacement, and a labour force to make it productive, the forest, as an industry, produces goods and services critical to humanity without requiring any of these. It generates its own energy, produces its own raw materials, maintains and replaces itself, and goes on for eternity without needing any human input. However, the economic value attributed to forests never reflects this miracle of productivity and renewability.

The Solution: But what is the solution? Perhaps one way out is to adopt a dual approach of both budgeting and accounting. The elements of this approach are described below.

First, a natural resource, say water, needs to be budgeted in physical terms and allocations made to meet the basic ecological and social requirements. This means that, in a river, the minimum flows required for maintaining the ecological balance of the river and consequently its ability to cleanse itself and support life, must be assured.

Once this is done, then the surplus water must next be allocated for meeting the basic needs of the human populations dependent on the river. This includes their drinking water requirements and other basic needs. If any 'surplus' remains, this can then be subjected to market forces and its use determined based on the paying capacity of the various contenders.

In such a model, where there is industrial demand for water, then the industrial sector must pay for enhancing lean season flows by, for example, regenerating catchments, in order to produce larger surpluses. There is also, then, an economic incentive to invest in water saving technology, as the real cost of water is being charged.

5 SOCIAL JUSTICE AND ENVIRONMENTAL ETHICS

Perhaps one way of assessing the levels of social justice in a society is to determine who uses and controls whose natural resources, for what purpose, and why. The age-old conflicts, between societies and nations, for the control of markets have often been preceded by even fiercer conflicts for the control of natural resources. Access to natural resources continues to be a contentious issue among rural communities, and between rural communities and governments.

For nature and natural resources to be managed ethically and justly, equity between different segments of this generation of human beings, between this generation and future generations of human beings, and between human beings and other species has to be assured.

Intra Generational Equity

The major intra generation equity issue is: who pays the costs and who reaps the benefits of environmental conservation and use. Historically, rich and powerful nations and people have cornered most of the world's natural resources, transferring the costs of

their use on the weaker and poorer nations and communities. In recent times, with the growing awareness of the need to conserve environment, there is the additional tendency to make the poorer nations and, among them, the poorer people, especially the rural communities, bear the costs of conservation. This happens when forest and other areas are closed up and local communities' access and use is restricted. It also happens when factories producing goods for urban consumption use up the water and other natural resources of rural communities, and pollute their rivers and atmosphere. In cities, it happens when the poorer populations are pushed into congested and unsanitary areas, with high levels of pollution, while the rich and powerful for whom they work, keep their own environment healthy and clean. This also happens when the resources needed to maintain the wasteful and ostentatious life styles of the rich and powerful are procured by destroying the environment and further impoverishing those poor local communities who were dependent on them for their subsistence needs.

Therefore, the major intra generational ethical issue is the promotion of equity among nations and among classes of people, by ensuring that the costs and benefits of environmental conservation and use are fairly apportioned.

Inter Generational Equity

The major inter generation issue is that of sustainability. Is it ethical to use up natural resources to meet the demands, sometimes urgent and genuine demands, of the current generation, if this results in the foreclosing of options for future generations?

Where these demands are to meet wasteful and ostentatious life styles, the answer is relatively easy. However, the answer is far more difficult when the demands are from poor people striving to make two ends meet. It is a difficult ethical dilemma to choose between the survival of the present generation of poor and the survival options of future generations.

Fortunately, the dilemma is rarely such. By and large, the poor are not in conflict with future generations but with the rich and powerful of their own generation. If the natural and other economic resources of the world were more equitably distributed,

there would be no need for the poor of the world to destroy their own natural surrounds. Similarly, if the resources within nations were more equitably distributed, the issue of the survival of the poor would not haunt humanity.

Inter Species Equity

In recent years, there has been an increasing recognition that animals have a right to survive and live happy and healthy lives, independent of their utility to human beings. Of course, this is not a new sentiment. In India, as in many of the old cultures the world over, the rights of other living creatures were not only recognised but many of them were objects of awe and reverence. Unfortunately, this ethic has gradually been overtaken by utilitarianism, where nothing has a justification unless it has utility, and that too utility for the human race.

Though there is now a reaffirmation of the rights of all living creatures, it is still in the early stages. The movement against cruelty to animals has also begun to gain support. In any case, there is no evidence to believe that this world was created for human beings alone. Therefore, other life forms must be conserved not just because such conservation is critical to the present and future generations of human beings but because these other life forms also have a right to life.

Consumption Patterns and the Environment

The large and rapidly growing Indian population is often blamed for our many environmental predicaments. Actually, the environment is threatened more by levels of consumption than by the absolute number of people. If we consider consumption units rather than human units, then the one billion plus people in India are much less of a threat to the environment than the much smaller populations of many countries of Europe and North America, who have much higher rates of consumption. Similarly, within India, the 200 million middle class, and especially the four or five million upper and upper middle class among them, consume far more and have a much greater impact on the environment, than the remaining 800 million. Yet we focus on images of rural women carrying firewood out of forests, and see them as a major threat to the environment, while blissfully sitting

in conference halls with central air conditioning, a hundred light bulbs, wall to wall carpeting and wood panelling.

It can, therefore, be argued that even if the population of India were halved, we would not solve our environmental problems if the half that disappeared were essentially the frugal poor and the remaining half grew into being the consumerist middle class. Clearly the pattern of consumption that societies adopt is a central environmental issue.

Nevertheless, arguments about consumption patterns and lifestyles often get misunderstood to be arguments against progress, against technology and even as arguments for going back in time. In this polarized debate, the essential issue is our view of human needs and wants. Are the acquisition and multiplication of human needs seen as a regressive or progressive human trait, especially when a privileged few keep acquiring and fulfilling new needs, while the large majority of the people are losing the battle to meet even their original and basic ones?

Basic biological needs are reasonably well defined and include the food, clothing, and shelter required for a healthy life. Though basic socio- psychological needs are less well defined and could differ from society to society, they ordinarily have a cultural and historical basis. Acquired physical needs are usually irrelevant to a healthy life and often militate against it, especially when manifested in unhealthy food choices, lack of physical exercise, or an artificial and unhealthy living and work environment, among others. Similarly, acquired socio- psychological needs are essentially irrelevant to the psychological well being or the social functioning of an individual. They are often acquired or promoted with some other agenda, for example to promote commercial interests. In some cases it can also be an attempt to mimic, or seek the acceptance of, individuals or social groups that are perceived to be superior.

Of course, this does not mean that all that exists in ones own society is necessarily good and all that exists in other societies is necessarily bad. In fact, the need to maintain and promote social and cultural diversity must be balanced against the need to socially evolve. Therefore, positive values and practices must be appropriately adopted, wherever they are found. The problem is in

determining what are positive values and practices. There is also the problem of mindlessly copying things that others do, without even being aware of the adverse impacts these might have on oneself and ones society. This happens even when these adverse impacts are obvious in the host societies.

It must also be accepted that individual freedom of choice is a universal value and, though not an unlimited right, it is nevertheless an important right in a democracy. Consequently, an enlightened society will not seek to impose patterns of living and consumption, but will create conditions and circumstances conducive to making rational choices while exercising the right to choose.

6 NEW AND EMERGING ISSUES

In the last few years the attention of the global community has increasingly been drawn to two potentially catastrophic impacts of human activities. The first is the hole in the ozone layer and the second is climate change.

Ozone depletion

Ozone (O_3) is a gas that, among other things, forms a protective layer around the Earth and filters some of the more harmful ultra violet rays from the sun. In the 1980s it was discovered that a hole was forming in this layer primarily because of human made chemicals, also called ozone depleting substances or ODS, like chlorofluorocarbon (CFC) compounds, which were being released into the atmosphere and then making their way up to the ozone layer and gradually destroying it. CFCs were a human made compound that was used as refrigerator "gas" and had various other industrial uses.

If UV levels increased they would cause many problems, including increased skin cancer. In the ultimate analysis, if the ozone layer was totally destroyed or made ineffective, the amount of UV rays reaching the Earth would probably finish all terrestrial life and life would survive only in the depth of the oceans.

As a response, countries around the World got together and signed a protocol, popularly known as the Montréal Protocol, which aimed at phasing out all substances that depleted the ozone layer. Current trends suggest that the quantity of ODS being

released in the atmosphere has gone down and continues to reduce and that, if all goes well, ozone levels will recover to 1980 levels by around 2068.

Climate Change

Recent changes in world climate, more specifically global warming, have rung alarm bells around the World. It has been determined that global warming is being caused by the release of gases, primarily water vapour, carbon dioxide and atmospheric ozone, known as green house gases (GHGs), into the atmosphere. These gases are produced mainly as a result of burning fossil fuels, like coal and petroleum, and because of deforestation. The GHGs move up the atmosphere and form a layer over the Earth that traps the heat of the Earth and does not allow it to dissipate into space. This results in the raising of global temperatures.

The raising of global temperatures is expected to lead to the raising of sea levels and the consequent submergence of coastal areas and low lying islands. This would happen mainly because of the melting of the polar ice due to raised temperatures, and would also devastate the polar regions and the wild life that lives there.

Global warming is also causing the rapid disappearance of glaciers, thereby threatening the water flow of rivers that were significantly fed by these glaciers, like most of the major rivers in India. In the medium to long run, it would adversely affect the availability of water in countries like India, turning many fertile areas into veritable deserts. It would change rainfall patterns and significantly interfere with existing agricultural practices. Considering the important role that climate plays in the life of the people, global warming would disrupt life as we know it today and most likely result in huge forced migrations and famines, especially in the poorer countries.

The response of the world community to this impending disaster was to sign a protocol, popularly known as the Kyoto Protocol, which was supposed to result in a significant reduction in the emission of GHGs globally. However, the climate change agenda had been hijacked by political and economic agendas of the countries across the globe and there continues to be a virtual

stand off between the industrialised and the industrialising nations.

The latter blames, and rightly so, the former for creating the problem and therefore demands that they pay for the opportunity costs that the industrialising countries (like India) have to pay if they are to voluntarily curb their use of fossil fuels. There is also a demand that the industrialised nations (like the USA) first bring down its own emissions to the per capita level of countries like India and China before they can expect India and China to further cut their own emission levels.

Some Industrialised nations, especially the USA, are on the other hand not willing to accept caps on their own emissions till countries like India and China also accept caps. Also, much of the industrialised world, specifically North America and Europe, is not willing to provide the sorts of financial resources that the rest of the world estimates would be required to mitigate climate change and turn the clock back.

In recent times, the debate has moved from prevention and mitigation of climate change, to adaptation of its adverse impacts. The logic is that whatever happens, there is bound to be some adverse impact of climate change, and while the world debates on who will pay for preventing further impact, at least it should prepare itself for adapting to the already inevitable impact. Here, again, the world community cannot agree on who should pay the adaptation costs, and in what proportion.

Unfortunately, in India there is very little that has been done towards preparing state governments and district authorities to meet with the soon to be felt inevitable adverse impacts of climate change. Though there is much talk at the national level, there is little action where it matters, at the grass roots.

7 CONCLUSIONS

Many urban people are insensitive to nature, and see it only as a resource for their use and consumption. Urban educational and professional institutions reinforce such insensitivity, but also produce and house a large majority of our planners and decision makers. It is these individuals, in control of the government and articulating its social and economic policies, who have so far

made decisions about the use of natural resources. It is assumed that the common person is not sufficiently concerned and informed about nature and natural processes, to make responsible decisions. The common person, especially the villager or tribal, is therefore consistently ignored in the decision making process for even those natural resources on which he or she is directly dependent.

But the resultant centralized decisions have forced the villagers and tribals into impossible situations where, in order to survive, they have to surreptitiously degrade “government” forests and lands, thereby alienating themselves from nature, from the governmental machinery and, often, from each other. Such an alienation is inevitable where an individual or community has been isolated from the environment, by acts of the government or other institutions enforcing exclusive control and right to manage. It is aggravated when individuals and communities are denied other ways of earning their livelihood, and forced to destroy their own environment. The alienation is complete when industrial and urban demands are allowed to destroy the environment which local communities, in the name of conservation, were not even allowed to use sustainably.

Even before we could resolve our local issues, we are now confronted with unprecedented global issues that threaten to disrupt our way of life and to threaten the very existence of our most vulnerable sections of society.

It has taken over fifty years of experience to learn that the natural environment cannot be protected by Government alone, often because it has to be protected from governmental activities themselves. Besides, environmental reality in India is too varied to lend itself to generalized policies, or to centralized fiat, however well meaning. But, despite this, governmental and other formal institutional structures, including those at local levels, are still without the will and ability to evolve a consensus of opinion, with the people, on the use and protection of natural resources. They instruct, order, consult, even evoke participation, but are not able to sit with the people and agree on an optimal solution or strategy, based on the understanding, knowledge and experience of all the participants. Efforts are made to “convince” people, to “educate” them, but rarely to listen to them. It is this

lack of a national dialogue and consensus that has reinforced patterns of centralized control on the environment and the consequent alienation. It has, in many parts of the country, transformed traditional social process into a war of attrition which benefits no one, least of all nature. It is justifiable to expect the people of India to conserve their environment, but it has to be ensured that they have a real option to do so.

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