ECONOMIC DEVELOPMENT AND CONSERVATION OF NATURAL RESOURCES

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"People must come to accept private enterprise not as a necessary evil, but as an affirmative good."

—Eugene Black

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by

ZAFAR FUTEHALLY

During the past century, economic and industrial development has acquired such a pace that the landscape of the world has been fundamentally changed, and the basic proposition seems to have been forgotten that our civilisation ultimately depends on natural resources. These are seldom given the importance that is their due, and in fact they are often treated as if they were of no consequence at all.

There are two kinds of natural resources: there are the renewable natural resources like fresh water, clean air, vegetation, soil and all forms of animal life; and the non-renewable resources which consist of items like oil, coal, iron ore and other minerals. Renewable resources can be used over and over again, if they are handled intelligently and with care, and if their progenitor, nature, is not destroyed. With all its ingenuity modern technology is still incapable of creating a drop of fresh water, but we can use the same drop of water continuously if only we ensure that it is not irretrievably polluted. We can keep using the natural growth of a plant or a shrub or grass provided we do not damage the organism permanently by allowing it to be overgrazed or by overcutting it. It takes almost 600 years to create one inch of top soil by the action of

* This text is based on a public lecture delivered under the auspices of the Forum of Free Enterprise in Bombay on 23rd July, 1971. Mr. Futehally is an internationally known conservationist and is Honorary Secretary of the Bombay Natural History Society.

decaying vegetation and the interaction of micro fauna and flora. But provided we keep the soil well covered with vegetation, and safe against erosion by wind or rain, we can use it for long periods without artificial rejuvenation. The same is true of the air on which all of us depend.

As against these renewable natural resources, the non-renewable resources to which I have referred are fixed in quantity, and they have been created by the action of natural forces over a geological time scale which we are not in a position to affect in any way. All that we can do is not to be too improvident in their use. In this essay, I shall confine my remarks to renewable resources because these are really vital for our existence. Steel, aluminium and petrol certainly enhance the quality of our life, but they are obviously not as essential for our survival as water, air or vegetation.

Since we are so dependent on our renewable natural resources, one would have thought that human beings would have treated nature and natural resources with a great deal of respect, in fact even with reverence. But, in fact, from the earliest days of human life nature has been over-exploited. In the words of Stewart Udall, the former Secretary of the Interior of the United States, "When man first came on the planet all that he did was to cut a tree, to hunt an animal, to catch a fish or mine a mineral." Even in the days of the Roman Empire, Pliny writes about land which looked as bare and miserable as a skeleton from which all the fat had been removed. So the point to remember is that the over-exploitation of the planet and the damage to the natural eco-systems of nature about which we hear so much to-day, is not due only to synthetic chemicals and heavy machinery. With our bare hands and with the assistance of goats, sheep, cattle and other animals, our lush, and productive environments have been reduced to deserts. The Sahara and the Rajasthan deserts are classic

examples of areas which were once green and fertile, and are now reduced to a state of total unproductivity. In centuries gone by, when people had used one area of land, they could move on to another, giving it time to recover. Today there are no fresh frontiers left to conquer and, therefore, people are talking about colonising other planets in space. It may not be irrelevant in this context to quote here from a famous speech which Neil Armstrong, the first man to step on the moon, delivered at the Second International Congress of the World Wildlife Fund in London in November 1970. "To stand on the surface of the Moon and look at the Earth high overhead is certainly a unique experience. Although it is very beautiful it is very remote and apparently very small. We have all been struck by the simile to an oasis or an island. More importantly, it is the **only** island that we know is a suitable home for man. The importance of protecting and saving that home has never been felt more strongly. Protection seems most required, however, not from foreign aggressors or natural calamity, but from its own population...."

It must be said to the credit of the human race, however, that there are a few small communities who have recognised that nature should be used rather than conquered in the interest of human beings. The Eskimos who live on fish and caribou, and certain groups of people who live in the Pacific Islands under the sovereignty of the United States, have managed to attune themselves beautifully to the environment. They truly live on the income and not on the capital of nature as so many other societies do; and provided they are not interfered with by outsiders they could go on living happily for ever. Recognising the wisdom of their social customs, the United States Government has decided to leave them alone and not try to "modernise" them in any way.

In the initial stages of our history, the over-exploitation of the environment did not matter too much. Man started his career as a hunter. It was then necessary for him to have two square miles of land per person for subsistence, and on this basis the population ceiling was 20 million. Round about 6000 B.C. when he commenced the era of settled agriculture, the ceiling went up by 50 times, to one billion. This figure was reached in fact only in 1850, and if it had remained there we would all have been in a very happy state. But the fact that the population is 3.6 billion today and increasing every year is the central problem of our age. There are persons like Prof. Colin Clark who maintain that by using the ingenuity of the Dutch and the productivity of the Japanese, the earth can support ten times the number of human beings that exist today. But if we do this we will have to live on yeast farms and grass chops, and under those conditions there would be very few humans who would think that life was worth living at all.

We have noted earlier that the human race has always abused the environment, and the question may well be asked how they have managed to survive upto the present time. The answer is that the planet earth is 3.8 billion years old, while man has been here for only 1.6 million years. During this long period, the action of sunlight on the biotic community has created a vast capital of natural resources on which we are now subsisting. The atmospheric composition of 20% oxygen for example has been arrived by photo synthesis and by the deposition of vegetation in the ocean. But a jet plane crossing the Atlantic consumes 35 tons of oxygen, and a motor car travelling for only 1 km consumes as much oxygen as is needed for a human being for a whole year. We have never tried to work out a balance sheet of income and expenditure as far as our natural resources are concerned; and, in fact, almost the first attempt on a world-wide basis was made in this direction at the Biosphere

Conference organised by UNESCO, in September, 1968, in Paris. The meeting was attended by 200 scientists from over 50 countries, and their attempt was to arrive at a scientific basis for the rational use and conservation of the resources of the biosphere. The term biosphere covers the land surface, the lower layers of the atmosphere, hydrosphere and the multifarious species of life which constitute our natural world. It is an open system with the main force provided by solar energy. A paper by Prof. Kovda, of the USSR Academy of Sciences, informed the meeting that the efficiency of the photo synthesis processes through which solar energy is converted into organic matter by plants is as yet only about 2%. This could be increased to 10% by the combined effort of geneticists, physiologists and agronomists. As a matter of fact, an efficiency rate of 6% has already been achieved with regard to certain micro-algae, and this holds the best promise for feeding a hungry world.

It is estimated that to cover the gap in protein deficiency, 42 million tons of protein have to be manufactured annually, instead of the 20 million available today. In this endeavour, understanding the processes of nature is crucially important. Animals, for instance, differ greatly in their efficiency of protein production. In order to obtain one calorie cattle meat protein, 7 calories of carbo-hydrates must be fed to cattle. On the other hand, for one calorie of chicken meat only 3.5 calories of vegetable carbo-hydrates are required. Obviously, then cattle are rather expensive "middle men", and there may be a case for vegetarianism if the scarce resources of the world have to be used on a sustained yield basis. However, if the grass chop is really round the corner we may be able to keep famine away for a long time, for the major part of the phytobiomass of the land is not used by man as a source of food. About 4 billion tons are produced in fields and pastures but only 360 million tons or about 9% is consumed by man.

At the Biosphere Conference, it emerged that the attitudes of people, whom we consider to be backward, are often in fact very much more in harmony with nature than we have imagined. Sir Frank Frazer Darling emphasised the great damage done by man to his environment as he dug into the organic store of the planet's eco-system : "Even to light a fire of dead wood for keeping warm is to deflect a natural process of decay which would be humus building into the production of inorganic ash..... We should now learn to envy the deep ecological understanding of many primitive people, and the greater concern which they showed for preserving the productivity of their habitat." The nomads of the early days for instance knew that any undue lingering in the same area punishes the vegetable complex and by reducing the number of species impoverishes it. Nomadism "is essentially ecological in structure relying on movement and seasonal use, a wide spectrum of grazing animals adapted to well understood differences in habitats and producing much energy without loss of organic matter". Unfortunately, in India we are particularly handicapped by the climatic situation of a short wet season followed by a long dry summer. This makes the soil and the vegetation unusually vulnerable to ill treatment, and even as a result of simple trampling by human feet a new village site in a secondary jungle becomes a stretch of brown bare land in under three years.

India's growing population which is now 550 million cannot possibly be supported adequately by her land surface and population control is obviously the only solution. In a way it is a pity that human beings do not have the checks against over-population which wildlife has. Let me give an example from two species of Indian birds.

The Grey Jungle Fowl (**Gallus sonneratii**) lays a clutch of eggs ranging from 3 to 6, and the clutch size varies with

the availability of food in its particular locality. In those years when the shrub *Strobilanthes* flowers (which is once every 7 or 8 years) the bird lays a large clutch of eggs because it knows that there will be enough food for feeding its family. In the years when conditions are not propitious, a smaller clutch is laid. In the case of our common garden bird, the Magpie Robin (**Copsychus saulauris**) every male of the species tries to acquire a plot of land on which to build its nest, and hold it free from intrusion by others of the same species. In the breeding season the male mounts the highest tree of the area and starts to sing. The song is an indication to others that in that particular plot of land no trespassing will be permitted. This is done of course to ensure that each family has an adequate supply of food for the young. If two families nested too close together there would be unnecessary competition and conflict. If an individual male is unable to establish its dominance over a plot of land it skips the matrimonial season, and does not raise a family at all. So we see that birds are far more sensible than humans because they show greater foresight in the matter of providing for their families. As far as the human race is concerned, the situation is quite the reverse and destitution only adds to our numbers.

Coming back to our central topic of development and resources, I will not refer to industrial pollution and the damage which synthetic chemicals and heavy machinery inflict on the environment. The subject has been almost over-killed. We all know the consequences of resource deterioration, biological pollution, chemical pollution, physical and social disruption. But I would like to refer to two aspects of this particular situation. The decision of the World Bank, that apart from economic assessment there will in future also be an ecological validation of all large projects, is an extremely healthy development. It will now mean that thoughtless development leading to permanent

damage to natural resources and to valuable eco-systems will not take place. A striking example of what happens when ecology is not taken sufficiently into account is provided by the Aswan Dam. When the dam was initially planned it was expected to double Egypt's national income within 10 years. Apart from creating a vast amount of electrical energy, the artificial lakes behind the dam were expected to irrigate vast surfaces of desert land and above everything else the dam was expected to pay for itself in just two years from the prosperity which it would generate throughout the country. Lake Nasser began to fill in 1964, and was planned to be full in 1970. In 1971 the lake is only half full, and the reason is that "the huge surface of the new lake has brought to birth a number of completely unknown Sahara winds. Winds lead to evaporation, and these new winds mean that the lake water is evaporating at a far greater rate than was forecast." Then again the fundamental change in the hydrology of the land has resulted in the spread of the dreaded disease *bilhazariassis* whose vector is a fresh water snail. To kill the snail copper sulphate has been employed on a wide scale, and this has resulted in doing serious damage to the sardine fisheries in the Mediterranean. It is not contended that the Aswan Dam should not have been built, but it is clear that if more attention had been paid to the ecology of the enterprise these disasters would have been avoided.

The second point which I wanted to make about industrial pollution is with regard to the prevalent feeling in India and other developing countries that pollution and its consequences apply only to the over-developed West, and we ourselves need not worry about it too much. Strangely a recent study by the Indian Council for Agricultural Research has revealed the alarming fact that the DDT content in the fat of humans in Delhi is considerably higher than in any other part of the world. This consequence has ob-

viously flowed from the fact that in our godowns, warehouses and other areas we are using DDT liberally in the mistaken belief that the more we use of it the better off we will be. The damage which a persistent chemical like DDT can do to a whole chain of living organisms cannot be under-estimated, and some means must be found of alerting the uneducated public about the dangers of the situation.

I now come to the central theme of this discourse which is that our development plans must be based firmly on the natural principles of land use, and in this connection I cannot do better than to refer to Edward Graham, one of the great ecologists of recent years. In his book, *Natural Principles of Land Use,* he points out the importance of looking at the past of a land before we plan for its future use. In our desire to raise our standard of living, we are much too much in a hurry to implement industrial and agricultural plans without giving adequate thought to the history and the quality of the land where development is to take place.

Once we understand a landscape's history, we are better prepared to consider how wise or unwise has been the use to which that land was put. Then with a knowledge of climate, soils, vegetation and other habitat factors we can gauge something of the potential productivity of the area.

With our growing population and the great pressure on our land, the danger is that it will be put to any use which serves an immediate need. Agricultural land near a city is converted into an industrial estate, forests are given over for agriculture and settlement of human beings, and marshes drained in the hope that the price of reclamation will be covered by the benefits accruing from the conversion.

In fact, experience the world over suggests that all nations have paid a heavy price because they did not take into account the ecology of the environment and had little

comprehension of the potential productivity of the landscape they were altering. India has a total land area of 1.187 million sq. miles. Almost 46 per cent of this is already under agriculture. It is obvious that this is too high a percentage, taking our total food demands into account. If our food supplies have to be increased, the increase must come from more intensive agriculture, for which there is almost unlimited scope, rather than from extending agricultural operations over land which can be better put to other use. The U.S.A. suffered greatly by the wrong use of land for many decades, and it was only in 1935 after the U.S. Soil Service was established that a significant increase took place in productivity.

The need for such a service in India to act as the custodian of our soil, perhaps the most valuable of all our natural resources, is obvious. It takes 600 years to produce one inch of good top-soil by the action of natural forces. But by ill-conceived policies we can wipe out in a matter of months the hard earned gains which have accrued over centuries.

We noted that 46 per cent of India's land is under agriculture, and we find that only about 13 per cent is employed for grazing and pasture. But we can well see how much national waste is involved when this is severely damaged by overuse. We have 229 million head of cattle and 106 million head of sheep and goats. Unless these numbers are reduced drastically we will never be able to take advantage of the natural productivity of our land. Compared to the temperate lands of Europe and America, the productivity of a tropical country like India is very high, and this fact was confirmed again by recent studies in the Gir Sanctuary, sponsored by the Bombay Natural History Society, the Smithsonian Institution, Washington, and the Yale School of Forestry. U.S.A. What was done was that 20 enclosures in various places inside the Gir forest were set

up with the object of finding out what the natural productivity of the land is. At the end of the monsoon, the vegetation growth from all these enclosures was clipped and the dry weight of the produce measured. It was found that in the areas which were free from human and cattle pressure, the output was almost 4,000 lb. per acre. But in areas around the villages where the soil has been trampled by humans and cattle, and where, therefore the productivity of nature has been considerably reduced, the output was only 412 lb. These findings show clearly again that if we only allow nature to give us of her bounty by reducing our cattle and sheep population, there would be a manifold increase in the output of our land.

Over and above our good grazing land, there is a large area of so-called marginal land with arid conditions and poor soil which will not be productive in the long run if we try to bring it under the plough, or use it as pasture for cattle. The land is just not good enough to bear the heavy impact of these operations. Learning from the experience of other countries, we must turn this land over to wild life, and we can then harvest surplus animals on a sustained yield basis.

In a paper presented to the General Assembly of the International Union for Conservation of Nature and Natural Resources in New Delhi in November, 1969, Juan Spillett (who knows India well) gave the example of the State of Utah in the U.S.A. where 55 per cent of the land is technically designated as waste land. Utah's area is only one-fifteenth of the area of India, and yet 1.5 million game animals are legally harvested, which yield 12.8 million pounds of dressed meat. Spillett confirms what studies in Africa, the U.S.S.R. and the U.S.A. have revealed that the capacity of wildlife to exploit the resources of the habitat is much greater than that of cattle.

The forage potential of shrub dominated arid lands such as in the South-West U.S.A., Mexico and much of India has been overlooked and largely unexploited. It is also extraordinary that the total biomass of wild animals even from marginal lands is higher than the biomass obtained from cattle on good land.

There are incontrovertible arguments for developing these areas for wildlife rather than for the traditional domestic animals. Most kind of wild animals produce more protein per given area of land; they need very little water compared to cattle or sheep; they thrive on land unsuitable for live-stock; because they are constantly on the move, they do not destroy the habitat as domestic animals do by either compaction of the soil or by overgrazing.

Let us see what the position is with regard to one of the most important assets of India, which is her forest land. The National Forest Policy enunciated in 1952 says that 33% of our land has to be kept under forest cover. Unfortunately, this has remained a paper dream, and year by year the area under forest is being reduced. Illegal cutting and the opening up of forest land for agriculture is the main reason. Though the difficulties of protecting our forests are obvious, it is equally obvious that our administration has not geared itself for protecting this great national asset with the seriousness it deserves. The position is similar in most countries of South-East Asia, and everywhere the cutting down of forests has resulted in severe floods in the monsoon, followed by soil erosion and loss of productivity year after year. A report on the forest situation in the Philippines by the well-known ecologist Lee Talbot, who has specialised in the ecological situation of South-East Asia, is worth recording:

"Watershed is a renewable natural resource of critical importance to the Philippines as it is to most countries. Yet

there is often insufficient understanding of the role of watershed, of what it is, and what it does. Very briefly, watershed is usually an area of vegetation covered land which accepts and catches the rainfall during the rainy season, absorbs it rather like a sponge, and releases it during the rest of the year in a relatively even flow of clear water in underground water, springs, streams and rivers.

"To be effective, the watershed must have the protective covering of vegetation on it which helps to give it the effect of a sponge. When this vegetation is cleared, and the soils are bared, as occurs with destructive cultivation, the immediately off the bare ground, carrying away the soil and area is converted from an effective sponge to something more like a tin roof. During the wet season the rainfall flows often creating destructive floods which can cause loss of life and property on lands below. No water is absorbed in the wet season, and consequently in the dry season there is no release of water, so that lands and people below suffer drought.

"Wherever we have travelled.....we have been told the same story: When the farms, barrios, or towns we were visiting were started there was abundant year-long water and no floods. However, as the hills above were deforested and poorly cultivated, the dry season water supply has become steadily—often critically—reduced, and the floods become annually more common and more destructive."

The recent spate of unprecedented floods in India is an indication of the extent to which our catchment areas have been denuded, and the recurring problem of floods and drought has been well described by the Civil Servants of the last century. In 1877 a great famine raged in South India, and Sir Richard Temple, sent to aid the Madras

Government, wrote: "We cannot but reflect whether the uncertainty of season which often proves so disastrous in Southern India is not becoming worse and worse; whether there may not be some physical causes at work to render the rainfall precarious.....Beyond the Ghat mountains in Bellary and Kurnool, the treeless shrub-less aspect of the country is as wonderful as it is melancholy. These are the very districts where famine is occasionally epidemic, and where scarcity has been almost endemic."

The Indian Famine Commission reporting in 1880 said: "There is before us a great amount of evidence from all parts of India that the destruction of forests is believed to have acted injuriously by allowing the rain waters to run off too rapidly. They descend from the hillsides in furious torrents, which carry down the soil, cause landslips, and form sandy deposits in the plains, so that the surface drainage which, if gently and evenly distributed over an absorbent soil protected by vegetation, should furnish a perennial supply of fertilising springs, passes rapidly away, and the streams into which it collects quickly cease to flow, after causing mischief instead of good."

So much for **terra firma.** Let us see what the position is with regard to wet lands. In 1965 a group of ecologists met in New Delhi, and one of the two resolutions passed sought to impress upon the Government of India the great value of aquatic areas from the economic as well as the scientific and aesthetic point of view. These areas include estuaries and coastal shallows, brackish and saline lagoons, natural and artificial lakes, small ponds and reservoirs of all kinds. As a result of scientific studies carried out in Europe, experts have begun to feel that the draining of large marshes is a highly undesirable undertaking.

Consider the advantages of a wet land area over reclaimed land. It is found that fish farming yields a substantially greater quantity of food than the same land would if reclaimed and put under wheat.

Secondly, marsh lands are great regulators of water for the whole surrounding countryside. They absorb water in the wet months and release it slowly in summer. If a large area of marsh is drained, there is a total dislocation of this function, and floods in the monsoon and drought in summer is the consequence for the neighbouring lands.

Thirdly, the educational value of the wet lands is very great, as they are a microcosm of the world around us, and an excellent basis for learning ecology, zoology and botany.

Finally, from the point of view of recreation—not the least consideration by any means—wet lands are areas of the highest order, where angling, sailing and shooting can be done. There are over a million anglers in England; and about two million people in the U.S.A. shoot migratory waterfowl in the season, and the food provided by these birds is a substantial contribution to the table.

As the IUCN emphasises, the use of wet lands is a biological problem, and in reaching a solution we must follow biological principles.

I have said enough already to indicate how productive nature is, but let me end with one classic example. The Island of Krakatau off the coast of Borneo blew off its head in 1883 "and absolutely destroyed all life under a rain of hot volcanic ash that lay more than a 100 ft. deep on some of the slopes". But amazingly it was re-colonised by plants and animals from the nearest land, and after only

50 years it had a rich and maturing jungle of forest inhabited by plants and animals of many kinds. Would it not be wiser for us to conserve nature rather than conquer it ?

The views expressed in this booklet are not necessarily the views of the Forum of Free Enterprise.

"Free Enterprise was born with man and shall survive as long as man survives."

—A. D. Shroff
(1899–1965)
Founder-President,
Forum of Free Enterprise.

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Published by M. R. PAI for the Forum of Free Enterprise, "Sohrab House", 235 Dr. Dadabhai Naoroji Road, Bombay-1, and printed by H. NARAYAN RAO at H. R. MOHAN & CO. (PRESS), 9-B, Cawasjee Patel Street, Bombay-1.

12/February/1972

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