Unit 1: [Media and the Environment]

Definition

After the scientific and industrial revolution in the recent past, there has been immense impact of man on his environment. Man has failed to realise that any new factor upsets the balance of the ecosystem as a whole/the environment.

Huge industrial installations every year, introduction of the faster mode of transport, sprouting up large crowded cities (urbanisation), changing the food habits, deforestation and decreasing the agricultural land, the main outcomes of the modern civilization: wide spread use of insecticides, pesticides, improper use of fertilizers and chemicals in environment are some others contributing factors which challenged the life of man, animals specially birds and other organisms.

Industries are causing much danger to man's life (causing air pollution), Similarly water pollution, soil pollution, marine pollution, noise pollution, global warming, effects of nuclear hazards etc. are some major factors for which public awareness is necessary.

The Active co-operation of every one, at every level of social organizations, scientist-educationists, social workers, politicians, administrators and public is needed for issues concerning environment. Individuals collectively make a society or a state.

Movements, which begin at gram root levels, effects the ideologies and policies of a country or the nation as a whole more effectively than the policies introduced from top to downwards.

When the opinion of the public will change, ii will affect the govt. policies, which transform in to actions. Therefore, little efforts on the part of each individual shall add up to introduce significant improvements of the environment.

Over exploitation of natural resources is a basic concern for everybody. Food shortage we increase in frequency and severity if population growth, soil erosion and nutrient depletions we continue at the existing rate. Therefore, it is our duty and we can accept the family planning schemes this will not only reduce the population but also solve the problems of food and rehabilitation.

Burning fossil fuels (oil, coal and natural gas), we release carbon-dioxide and other heat absorbing; gases, that cause global warming and may bring about sea level rise and catastrophic climatic changes.

Acid rain is the result of it. Chlorinated compounds such as chlorofluorocarbons used in refrigerator and air conditioner also contribute to global warming as well as damaging the stratospheric ozone that protect us from cancer causing ultraviolet radiations in sunlight.

Now a day's everybody talks about environment but how many of us are serious about it. How many of us (from all walks of life) have clear concepts of environment? There must be planning about the effects and control measures of environmental pollution. Govt. should initiate and help by awareness campaigns to save environment.

There should not be the political propaganda but should be the integral part of our educational programmes. By writing on walls the word "save water", "save oil" is not enough for Govt. or people.

We should opt some programmes relating to it. We should discourage to use fuel vehicles, until it is not necessary. For short routes, we should use bicycle; on foot. We should

accompany the four seated or so with others over use of water, for cleaning and other purposes should be decreased.

Rain water harvesting is another example for using the rain water instead flowing out. Any government at its own level cannot achieve the goals of sustainable development until the public has a participatory role in it.

It is only possible only when public aware about the ecological and environmental issues. For example, ban the littering of polythene cannot be successful until the public understands the environmental implications of the same.

Public should understand about the fact that if we degrading our environment, we are harming ourselves. This is the duty of we educated people to educate the others about the adverse effect of environment.

For the first time, the attention of general public was attracted at global level when "Earth Summit" in 1992 was held in Rio de Janeiro on environment and development. Later on, another world summit on "Sustainable Development" at Johannesburg in 2002 was also held to discuss the environment and aware the public to save the environment.

In these directions, United Nations has organised several conferences in different parts of the world (Stockholm 1972, Vienna 1985, Montreal 1987, Brazil 1992 etc) to work out the action plan from time to time for fighting with menace of environmental pollution. We should keep the earth green and alive as it provides shelter, food and protective cover.

The soil degradation, soil erosion, deforestation, losing wetlands, land conversion etc. are the measure issues which force ourselves to think and aware the public in this regard. Because human himself is responsible for this environmental deterioration. Therefore, it is necessary to check all these destructive processes. Govt. also doing some efforts on national level but still much more has to be done.

The marine ecosystem includes the oceans, seas, sea shores, bays and summaries of the world. The physical factors like wares, tides, currents, salinities, temperature, pressures and sunlight dominate life in the ocean and determine the makeup of biological communities.

These communities have significant effect on biomass, leakage from oil tankers, oil drilling, catchment area (coastline) and rivers polluted the sea water, which effects sensitive flora and fauna, various species of invertebrate, mammals, coral reps, fishes and other organisms.

A Diesel vehicle emits particles in their exhaust which have a diameter less than 10 microns (PH-10). It is easily inhaled. Any amount of these particles in the air is dangerous for health (particularly effects lungs). In India about 20 million people are asthmatics.

Mine waste and effluents from mining and metallurgical industries give a number of physical and chemical problems to human beings. Certain other industries like paper and pulp industries, fertilizer industries, explosive industries, soap and detergent industries, chemical industries, food processing industries, textile Tannery, leather, and petroleum industries release/discharge undesirable and harmful constituents which are responsible for air and water pollution, causes great public concern.

Sewage begins to cause nuisance as it starts to become stale. It is therefore necessary to dispose it off as soon as possible. Proper methods of disposal and its treatment should be applied otherwise causes the chronic diseases. When sewage is applied continuously on a part of land, the pores or voids of the soil are clogged and free circulation of air is prevented.

Scope and Importance

As a result, anaerobic conditions are developed in place of aerobic conditions and the land is not capable of taking further sewage load. At this stage, decomposition of sewage takes place and offensive gases are produced. This is called the sewage sickness of land. People should aware of it.

The noise which is increasing pollution is one of the important factors of environment due to population's explosion, rapid industrializations and urbanisations. We should know the consequences of noise pollutions. Ear drum can be damage when exposed to very loud and sudden noise. Noise pollution affects human health, comfort and efficiency.

It causes contraction of blood vessels, high blood pressure, mental distress, high cholesterol, heart attacks, neurological problems, birth defects, abortion etc. The department of environment realised the importance of creating a sound research base for scientific studies relating to environmental problems. Environmental protection act was introduced in 1976 as the 42nd amendment act in the constitution.

Only by celebrating "World Environmental Day" we cannot get rid of this concern. Govt. along cannot do anything until unless every citizen is aware of the environmental pollution & their effects. This is the time to make aware and motivate each and every individual for environmental consciousness.

Human population is growing day-by-day. Continuous increase in population caused an increasing demand for natural resources. Due to urban expansion, electricity needs and industrialization, man started utilising natural resources at a much larger scale. Non-renewable resources are limited.

They cannot be replaced easily. After some time, these resources may come to an end. It is a matter of much concern and ensures a balance between population growth and utilisation of resources.

This overutilisation creates many problems. In some regions there are problems of water logging due to over irrigation. In some areas, there is no sufficient water for industry and agriculture. Thus, there is need for conservation of natural resources.

There are many problems associated with natural resources:

Forest resources and associated problems

1. Use and over-exploitation.

2. Deforestation.

3. Timber extraction.

4. Mining and its effects on forest.

5. Dams and their effects on forests and tribal people.

Water resources and associated problems

1. Use and overutilization of water.

2. Floods, droughts etc.

3. Conflicts over water.

4. Dams and problems.

Mineral resource and associated problems

1. Use and exploitation.

2. Environmental effects of extracting and using minerals.

Food resources and associated problems

1. World food problems.

2. Changes caused by agriculture and over grazing.

3. Effects of modern agriculture.

4. Fertilizer-pesticide problems.

5. Water logging and salinity.

Energy resources and associated problems

1. Growing energy needs.

Land resources and associated problems

1. Land degradation.

2. Man-induced landslides.

3. Soil erosion and desertification.

Need for Public awareness via Media

The rapid expansion and new breakthroughs in the arena of science and technology have taken humankind into a new age. The developments have both pros and cons. On the one hand, while technological developments have affected almost every aspect of human life, at the other, it has its devastating effect on the nature itself. Thus, mankind faces double challenges from modern machines and from saving the nature, the mother earth. At this paradoxical juncture, the role of media, so to say, becomes very important and worthwhile. In this modern knowledge-society, media plays the role of facilitator of development, disseminator of information, and being an agent of change. Regarding the issue of environment awareness, media plays a vital role in spreading the true message. Along with bringing it into the hub of debates and discussions, it tries to suggest alternatives to people and policy-makers. First of all, the mere awareness also creates a genuine interest to probe into the exact matter. Thus, environment awareness is one of the important issues which media presents consciously and effectively to say a few things to the people.

The awareness on environment has shown multiplicity of results in the form different issues of livelihood rights, of displacement and rehabilitation, of sustainability, of pollution led damages and its control etc. Thus, the all-pervading media has really raised the awareness on environment among people.

To see how far media has attempted to raise the awareness, a case study is taken of the fortnightly-published magazine, from the Centre for Science and Environment-'DOWN TO EARTH'. This magazine is solely committed to raise each and every issue regarding environment, nature and sustainable development. From the various issues of concern, in this

paper, three important issues are raised. They are the rural regeneration, the drought in Gujarat, and the air pollution in Delhi.

Role of an individual and Media in conservation of natural resources

The next logical step to environment protection is that of environment regeneration. As thy name suggests, it raises issues of regeneration: of biomass, watershed and other sources of sustainable development. This process is needed to be

Undertaken in a 'satyagraha' mould. Without the concerted effort, it would be difficult to produce enough of food grains, drinking water and biomass to sustain the burgeoning population. The population has touched the all-time high of 1000million mark. Every million hectare of India 's land today supports about 3 million people.

Studies conducted by Indian environmentalists over the last decade have clearly shown that the majority of the people survive within 'a biomass-based subsistence economy', that is, on products obtained from plants and animals. Over the coming years, India 's demand for food, firewood, fodder, building materials like timber and thatch, industrial raw materials and various such products will grow by leaps and bounds.

Along with food grains, production of milk, cotton, rubber, fish, and various other sources of food and industrial raw materials must grow rapidly. Almost half the industrial output comes from biomass-based industry and so even industrial output will be seriously affected if biomass production cannot keep pace with the population growth. At the same time, to meet basic survival needs, firewood production must increase from a current production of 100 million tonnes to about 300 million tones and green fodder production from about 230 million tonnes to 780 million tonnes.

India's land area is not going to increase and, therefore, these growing demands can be met only if we can find highly productive systems for growing all forms of biomass from food grains to grasses and trees which will be at the same time ecologically-sound and sustainable-not technical systems that give bumper yield today but discount the future. The limited land and water resources will come under increasing pressure to meet these diverse biomass needs. India has to find a strategy to optimise the use of its Natural resources in a way that it can get high productivity as well as sustainability.

This will pose a major scientific, social and political; challenge for India. And in this, India can learn precious little from the countries of the so-called developed world. As the economies and populations of the Western world grew, they began to extract resources from other parts of the world. First there was the stage of colonialism. Today it is done through the world market system. Western countries are net importers of biomass. Products from the Third World not net exporters to the Third World.

Indian villages are highly integrated agrosylvopastoral systems. In other words, each Indian village has its own croplands, grazing lands and tree or forestlands, and each of these land-use components interacts with each other. What happens in one component invariable impact on the others? The entire village ecosystem is often held in fine ecological balance. Trees or forestlands provide firewood. This helps villagers to avoid the burning of cow dung, which in turn helps them to maintain the productivity of their croplands where this dung is applied as manure. Simultaneously trees and crops help to compliments the grassland in the supply of fodder for domestic animals. Grass is generally available from the grassland during the monsoon period. As grass availability declines with the unset of the dry months, crop

residues obtained from croplands and leaf fodder obtained from trees helps animals to tide over the typical scarcity period.

This finely tuned system can be easily split apart. If too many trees were cut for commercial or any other reason or growing population pressures were to force local people to expand their croplands and, thus, reduce the area of the adjoining forest and grazing lands, there would be a growing shortage of firewood and people would be forced to burn cow dung as cooking fuel, leaving little manure to fertilise the croplands, affecting, in the long run, their productivity too. Moreover, as fodder sources decline, animals will starve and will not produce much cow dung anyway. Overall biomass production in the village ecosystem will steadily go down, the system will become increasingly susceptible to the vagaries of the weather (in other words, floods and droughts) and will soon take on the shape of pseudo-desert. Nearly half of India is today a pseudo-desert.

It is not only the various components of the land sub-system that interact with each other. The land sub-system in turn interacts with the animal, water and energy sub-systems of the overall village ecosystem and all these sub-systems interact with each other to sustain overall productivity and extend economic and ecological stability. Animals, for instance, not only provide theoretical energy input into croplands that is required for ploughing, threshing and other farm operations, they also lend stability to the villager economy during a drought period when cropland production is most likely to fail. Similarly, the land sub-system interacts with the water sub-system. When digging ponds and lands for harvesting wear to tide over the dry period, it is equally important to change the land-use of village ecosystem in a way that the nutrients of the land is protected by trees. Otherwise, soil erosion will be excessive and the village community would have to desalt the tank every so often.

What Indian desperately needs today is the holistic enrichment of each of its village ecosystems. By holistic we mean an approach in which attempts are made to increase the productivity of all the components of the village ecosystems. By holistic we mean an approach in which attempts are made to increase the productivity of all the components of the village ecosystem- from its grazing lands and forestlands to its croplands, water systems and animals and in a way that this enrichment is sustainable. Current rural development efforts are extremely fragmented, they focus mostly on agriculture, and often the efforts are contradictory and counterproductive. For instance, the people who build ponds and tanks do not want to do anything about getting an appropriate land use implemented in the village to protect the catchment of these tanks. Those who look after animal husbandry or promote dairying operations pay little attention to increasing fodder supply. The only way to end these fragmented approaches is to promote integrated village ecosystem planning.

The most important goals of village ecosystem planning for biomass regeneration will have to be: 1] enhancement of the total natural resource base of the village ecosystem; 2] production of basic biomass needs of the village community on a priority basis; and, 3] equity in the distribution of biomass resources.

Thus, any village-level plan to both sustainable and equitous would have to be a matrix of solutions which keeps in mind the specific natural resource base of the village, its biomass needs and its social structure.

The biggest problem lies in the alienation that the modern state has created amongst village communities towards their commons. Before the advent of the modern state, grazing lands, forest lands and water bodies were mostly common property and village communities played an important role in their use and management. The British were the first to nationalize these resources and bring them under the management of government bureaucracies. In other

words, the British initiated the policy of converting common property resources into government property resources.

This expropriation has alienated the people from their commons and has started a free-for-all. Today even tribal, who have lived in harmony with forests for centuries, are so alienated that they feel little in felling a green tree to sell it off for a pittance. Repeatedly tribal groups, what is the point in saving the forests have asked us, because if they don't take them first, the forest contractors would take them away. The desperate economic condition of the poor, made worse by ecological destruction, has often left them with no other option but to survive by cutting trees. Unless people's alienation from their commons can be arrested and reversed, there cannot be any regeneration of common lands.

Why is people's participation in the regeneration of common lands so crucial?

To answer this question, it is important to understand the key obstacle to environmental regeneration. India 's ecology is such that any piece of land, left to itself, will soon get converted into a forest except in a few desert districts of Western Rajasthan and in the upper reaches of the Himalayan mountains. In a country like India where agriculture and animal husbandry are closely intertwined activities, the animal pressure is extremely high. Continuous grazing not only suppresses all regeneration of trees, but also steadily reduces the productivity and the quality of the grasslands. In fact, this is why vast tracts of India have today come to be called wastelands.

The use of the word 'wasteland' by the government to describe degraded lands has conjured up an image of vast tracts of land that are lying totally unused and barren. On the contrary, no piece of land in India can lie barren and degraded for a long time-India's ecology would automatically turn it into a forest -unless it is constantly overused or misused. In other words, all 'wastelands' have intense users.

Government programmes have over the years created a feeling of total dependence within the people. Today, villagers not only expect the government to build roads and schools and give them employment but also plant trees and grasses and look after their local water sources like ponds and tanks. This has been self-defeating. The villagers themselves can only manage the natural resource base of a village. Rational use and maintenance of village land and water resources needs discipline. Villagers have to ensure that animals do not graze in their protected commons, the catch-mends of their local water bodies are conserved and properly used, and the common produce from these lands is equitably distributed within the village. The government cannot do this in each and every village of India. Environmental regeneration in every village of India is a task that the people must undertake themselves.

The villagers can do all this and more, only if there is an effective village-level institution to energise and involve them in controlling and managing their environment, and to resolve any disputes that may arise amongst them. Unfortunately, there is an effective forum in Indian villages today for this purpose.

Voluntary agencies are often cited as effective agents for ensuring people's participation in rural development programs. We have found that all good cases of environmental regeneration undertaken by voluntary agencies are invariably those cases where voluntary agencies have set up an effective institution at the village level and then give moral, technical and financial support to it. But it is the creation of a village level institution which brings the people together, spurs them into action and ensures the protection and the development of the natural resource base.

The Village of Sukhomajri

The village of Sukhomajri near Chandigarh has been widely hailed for its pioneering efforts in micro water shed development. The inhabitants of Sukhomajri have protected the heavily degraded forest land that lies within the catchment of their minor irrigation tank. The tank has helped to increase their crop production nearly three times and the protection of the forest area has greatly increased grass and fodder availability. This in turn has greatly increased milk production. In just about five years, annual household incomes have increased by an estimated Rs. 2,000 to 3,000-a stupendous achievement by any count and all of it has been achievement through the improvement of the village natural resource base and self-reliance. Few government schemes can boast of such results.

The crucial role in this entire exercise was played by a village-level institution that was specifically created in Sukhomajri for the purpose. This institution called the Hill Resources Management Society consists of one member from each household in the village. Its job is to provide a forum for the village. Its job is to provide a forum for the villagers to discuss their problems, mobilise them to take control over their environment and ensure discipline amongst its members. The society makes sure that no household grazes its animals in the watershed and in return it has created a framework for a fair distribution of the resources so generated-namely, water, wood and grass-amongst all the households in the village. Today the entire catchment of the tank is green and the village is prosperous, capable of withstanding drought.

The Chipko Movement:

Nowhere in the world has a more successful community afforestation programme been organised than the one spearheaded by the Chipko Movement under the leadership of the Dasholi Gram Swarajya Mandal in Gopeshwar. The Mandal has organised an informal village-level institution in each of the villages it is working. This institution-a Mahila Mangal Dal- consists of a woman member from each household in the village. These village dals have slowly taken control of the community lands surrounding their villages. They protect these lands, plant trees on them and ensure fair distribution of the grass and fodder the becomes available in increased quantities from these lands. The forum of the Mahila Mangal Dal provides the women of these villages an opportunity to get together, discuss their problems, seek their solutions and assert their priorities. And now from afforestation, they are steadily moving towards articulation other needs and activities like provision of drinking water, schools for their children and primary health care facilities.

Pani Panchayats:

The concept of Pani Panchayats, another type of village level institution, was developed by Gram Gaurav Pratisthan in Pune to bring about equitable distribution of a scare resource like water in an acutely drought prone area. This is an extremely difficult objective to achieve. Yet Pani Panchayata have done it.

They help villages to discuss their problem and organize them to distribute irrigation water equitably. A Pani Panchayat consists of all marginal farmers, landless laborers and Harijans in a village - all of whom unite because of their common desire for irrigation water for their parched fields. Once water is made available, the panchayat controls its distribution, use and even the cropping pattern. For instance, all villages with Pani Panchayats have decided that water consuming crops like sugar cane will not be grown by their members so that the maximum number of members and the maximum amount of land can benefit from the limited water resources available.

Vankar Cooperatives:

The St. Xavier's Behavioural Science Centre in Ahmedabad has been organizing afforestation programmers in the highly saline lands of the Bhal area of Gujarat. The Centre has formed cooperatives in each of the villages it is working. The cooperatives consist of all households of the scheduled caste community of vankars living in these villages. The cooperatives have undertaken afforestation projects on the community lands of vankars. It seems that the state government has setup cooperatives of schedule casts communities in the 1950 and had allotted land to them, but the land has since been lying waste. As the afforestation programme supported by the Behavioural Science Centre began to yield money- prosopies juliflora trees were grown in their wood converted into charcoal-resentment within the dominate Rajput community also began to grow. But the cooperative's way able to continue their works and organised the poor workers to manage the community lands, earn money and achieve a high degree economy and independence.

Participation of Women

It is absolutely vital that women play an important role in the affairs of village communities. Experience in India shows that women take an active interest in programmes design to improve ecological condition because of their cultural determined role as fuel, fodder and water carries. Despite the extra ordinary works burned that feel women have to beer, the members of Mahila Mangal Dals organised by the Chipko movements willing fins the time to take on the extra burned planting and carrying for the trees and grass lands.

Women, of course, will be members of any Gram Sabha as proposed above but women really participate in any institution dominated by men. Therefore, together with the establishment of Gram Sabhas of all adults, separate Sabhas Mandals could be formed in every village, as a distinct sub-unit of the Gram Sabha, but with clearly and legally defined rules, rights and access to funds. The national commission on self-employed women has also recommended the revival of Mahila Mandals in every village.

The institutional mechanisms needed to ensure women's participation have to be thought through clearly. It is already clear from all the past experience in India that women's participation will make a crucial difference for ecological regeneration programmes must be achieved on all counts.

The ultimate purpose of political de-centralization must be to solve the moist vital programme facing India today, that of regenerating its environment and restoring the survival base of the country's vast rural population, especially those living in ecological fragile regions of India.

India has already gain considerable experience through the numerous grass roots efforts of both governmental and voluntary agencies. All these efforts so that the involvement of the people is crucial for success. These efforts also show that equity and sustainability always go hand in hand.

The only way this objective can be achieved is by depending democracy in participation at the village-level as much as possible. Every settlement in the country must have a clearly defined environment to protect, care for a use and an open forum in which all can get together to discuss the problem and find common solutions.

By strengthening and empathizing the importance of open forum, common solutions and common natural resources, India has also had the glorious opportunity to make a determined bid to revive the young community spirit.

We are convinced that there are no solutions except through democracy and equity. Culture has as much as role to play as does technology. Gandhiji's concept of village republics has been an imperative.

GUJRAT DROUGHT

Indians have lived with drought since time immemorial. Communities have built water harvesting structures and learnt to treasure the value of every raindrop. All this has been done keeping in mind that it does not rain throughout the year and it may not rain next year. Therefore, it would not be wrong to say that the Indian media has no sense of history. The media's reaction to the drought is the same as their reaction to a fire or a gas leak tragedy. They are treating it like a catastrophe, not as a process that needs to be managed. To begin with when other sections of society were talking about the drought as far back as October, the mainstream media woke up to it a few weeks ago, that too because water riots broke out in Gujrat at resulting in causalities. Something the media understands. Next came a flood of drought- related stories in the press. But the understanding of the crises was in the disaster's mode and the issues that w3er4e raised were about disaster relief, almost as if they were talking about a cyclone or an earthquake. One nearly expected TV reporters to ask questions like what is rain, followed by what is drought and then talks about casualty figures.

But a drought is not a catastrophe. It can be managed. As part of this process communities try and anticipate the crisis. They do so by taking measures to conserve and harvest water use is regulated. Where the ecology is fragile, farmers desist from planting water-intensive crops like sugarcane and rise. More than 60 villages have proven that droughty is a myth and that this system works in the Alwar district of Rajasthan and the Jhabua district of Madhya Pradesh. Even in this drought there is water for drinking and irrigation in the wells out there.

While it is good that the media has finally woken up to the drought they should try and cover it more as a process than as an event. There should be a post-drought6 coverage as well so that issues of water4 and the role of communities in managing it are kept under public scrutiny. We don't need drought relief but relief against draught.

Then also there should be an analysis of what goes on in the name of drought-relief measures. There is a story that dated back to the time of the Nawabs of Avadh. The kingdom was experiencing a severe drought. As part of the drought relief work it was decided that a palace be built in Lucknow. The people were provided with work and food. Even the nobles and high officials were provided with work. While the workers were paid for raising the walls during the day, the nobles were paid for pulling down the walls at night, as it would be beneath their status to be seen mingling with the common folk. Everybody loved the drought.

AIR POLLUTION IN DELHI:

One person dies every hour in Delhi due to ambient air choked with particles. Diesel exhaust is a major source of fine particles that are the most lethal. Environmental regulators in California and elsewhere are putting the brakes on diesel cars. But transnational carmakers - from Toyota and ford to Mercedes- are bringing diesel cars into India. While this is not against the law, it will certainly add to the body count in India cities.

Some observations are noted below:

• One person dies prematurely every hour in Delhi due to the extremely high levels of suspended particulate matter (SPM) in the city's ambient air, according to a study conducted by the New Delhi-based Centre for Science and Environment (CSE). Moreover, 52,000 people die every year in 36 Indian cities due to high levels of SPM.

• The real killers are fine particles- the smaller the particles the deeper they penetrate into the respiratory tract.

• Diesel engines produce 10-100 times more particles (one to two orders of magnitude) than petrol engines.

• Over 90 percent of these particles are dangerously fine.

• Delhi uses 2.5 times more diesel than petrol.

• Diesel particles are very carcinogenic. In 1997, a Japanese scientist identified in diesel emissions the most potent carcinogen known as of date.

• There is no technology that can get rid of dangerous particles in diesel exhaust. As the diesel fuel quality gets better and the engine designs get efficient, the number of PM2.5s (particles less than 2.5 microns in diameter) rises dramatically.

• The concentrations of particles less than 10 microns in diameter (PM10s) reaches six times the recommended levels in Delhi winters. The only way to prevent air quality from deteriorating further is to substantially reduce the use of diesel.

• The Supreme Court (SC) of India has already ordered that all diesel buses in Delhi should move to Compressed Natural Gas (CNG) by March 31, 2001, which will reduce particulate emissions from vehicles by 30-35 percent. But particulate levels have to drop by 90 percent if Delhi is to get clean air.

• It was hoped that liberalisation of the car industry would help bring better and cleaner technology to India. But transnational carmakers, who are aware of the severe pollution load in Indian cities, are promoting diesel cars, creating a very obvious and serious threat to public health.

• While the Indian government does next to nothing to control air pollution, people will keep dying in Indian cities due to car industry's lack of regard for public health. The transnationals' lack of moral responsibility will kill urban Indians.

The transnational carmakers' claim that dieselisation is a global phenomenon does not hold water. It is difficult to ignore the enormous body of evidence proving that environmental regulators are discouraging the use of diesel in several parts of world, most of them with better with better air quality than Delhi. Yet environmental regulations in India have been turning a Nelson’s eye to the diesel menace. Diesel is less than half the price of petrol in India, and almost all car companies are introducing diesel versions of private cars. While Indian companies can say that they were not aware of the public health effects of diesel vehicles, the transnationals cannot offer the same reason. They are aware of the danger that fine particles from diesel emissions pose to public health. So, by bringing in diesel cars to India, they are deliberately adding to the risk to public health to earn fast profit.

Despite knowing that SPM levels are extremely high in Delhi and that fine particles from diesel exhaust kill, transnational auto manufactures in India evade the issue of diesel exhaust completely and spread total disinformation, especially as they know there is nobody in the government to question them. They are aware that as of now, there is no technology in the world that can effectively control the levels of fine particles in diesel emissions. This becomes all the more ominous in the light of WHO's conclusion that there are no safe limits of SPM. So, there is no reason for adding to the existing SPM overload in cities like Delhi by selling more diesel cars, even if they meet the most stringent emission norms.

Moreover, articles and advertisements issued by car manufactures and their association have been appearing in the media, deliberately trying to mislead people about diesel cars and the state of population in Indian cities, Delhi in particular.

To find out what industry leaders feel about the high SPM levels in Delhi, researchers with CSE's Right to Clean Air Campaign sent a questionnaire to the top brass of transitional companies in India. This was to act as an assessment of these corporate giants' sense of moral responsibility and how they factor in environmental and public health concerns while making their investment decisions.

Unit II [Media & Ecology]

Introduction - What is an Ecosystem?

An ecosystem consists of the biological community that occurs in some locale, and the physical and chemical factors that make up its non-living or abiotic environment. There are many examples of ecosystems -- a pond, a forest, an estuary, a grassland. The boundaries are not fixed in any objective way, although sometimes they seem obvious, as with the shoreline of a small pond. Usually, the boundaries of an ecosystem are chosen for practical reasons having to do with the goals of the particular study.

The study of ecosystems mainly consists of the study of certain processes that link the living, or biotic, components to the non-living, or abiotic, components. Energy transformations and biogeochemical cycling are the main processes that comprise the field of ecosystem ecology. As we learned earlier, ecology generally is defined as the interactions of organisms with one another and with the environment in which they occur. We can study ecology at the level of the individual, the population, the community, and the ecosystem.

Studies of individuals are concerned mostly about physiology, reproduction, development or behaviour, and studies of populations usually focus on the habitat and resource needs of individual species, their group behaviours, population growth, and what limits their abundance or causes extinction. Studies of communities examine how populations of many species interact with one another, such as predators and their prey, or competitors that share common needs or resources.

In ecosystem ecology we put all of this together and, insofar as we can, we try to understand how the system operates as a whole. This means that, rather than worrying mainly about particular species, we try to focus on major functional aspects of the system. These functional aspects include such things as the amount of energy that is produced by photosynthesis, how energy or materials flow along the many steps in a food chain, or what controls the rate of decomposition of materials or the rate at which nutrients are recycled in the system.

Components of an Ecosystem

ABIOTIC COMPONENTS BIOTIC COMPONENTS Sunlight Primary producers Temperature Herbivores Precipitation Carnivores Water or moisture Omnivores Soil or water chemistry (e.g., P, NH4+) Detritivores etc. etc.

All of these vary over space/time

By and large, this set of environmental factors is important almost everywhere, in all ecosystems.

Usually, biological communities include the "functional groupings" shown above. A functional group is a biological category composed of organisms that perform mostly the same kind of function in the system; for example, all the photosynthetic plants or primary producers form a functional group. Membership in the functional group does not depend very much on who the actual players (species) happen to be, only on what function they perform in the ecosystem.

Processes of Ecosystems

Energy enters the biological system as light energy, or photons, is transformed into chemical energy in organic molecules by cellular processes including photosynthesis and respiration, and ultimately is converted to heat energy. This energy is dissipated, meaning it is lost to the system as heat; once it is lost it cannot be recycled. Without the continued input of solar energy, biological systems would quickly shut down. Thus, the earth is an open system with respect to energy.

Elements such as carbon, nitrogen, or phosphorus enter living organisms in a variety of ways. Plants obtain elements from the surrounding atmosphere, water, or soils. Animals may also obtain elements directly from the physical environment, but usually they obtain these mainly as a consequence of consuming other organisms. These materials are transformed biochemically within the bodies of organisms, but sooner or later, due to excretion or decomposition, they are returned to an inorganic state. Often bacteria complete this process, through the process called decomposition or mineralization (see previous lecture on microbes).

During decomposition these materials are not destroyed or lost, so the earth is a closed system with respect to elements (with the exception of a meteorite entering the system now and then). The elements are cycled endlessly between their biotic and abiotic states within ecosystems.

Those elements whose supply tends to limit biological activity are called nutrients.

The Transformation of Energy

The transformations of energy in an ecosystem begin first with the input of energy from the sun. Energy from the sun is captured by the process of photosynthesis. Carbon dioxide is combined with hydrogen (derived from the splitting of water molecules) to produce carbohydrates (CHO). Energy is stored in the high energy bonds of adenosine triphosphate, or ATP (see lecture on photosynthesis).

The prophet Isaah said "all flesh is grass", earning him the title of first ecologist, because virtually all energy available to organisms originates in plants. Because it is the first step in the production of energy for living things, it is called primary production (click here for a primer on photosynthesis). Herbivores obtain their energy by consuming plants or plant products, carnivores eat herbivores, and detritivores consume the droppings and carcasses of us all.

Figure 2 portrays a simple food chain, in which energy from the sun, captured by plant photosynthesis, flows from trophic level to trophic level via the food chain. A trophic level is composed of organisms that make a living in the same way, that is they are all primary

producers (plants), primary consumers (herbivores) or secondary consumers (carnivores). Dead tissue and waste products are produced at all levels. Scavengers, detritivores, and decomposers collectively account for the use of all such "waste" -- consumers of carcasses and fallen leaves may be other animals, such as crows and beetles, but ultimately it is the

microbes that finish the job of decomposition. Not surprisingly, the amount of primary production varies a great deal from place to place, due to differences in the amount of solar radiation and the availability of nutrients and water.

For reasons that we will explore more fully in subsequent lectures, energy transfer through the food chain is inefficient. This means that less energy is available at the herbivore level than at the primary producer level, less yet at the carnivore level, and so on. The result is a pyramid of energy, with important implications for understanding the quantity of life that can be supported.

Usually when we think of food chains we visualize green plants, herbivores, and so on. These are referred to as grazer food chains, because living plants are directly consumed. In many circumstances the principal energy input is not green plants but dead organic matter. These are called detritus food chains. Examples include the forest floor or a woodland stream in a forested area, a salt marsh, and most obviously, the ocean floor in very deep areas where all sunlight is extinguished 1000's of meters above. In subsequent lectures we shall return to these important issues concerning energy flow.

Finally, although we have been talking about food chains, in reality the organization of biological systems is much more complicated than can be represented by a simple "chain". There are many food links and chains in an ecosystem, and we refer to all of these linkages as a food web. Food webs can be very complicated, where it appears that "everything is connected to everything else", and it is important to understand what are the most important linkages in any particular food web.

Define producer, autotroph, consumer, heterotroph, and decomposer.

Producers are organisms, like green plants, that produce organic compounds from inorganic compounds. These are also a type of autotroph. Then green plants, for example, are are eaten by consumers in this case, grazing animals like the zebra.

An autotroph is an organism that makes its own food from inorganic substances. It is then eaten by a consumer if it is a plant for example.

A consumer is the organisms that obtain nutrients from other organisms. This is also a heterotroph.

A heterotroph is an organism that cannot synthesize their own food and must obtain it ready made.

A decomposer is an organism of decay. These are also called saprobes. They break down the remains of dead animals and plants, releasing the substances that can be used by other members of the ecosystem.

Define and give examples of each of these heterotrophic types: herbivores, carnivores, omnivores, and saprobes.

There are several groups of heterotrophs. Heterotrophs are all organisms that obtain their food from the environment. All animals and certain types of micro-organisms are heterotrophs. These organisms must take in, or ingest, food containing already made organic nutrients from other plants or animals. It all depends on what they eat and how they obtain it. Heterotrophs include herbivores, carnivores, omnivores and saprobes.

Herbivores are animals that feed only on plants. Rabbits, cattle, horses, sheep and deer are all herbivores.

Carnivores are animals that feed on other animals. Some carnivores may be predators (such as lions, hawks, and wolves who attack and kill their prey and feed on their bodies) and some may be scavengers (they feed on dead animals that they find).

Omnivores are animals that feed on both plants and animals. Examples of omnivores are humans and bears.

Saprobes are organisms that get nutrients by breaking down the remains of dead plants and animals. Examples of saprobes are bacteria and fungi.

Explain the role played by decomposers in an ecosystem.

Decomposers are an essential component of any ecosystem. Their main role is to recycle nutrients in dead organisms and their wastes. Most decomposers are bacteria and fungi. Without the decomposers, there could be no life since plants would run out of nutrients.

Differentiate between scavengers and predators as two types of carnivores.

A carnivore is a type of heterotroph that feeds only on other animals. There are two different ways to classify carnivores. The first group are known as predators. Predator's hunt and kill other animals for food. Animals like lions, wolves, snakes, and sharks are all classified as predators. Another group of animals that are considered carnivores are scavengers. Scavengers are animals that feed on the dead bodies of other organisms. Animals such as vultures, hyenas, and griffins and all classified as scavengers. Scavengers eat the food that has been killed and left behind by predators. Scavengers are a very important group because they dispose of the carcasses of animals that have been left to decompose.

Recognize that the routes by which the flow of energy and the recycling of matter through the ecosystem occur are called food chains.

The ultimate source of energy for life on Earth is the sun. Solar energy is trapped during the process of photosynthesis and converted into a chemical form that we normally call food. Food contains both materials (the elements carbon, hydrogen, nitrogen, and the other essential elements) as well as stored energy. The materials within the food are recycled. They pass from the producers to the consumers and finally are recycled back to the producers by the action of the decomposers. Energy, unlike the materials, is not recycled. As the food is passed through the food web, energy is lost. In general terms, only 10% of the energy stored in one trophic level (such as producers) is actually transferred t the next trophic level (for example the herbivores). This is known as the pyramid of energy. Eventually there is so little energy remaining in the top trophic level that no higher trophic level can be supported. This is why there are few if any fourth order consumers in any ecosystem.

Explain how autotrophs are the basis of energy flow in all food chains (and food webs) by capturing solar energy and making it available to consumers.

Autotrophs are organisms that are able to make their own food using carbon dioxide. Most autotrophs carry on photosynthesis. Photosynthesis is the process by which organic compounds are synthesized from inorganic carbon, in the presence of light or solar energy. Autotrophs provide food for the primary consumers, which are heterotrophs. heterotrophs such as herbivores, omnivores, saprobes feed on autotrophs. The heterotrophs are in turn eaten by the secondary consumers, which are carnivores.

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Producers are eaten by the primary consumers which are eaten by the secondary consumers, when all of these die the saprobes break down their remains which then can be reused by other members in the cycle.

Summarize the roles of producers, consumers, and decomposers in relation to a food chain and all of the food web interactions.

Producers (photosynthetic organisms) capture solar energy and take in materials (elements such as carbon, hydrogen, oxygen, nitrogen, etc.) and make food which is then passed on to the consumers. Consumers generally carry on a process of cellular respiration which releases the energy for use for their own life functions. Both the producers and the consumers die and produce waste products which are then passed on to the decomposers (saprophytes). Decomposers are mainly bacteria and fungi that break down the materials in the waste and dead bodies and recycle them back to the producers. Note that materials are recycled but energy is not. For this reason, it is important that the Earth receive solar energy since it is the solar energy that drives the entire cycle of life, that is all the interactions and feeding relationships that we refer to as the food web.

What is "ecological succession"?

"Ecological succession" is the observed process of change in the species structure of an ecological community over time. Within any community some species may become less abundant over some time interval, or they may even vanish from the ecosystem altogether. Similarly, over some time interval, other species within the community may become more abundant, or new species may even invade into the community from adjacent ecosystems. This observed change over time in what is living in a particular ecosystem is "ecological succession".

Why does "ecological succession" occur?

Every species has a set of environmental conditions under which it will grow and reproduce most optimally. In a given ecosystem, and under that ecosystem's set of environmental conditions, those species that can grow the most efficiently and produce the most viable offspring will become the most abundant organisms. As long as the ecosystem's set of environmental conditions remains constant, those species optimally adapted to those conditions will flourish. The "engine" of succession, the cause of ecosystem change, is the impact of established species have upon their own environments. A consequence of living is the sometimes subtle and sometimes overt alteration of one's own environment. The original environment may have been optimal for the first species of plant or animal, but the newly altered environment is often optimal for some other species of plant or animal. Under the changed conditions of the environment, the previously dominant species may fail and another species may become ascendant.

Ecological succession may also occur when the conditions of an environment suddenly and drastically change. A forest fires, wind storms, and human activities like agriculture all greatly alter the conditions of an environment. These massive forces may also destroy species

and thus alter the dynamics of the ecological community triggering a scramble for dominance among the species still present.

Are there examples of "ecological succession" on the Nature Trail?

Succession is one of the major themes of our Nature Trail. It is possible to observe both the on-going process of succession and the consequences of past succession events at almost any point along the trail. The rise and the decline of numerous species within our various communities illustrates both of the types of motive forces of succession: the impact of an established species to change a site's environmental conditions, and the impact of large external forces to suddenly alter the environmental nature of a site. Both of these forces necessarily select for new species to become ascendant and possibly dominant within the ecosystem.

Some specific examples of observable succession include:

1. The growth of hardwood trees (including ash, poplar and oak) within the red pine planting area. The consequence of this hardwood tree growth is the increased shading and subsequent mortality of the sun loving red pines by the shade tolerant hardwood seedlings. The shaded forest floor conditions generated by the pines prohibits the growth of sun-loving pine seedlings and allows the growth of the hardwoods. The consequence of the growth of the hardwoods is the decline and senescence of the pine forest. (Observe the dead pine trees that have fallen. Observe the young hardwoods growing up beneath the still living pines).

2. The raspberry thickets growing in the sun lit forest sections beneath the gaps in the canopy generated by wind-thrown trees. Raspberry plants require sunlight to grow and thrive. Beneath the dense shade canopy particularly of the red pines but also beneath the dense stands of oaks, there is not sufficient sunlight for the raspberry's survival. However, in any place in which there has been a tree fall the raspberry canes have proliferated into dense thickets. You may observe this succession consequence of microecosystem change within the red pine stand and all along the more open sections of the trail. Within these raspberry thickets, by the way, are dense growths of hardwood seedlings. The raspberry plants are generating a protected "nursery" for these seedlings and are preventing a major browser of tree seedlings (the white-tailed deer) from eating and destroying the young trees. By providing these trees a shaded haven in which to grow the raspberry plants are setting up the future tree canopy which will extensively shade the future forest floor and consequently prevent the future growth of more raspberry plants!

3. The succession "garden" plot. This plot was established in April, 2000 (please see the series of photographs on the "Succession Garden Plot" page). The initial plant community that was established within the boundaries of this plot was made up of those species that could tolerate the periodic mowing that "controlled" this "grass" ecosystem. Soon, though, other plant species became established as a consequence of the removal of the stress of mowing. Over time, the increased shading of the soil surface and the increased moisture retention of the undisturbed soil-litter interface allowed an even greater diversity of plants to grow and thrive in the Succession Garden. Eventually, taller, woody plants became established which shaded out the sun-loving weed community. In the coming years we expect tree seedlings to grow up within the Succession Garden and slowly establish a new section of the forest.

Threats to Biodiversity: How are humans affected by ecological succession?

Ecological succession is a force of nature. Ecosystems, because of the internal species dynamics and external forces mentioned above, are in a constant process of change and re-

structuring. To appreciate how ecological succession affects humans and also to begin to appreciate the incredible time and monetary cost of ecological succession, one only has to visualize a freshly tilled garden plot. Clearing the land for the garden and preparing the soil for planting represents a major external event that radically re-structures and disrupts a previously stabilized ecosystem. The disturbed ecosystem will immediately begin a process of ecological succession. Plant species adapted to the sunny conditions and the broken soil will rapidly invade the site and will become quickly and densely established. These invading plants are what we call "weeds". Now "weeds" have very important ecological roles and functions (see, for example, the "Winter Birds" discussion), but weeds also compete with the garden plants for nutrients, water and physical space. If left unattended, a garden will quickly become a weed patch in which the weakly competitive garden plants are choked out and destroyed by the robustly productive weeds. A gardener's only course of action is to spend a great deal of time and energy weeding the garden. This energy input is directly proportional to the "energy" inherent in the force of ecological succession. If you extrapolate this very small-scale scenario to all of the agricultural fields and systems on Earth and visualize all of the activities of all of the farmers and gardeners who are growing our foods, you begin to get an idea of the immense cost in terms of time, fuel, herbicides and pesticides that humans pay every growing season because of the force of ecological succession.

Does ecological succession ever stop?

There is a concept in ecological succession called the "climax" community. The climax community represents a stable end product of the succession sequence. In the climate and landscape region of the Nature Trail, this climax community is the "Oak-Poplar Forest" subdivision of the Deciduous Forest Biome. An established Oak-Poplar Forest will maintain itself for a very long period of time. Its apparent species structure and composition will not appreciably change over observable time. To this degree, we could say that ecological succession has "stopped". We must recognize, however, that any ecosystem, no matter how inherently stable and persistent, could be subject to massive external disruptive forces (like fires and storms) that could re-set and re-trigger the successional process. As long as these random and potentially catastrophic events are possible, it is not absolutely accurate to say that succession has stopped. Also, over long periods of time ("geological time") the climate conditions and other fundamental aspects of an ecosystem change. These geological time scale changes are not observable in our "ecological" time, but their fundamental existence and historical reality cannot be disputed. No ecosystem, then, has existed or will exist unchanged or unchanging over a geological time scale.

It is the variety and variation of living forms that exists in an ecological complex. The living form may vary from plants, animal life and micro-organisms. The plants may include species of herbs to large trees and animal life may vary from tiny insects to huge mammals. There are three levels at which biodiversity can be classified.

1. Ecosystem biodiversity: It consists of various habitats and the organisms living under the different ecosystems. Hence it is broader level of biodiversity and determines the structure and function of the particular ecosystem through keystone species i.e., those species which determine the ability of other communities to exist in the ecosystem.

2. Species biodiversity: It takes into account different number of species of organisms that exists in an ecosystem. It is measured by two parameters.

(a). Species richness: It is a number of species per unit area. Larger is the area, higher will be the species richness and greater will be the species biodiversity.

(b). Evenness or Equitability: It refers to the distribution of organisms of various species at a particular area. Let us take an example of sample area 1 and sample area 2 having three species A, B & C each. Sample area 1 has four organisms of species A and 1 each of B & C. Similarly sample area 2 has 2 organisms of A, B & C. The evenness of sample area 2 is greater as there is uniform distribution of various organisms of any particular species. More is the evenness, higher is the species richness.

3. Genetic biodiversity: It is the variation among the genes of organisms of any species. It deals with speciation i.e., evolution of new species. It is a part of species biodiversity but is considered to be a complex level of biological diversity.

India's rich biological diversity - its immense range of ecosystems, species and genetic forms is by virtue of its tropical location, climate and physical features. India's bio-geographical composition is unique as it combines living forms from three major bio-geographical realms, namely - Eurasian, Agro-Tropical and Indo-Malayan.

India's fabulous biodiversity is estimated to be over 45,000 plant species representing about seven percent of the world's flora; and its bewildering variety of animal life represents 6.5 per cent of world's fauna. 15,000 species of flowering plants, 53,430 species of insects; 5050 species of molluscs, 6,500 species of other invertebrates; 2,546 species of fishes; 1228 species of birds, 446 species of reptiles, 372 species of mammals and 204 species of amphibians have been identified.

In India about 1, 15,000 species of plants and animals have been identified and described. India stands tenth in 25 most plant-rich countries of the world. Plant richness means greater uniqueness of species present.

India has been described as one of 12 mega-diversity countries possessing a rich means of all living organisms when biodiversity is viewed as a whole. The greater the multi-diversity of species, greater is the contribution to biodiversity. There are 25 clearly defined areas in the world called 'hot spots' which support about 50,000 endemic plant species, comprising 20 per cent of the world's total flora. India's defined location of 'hot spots' is the Western Ghats and the North-eastern regions.

Forests, which embrace a sizeable portion of biodiversity, now comprise about 64 m. hectares or about 19 per cent of the land area of the country, according to satellite imaging. Roughly 33 cent of this forest cover represents primary forest. Indian flora comprises about 15,000 flowering plants and bulk of our rich flora is to be found in the Northeast, Western Ghats, the Northwest and Eastern Himalayas, and the Andaman and Nicobar Islands. Likewise, Assam and the Western Ghats are home to several species of mammal fauna, birds, and reptilian and amphibian fauna.

As one of the oldest and largest agriculture societies, India has also a striking variety of at least 166 species of crop plants and 320 species of wild relatives of cultivated crops. There is a vital, but often-neglected factor when we focus on biodiversity. It may be a matter of she surprises for many to understand that the tribals who officially constitute 7.5 per cent of India's population have preserved 90 per cent of the country's bio-cultural diversity. To a large extent, the survival of our biodiversity depends on how best the tribals are looked after.

To preserve our rich biodiversity, nine biosphere reserves are set up in specific bio-geographic" zones: the biggest one is in the Deccan Peninsula in the Nilgiris covering Tamil Nadu, Andhra Pradesh and Karnataka. Others are the Nanda Devi in Uttarakhand in the Western Himalayas, the Nortek in Meghalaya, Manas and Dibru Saikhowa in Assam, the

Sunderban's in the Gangetic plain in West Bengal, Similar in Orissa, the Great Nicobar and the Gulf of Mannar in Tamil Nadu.

What are the Threats to Biodiversity?

Extinction is a natural event and, from a geological perspective, routine. We now know that most species that have ever lived have gone extinct. The average rate over the past 200 my is 1-2 species per year, and 3-4 families per me. The average duration of a species is 2-10 million years (based on last 200 million years). There have also been occasional episodes of mass extinction, when many taxa representing a wide array of life forms have gone extinct in the same blink of geological time.

In the modern era, due to human actions, species and ecosystems are threatened with destruction to an extent rarely seen in earth history. Probably only during the handful of mass extinction events have so many species been threatened, in so short a time.

What are these human actions? There are many ways to conceive of these - let's consider two.

First, we can attribute the loss of species and ecosystems to the accelerating transformation of the earth by a growing human population (GCII). As the human population passes the six billion marks, we have transformed, degraded or destroyed roughly half of the world's forests (GCII). We appropriate roughly half of the world's net primary productivity for human use (GCII).

We appropriate most available fresh water (GCII), and we harvest virtually all of the available productivity of the oceans (GCII). It is little wonder that species are disappearing and ecosystems are being destroyed.

Second, we can examine six specific types of human actions that threaten species and ecosystems - the "sinister sextet"

Over-hunting has been a significant cause of the extinction of hundreds of species and the endangerment of many more, such as whales and many African large mammals. Most extinction over past several hundred years are mainly due to over-harvesting for food, fashion, and profit.

Habitat loss/degradation/fragmentation is an important cause of known extinctions. As deforestation proceeds in tropical forests, this promises to become THE cause of mass extinctions caused by human activity.

All species have specific food and habitat needs. The more specific these needs and localized the habitat, the greater the vulnerability of species to loss of habitat to agricultural land, livestock, roads and cities. In the future, the only species that survive are likely to be those whose habitats are highly protected, or whose habitat corresponds to the degraded state associated with human activity (human commensals).

Invasion of non-native species is an important and often-overlooked cause of extinctions. The African Great Lakes - Victoria, Malawi and Tanganyika - are famous for their great diversity of endemic species, termed "species flocks", of cichlid fishes. In Lake Victoria, a single, exotic species, the Nile Perch, has become established and may cause the extinction of most of the native species, by simply eating them all. It was a purposeful introduction for subsistence and sports fishing, and a great disaster.

Pollution from chemical contaminants certainly poses a further threat to species and ecosystems. While not commonly a cause of extinction, it likely can be for species whose range is extremely small, and threatened by contamination. Several species of desert pupfish, occurring in small isolated pools in the US southwest, are examples.

Climate change: A changing global climate threatens species and ecosystems. The distribution of species (biogeography) is largely determined by climate, as is the distribution of ecosystems and plant vegetation zones (biomes) [GCI]. Climate change may simply shift these distributions but, for a number of reasons, plants and animals may not be able to adjust. The pace of climate change almost certainly will be more rapid than most plants are able to migrate the presence of roads, cities, and other barriers associated with human presence may provide no opportunity for distributional shifts. Parks and nature reserves are fixed locations. The climate that characterizes present-day Yellowstone Park will shift several hundred miles northward. The Park itself is a fixed location. For these reasons, some species and ecosystems are likely to be eliminated by climate change.

India’s Endangered Species

For all those new to conservation, here is a quick list of species that are struggling for survival in our vast country. Pick any and start your campaign of conservation today.

Critically Endangered

• Jenkin's Shrew (Crocidura jenkensii). (Endemic to India.)

• Malabar Large-spotted Civet (Viverra civettina).

• Himalayan Wolf (Canis himalayensis) (Endemic to India and Nepal.)

• Namdapha Flying Squirrel (Biswamayopterus biswasi). (Endemic to India.)

• Pygmy Hog (Sus salvanius).

• Salim Ali's Fruit Bat (Latidens salimalii). (Endemic to India.)

• Sumatran Rhinoceros (Dicerorhinus sumatrensis).

• Wroughton's Free-tailed Bat (Otomops wroughtoni). (Endemic to India.)

• Indian Vulture

Endangered

• Asiatic Lion (Panthera leo persica)

• Asiatic Wild Dog/ Dhole (Cuon alpinus)

• Asiatic Black Bear (Selenarctos thibetanus)

• Desert Cat (Felis libyca ornata)

• Great Indian Rhinoceros (Rhinoceros unicornis)

• Hispid Hare (Caprolagus hispidus)

• Hoolock Gibbon (Hylobates hoolock)

• Flamingo

• Kashmir Stag/ Hangul (Cervus elaphus hanglu)

• Lion-tailed Macaque (Macaca silenus)

• Malabar Civet (Viverra civettina)

• Markhor (Capra falconeri)

• Nilgiri Leaf Monkey (Presbytis johni)

• Pygmy Hog (Sus salvanius)

• Andaman Shrew (Crocidura andamanensis). (Endemic to India)

• Andaman Spiny Shrew (Crocidura hispida). (Endemic to India)

• Indian Elephant or Asian Elephant (Elephas maximus)

• Banteng (Bos javanicus)

• Blue Whale (Balaenoptera musculus)

• Capped Leaf Monkey (Trachypithecus pileatus)

• Chiru (Tibetan Antelope) (Pantholops hodgsonii)

• Fin Whale (Balaenoptera physalus)

• Ganges River Dolphin (Platanista gangetica gangetica)

• Golden Leaf Monkey (Trachypithecus geei)

• Hispid Hare (Caprolagus hispidus)

• Asian arowana (Scleropages formosus).

• Loggerhead Sea Turtle (Caretta caretta).

• Hoolock Gibbon (Bunipithecus hoolock) (Previously Hylobates hoolock).

• Indus River Dolphin (Platanista minor).

• Kondana Soft-furred Rat (Millardia kondana). (Endemic to

India).

• Lion-tailed Macaque (Macaca silenus). (Endemic to India).

• Markhor (Capra falconeri).

• Marsh Mongoose (Herpestes palustris). (Endemic to India.) (Previously considered to be a subspecies of Herpestes javanicus).

• Nicobar Shrew (Crocidura nicobarica). (Endemic to India).

• Nicobar Tree Shrew (Tupaia nicobarica). (Endemic to India).

Threatened

• Indian Wild Ass (Equus hemionus khur)

- Leopard (Panthera pardus)
- Red Fox (Vulpes vulpes montana)