ENVIRONMENT COMMUNICATION

FIFTH SEMESTER

Course Code : BJ(MC) 306	L: 3	T/P : 0	CREDITS : 3

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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 Janerio 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 these 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 Imprtance

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 need 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 it's 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 Center 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 tones to about 300 million tones and green fodder production from about 230 million tones to 780 million tones.

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 it's 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 cowdung 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.

Indian peasants have always understood these interrelationships and it is not surprising to find that Indian farmers are not just simply practitioners of agriculture but a mix of agriculture, animal care and sylviculture which requires the intensive use of croplands as well as of the grazing lands and forest lands adjoining the village. And as a community, Indian villages have been great water harvesters, possibly the best in the world.

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-ments 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 Chipoko Movement:

Nowhere in the world has a more successful community afforestation programme been organised than the one spearheaded by the Chipoko Movement under the leadership of the Dasholi Gram Swarajya Maandal 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 Panchaya 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 Behavioral Science Centre in Ahmedabad has been organizing afforestation programmers in the highly saline lands of the Bhal area of Gujurat. 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 alloted land to them, but the land has since been lying waste. As the afforestation programme supported by the Behavioral 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 takes an active interest in programmes design to improve ecological condition because of their cultural determined role as fuel, fooder 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 Mhila 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 an 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 has 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 disasters 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-relied 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.

The myth of drought

For every administrator, there is a lesson to be learnt from Gujrat's drought. Specially since this dry spell has brought about more due to water mismanagement than an erratic monsoon.

Even as this story goes to the press, Gujrat may be witnessing many more clashes over water. From as early as December 1999, when the farmers lost their lives in supply then.

The riots over water in Jammagar district, the dread of the dry summer months ahead were felt across the state. "Water availability should have been checked in winter and the municipal corporation should have started economising on water water supply.

But the state had missed out on those early opportunities to regulate and control water supply. So much so, that even the industries in the state were given a free hand to extract groundwater for their production propose. For instance, before the water crisis had escalated to the present levels, the Tata Chemicals factory in Mithapur of Jamnagar district was extracting 14 million litter of water every day from the ground and two other lakes in the area.

Worse, the state government, seeming unaware of the water related woes of the local people, allowed the Tata Chemicals cement plant to increase production from, 1,000 tones to 2,500 tones per day. Amazed by the government's move, D.S. Ker, president of the Gram Vikar Trust, a non-government organization (NGO) in Dwarka, was shocked: "How can the government allow expansion of such a water- intensive plant, which will deplete whatever groundwater resources are left in the region?"

This and several such desperate measures to cater to commercial and political interests seem to have taken a heavy toll on the state's groundwater resources. The government has already conceded those all-major towns of Saurashtra, kachchh and north Gujrat and more than one - third of the state's 18,000 villages are struggling for a daily supply of drinking water. Officials say, that with more than 100 of the state's 140 dams having gone dry and the remaining

containing g water that will last for not more a couple of weeks, running trains carrying water tankers to these regions-- as was done in the 1980s-- seems to be the only solution.

Meanwhile, the administration struggles to control tempers frayed by shortage of water while local people rue the government's apathy for bringing matters to such a stage. "Those responsible for water supply overdrew water, distributed it like nobody's business and we are paying the price now," says Arvind Acharya, a social worker. He goes on to add: "We are sitting on a volcano that may erupt at any time."It has, in fact, erupted.

Sharing water

A case in point is Rajkoit. The government is transporting groundwater collected from Wankaner to quench the thirst of Rajkot . The subsequent fallout of such a measure could spell more trouble as unrest of sort has begun to brew in Wankaner, where residents may not have enough water to see them through the scorching summer months. When the monsoons failed, a 100-kilometere (km) long pipeline was laid to supply water to Rajkot from Wankaner at a cost of about Rs 75 crore. The project was implemented in an amazingly short period of three-four months.

It was decided that 45 million liters of water would be extracted daily from 125 borewells dug in the Jamboodia Reserve Forest in the Halbar- Wankaaaanedr area. " In the four months that grolujdwater is eight extracted from the reserve, the Legislative Assembly (MLA) from Wankaner. Singh has been severely protesting the t5ransport of water from Wankaner for Rajkot .

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 ofsuspended particulate matter (SPM) in the city's ambient air, according to a study conducted 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 where 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.

Almost all chief executive officers (CEOS) or other senior executives responded to the questionnaire. While each company insisted that it was concerned about the environment, not one addressed the question of particulates properly. Every single one of them evaded this issue. The tone of the CEO's responses was underlined by two factors: On the one hand, they want to maintain an image of concern towards public health. To this end, they do not hesitate to misinform and disinform. But their real concern is to defend their investment, which they do by saying that diesel is an environment-friendly fuel.

Deaths due to high SPM levels in cities like Delhi hardly figure on the agenda of transnational carmakers. They want profits at any cost, as long as they not caught breaking any rules. The dieselisation of the Indian private vehicle fleet is propelled by transnationals, who are very careful about what they do back home. If governance in India is weak, it is clear that even these auto giants will take advantage of it.

Delhi faces the challenge of decreasing 90 percent of its particle load if the capital's air is to become clean. In this scenario, each and every diesel vehicle sold at the showroom makes the air that much heavier with particles. One would expect that it is easier for the private vehicle fleet to move away from diesel while the same will be difficult for public transport. Not really. After the Supreme Court order, Delhi 's buses are going switch to CNG to help bring down the SPM load. All that effort will be in vain if transnational carmakers keep flooding the market with diesel cars. This amount to a sabotage of the SC order.

Transnational' claims that they would meet the most stringent emission norms also seems doubtful. While their cars may meet the norms at the factory gates, chances are that they would not meet the norms a few months later on the road, given the poor quality of fuel, especially diesel, in India.

All companies interviewed say diesel cars comprise a very small fragment of the market and thus the pollution threat is minimal. But dieselistion of the private vehicle fleet is not merely an immediate problem with no long-term consequences. All over the world, pollution control agencies look several years ahead while decking on emission norms because improvement of air quality requires long-term planning. But, in India, where the problem of SPM load is most acute, the trend seems to be to look backward. While the world is increasingly showing signs of moving away from diesel, the Indian market is seeing more cars running on diesel that is kept cheap for the requirements of the nation's food security.

While the Indian government knows very little about the air pollution problem, let alone doing anything to deal with it, transnational carmakers say public health is primarily the concern of the

government. So where does this leave the residents of urban Indian? Dead, probably. Because we do not have a government that will protect the health of the people.

CONCLUSION:

The different sets of studies have share that how the Centre for Science and Environment through its publication 'Down To Earth' have tried their best to bring complex but important issues into limelight. The coverage has raised furors among many. Starting from ministers to bureaucrats to big fundamentalist, everybody is looking forward to the issues raised by the magazine. The publication has not only succeeded in bringing issues which were considered non-important in the popular parlance have gained importance and popularity overnight. Thus we can say with confidence that the magazine has served its purpose well. One can only hope that more and more publications of this kind must care forward and spread the awareness regarding environmental issues among a vast array of concerned citizens. Thus media has performed its part with much interest and enthusiasm as well as with great precision. Long live the enthusiasm, long live the quest for excellence.

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 behavior, and studies of ***populations*** usually focus on the habitat and resource needs of individual species, their group behaviors, 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

You are already familiar with the parts of an ecosystem. You have learned about climate and soils from past lectures. From this course and from general knowledge, you have a basic understanding of the diversity of plants and animals, and how plants and animals and microbes obtain water, nutrients, and food. We can clarify the parts of an ecosystem by listing them under the headings "abiotic" and "biotic".

ABIOTIC COMPONENTS	BIOTIC COMPONENTS
Sunlight	Primary producers
Temperature	Herbivores
Precipitation	Carnivores
Water or moisture	Omnivores
Soil or water chemistry (e.g., P, NH_4+)	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

This figure with the plants, zebra, lion, and so forth illustrates the two main ideas about how ecosystems function: ***ecosystems have energy flows*** and ***ecosystems cycle materials***. These two processes are linked, but they are not quite the same (see Figure 1).

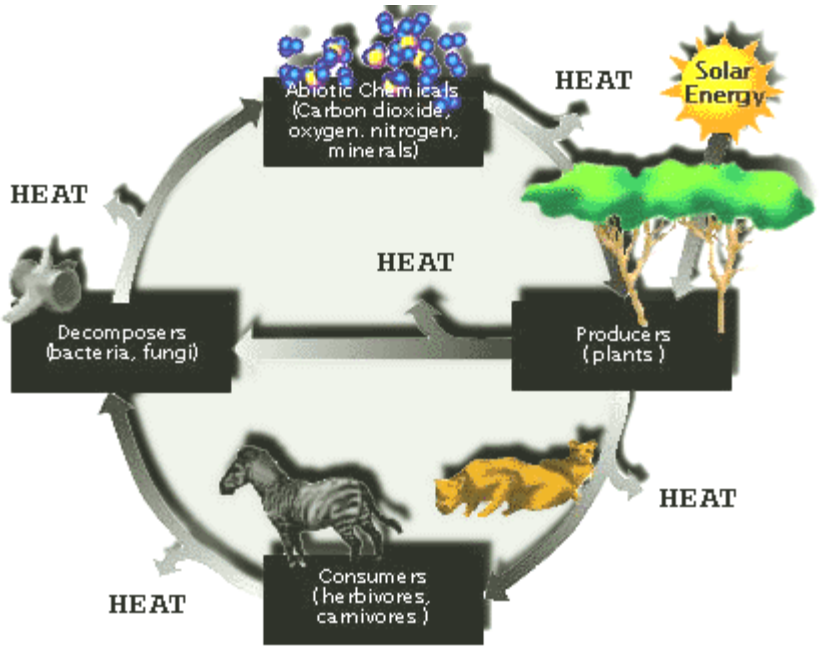


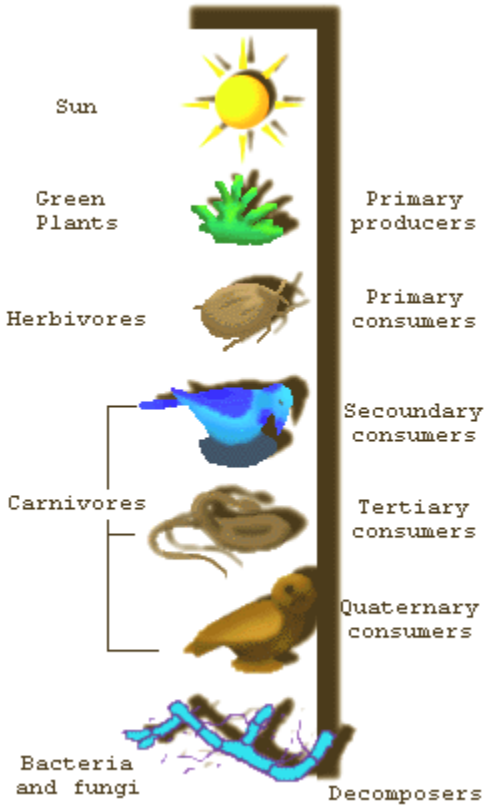
Figure 1. Energy flows and material cycles.

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.

Biogeochemistry: Ecological Succession

How can we study which of these linkages in a food web are most important? One obvious way is to study the flow of energy or the cycling of elements. For example, the cycling of elements is controlled in part by organisms, which store or transform elements, and in part by the chemistry and geology of the natural world. The term ***Bio-geochemistry*** is defined as the study of how living systems influence, and are controlled by, the geology and chemistry of the earth. Thus biogeochemistry encompasses many aspects of the abiotic and biotic world that we live in.

There are several main ***principles and tools*** that bio-geochemists use to study earth systems. Most of the major environmental problems that we face in our world today can be analyzed using biogeochemical principles and tools. These problems include global warming, acid rain, environmental pollution, and increasing greenhouse gases. The principles and tools that we use can be broken down into 3 major components: ***element ratios, mass balance, and element cycling***.

1. Element ratios

In biological systems, we refer to important elements as ***"conservative"***. These elements are often nutrients. By "conservative" we mean that an organism can change only slightly the amount of these elements in their tissues if they are to remain in good health. It is easiest to think of these conservative elements in relation to other important elements in the organism. For example, in healthy algae the elements C, N, P, and Fe have the following ratio, called the ***Redfield ratio*** after the oceanographer who discovered it:

C : N : P : Fe = 106 : 16 : 1 : 0.01

Once we know these ratios, we can compare them to the ratios that we measure in a sample of algae to determine if the algae are lacking in one of these limiting nutrients.

2. Mass Balance

Another important tool that bio-geochemists use is a simple mass balance equation to describe the state of a system. The system could be a snake, a tree, a lake, or the entire globe. Using a mass balance approach we can determine whether the system is changing and how fast it is changing. The equation is:

NET CHANGE = INPUT + OUTPUT + INTERNAL CHANGE

In this equation the net change in the system from one time period to another is determined by what the inputs are, what the outputs are, and what the internal change in the system was. The example given in class is of the acidification of a lake, considering the inputs and outputs and internal change of acid in the lake.

3. Element Cycling

Element cycling describes where and how fast elements move in a system. There are two general classes of systems that we can analyze, as mentioned above: ***closed and open systems.***

*A **closed system** refers to a system where the inputs and outputs are negligible compared to the internal changes. Examples of such systems would include a bottle, or our entire globe. There are two ways we can describe the cycling of materials within this closed system, either by looking at the rate of movement or at the pathways of movement.*

1. ***Rate** = number of cycles / time * as rate increases, productivity increases*
2. ***Pathways**-important because of different reactions that may occur*

*In an **open system** there are inputs and outputs as well as the internal cycling. Thus we can describe the rates of movement and the pathways, just as we did for the closed system, but we can also define a new concept called the **residence time**. The residence time indicates how long on average an element remains within the system before leaving the system.*

1. ***Rate***
2. ***Pathways***
3. ***Residence time, Rt***

***Rt** = total amount of matter / output rate of matter*

(Note that the "units" in this calculation must cancel properly)

Controls on Ecosystem Function

Now that we have learned something about how ecosystems are put together and how materials and energy flow through ecosystems, we can better address the question of "what controls ecosystem function"? There are two dominant theories of the control of ecosystems. The first, called **bottom-up control**, states that it is the nutrient supply to the primary producers that ultimately controls how ecosystems function. If the nutrient supply is increased, the resulting increase in production of autotrophs is propagated through the food web and all of the other trophic levels will respond to the increased availability of food (energy and materials will cycle faster).

The second theory, called **top-down control**, states that predation and grazing by higher trophic levels on lower trophic levels ultimately controls ecosystem function. For example, if you have an increase in predators, that increase will result in fewer grazers, and that decrease in grazers will result in turn in more primary producers because fewer of them are being eaten by the grazers. Thus the control of population numbers and overall productivity "cascades" from the top levels of the food chain down to the bottom trophic levels.

So, which theory is correct? Well, as is often the case when there is a clear dichotomy to choose from, the answer lies somewhere in the middle. There is evidence from many ecosystem studies that BOTH controls are operating to some degree, but that NEITHER control is complete. For example, the "top-down" effect is often very strong at trophic levels near to the top predators, but the control weakens as you move further down the food chain. Similarly, the "bottom-up" effect of adding nutrients usually stimulates primary production, but the stimulation of secondary production further up the food chain is less strong or is absent.

Thus we find that both of these controls are operating in any system at any time, and we must understand the relative importance of each control in order to help us to predict how an ecosystem will behave or change under different circumstances, such as in the face of a changing climate.

Biodiversity at Global : The Geography of Ecosystems

There are many different ecosystems: rain forests and tundra, coral reefs and ponds, grasslands and deserts. Climate differences from place to place largely determine the types of ecosystems we see. How terrestrial ecosystems appear to us is influenced mainly by the dominant vegetation.

The word "biome" is used to describe a major vegetation type such as tropical rain forest, grassland, tundra, etc., extending over a large geographic area (Figure 3). It is never used for aquatic systems, such as ponds or coral reefs. It always refers to a vegetation category that is dominant over a very large geographic scale, and so is somewhat broader than an ecosystem.

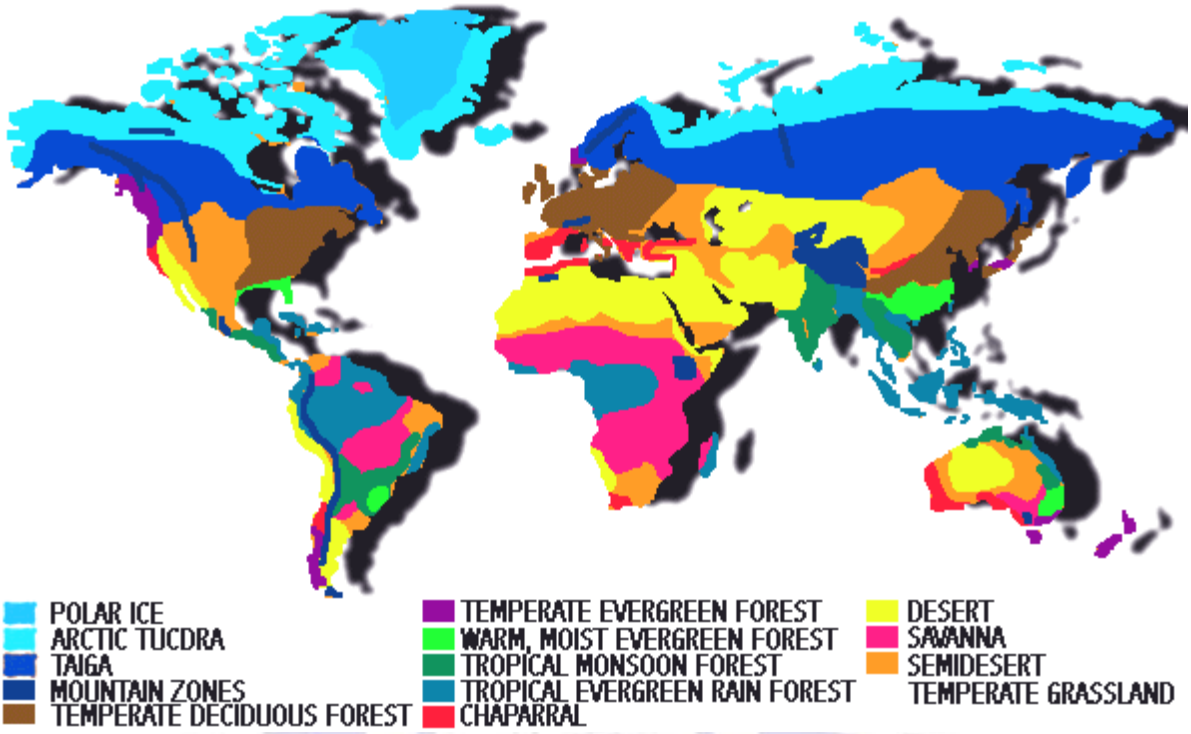


Figure 3: The distribution of biomes.

We can draw upon previous lectures to remember that temperature and rainfall patterns for a region are distinctive. Every place on earth gets the same total number of hours of sunlight each year, but not the same amount of heat. The sun's rays strike low latitudes directly but high latitudes obliquely. This uneven distribution of heat sets up not just temperature differences, but global wind and ocean currents that in turn have a great deal to do with where rainfall occurs. Add in the cooling effects of elevation and the effects of land masses on temperature and rainfall, and we get a complicated global pattern of climate.

A schematic view of the earth shows that, complicated though climate may be, many aspects are predictable (Figure 4). High solar energy striking near the equator ensures nearly constant high temperatures and high rates of evaporation and plant transpiration. Warm air rises, cools, and sheds its moisture, creating just the conditions for a tropical rain forest. Contrast the stable temperature but varying rainfall of a site in Panama with the relatively constant precipitation but seasonally changing temperature of a site in New York State. Every location has a rainfall-temperature graph that is typical of a broader region.

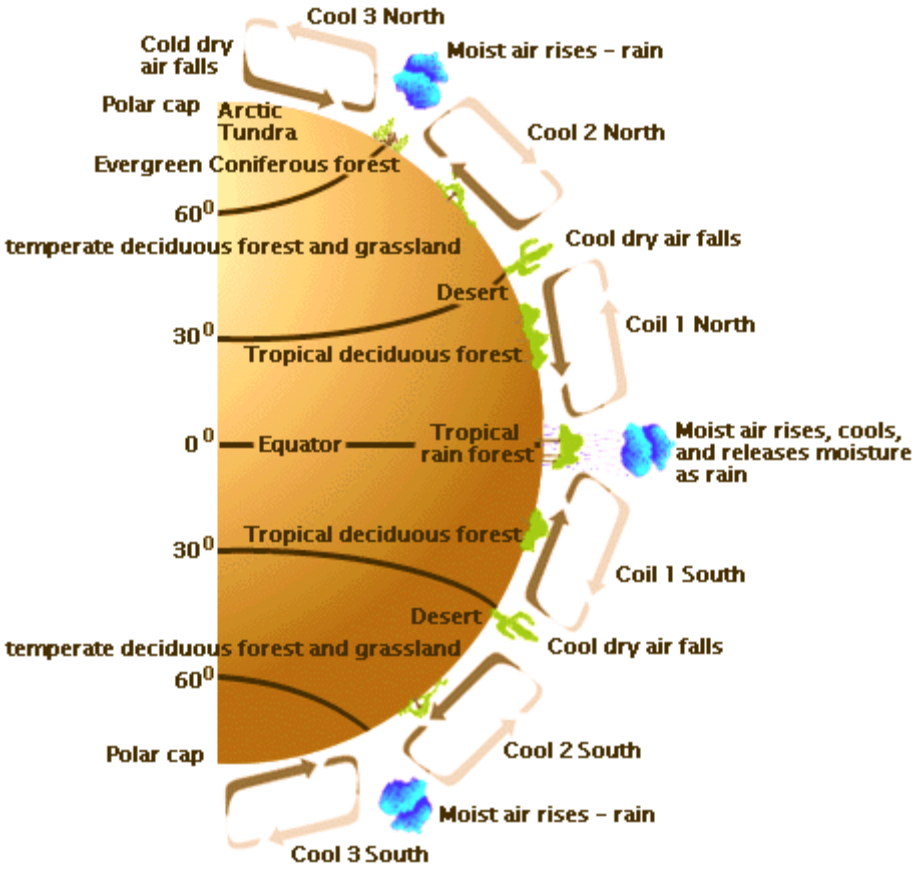


Figure 4. Climate patterns affect biome distributions.

We can draw upon plant physiology to know that certain plants are distinctive of certain climates, creating the vegetation appearance that we call biomes. Note how well the distribution of biomes plots on the distribution of climates (Figure 5). Note also that some climates are impossible, at least on our planet. High precipitation is not possible at low temperatures -- there is not enough solar energy to power the water cycle, and most water is frozen and thus biologically unavailable throughout the year. The high tundra is as much a desert as is the Sahara.

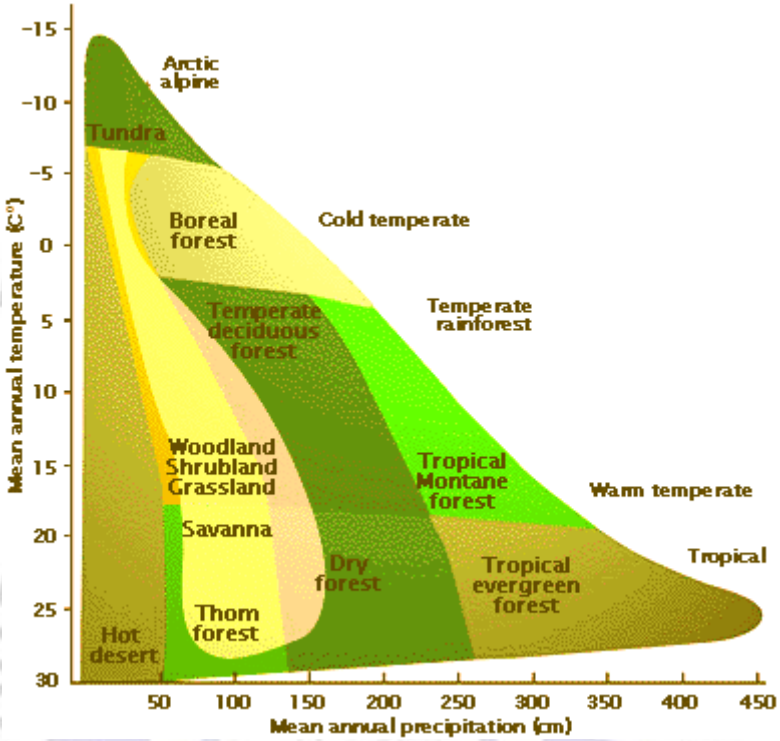


Figure 5. The distribution of biomes related to temperature and precipitation.

Summary

- Ecosystems are made up of abiotic (non-living, environmental) and biotic components, and these basic components are important to nearly all types of ecosystems. Ecosystem Ecology looks at energy transformations and biogeochemical cycling within ecosystems.
- Energy is continually input into an ecosystem in the form of light energy, and some energy is lost with each transfer to a higher trophic level. Nutrients, on the other hand, are recycled within an ecosystem, and their supply normally limits biological activity. So, "energy flows, elements cycle".
- Energy is moved through an ecosystem via a food web, which is made up of interlocking food chains. Energy is first captured by photosynthesis (primary production). The amount of primary production determines the amount of energy available to higher trophic levels.
- The study of how chemical elements cycle through an ecosystem is termed biogeochemistry. A biogeochemical cycle can be expressed as a set of stores (pools) and transfers, and can be studied using the concepts of "stoichiometry", "mass balance", and "residence time".
- Ecosystem function is controlled mainly by two processes, "top-down" and "bottom-up" controls.
- A biome is a major vegetation type extending over a large area. Biome distributions are determined largely by temperature and precipitation patterns on the Earth's surface.

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 obtian it ready made.

A decomposer is an organism of decay. These are also called saprobes. They break down the remaines 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 carnivor is a type of heterotroph that feeds only on other animals. There are two different ways to classify carnivors. The first group are known as predators. Predators 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 carnivors are scavengers. Scavengers are animals that feed on the dead bodies of other organisums. 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 carcus's 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 liitle 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. Photosnythesis 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.

Autotrophs are organisms that are able to make their own food using carbon dioxide, they can also be called producers. Most autotrophs carry on photosynthesis. Photosnythesis 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, and omnivores, feed on autotrophs. The heterotrophs are in turn eaten by the secondary consumers, which are carnivores.

Producers are eaten by the primary consumers which are eaten by the secondary consumers, when all of these die the saprobes break down their reamins 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 macro-ecosystem 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 Northeastern 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 surprise 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 Uttar khand in the Western Himalayas, the Nokrek 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.

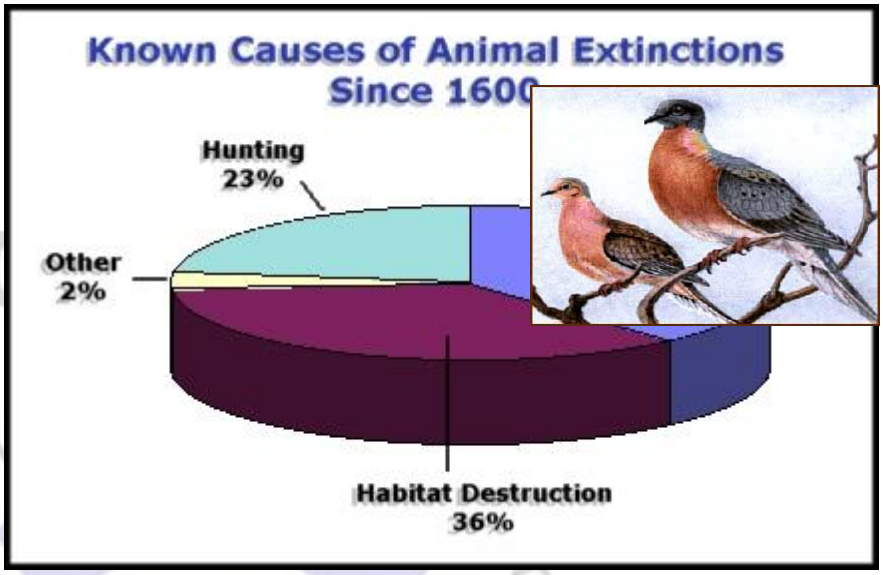
What are the Threats to Biodiversity?

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 my. 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 mark, 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).



Source: World Conservation Monitoring Centre, "Global Biodiversity" Chapman & Hall, London, 1992).

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.

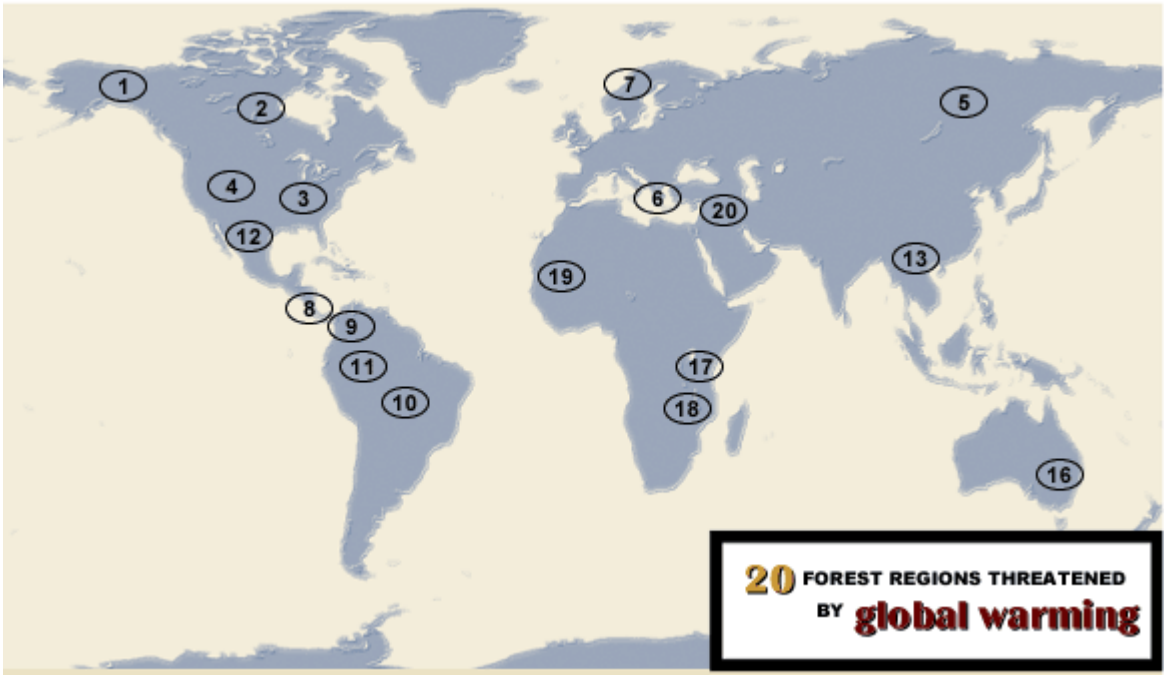
Commercial hunting, both legal and illegal (poaching), is the principal threat. Snowy egret, passenger pigeon, heath hen are USA examples. At $16,000 per pound, and $40,000 to $100,000 per horn, it is little wonder that some rhino species are down to only a few thousand individuals, with only a

Passenger Pigeons

slim hope of survival in the wild. The pet and decorative plant trade falls within this commercial hunting category, and includes a mix of legal and illegal activities. The annual trade is estimated to be at least $5 billion, with perhaps 1/4 to 1/3 of it illegal.

Sport or recreational hunting causes no endangerment of species where it is well regulated, and may help to bring back a species from the edge of extinction. Many wildlife managers view sport hunting as the principal basis for protection of wildlife.

While over-hunting, particularly illegal poaching, remains a serious threat to certain species, for the future, it is less important than other factors mentioned next.



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).

Habitat damage, especially the conversion of forested land to agriculture (and, often, subsequent abandonment as marginal land), has a long human history. It began in China about 4,000 years ago, was largely completed in Europe by about 400 years ago, and swept across USA over the

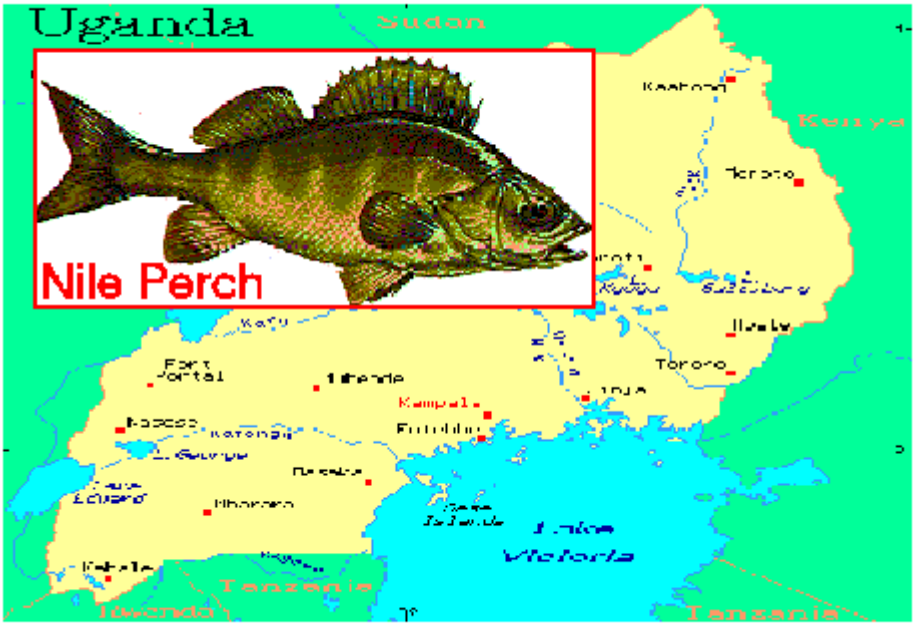
past 200 years or so. Viewed in this historical context, we are now mopping up the last forests of Pacific Northwest.

In the new world tropics, lowland, seasonal, deciduous forest began to disappear after 1500 with Spanish and Portuguese colonization of the New World. These were the forested regions most easily converted to agriculture, and with a more welcoming climate. The more forbidding, tropical humid forests came under attack mainly in 20th C, under the combined influences of population growth, inequitable land and income distribution, and development policies that targeted rain forests as the new frontier to colonize.

Tropical forests are so important because they harbor at least 50%, and perhaps more, of world's biodiversity. Direct observations, reinforced by satellite data, documents that these forests are declining. The original extent of tropical rain forests was 15 million km^2. Now there remains about 7.5-8 million km^2, so half is gone. The current rate of loss is estimated at near 2% annually (100,000 km^2 destroyed, another 100,000 km^2 degraded). While there is uncertainty regarding the rate of loss, and what it will be in future, the likelihood is that tropical forests will be reduced to 10-25% of their original extent by late 21^{st} C. Habitat fragmentation is a further aspect of habitat loss that often goes unrecognized. The forest, meadow, or other habitat that remains generally is in small, isolated bits rather than in large, intact units. Each is a tiny island that can at best maintain a very small population. Environmental fluctuations, disease, and other chance factors make such small isolates highly vulnerable to extinction. Any species that requires a large home range, such as a grizzly bear, will not survive if the area is too small. Finally, we know that small land units are strongly affected by their surroundings, in terms of climate, dispersing species, etc. As a consequence, the ecology of a small isolate may differ from that of a similar ecosystem on a larger scale.

For the future, habitat loss, degradation, and fragmentation combined is the single most important factor in the projected extinction crisis.

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.

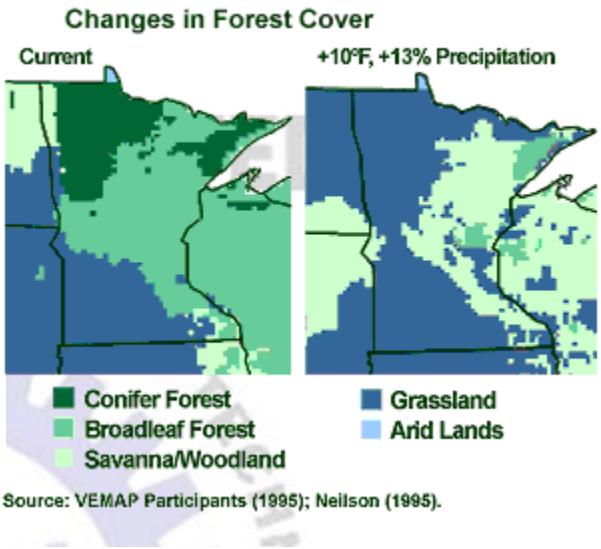


Of all documented extinctions since 1600, introduced species appear to have played a role in at least half. The clue is the disproportionate number of species lost from islands: some 93% of 30 documented extinctions of species and sub-species of amphibians and reptiles, 93% of 176 species and sub-species of land and freshwater birds, but only 27% of 114 species and subspecies of mammals. Why are island species so vulnerable and why is this evidence of the role of non-indigenous species?

Islands are laboratories for evolution (occur when the removal of one species (an extinction event) or the addition of one species (an invasion event) affects the entire biological system. Domino effects are especially likely when two or more species are highly inter-dependent, or when the affected species is a "keystone" species, meaning that it has strong connections to many other species (GCI).

The seeds of the tree Calvaria major, now found exclusively on the island of Mauritius, must pass through the abrasive gut of a large animal in order to germinate. Their tough seed coats are protection against digestion, but also a kind of living coffin, for the seed cannot germinate unless abraded. None of the animals currently on Mauritius have that ability. The dodo (a 25 kg pigeon), hunted to extinction in the late 17th century, probably was the key to recruitment in this species. Some seeds, abraded, roughened, and excreted by dodos, germinated and grew. Today, no seeds germinate, and only a few very old trees now survive. The black footed ferret was once very abundant in the western prairies. It preyed upon prairie dogs and used their burrows to nest in. Poisoning of prairie dogs has greatly reduced their abundance, and the blackfooted ferret is now the rarest mammal in North America

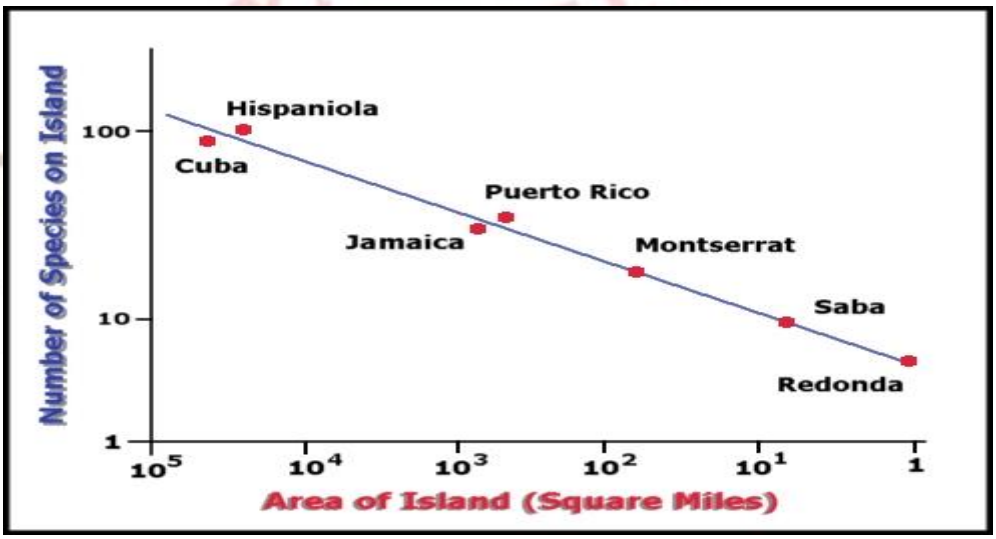
Pollution from chemical contaminants certainly poses a further threat to species and ecosystems. While not commonly a cause of extinction, it likely can be for species whose range is extremely small, and threatened by contamination. Several species of desert pupfish, occurring in small isolated pools 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. Agricultural production likely will show regional variation in gains and losses, depending upon crop and climate.

As a consequence of these multiple forces, many scientists fear that by end of next century, perhaps 25% of existing species will be lost.

3. How Can We Estimate Rates of Species Loss?



The Number of species living on islands increases or decreases with the area of the island. The diversity of reptiles and amphibians in the West Indies is depicted here. A reduction of 90 percent in area from one island to the next results in a 50 percent loss of species.

Estimates of current and future extinction rates are based on well-documented relationships between the number of species in a region and habitat area, and on reasonably well-known rates of habitat loss. We must also employ some ratio to approximate the total number of species (described and undescribed), from the number of described species.

The relationship between species (S) and area (A) is described by the equation:

$$S = c A^{z}$$

where z is the slope of the log-linear relationship, and c is a constant which described the height of the line. Based on censuses of species on islands, the number of species found on an island increases log-linearly with island area. Conversely, as island (or habitat area) is reduced, so is the number of species that will be found there. The slope (z) usually varies between 0.15 to 0.35. When combined with current rates of loss of tropical forest (this calculation uses 1.8% per year), these values of the slope translate into species extinction rates of roughly 0.5% annually. Extrapolated to the year 2020, roughly 20% of remaining species will disappear. Simply using the most conservative values of the slope, and assuming the true biodiversity of tropical forests is roughly 10 million species, the projected rate of loss of species is 27,000 per year, and three during this hour.

4. Summary

- Biodiversity refers to the number and variety of species, of ecosystems, and of the genetic variation contained within species.
- Roughly 1.4 million species are known to science, but because many species are undescribed, an estimated 10-30 million species likely exists at present.
- Biodiversity is threatened by the sum of all human activities. It is useful to group threats into the categories of over-hunting, habitat destruction, invasion of non-native species, domino effects, pollution, and climate change.
- Habitat loss presents the single greatest threat to world biodiversity, and the magnitude of this threat can be approximated from species-area curves and rates of habitat loss. The spread of non-native species threatens many local species with extinction, and pushes the world's biota toward a more homogeneous and widely distributed sub-set of survivors. Climate change threatens to force species and ecosystems to migrate toward higher latitudes, with no guarantee of suitable habitat or access routes. These three factors thus are of special concern.

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).
• Nilgiri Tahr (*Hemitragus hylocrius*). (Endemic to India).
• Particolored Flying Squirrel (*Hylopetes alboniger*).
• Peter's Tube-nosed Bat (*Murina grisea*). (Endemic to India).
• Red Panda(*Lesser Panda*) (Ailurus fulgens).
• Sei Whale (*Balaenoptera borealis*).
• Servant Mouse (*Mus famulus*). (Endemic to India).
• Snow Leopard (*Uncia uncia*).
• Tiger (*Panthera tigris*).
• Wild Water Buffalo (*Bubalus bubalis*). (Previously *Bubalus arnee*).
• Woolly Flying Squirrel (*Eupetaurus cinereus*).
• Narcondam Hornbill
• Brow-antlered Deer (*Cervus eldi eldi*)
• Brown Bear (*Ursus arctos*)
• Brown Palm Civet (*Paradoxurus jerdoni*)
• Clouded Leopard (*Neofelis nebulosa*)
• Common Otter (*Lutra lutra*)

• Dugong/ Seacow (*Dugong dugon*)
• Ganges River Dolphin (*Platanista gangetica*)
• Gaur (*Bos gaurus*)
• Goral (Nemorhaedus goral)

• Indian Wolf (*Canis lupus indica*)
• Himalayan W-toothed Shrew (*Crocidura attenuata)*
• Himalayan Musk Deer (*Moschus chrysogaster)*
• Himalayan Shrew (*Soriculus nigrescens)*
• Golden Jackal (*Canis aureus*)
• Indian Fox (*Vulpes bengalensis*)

• Andaman Horseshoe Bat (*Rhinolophus cognatus*). (Endemic to India.)

• Andaman Rat (*Rattus stoicus*). (Endemic to India.)
• Argali (*Ovis ammon*).
• Asiatic Black Bear (*Ursus thibetanus*).
• Asiatic Golden Cat (*Catopuma temminckii*).
• Asiatic Wild Ass (*Equus hemionus*).
• Assamese Macaque (*Macaca assamensis*).
• Back-striped Weasel (*Mustela strigidorsa*).
• Barasingha (*Cervus duvauceli*).
• Bare-bellied Hedgehog (*Hemiechinus nudiventris*). (Endemic to India.)
• Blackbuck (*Antilope cervicapra*).

• Brown fish owl (*Ketupa zeylonensis*). (Endemic to India.)
• Central Kashmir Vole (*Alticola montosa*). (Endemic to India.)
• Clouded Leopard (*Neofelis nebulosa*).
• Day's Shrew (*Suncus dayi*). (Endemic to India.)
• Dugong (*Dugong dugon*).
• Eld's Deer (*Cervus eldi*).
• Elvira Rat (*Cremnomys elvira*). (Endemic to India.)
• Eurasian Otter (*Lutra lutra*).
• Fishing Cat (*Prionailurus viverrinus*).
• Four-horned Antelope (*Tetracerus quadricornis*).
• Gaur (*Bos frontalis*).
• Himalayan Tahr (*Hemitragus jemlahicus*).
• Humpback Whale (*Megaptera novaeangliae*).
• Indian Giant Squirrel (*Ratufa indica*). (Endemic to India.)
• Irrawaddy Squirrel (*Callosciurus pygerythrus*).
• Jerdon's Palm Civet (*Paradoxurus jerdoni*). (Endemic to India.)
• Kashmir Cave Bat (*Myotis longipes*).
• Kerala Rat (*Rattus ranjiniae*). (Endemic to India.)
• Khajuria's Leaf-nosed Bat (*Hipposideros durgadasi*). (Endemic to India.)

- Kolar Leaf-nosed Bat (*Hipposideros hypophyllus*). (Endemic to India.)
- Lesser Horseshoe Bat (*Rhinolophus hipposideros*).
- Mainland Serow (*Capricornis sumatraensis*).
- Malayan Porcupine (*Hystrix brachyura*).
- Mandelli's Mouse-eared Bat (*Myotis sicarius*).
- Marbled Cat (*Pardofelis marmorata*).
- Mouflon (or Urial) (*Ovis orientalis*).
- Nicobar Flying Fox (*Pteropus faunulus*). (Endemic to India.)
- Nilgiri Leaf Monkey (*Trachypithecus johnii*). (Endemic to India.)
- Nilgiri Marten (*Martes gwatkinsii*). (Endemic to India.)
- Nonsense Rat (*Rattus burrus*). (Endemic to India.)
- Pale Grey Shrew (*Crocidura pergrisea*). (Endemic to India.)
- Palm Rat (*Rattus palmarum*). (Endemic to India.)
- Red Goral (*Naemorhedus baileyi*).
- Royal Bengal Tiger
- Rock Eagle-owl (*Bubo bengalensis*). (Endemic to India.)
- Rusty-spotted Cat (*Prionailurus rubiginosus*).
- Sikkim Rat (*Rattus sikkimensis*).
- Sloth Bear (*Melursus ursinus*).
- Slow Loris (*Loris tardigradus*).
- Smooth-coated Otter (*Lutrogale perspicillata*). (Previously *Lutra perspicillata*)
- Sperm Whale (*Physeter macrocephalus*).
- Sri Lankan Giant Squirrel (*Ratufa macroura*).
- Sri Lankan Highland Shrew (*Suncus montanus*).
- Stumptail Macaque (*Macaca arctoides*).
- Takin (*Budorcas taxicolor*).
- Wild Goat (*Capra aegagrus*).
- Wild Yak (*Bos grunniens*).
- Lesser Panda (*Ailurus fulgens V)*

Threatened

- Indian Wild Ass (*Equus hemionus khur*)
- Leopard (*Panthera pardus)*

- Red Fox (*Vulpes vulpes montana*)

Unit III [Media & Environmental Disaster]

Environmental pollution, problems and control measures – Overview

A. Introduction and definition of environmental pollution – We know that, a living organism cannot live by itself. Organisms interact among themselves. Hence, all organisms, such as plants, animals and human beings, as well as the physical surroundings with whom we interact, form a part of our environment. All these constituents of the environment are dependent upon each other. Thus, they maintain a balance in nature. As we are the only organisms try to modify the environment to fulfill our needs; it is our responsibility to take necessary steps to control the environmental imbalances.

The environmental imbalance gives rise to various environmental problems. Some of the environmental problems are pollution, soil erosion leading to floods, salt deserts and sea recedes, desertification, landslides, change of river directions, extinction of species, and vulnerable ecosystem in place of more complex and stable ecosystems, depletion of natural resources, waste accumulation, deforestation, thinning of ozone layer and global warming. The environmental problems are visualized in terms of pollution, growth in population, development, industrialization, unplanned urbanization etc. Rapid migration and increase in population in the urban areas has also lead to traffic congestion, water shortages, solid waste, and air, water and noise pollution are common noticeable problems in almost all the urban areas since last few years.

Environmental pollution is defined as the undesirable change in physical, chemical and biological characteristics of our air, land and water. As a result of over-population, rapid industrializations, and other human activities like agriculture and deforestation etc., earth became loaded with diverse pollutants that were released as by-products. Pollutants are generally grouped under two classes:

(a) **Biodegradable pollutants** - Biodegradable pollutants are broken down by the activity of micro-organisms and enter into the biogeochemical cycles. Examples of such pollutants are domestic waste products, urine and faucal matter, sewage, agricultural residue, paper, wood and cloth etc.

(b) **Non- Biodegradable pollutants** - Non-biodegradable pollutants are stronger chemical bondage, do not break down into simpler and harmless products. These include various insecticides and other pesticides, mercury, lead, arsenic, aluminum, plastics, radioactive waste etc.

B. Classification of Environmental Pollution - Pollution can be broadly classified according to the components of environment that are polluted. Major of these are: Air pollution, Water

pollution, Soil pollution (land degradation) and Noise pollution. Details of these types of pollutions are discussed below with their prevention measures.

(1) **Air Pollution:** Air is mainly a mixture of various gases such as oxygen, carbon dioxide, nitrogen. These are present in a particular ratio. Whenever there is any imbalance in the ratio of these gases, air pollution is caused. The sources of air pollution can be grouped as under

(i) Natural; such as, forest fires, ash from smoking volcanoes, dust storm and decay of organic matters.

(ii) Man-made due to population explosion, deforestation, urbanization and industrializations.

Certain activities of human beings release several pollutants in air, such as carbon monoxide (CO), sulfur dioxide (SO2), hydrocarbons (HC), oxides of nitrogen (NOx), lead, arsenic, asbestos, radioactive matter, and dust. The major threat comes from burning of fossil fuels, such as coal and petroleum products. Thermal power plants, automobiles and industries are major sources of air pollution as well. Due to progress in atomic energy sector, there has been an increase in radioactivity in the atmosphere. Mining activity adds to air pollution in the form of particulate matter. Progress in agriculture due to use of fertilizers and pesticides has also contributed towards air pollution. Indiscriminate cutting of trees and clearing of forests has led to increase in the amount of carbon dioxide in atmosphere. Global warming is a consequence of green house effect caused by increased level of carbon dioxide (CO2). Ozone (O3) depletion has resulted in UV radiation striking our earth.

The gaseous composition of unpolluted air	
The Gases	**Parts per million (vol)**
Nitrogen	756,500
Oxygen	202,900
Water	31,200
Argon	9,000
Carbon Dioxide	305

Neon	17.4
Helium	5.0
Methane	0.97-1.16
Krypton	0.97
Nitrous oxide	0.49
Hydrogen	0.49
Xenon	0.08
Organic vapours	ca.0.02

Harmful Effects of air pollution –

(a) It affects respiratory system of living organisms and causes bronchitis, asthma, lung cancer, pneumonia etc. Carbon monoxide (CO) emitted from motor vehicles and cigarette smoke affects the central nervous system.

(b) Due to depletion of ozone layer, UV radiation reaches the earth. UV radiation causes skin cancer, damage to eyes and immune system.

(c) Acid rain is also a result of air pollution. This is caused by presence of oxides of nitrogen and sulfur in the air. These oxides dissolve in rain water to form nitric acid and sulfuric acid respectively. Various monuments, buildings, and statues are damaged due to corrosion by acid present in the rain. The soil also becomes acidic. The cumulative effect is the gradual degradation of soil and a decline in forest and agricultural productivity.

(d) The green house gases, such as carbon dioxide (CO2) and methane (CH4) trap the heat radiated from earth. This leads to an increase in earth's temperature.

(e) Some toxic metals and pesticides also cause air pollution.

(2) **Water Pollution**: Water is one of the prime necessities of life. With increasing number of people depend on this resource; water has become a scarce commodity. Pollution makes even the limited available water unfit for use. Water is said to be polluted when there is any physical,

biological or chemical change in water quality that adversely affects living organisms or makes water unsuitable for use. Sources of water pollution are mainly factories, power plants, coal mines and oil wells situated either close to water source or away from sources. They discharge pollutants directly or indirectly into the water sources like river, lakes, water streams etc. The harmful effects of water pollution are:

(a) Human beings become victims of various water borne diseases, such as typhoid, cholera, dysentery, hepatitis, jaundice, etc.

(b) The presence of acids/alkalies in water destroys the microorganisms, thereby hindering the self-purification process in the rivers or water bodies. Agriculture is affected badly due to polluted water. Marine eco-systems are affected adversely.

(c) The sewage waste promotes growth of phytoplankton in water bodies; causing reduction of dissolved oxygen.

(d) Poisonous industrial wastes present in water bodies affect the fish population and deprives us of one of our sources of food. It also kills other animals living in fresh water.

(e) The quality of underground water is also affected due to toxicity and pollutant content of surface water.

(2.1) Water pollution by industries and its effects - A change in the chemical, physical, biological, and radiological quality of water that is injurious to its uses. The term "water pollution" generally refers to human-induced changes to water quality. Thus, the discharge of toxic chemicals from industries or the release of human or livestock waste into a nearby water body is considered pollution.

The contamination of ground water of water bodies like rivers, lakes, wetlands, estuaries, and oceans can threaten the health of humans and aquatic life. Sources of water pollution may be divided into two categories. (i) Point-source pollution, in which contaminants are discharged from a discrete location. Sewage outfalls and oil spills are examples of point-source pollution. (ii) Non-point-source or diffuse pollution, referring to all of the other discharges that deliver contaminants to water bodies. Acid rain and unconfined runoff from agricultural or urban areas falls under this category.

The principal contaminants of water include toxic chemicals, nutrients, biodegradable organics, and bacterial & viral pathogens. Water pollution can affect human health when pollutants enter the body either via skin exposure or through the direct consumption of contaminated drinking water and contaminated food. Prime pollutants, including DDT and polychlorinated biphenyls (PCBs), persist in the natural environment and bioaccumulation occurs in the tissues of aquatic organisms. These prolonged and persistent organic pollutants are transferred up the food chain and they can reach levels of concern in fish species that are eaten by humans. Moreover, bacterial and viral pathogens can pose a public health risk for those who drink contaminated water or eat raw shellfish from polluted water bodies.

Contaminants have a significant impact on aquatic ecosystems. Enrichment of water bodies with nutrients (principally nitrogen and phosphorus) can result in the growth of algae and other aquatic plants that shade or clog streams. If wastewater containing biodegradable organic matter is discharged into a stream with inadequate dissolved oxygen, the water downstream of the point of discharge will become anaerobic and will be turbid and dark. Settle able solids will be deposited on the streambed, and anaerobic decomposition will occur. Over the reach of stream where the dissolved-oxygen concentration is zero, a zone of putrefaction will occur with the production of hydrogen sulfide (H2S), ammonia (NH3), and other odorous gases. Because many fish species require a minimum of 4–5 mg of dissolved oxygen per liter of water, they will be unable to survive in this portion of the stream.

Direct exposures to toxic chemicals are also a health concern for individual aquatic plants and animals. Chemicals such as pesticides are frequently transported to lakes and rivers via runoff, and they can have harmful effects on aquatic life. Toxic chemicals have been shown to reduce the growth, survival, reproductive output, and disease resistance of exposed organisms. These effects can have important consequences for the viability of aquatic populations and communities.

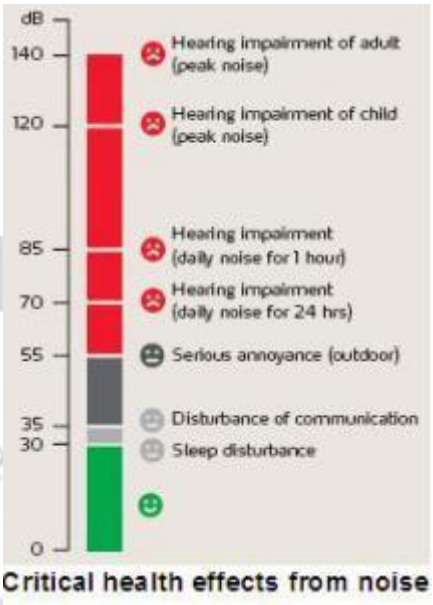
Wastewater discharges are most commonly controlled through effluent standards and discharge permits. Under this system, discharge permits are issued with limits on the quantity and quality of effluents. Water-quality standards are sets of qualitative and quantitative criteria designed to maintain or enhance the quality of receiving waters. Criteria can be developed and implemented to protect aquatic life against acute and chronic effects and to safeguard humans against deleterious health effects, including cancer.

[For more refer 'Water Conservation – Need-of-the-day for our very survival']

(3) Soil pollution (Land degradation): Land pollution is due to

(i) Deforestation and

(ii) Dumping of solid wastes.



Critical health effects from noise

Deforestation increases soil erosion; thus valuable agricultural land is lost. Solid wastes from household and industries also pollute land and enhance land degradation. Solid wastes include things from household waste and of industrial wastes. They include ash, glass, peelings of fruit and vegetables, paper, clothes, plastics, rubber, leather, brick, sand, metal, waste from cattle shed, night soil and cow dung. Chemicals discharged into air, such as compounds of sulfur and lead, eventually come to soil and pollute it. The heaps of solid waste destroy the natural beauty and surroundings become dirty. Pigs, dogs, rats, flies, mosquitoes visit the dumped waste and foul smell comes from the waste. The waste may block the flow of water in the drain, which then becomes the breeding place for mosquitoes. Mosquitoes are carriers of parasites of malaria and dengue. Consumption of polluted water causes many diseases, such as cholera, diarrhea and dysentery.

(4) **Noise pollution :** High level noise is a disturbance to the human environment. Because of urbanization, noise in all areas in a city has increased considerably. One of the most pervasive sources of noise in our environment today is those associated with transportation. People reside adjacent to highways, are subjected to high level of noise produced by trucks and vehicles pass on the highways. Prolonged exposure to high level of noise is very much harmful to the health of mankind.

In industry and in mines the main sources of noise pollution are blasting, movement of heavy earth moving machines, drilling, crusher and coal handling plants etc. The critical value for the development of hearing problems is at 80 decibels.

Chronic exposure to noise may cause noise-induced hearing loss. High noise levels can contribute to cardiovascular effects. Moreover, noise can be a causal factor in workplace accidents.

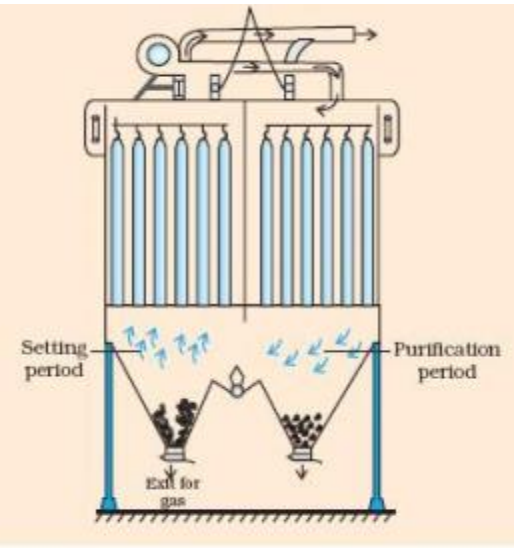
C. Fundamentals of prevention and control of air pollution:

As mentioned above, air pollutants can be gaseous or particulate matters. Different techniques for controlling these pollutants are discussed below:

a. Methods of controlling gaseous pollutants –

1. Combustion – This technique is used when the pollutants are in the form of organic gases or vapors. During flame combustion or catalytic process, these organic pollutants are converted into water vapor and relatively less harmful products, such as CO2.

2. Absorption – In this technique, the gaseous effluents are passed through scrubbers or absorbers. These contain a suitable liquid absorbent, which removes or modifies one or more of the pollutants present in the gaseous effluents.



A typical bag filter

3. Adsorption – The gaseous effluents are passed through porous solid adsorbents kept in suitable containers. The organic and inorganic constituents of the effluent gases are trapped at the interface of the solid adsorbent by physical adsorbent.

b. Methods to control particulate emissions –

1. Mechanical devices generally work on the basis of the following:

(i) Gravity: In this process, the particles settle down by gravitational force.

(ii) Sudden change in direction of the gas flow. This causes the particles to separate out due to greater momentum.

2. Fabric Filters: The gases containing dust are passed through a porous medium. These porous media may be woven or filled fabrics. The particles present in the gas are trapped and collected in the filters. The gases freed from the particles are discharged.

3. Wet Scrubbers: Wet scrubbers are used in chemical, mining and metallurgical industries to trap SO2, NH3, metal fumes, etc.

4. Electrostatic Precipitators: When a gas or an air stream containing aerosols in the form of dust, fumes or mist, is passed between two electrodes, then, the aerosol particles get precipitated on the electrode.

c. Other practices in controlling air pollution -Apart from the above, following practices also help in controlling air pollution.

(i) Use of better designed equipment and smokeless fuels, hearths in industries and at home.

(ii) Automobiles should be properly maintained and adhere to recent emission-control standards.

(iii) More trees should be planted along road side and houses.

(iv) Renewable energy sources, such as wind, solar energy, ocean currents, should fulfill energy needs.

(v) Tall chimneys should be installed for vertical dispersion of pollutants.

d. General air pollution control devices / equipments for industries – The commonly used equipments / process for control of dust in various industries are (a) Mechanical dust collectors in the form of dust cyclones; (b) Electrostatic precipitators – both dry and wet system; (c) particulate scrubbers; (d) Water sprayer at dust generation points; (e) proper ventilation system and (f) various monitoring devices to know the concentration of dust in general body of air.

The common equipments / process used for control of toxic / flue gases are the (a) process of desulphurisation; (b) process of denitrification; (c) Gas conditioning etc. and (d) various monitoring devices to know the efficacy of the systems used.

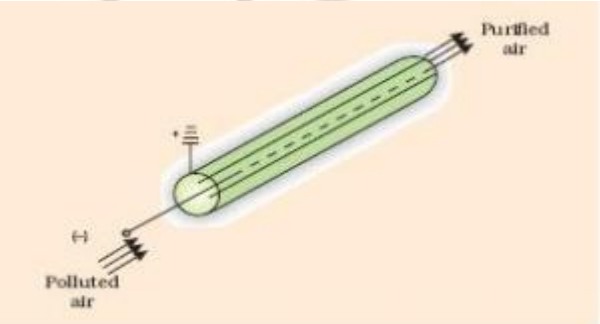
e. Steps, in general, to be taken for reduction of air pollution - To change our behavior in order to reduce AIR POLLUTION at home as well as on the road, few following small steps taken by us would lead to clean our Environment.

At Home:

1. Avoid using chemical pesticides or fertilizers in your yard and garden. Many fertilizers are a source of nitrous oxide, a greenhouse gas that contributes to global warming. Try organic products instead.

2. Compost your yard waste instead of burning it. Outdoor burning is not advisable, as it pollutes air. Breathing this smoke is bad for you, your family and your neighbors. Plus, you can use the compost in your garden.

3. If you use a wood stove or fireplace to heat your home, it would be better to consider switching to another form of heat which does not generate smoke. It is always better to use sweater or warm clothing than using fireplace.



Electrostatic precipitator

4. Be energy efficient. Most traditional sources of energy burn fossil fuels, causing air pollution. Keep your home well-maintained with weather-stripping, storm windows, and insulation. Lowering your thermostat can also help – and for every two degrees Fahrenheit you lower it,

you save about two percent on your heating bill.

5. Plant trees and encourage other to plant trees as well. Trees absorb and store carbon dioxide from the atmosphere, and filter out air pollution. During warmer days, trees provide cool air, unnecessary use of energy on air conditioning is avoided, hence the air pollution.

6. Try to stop smoking; at home, at office or at outside. Tobacco smoking not only deteriorates self's health, it affects others health too.

On the Road:

7. Keep your vehicle well maintained. A poorly maintained engine both creates more air pollution and uses more fuel. Replace oil and air filters regularly, and keep your tires properly inflated.

8. Drive less. Walking, bicycling, riding the bus, or working from home can save you money as well as reducing air pollution.

9. Don't idle your vehicle. If you stop for more than 30 seconds, except in traffic, turn off your engine.

10. Don't buy more car than you need. Four-wheel drive, all-wheel drive, engine size, vehicle weight, and tire size all affect the amount of fuel your vehicle uses. The more fuel it uses the more air pollution it causes.

D. Water pollution prevention and control:

Water is a key resource for our quality of life. It also provides natural habitats and eco-systems for plant and animal species. Access to clean water for drinking and sanitary purposes is a precondition for human health and well-being. Clean unpolluted water is essential for our ecosystems. Plants and animals in lakes, rivers and seas react to changes in their environment caused by changes in chemical water quality and physical disturbance of their habitat.

Water pollution is a human-induced change in the chemical, physical, biological, and radiological quality of water that is injurious to its existing, intended, or potential uses such as boating, waterskiing, swimming, the consumption of fish, and the health of aquatic organisms and ecosystems. Thus, the discharge of toxic chemicals from a pipe or the release of livestock waste into a nearby water body is considered pollution. The contamination of ground water, rivers, lakes, wetlands, estuaries, and oceans can threaten the health of humans and aquatic life.

Contaminants have a significant impact on aquatic ecosystems. for example, enrichment of water bodies with nutrients (principally nitrogen and phosphorus) can result in the growth of algae and other aquatic plants that shade or clog streams. Direct exposures to toxic chemicals such as pesticides, is also a health concern for individual aquatic plants and animals. Without healthy water for drinking, cooking, fishing, and farming, the human race would perish. Clean water is also necessary for recreational interests such as swimming, boating, and water skiing.

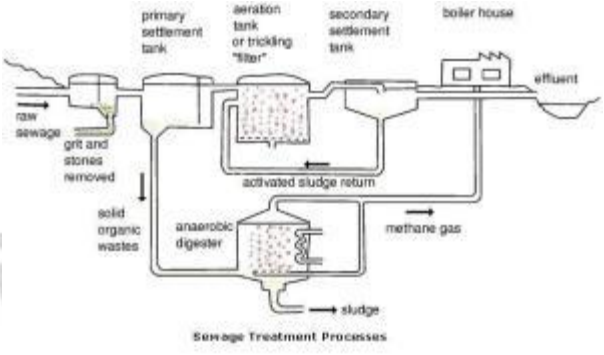
a. Sources of Water Pollution - Sources of water pollution are generally divided into two categories. The first is point-source pollution, in which contaminants are discharged from a discrete location. Sewage outfalls and oil spills are examples of point-source pollution. The second category is non-point-source or diffuses pollution, referring to all of the other discharges that deliver contaminants to water bodies.

Numerous manufacturing plants pour off undiluted corrosives, poisons, and other noxious byproducts to water streams. The construction industry discharges slurries of gypsum, cement, abrasives, metals, and poisonous solvents. The mining industry also presents persistent water pollution problems. In yet another instance of pollution, hot water discharged by factories and power plants causes so-called 'thermal pollution' by increasing water temperatures. Such increases change the level of oxygen dissolved in a body of water, thereby disrupting the water's ecological balance, killing off some plant and animal species while encouraging the overgrowth of others. Towns and municipalities are also major sources of water pollution.

In many public water systems, pollution exceeds safe levels. One reason for this is that much groundwater has been contaminated by wastes pumped underground for disposal or by seepage from surface water. When contamination reaches underground water tables, it is difficult to correct and spreads over wide areas. Discharge of untreated or only partially treated sewage into the waterways threatens the health of their own and neighboring populations as well. Along with domestic wastes, sewage carries industrial contaminants and a growing tonnage of paper and plastic refuse. Although thorough sewage treatment would destroy most disease-causing bacteria, the problem of the spread of viruses and viral illness remains. Additionally, most sewage treatment does not remove phosphorus compounds, contributed principally by detergents.

b. Dangers of Water Pollution - Virtually all water pollutants are hazardous to humans as well as lesser species; sodium is implicated in cardiovascular disease, nitrates in blood disorders. Mercury and lead can cause nervous disorders. Some contaminants are carcinogens. DDT is toxic to humans and can alter chromosomes. Along many shores, shellfish can no longer be taken because of contamination by DDT, sewage, or industrial wastes.

c. Prevention and Control of Water Pollution - Sewage should be treated before it is discharged into the river or ocean. This is possible through modern techniques.



Sewage Treatment Processes

Sewage is first passed through a grinding mechanism. This is then passed through several settling chambers and neutralized with lime. Up to this stage, the process is called primary treatment. The sewage still contains a large number of pathogenic and non-pathogenic organisms, and also sufficient quantity of organic matter. The neutralized effluents are sent to UASB (up-flow anaerobic sludge blanket). It is a reactor. In this, the anaerobic bacteria degrade the biodegradable material present in the waste water. This removes foul odor and releases methane, which can be used elsewhere. In this system, the pollution load is reduced upto 85 percent. After this, water is sent to aeration tanks where it is mixed with air and bacteria. Bacteria digest the organic waste material. This is called biological or secondary treatment. Even after the treatment, water is not yet fit for drinking. The harmful microorganisms need to be killed. The final step (tertiary treatment) is, therefore, a disinfection process, to remove final traces of organics, bacteria, dissolved inorganic solids, etc. For tertiary treatment, methods, such as chlorination, evaporation, and exchange absorption may be employed. These depend upon the required quality of the final treatment.

Apart from the above, you should also adopt the following practices:

(i) Waste food material, paper, decaying vegetables and plastics should not be thrown into open drains.

(ii) Effluents from distilleries, and solid wastes containing organic matter should be sent to biogas plants for generation of energy.

(iii) Oil slicks should be skimmed off from the surface with suction device. Sawdust may be spread over oil slicks to absorb the oil components.

E. Soil erosion and its prevention: Soil erosion by water, wind and tillage affects both agriculture and the natural environment. Soil loss, and its associated impacts, is one of the most important (yet probably the least well-known) of today's environmental problems. It is

mostly due to poor land use practices, which include deforestation, overgrazing, unmanaged construction activity and road or trail building.

Soil is a complex mixture of living and non-living materials. It provides anchorage and sustenance to plants. Natural agents like water and wind, constantly tend to remove the top soil and cause erosion. Rain falling upon the unprotected top soil, washes it down into the streams. Due to the absence of plant covering, eroded soil cannot hold water. Water rushes into the rivers and overflows as flood. Dust storm also causes soil erosion. The particles of top soil are picked up in such quantities that they form clouds of dust. Human beings also cause soil erosion. The growing human habitation and expansion of urban areas lead to removal of vegetation. Once vegetation is removed, the naked soil gets exposed to wind and water. Improper tillage is another cause of soil erosion. Farmers often loosen the top soil for removing weeds and preparing seed beds. They also leave agricultural fields lying fallow for long time. These practices expose the top soil to the wind and cause erosion.

Soil erosion is always a result of mankind's unwise actions, such as overgrazing or unsuitable cultivation practices. These leave the land unprotected and vulnerable. Accelerated soil erosion by water or wind may affect both agricultural areas and the natural environment, and is one of the most widespread of today's environmental problems. Soil erosion is just one form of soil degradation. Other kinds of soil degradation include salinisation, nutrient loss, and compaction.

Prevention of soil erosion - Plants provide protective cover on the land and prevent soil erosion for the reasons:

(a) Plants slows down water as it flows over the land (runoff) and this allow much of the rain to soak into the ground;

(b) plant roots hold the soil in position and prevent it from being washed away;

(c) plants break the impact of a raindrop before it hits the soil, thus reducing its ability to erode;

(d) plants in wetlands and on the banks of rivers are of particular importance as they slow down the flow of the water and their roots bind the soil, thus preventing erosion.

Preventing soil erosion requires technical changes to adopt. Aspects of technical changes include:

(i) use of contour ploughing and wind breaks;

(ii) leaving unploughed grass strips between ploughed land;

(iii) making sure that there are always plants growing on the soil, and that the soil is rich in humus (decaying plant and animal remains). This organic matter is the "glue" that binds the soil particles together and plays an important part in preventing erosion;

(iv) avoiding overgrazing and the over-use of crop lands;

(v) allowing indigenous plants to grow along the river banks instead of ploughing and planting crops right up to the water's edge;

(vi) encouraging biological diversity by planting several different types of plants together;

(vii) conservation of wetlands.

We can check soil erosion by adopting the following additional practices:

1. Intensive cropping and use of proper drainage canals.

2. Terracing on the sloping fields. This retards the speed of the flowing water.

3. Planting trees and sowing grasses.

4. Extensive aforestation practices to be carried out.

F. Mitigation of Noise pollution: Reducing noise pollution by muffling the sounds at the source is one of the best methods in industry and for urban living. Protective equipment is generally mandatory when noise levels exceed 85 dB(A) in industry. Creation of green cover adjacent to municipal roads and in mines is the way to mitigate noise pollution. It has been observed that noise level reduces by 10 decibels per every 10m wide green belt development. Apart, redesigning industrial equipment, shock mounting assemblies and physical barriers in the workplace are also for reduction and exposure of unwanted industrial noise.

High way noise pollution can be mitigated by constructing noise barriers. Artificial noise barriers are solid obstructions built between the highway and the residential areas along a highway. They block major portion of noise produced by passing vehicles on a highway. Effective noise barriers typically reduce noise levels by as much as half or more. The construction of noise barrier may be built in the form of earth mounds, vertical wall along the highways for creation of blockage of sound generated by heavy vehicles. Creation of greenbelt in the space between the residences and highways also reduces the noise nuisance.

G. Conservation and protection of environment: By now, all of us have realized how important it is to protect the environment for our own survival. The term 'conservation' of environment relates to activities which can provide individual or commercial benefits, but at the same time,

prevent excessive use leading to environmental damage. Conservation may be distinguished from preservation, which is considered to be "maintaining of nature as it is, or might have been before the intervention of either human beings or natural forces." We know that natural resources are getting depleted and environmental problems are increasing. It is, therefore, necessary to conserve and protect our environment. Following practices help in protecting our environment.

1. Rotation of crops.

2. Judicious use of fertilisers, intensive cropping, proper drainage and irrigation.

3. Treatment of sewage, so that it does not pollute the rivers and other water bodies.

4. Composting organic solid waste for use as manure.

5. Planting trees in place of those removed for various purposes.

6. National parks and conservation forests should be established by the government.

7. Harvesting of rain water.

Some action points to protect or improve the environment -

(i) Dispose the waste after separating them into biodegradable and non-biodegradable waste material.

(ii) Start a compost heap or use a compost bin. This can be used to recycle waste food and other biodegradable materials.

(iii) Avoid unnecessary or wasteful packaging of products.

(iv) Reuse carry bags.

(v) Plant trees. They will help to absorb excess carbon dioxide.

(vi) Observe World Environment Day on 5th June.

(vii) Never put any leftover chemicals, used oils down the drain, toilet or dump them on the ground or in water or burn them in the garden. If you do so, it will cause pollution.

(viii) Don't burn any waste, especially plastics, for the smoke may contain polluting gases.

(ix) Use unleaded petrol and alternate sources of energy, and keep the engine properly tuned and serviced and the tyres inflated to the right pressure, so that vehicle runs efficiently.

(x) Avoid fast starts and sudden braking of automobiles.

(xi) Walk or cycle where it is safe to do so – walking is free; cycling can help to keep you fit.

(xii) Use public transport wherever you can, or form a car pool for everyday travel.

(xiii) Send your waste oil, old batteries and used tyres to a garage for recycling or safe disposal; all these can cause serious pollution.

Environmental Information Dissemination

Through this Scheme environmental problems/issues of the State is being easily delivered to the target groups in order to develop skills, attitudes and values so as to enable and encourage individuals in the promotion of sustainable development by their actions

Under this programme, creating of mass awareness and imparting environment education are made effective with the use of multi-media. Implementation of Environment Information Dissemination programme is targeted to fill-up up some of the gaps, in the field of environmental information, with the common people through the use of certain device like print, electronic and advance information technologies.

Some of the significant achievements under this programme are:

- Compilation of News items on environmental sensitive topics/issues/problems
- Identification of information and data gaps
- Data bank generation of the information gaps of the State of Environment (SoE) of Manipur to put on the Website

Government of India recognizes the impact of pollution on environment and to ensure that India moves in the right direction, Central Pollution Control Board (**CPCB**) was established.

Central Pollution Control Board (CPCB) was constituted in 1974 as per the provisions of the Water (Prevention and Control of Pollution) Act, 1974. The **CPCB** has been playing a key role in abatement and control of pollution in the country by generating relevant data, providing scientific information, rendering technical inputs for information of national policies and

programmes, training and development of manpower and organizing activities for promoting awareness at different levels of the Government and public at large.

The main function of the Central Pollution Control Board (CPCB as spelt out in 'Water (Prevention and Control of Pollution) Act, 1974' and Air (Prevention and Control of Pollution) Act, 1981' are:-

1. To promote cleanliness of streams and wells in different areas of the States through prevention, control and abatement of water pollution;
2. To improve the quality of air and to prevent, control or abate air pollution in the country;
3. Advise the Central Government on any matter concerning prevention and control of water and air pollution and improvement of the quality of air;
4. Plan and cause to be executed a nation-wide programme for the prevention, control or abatement of water and air pollution;
5. Coordinate the activities of the State Boards and resolve disputes among them;
6. Provide technical assistance and guidance to the State Boards, carry out and sponsor investigations and research relating to problems of water and air pollution, and for their prevention, control abatement;
7. Plan and organise training of persons engaged in programmes for prevention, control or abatement of water and air pollution;
8. Organise through mass media, a comprehensive mass awareness programme on prevention, control or abatement of water and air pollution;
9. Collect, compile and publish technical and statistical data relating to water and air pollution and the measures devised for their effective prevention, control and abatement;
10. Prepare manuals, codes and guidelines relating to treatment and disposal of sewage and trade effluents as well as for stack gas cleaning devises, stacks and ducts;
11. Disseminate information in respect of matters relating to water and air pollution and their prevention and control;
12. Lay down, modify or annul, in consultation with the State Government concerned, the standards for stream or well, and lay down standards for quality of air;
13. Establish or recognize laboratories to enable the Board to perform; and
14. Perform such other functions as and when prescribed by the Government of India.
15. In addition to the above, the **CPCB** is empowered, on behalf of the Ministry of Environment & Forests
16. To issue directions to any industry, local bodies, or other authority for violation of the notified general emission and effluent standards, and rules relating to hazardous waste, bio-medical waste, hazardous chemicals, industrial solid waste, municipal solid waste including plastic waste under the Environment (Protection) Rules, 1986.

ROLE OF MEDIA IN DISASTER MANAGEMENT

According to the United Nations, in 2001 alone, natural disasters of medium to high range caused at least 25,000 deaths around the world more than double the previous year, and economic losses of around US $36 billion. These figures would be much higher, if the consequences of the many smaller and unrecorded disasters that cause significant losses at the local community level were to be taken into account. Devastations in the aftermath of powerful earthquakes that stuck Gujarat, El Salvador and Peru; floods that ravaged many countries in Africa, Asia and elsewhere; droughts that plagued Central Asia including Afghanistan, Africa and Central America; the cyclone in Madagascar and Orissa; and floods in Bolivia are global tragedies in our recent memory. While natural disasters are not new, what is disturbing is the knowledge that the trend of destruction and devastation are on the rise instead of being kept in check. Latest in this list are Katrina, Rita and earth quake which hit Indian sub-continent killing thousands of people.

The Unites Nations declared 1990-2000 as the INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION (IDNRN). Amid term review of IDNRN was carried out in May, 1994. It emphasized an urgent shift in strategy and called for:

Those affected most are the poor and the socially disadvantage in developing countries. They are least equipped to cope with the situation.

· Disaster prevention, mitigation and preparedness are better than disaster response.

· Disaster response alone yields temporary relief at a very high cost.

· Prevention contributes to lasting improvement in safety

Disasters and India

India has been traditionally vulnerable to natural disasters on account of its unique geo climatic conditions. The Himalayan range – covering the north – lie in an active seismic zone while the flood-plains in the north and deccan areas have histories of annual flooding. Consequently, floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year. The loss of private, community and public assets has been equally astronomical.

As elsewhere, in the recent past, there has been a steady increase in the number of natural disasters, and with it, increasing losses on account of urbanisation and population growth. As a

result, the impact of natural disasters is now felt to a very large extent. The recurrence of hazards like flood, draught, storms, landslides, tsunami, earthquake, and epidemics are having long term impact on people. The prime reasons for this is population growth, urbanization, rising poverty and environmental changes like global warming and rise of sea level.

The super cyclone in Orissa during October, 1999 and the Bhuj earthquake in Gujarat during January, 2001 underscored for the first time a need to adopt multi-dimensional approach for risk reduction and developmental strategy. It required the involvement of diverse processes - scientific, engineering, financial and social - in the developmental plans and strategies.

An analysis of major natural disasters in India, puts earthquakes as the number one reason for loss. In 1991, an earthquake of magnitude of 6.6 on the Richter Scale killed 770 people and injured 5000 people. 2093 villages were affected and property of millions was lost. Again in 1993 a earthquake of 6.4 magnitude in Maharashtra killed 9484 people, completely destroying 34313 houses and damaging an additional 16.5 lakhs houses. Once again in 2001 a devastating earthquake at Bhuj (Gujrat) was recorded as 6.9 on Richter Scale. This earthquake killed 1825 people, affecting 3825 villages and destroying 310657 houses.

Over the past couple of years, the Government of India has introduced a paradigm shift in the approach to disaster management. The new approach bases on the conviction that development cannot be sustainable unless disaster mitigation is built into the development process. Another corner stone of the approach is that mitigation has to be multidisciplinary effort spanning across all sectors of development. The new policy also emanates from the belief that investments in mitigation are much more cost effective than expenditure on relief and rehabilitation. Disaster management occupies an important place in this country's policy framework as it is the poor and the under-privileged who are worst affected on account of calamities/disasters.

Constitution of a High Power Committee by Govt of India The High Powered Committee (HPC) constituted for suggestion of institutional reforms and preparation of Disaster Management Plans at the National, State and District levels was set up at the behest of the Hon'ble Prime Minister by the Ministry of Agriculture, under the chairmanship of Shri J.C. Pant, former Secretary to the

Government of India. The high Power Committee in its interim report suggested for Enactment of a Disaster management Act. In this background Disaster Management Act, 2005 was enacted. The main features of the act are:

(i) Establishment of National Disaster Management Authority headed by the Hon'ble Prime Minister.

(ii) Establishment of State and District Disaster Management Authority

(iii) Preparation of National, State & District Disaster Management Plan.

(iv) Guidelines for Minimum Standard of relief.

(v) Central and State Govt. to take measures as it deems necessary for the purpose of Disaster Management.

(vi) Fixing of responsibilities of Ministries and Depts. Central and State Govt.

(vii) Establishment of National Institute of Disaster Management forHuman Resource Development at National level.

(viii) Provision of Punishment and Penalties for non-compliance. Emphasis of High Powered Committee on Role of Media

The High Powered committee in its recommendation clearly mentioned about appropriate publicity management plan/media publicity plan for disaster management. The committee felt that such a plan would be very useful in imparting timely and correct information to the public. The role of media needed to be tapped for disseminating preparedness aspects of disaster management among all section of society and making special provisions for the more vulnerable sections of the community such as women and children. Media should play a responsible role not only in terms of awareness but also in terms of accurate and informed reporting of events. The media could establish dedicated channels during the aftermath of a calamity to provide specific information about the local people and condition. Paradigm shift Towards Prevention And Reduction Till recently, the approach to Disaster Management has been post facto – centered

around relief after the event. A paradigm shift has now taken place at the national level from the relief centric view to holistic and integrated approach with emphasis on prevention, mitigation and preparedness. These efforts are aimed to conserve developmental gains as also minimize losses to lives, livelihood and property.

A typical Disaster Management continuum - as shown below - comprises of six elements - Prevention, Mitigation and Preparedness in pre-disaster phase, and Response, Rehabilitation and Reconstruction in post-disaster phase. Altogether the six elements define the complete approach to Disaster Management. 5Media one of the most powerful mode of Communication

India has a very active print and electronic media .The total number of news paper and periodicals in 2001 was 52980. Radio broadcasting began in the year 1920 today ithas got a network of 208 stations covering more than 90 % of the area and almost reaching the entire population of 100 crores. All India Radio (AIR) broadcasts in 24 languages and 146 dialects. Television transmission began in 1959. It has also grown tremendously with a parallel reach like radio. Today 24 hours news channel is a reality.

Besides Doordarshan there are numbers of channels broadcasting news and entertainment to the people round the clock. Satellite communication has made possible to receive international network through receivers. Another very fast medium of communication is the Internet. Today the Internet is being actively used to disseminate news and views on issues of public interests. Internet provides the cheapest way to link people anywhere on the planet.

Role of Media in Disaster management

Media - print, voice or visual - is an organized means of reaching a large number of people, quickly, effectively and efficiently. The suggestive, informative and analytical role of the media must form a key component of disaster education. It is the most potent way of educating the community on disaster prevention, mitigation and rehabilitation. These tasks can be carried out on the basis of the dual role of media related with imparting information and analyzing disasters discerningly. The effects of disasters need to be examined not only in technical mind scientific terms, but also in humanitarian, social and economic terms. The media can play an important part in this direction (Sahni and Dhameja, 2004).

By media, we generally imply the important channels of mass communication. This includes television, radio, newspapers, magazines, audio and video cassettes as well as movies. The electronic media have during recent times emerged as a major component of disaster management, as amply demonstrated in the aftermath of the Jammu and Kashmir earthquake in 2005. Special emphasis is laid on the role of electronic media and information technology as it is felt that this sector needs to be integrated with not only the disaster response but the overall disaster management strategy.

Role of the print media is also important, as this continues to be the medium of mass media in many parts of the Indian society which are still unreachable by the electronic media. The print media have a major role to play in the pre-disaster prevention, mitigation and preparedness activities through appropriate community awareness generation.

Media need to be proactive in nature rather than reactive. They need to disseminate the right information at the appropriate time. For instance in India, the reach of radio and television to the masses, in providing information is getting organized. However, there is a need to include professionals in these channels to enable easy comprehension and response to the information. For instance, the involvement of professional meteorologists or training of media experts in providing weather-related. Information would definitely make an impact on how meteorological information is presented.

Media can be extremely effective in the following areas:

1. Educational: Before a disaster, educating people about the hazard, prevention and self-help during the disaster. During rehabilitation, media can be extremely helpful in providing, accurate and unbiased coverage, post disaster impacts and needs.

2. Guiding: Guiding people in preparing resource disaster calendar, resource mapping and preparation of community contingency plan.

3. Critical: By critically evaluating the emergency plan and benefit to be transferred to the people. This may include review and improvement of any existing plan.

4. Suggestive: Media can suggest long term suggestions in the form of structured measure like enactment of certain legislation, adoption of code of conduct etc.

Measures to be taken by media in disaster management: Media plays an all round roll in pre disaster, during disaster and post disaster stage. The media not only is powerful, it has an inner reach to the lowermost tier and the top most tier as may be most useful for best Governance and management in the case disaster. However media for such disaster situations needs to be institutionalized and made purposeful, accurate, efficient and effective.

AREA WHERE MEDIA CAN PLAY EFFECTIVE ROLE IN DISASTER MANAGEMENT

Early warning to the people: The preparedness of the community before the disaster, relief work during the disaster and the rehabilitation after the disaster are all equally important. The role of media in all the three situations are very crucial in today's world. The early information by electronic media like television and radio about the likely disasters can save many human being and livestock. The loss to property can also be minimized to considerable extent. The media can create awareness among community about various types of disasters. It can also play a role in preparing the community by training them and making them aware about do's and don'ts during disasters.

Watch dog On the disaster machinery: The response time of the relief machinery is generally very late after any disaster. The rehabilitation work after the catastrophe is normally not carried out expeditiously. The media can play the role of a watch dog especially after the disaster when rehabilitation work is going on. The pressure of media in a democratic set up is tremendous and it should be used in a responsible and constructive manner for the benefit of the society. Resources such as search and rescue team equipment, relief material and money are essentially required during disaster and subsequent rehabilitation. The responsibility lies with the Govt. to

make available all the resources but some time the system is little lethargic and respond little late. In those circumstances media can play a vital role by being a watch dog and keeping the disaster machinery active.

In making appeal to the people: The depiction of devastation and of human misery through the media acts as an appeal to the people to come forward to render help in various ways. Generally media has a responsive image in the public eye and this image can be utilized effectively to generate resources to help disaster management efforts. In preventing rumour and panic management: During a disaster, with the breakdown of communications, rumour can have debilitating effect on the relief work. During this time, media can play a role of monitoring such rumours by relaying correct information about the measures being taken and monitoring them. In addition the media can also help by providing an early warning to the people likely to be affected, or about the Do's and Don'ts during a disaster. Media can also help in establishing contacts, identifying the needy spots and focusing attention on them. In addition, media can help

by assisting the authorities, voluntary organizations and volunteers in reaching informing and assuring the affected ones of the assistance and measures taken for their relief. In controlling law and order situation: media can keep a watch on antisocial elements who try to take advantage of such situations. They can report such matter and highlight such situations. They can also assist the law and order machinery in restoring peace and harmony in the affected community.

In Resource mobilization: Media had played very effective role in raising resources for disaster victims in the past. The role of media during Tsunami disaster, Bhuj earthquake where they not only raised crore of rupees but also truck loads of relief materials - clothes food and medicine - was commendable. They were able to convince people for larger participation by highlighting the contributions, providing tax-reliefs and quick and efficient mechanisms of donations.

As replacement of established communication network: In India a large part of communication network is land-based: telephone and telegraphy. During a disaster this network is severely affected. District administration who need to contact different agencies like Indian Air Force, Indian Navy, Army, Govt. officials and other departments for organization of relief have to rely upon the network available with the media. The district administration take the support of media in making various announcements , releasing the list of casualty, lost people, do's and don't of the disaster etc. Since media's network works on wireless mode, hence it is very effective and useful for the district administration.

Caution and Restrain necessary for media people. The media should be very careful during reporting of disasters. It should not create excitement and an atmosphere which lead to panic especially in today's time when there is cut-throat competition between various television channels and news papers. It is desired that a balance approach is taken to report a situation. The people should be provided true and correct picture of disaster, its impact, the relief arrangements

and coping mechanisms. They should avoid issuing warning signal unless it has been issued by the govt . Self generated code of conduct for media

1. Impartial

2. Sensitive to social norms and values

3. Not to infringe upon privacy of individuals and families.8

4. Avoiding provocation of one group against another.

5. Journalists covering disaster should have basic knowledge and training on disaster management.

6. Make available greater space and broadcasts related to disaster aspects in the form of brief spots, interviews and full-length features.

Great Expectations from media by the people during disaster People who are affected by a disaster as well as the relief providers expect widespread support from the media. They expect the media to play a constructive role by being 'partners' instead of critics. They should give correct assessment of the situation and refrain from providing subjective interpretations leading to modify and exaggerate the news.

Special training for media person for coverage of disasters:

Media persons who are assigned the job of covering a disaster must be trained about the sensitivity of such coverage .They should be fully aware about nature and type of disaster so that they are able to cover in an educative and informative manner. Media people must be trained not to expose themselves to the risks involved in covering a disaster. They should be taught how to be friendly and be part of the system in helping people in distress. Large-scale death and devastation can have unsettling effect on the reporter as well as the viewers. They should be trained how to over come from trauma and distress of such situation. Media people are also expected to be sympathetic to the people, who under shock and pain because of the disaster and not to use them as a 'showpiece'.

Some Success Stories of Media

In the aftermath of Tsunami, there were instances of rumour of yet another Tsunami hitting the coastal belts of Andhra Pradesh. This had put considerable fear on the relief and rehabilitation work in the area as instead of responding to aid, the affected people ran for safety. To control the

panic situation district administration had to make tremendous effort and was only successful when they took the support of media people.

Media was responsible in exposing the flood scam of Bihar in which crore of rupees was siphoned off by the contractors and corrupt officials of the state. Media has got many such success stories to their credit. In view the importance of the role of media, the Press Council of India organized a National Seminar on "Role of Media in Disaster Management" on Nov 16, 2000. The

objective was to highlight the proactive role of media in preparing people to cope with disasters. It is necessary that such steps taken by Press Council of India are further propagated at state and district levels to educate and strengthen all stakeholders of disaster management.

Environmental ethics

Environmental ethics is the part of environmental philosophy which considers extending the traditional boundaries of ethics from solely including humans to including the non-human world. It exerts influence on a large range of disciplines including environmental law, environmental sociology, Eco theology, ecological economics, ecology and environmental geography.

There are many ethical decisions that human beings make with respect to the environment. For example:

Should we continue to clear cut forests for the sake of human consumption?

Why should we continue to propagate our species, and life itself?

Should we continue to make gasoline powered vehicles?

What environmental obligations do we need to keep for future generations?

Is it right for humans to knowingly cause the extinction of a species for the convenience of humanity?

How should we best use and conserve the space environment to secure and expand life?

The academic field of environmental ethics grew up in response to the work of scientists such as Rachel Carson and events such as the first Earth Day in 1970, when environmentalists started urging philosophers to consider the philosophical aspects of environmental problems. Two papers published in Science had a crucial impact: Lynn White's "The Historical Roots of our Ecologic Crisis" (March 1967)[5] and Garrett Hardin's "The Tragedy of the Commons" (December 1968).[6] Also influential was Garett Hardin's later essay called "Exploring New

Ethics for Survival", as well as an essay by Aldo Leopold in his A Sand County Almanac, called "The Land Ethic," in which Leopold explicitly claimed that the roots of the ecological crisis were philosophical (1949).[7]

The first international academic journals in this field emerged from North America in the late 1970s and early 1980s – the US-based journal Environmental Ethics in 1979 and the Canadian based journal The Trumpeter: Journal of Ecosophy in 1983. The first British based journal of this kind, Environmental Values, was launched in 1992.

The Wildlife Protection Act, 1972 is an Indian legislation enacted by the Parliament of India for protection of plants and animal species. Before 1972, India only had five designated national parks. Among other reforms, the Act established schedules of protected plant and animal species; hunting or harvesting these species was largely outlawed.

The Act provides for the protection of wild animals, birds and plants; and for matters connected therewith or ancillary or incidental thereto. It extends to the whole of India, except the State of Jammu and Kashmir which has its own wildlife act. It has six schedules which give varying degrees of protection. Schedule I and part II of Schedule II provide absolute protection - offences under these are prescribed the highest penalties. Species listed in Schedule III and Schedule IV are also protected, but the penalties are much lower. Schedule V includes the animals which may be hunted. The plants in Schedule VI are prohibited from cultivation and planting. The hunting to the Enforcement authorities have the power to compound offences under this Schedule (i.e. they impose fines on the offenders). Up to April 2010 there have been 16 convictions under this act relating to the death of tigers.

THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981
No. 14 of 1981

[29th March, 1981]

An Act to provide for the prevention, control and abatement of air pollution, for the establishment, with a view to carrying out the aforesaid purposes, of Boards, for conferring on and assigning to such Boards powers and functions relating thereto and for matters connected therewith.

WHEREAS decisions were taken at the United Nations Conference on the Hum an Environment held in Stockholm in June, 1972, in which India participated, to take appropriate steps for the preservation of the natural resources of the earth which, among other things, include the preservation of the quality of air and control of air pollution;

AND WHEREAS it is considered necessary to implement the decisions aforesaid in so far as they relate to the preservation of the quality of air and control of air pollution;

BE it enacted by Parliament in the Thirty-second Year of the Republic of India as follows:-

PRELIMINARY

1. Short title, extent and commencement.

(1) This Act may be called the Air (Prevention and Control of Pollution) Act, 1981.

(2) It extends to the whole of India.

(3) It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint.

2. Definitions.

In this Act, unless the context otherwise requires,-

(a) "air pollutant" means any solid, liquid or gaseous substance [2][(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment;

(b) "air pollution" means the presence in the atmosphere of any air

(c) "approved appliances" means any equipment or gadget used for the bringing of any combustible material or for generating or consuming any fume, gas of particulate matter and approved by the State Board for the purpose of this Act;

(d) "approved fuel" means any fuel approved by the State Board for the purposes of this Act;

(e) "automobile" means any vehicle powered either by internal combustion engine or by any method of generating power to drive such vehicle by burning fuel;

(f) "Board" means the Central Board or State Board;

(g) "Central Board- means the [3][Central Board for the Prevention and Control of Water Pollution] constituted under section 3 of the Water (Prevention and Control of Pollution) Act, 1974;

(h) "chimney" includes any structure with an opening or outlet from or through which any air pollutant may be emitted,

(i) "control equipment" means any apparatus, device, equipment or system to control the quality and manner of emission of any air pollutant and includes any device used for securing the efficient operation of any industrial plant;

(j) "emission" means any solid or liquid or gaseous substance coming out of any chimney, duct or flue or any other outlet;

(k) "industrial plant" means any plant used for any industrial or trade purposes and emitting any air pollutant into the atmosphere;

(l) "member" means a member of the Central Board or a State Board, as the case may be, and includes the Chairman thereof,

(m) "occupier", in relation to any factory or premises, means the person who has control over the affairs of the factory or the premises, and includes, in relation to any substance, the person in posse ssion of the substance;]

(n) "prescribed" means prescribed by rules made under this Act by the Central Government or as the case may be, the State government;

(o) "State Board" means,-

(i) in relation to a State in which the Water (Prevention and Control of Pollution) Act, 1974, is in force and the State Government has constituted for that State a [5][State Board for the Prevention and Control of Water Pollution] under section 4 of that Act, the said State Board; and

(ii) in relation to any other State, the State Board for the Prevention and Control of Air Pollution constituted by the State Government under section 5 of this Act.

CENTRAL AND STATE BOARDS FOR THE PREVENTION AND CONTROL OF AIR POLLUTION

The Central Board for the Prevention and Control of Water Pollution constituted under section 3 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), shall, without prejudice to the exercise and performance of its powers and functions under this Act, exercise the powers and perform the functions of the Central Board for the Prevention and Control of Air Pollution under this Act.

State Boards for the Prevention and Control of Water Pollution to be, State Boards for the Prevention and Control of Air Pollution.

In any State in which the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), is in force and the State Government has constituted for that State a State Board for the Prevention and Control of Water Pollution under section 4 of that Act, such State Board shall be deemed to be the State Board for the Prevention and Control of air Pollution constituted under section 5 of this Act and accordingly that State Board for the Prevention and Control of Water Pollution shall, without prejudice to the exercise and performance of its powers and functions under that Act, exercise the powers and perform the functions of the State Board for the Prevention and Control of Air Pollution under this Act.]

Constitution of State Boards.

(1) In any State in which the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), is not in force, or that Act is in force but the State Government has not constituted a 8[State Board for the Prevention and Control of Water Pollution] under that Act, the State Government shall, with effect from such date as it may, by notification in the Official Gazette, appoint, constitute a State Board for the Prevention and Control of Air Pollution under such name as may be specified in the notification, to exercise the powers conferred on, and perform the functions assigned to, that Board under this Act.

(2) A State Board constituted under this Act shall consist of the following members, namely:-

(a) a Chairman, being a person, having a person having special knowledge or practical experience in respect of matters relating to environmental protection, to be nominated by the State Government:

Provided that the Chairman may be either whole-time or part-time as the State Government may think fit;

(b) such number of officials, not exceeding five, as the State Government may think fit, to be nominated by the State Government to represent that government;

(c) such number of persons, not exceeding five, as the State Government may think fit, to be nominated by the State Government from amongst the members of the local authorities functioning within the State;

(d) such number of non-officials, not exceeding three, as the State Government may think fit, to be nominated by the State Government to represent the interest of agriculture, fishery or industry or trade or labour or any other interest, which in the opinion of that government, ought to be represented;

(e) two persons to represent the companies or corporations owned, controlled or managed by the State Government, to be nominated by that Government;

9[(f) a full-time member-secretary having such qualifications knowledge and experience of scientific, engineering or management aspects of pollution control as may be prescribed, to be appointed by the State Governments

Provided that the State Government shall ensure that not less than two of the members are persons having special knowledge or practical experience in, respect of matters relating to the improvement of the quality of air or the prevention, control or abatement of air pollution.

(3) Every State Board constituted under this Act shall be a body corporate with the name specified by the State Government in the notification issued under sub-section (1), having perpetual succession and a common seal with power, subject to the provisions of this Act, to acquire and dispose of property and to contract, and may by the said name sue or be sued.

Central Board to exercise the powers and perform die functions of a State Board in the Union territories.

No State Board shall be constituted for a Union territory and in relation to -a Union territory, the Central Board shall exercise the powers and perform the functions of a State Board under this Act for that Union territory

Provided that in relation to any Union territory the Central Board may delegate all or any of its powers and functions under this section to such person or body of persons as the Central Government may specify.

Terms and conditions of service of members.

(1) Save as otherwise provided by or under this Act, a member of a State Board constituted under this Act, other than the member-secretary, shall hold office for a term of three years from the date on which his nomination is notified in the Official Gazette:

Provided that a member shall, notwithstanding the expiration of his term, continue to hold office until his successor enters upon his office.

(2) The terms of office of a member of a State Board constituted under this Act and nominated under clause (b) or clause (e) of sub-section (2) of section 5 shall come to an end as soon as he ceases to hold the office under the State Government as the case may be, the company or corporation owned, controlled or managed by the State Government, by virtue of which he was nominated.

(3) A member of a State Board constituted under this Act, other than the member- secretary, may at any time resign his office by writing under his hand addressed,-

(a) in the case of the Chairman, to the State Government; and

(b) in any other case, to the Chairman of the State Board, and the seat of be Chairman or such other member shall thereupon become vacant.

(4) A member of a State Board constituted under this Act, other than the member-secretary, shall be deemed to have vacated his scat, if he is absent without reason, sufficient in the opinion of the State Board, from three consecutive meetings of the State Board or where he is nominated under clause (c) of subsection (2) of section 5, he ceases to be a member of the local authority and such vacation of scat shall, in either case, take effect from such as the State Government may, by notification in the Official Gazette, specify.

(5) A casual vacancy in a State Board constituted under this Act shall be filled by a fresh nomination and the person nominated to fill the vacancy shall hold office only for the remainder of die term for which the member whose place lie takes was nominated.

(6) A member of a State Board constituted under this Act shall be eligible for re-nomination 10.

(7) The other terms and conditions of service of the Chairman and other members (except the member-secretary) of a State Board constituted under this Act shall be such as may be prescribed.

8. Disqualifications.

(1) No person shall be a member of a State Board constituted under this

(a) is, or at any time has been, adjudged insolvent, or

(b) is of unsound mind and has been so declared by a competent court,

(c) is, or has been, convicted of an offence which, in the opinion of the State Government, involves moral turpitude, or

(d) is, or at any time has been, convicted of an offence under this Act,

(e) has directly or indirectly by himself on by any partner.. any share or interest in any Finn or company carrying on the business of manufacture, sale, or hire of machinery, industrial plant, c6ntrol equipment or any other apparatus for the improvement of the quality of air or for the prevention, control or abatement of air pollution, or

(f) is a director or a secretary, manager or other salaried officer or employee of any company or firm having any contract with the Board, or with the Government constituting the Board or with a local authority in the State, or with a company or corporation owned, controlled or managed by the Government, for the carrying out of programmes for the improvement of the quality of air or for the prevention, control or abatement of air pollution, or

(g) has so abused, in the opinion Of the State Government, his position as a member, as to render his continuance on the State Board detrimental to the interest of the general public.

(2) The State Government shall, by order in writing, remove any member who is, or has become, subject to any disqualification mentioned in sub-section M.

Provided that no order of removal shall be made by the State Government under this section unless the member concerned has been given a reasonable opportunity of showing cause against the same.

(3) Notwithstanding anything contained in sub-section (1) or sub-section (6) of section 7, a member who has been removed under this section shall not be eligible to continue to hold office until his successor enters upon his office, or, as the case may be, for re-nomination as a member.

9. Vacation of seats by members.

If a member of a State Board constituted under this Act becomes subject to any of the disqualifications specified in section 8, his seat shall become vacant.

10. Meetings-of Board.

(1) For the purposes of this Act, a Board shall meet at least once in every three months and shall observe such rules of procedure in regard to the transaction of business at its meetings as may be prescribed:

Provided that it, in the opinion of the Chairman, any business of an urgent nature is to be transacted, he may convene a meeting of the Board at such time as he thinks fit for the aforesaid purpose.

(2) Copies of minutes of the meetings under sub-section (1) shall be forwarded to the Central Board and to the State Government concerned.

11. Constitution -of committees.

(1) A Board may constitute as many committees consisting wholly of members or partly of members and partly of other persons and for such purpose or purposes as it may think fit.

(2) A committee constituted under this section shall meet at such time and at such place, and shall observe such rules of procedure in regard to the transaction of business at its meetings, as may be prescribed.

(3) The members of a committee other than the members of the Board shall be paid such fees and allowances, for attending its meetings and for attending to any other work of the Board as may be prescribed.

12. Temporary association of persons with Board for particular purposes.

(1) A Board may associate with itself in such manner, and for such purposes, as may be prescribed, any person whose assistance or advice it may desire to obtain in performing any of its functions under this Act.

(2) A person associated with the Board under sub-section (1) for any purpose shall have a right to take part in the discussions of the Board relevant to that purpose, but shall riot have a tight to vote at a meetings of the Board and shall not be a member of the Board for any other purpose.

(3) A person associated with a Board under sub-section (1) shall be entitled to receive such fees and allowances as may be prescribed.

13. Vacancy in Board not to invalidate acts or proceedings.

No act or proceeding of a Board or any committee thereof shall be called in question on the ground merely of the existence of any vacancy in or any defect in the constitution of, the Board or such committee, as the case may be.

14. Member-secretary and officers and other employees of State Boards.

(1) The terms and conditions of service of the member-secretary of a State Board constituted under this Act shall be such as may be prescribed.

(2) The member-secretary of a State Board, whether constituted under this Act or not, shall exercise such powers and perform such duties as may be prescribed or as may, from time to time, be delegated to him by the State Board or its Chairman.]

(3) subject to such rules as may be made by the State Government in this behalf, a State Board, whether constituted under this Act or not, may appoint such officers and other employees as it considers necessary for the efficient performance of its functions under this Act.

(4) The method of appointment, the conditions of service and the scale of pay of the officers (other than the member-secretary) and other employees of a State Board appointed under sub-section (3) shall be such as may be determined by regulations made by the State Board under this Act.

(5) Subject to such conditions as may be prescribed, a State Board constituted under this Act may from time to time appoint any qualified person to be a consultant to the Board and pay him such salary and allowances or fees, as it thinks fit.

Delegation of powers

A State Board may, by general or special order, delegate to t1he Chairman or the member-secretary or any other officer of the Board subject to such conditions and limitations, if any. as may be specified in the order, such of its powers and functions under this Act as It may deem necessary.

POWERS AND FUNCTIONS OF BOARDS

Functions of Central Board.

(1) Subject to the provisions of this Act, and without prejudice to the performance, of its functions under the Water (Prevention and Control of Pollution) Act, IL974 (6 of 1974), the main functions of the Central Board shall be to improve the quality of air and to prevent, control or abate air pollution in the country.

(2) In particular and without prejudice to the generality of the foregoing functions, the Central Board may-

(a) advise the Central Government on any matter concerning the improvement of the quality of air and the prevention, control or abatement of air pollution;

(b) plan and cause to be executed a nation-wide programme for the prevention, control or abatement of air pollution;

(c) co-ordinate the activities of the State and resolve disputes among them;

(d) provide technical assistance and guidance to the State Boards, carry out and sponsor investigations and research relating to problems of air pollution and prevention, control or abatement of air pollution;

(e) plan and organise the training of persons engaged or to be engaged in programmes for the prevention, control or abatement of air pollution on such terms and conditions as the Central Board may specify;

(f) organise through mass media a comprehensive programme regarding the prevention, control or abatement of air pollution;

(g) collect, compile and publish technical and statistical data relating to air pollution and the measures devised for its effective prevention, control or abatement and prepare manuals, codes or guides relating to prevention, control or abatement of air pollution;

(h) lay down standards for the quality of air.,

(i) collect and disseminate information in respect of matters relating to air pollution;

(j) perform such other functions as may be prescribed.

(3) The Central Board may establish or recognise a laboratory or laboratories to enable the Central Board to perform its functions under this section efficiently.

(4) The Central Board may-

(a) delegate any of its functions under this Act generally or specially to any of the committees appointed by it;

(b) do such other things and perform such other acts as it may think necessary for the proper discharge of its functions and generally for the purpose of carrying into effect the purposes Of this Act.

Functions of State Boards.

(1) subject to the provisions of this Act, and without prejudice to the performance of its functions, if any, under the Water (Prevention and Control of Pollution) Act, 1974 (Act 6 of 1974), the functions of a State Board shall be-

(a) to plan a comprehensive programme for the prevention, control or abatement of air pollution and to secure the execution thereof-,

(b) to advise the State Government on any matter concerning the prevention, control or abatement of air pollution;

(c) to collect and disseminate information relating to air pollution;

(d) to collaborate with the Central Board in organising the training of persons engaged or to be engaged in programmes relating to prevention, control or abatement of air pollution and to organise mass-education programme relating thereto;

(e) to inspect, at all reasonable times, any control equipment, industrial plant or manufacturing process and to give, by order, such directions to such persons as it may consider necessary to take steps for the prevention, control or abatement of air pollution;

(f) to inspect air pollution control areas at such intervals as it may think necessary, assess the quality of air therein and take steps for the prevention, control or abatement of air pollution in such areas;

(g) to lay down, in consultation with the Central Board and having regard to the standards for the quality of air laid down by the Central Board, standards for emission of air pollutants into the atmosphere from industrial plants and automobiles or for the discharge of any air pollutant into the atmosphere from any other source whatsoever not being a ship or an aircraft:

Provided that different standards for emission may be laid down under this clause for different industrial plants having regard to the quantity and composition of emission of air pollutants into the atmosphere from such industrial plants;

(h) to advise the State Government with respect to the suitability of any premises or location for carrying on any industry which is likely to cause air pollution;

(i) to Perform such other functions as may be prescribed or as may, from time to time, be entrusted to it by the Central Board or the State Government;

(j) to do such other things and to perform such other acts as it may think necessary for the proper discharge of its functions and generally for the purpose of carrying into effect the purposes of this Act.

(2) A State Board may establish or recognise a laboratory or laboratories to enable the State Board to perform its functions under this section efficiently.

Power to give directions.

(1) In the performance of its functions under this Act-

(a) the Central Board shall be bound by such directions in writing as the Central Government may give to it; and

(b) every State Board shall be bound by such directions in writing as the Central Board or the State Government may give to it:

Provided that where a direction given by the State Government is inconsistent with the direction given by the Central Board, the matter shall be referred to the Central Government for its decision.

(2) Where the Central Government is of the opinion that any State Board has defaulted in complying with any directions given by the Central Board under sub-section (1) and as a result of such default a grave emergency has arisen and it is necessary or expedient so to do in the

public interest, it m4y, by order, direct the Central Board to perform any of the functions of the State Board in relation to such area, for such period and for such purposes, as may be specified in the order.

(3) Where the Central Board performs any of the functions of the State Board in pursuance of a direction under sub-section (2), the expenses, if any incurred by the Central Board with respect to the performance of such functions may, if the State Board is empowered to recover such expenses, be recovered by the Central Board with interest (at such reasonable rate as the Central Government may, by order, fix) from the date when a demand for such expenses is made until it is paid from the person or persons concerned as arrears of land revenue or of public demand.

(4) For the removal of doubts, it is hereby declared that any directions to perform the functions of any State Board given under sub-section (2) in respect of any area would not preclude the State Board from performing such functions in any other area in the State or any of its other functions'in that area.]

PREVENTION AND CONTROL OF AIR POLLUTION

Power to declare air pollution control areas,

(1) The State Government may, after consultation with the State Board, by notification in the Official Gazette declare in such manner as may be prescribed, any area or areas within the State as air pollution control area or areas for the purposes of this Act.

(2) The State government may, after consultation with the State Board, by notification in the Official Gazette,-

(a) alter any air pollution control area whether by way of extension or reduction ;

(b) declare a new air pollution control area in which may be merged one or more existing air pollution control areas or any part or parts thereof.

(3) If the State Government, after consultation with the State Board, is of opinion that

the use of any fuel, other than an approved fuel, in any air pollution control area or part thereof, may cause or is likely to cause air pollution, it may, by notification in the Official Gazette, prohibit the use of such fuel in such area or part thereof with effect from such date (being not less than three months from the date of publication of the notification) as may be specified in the notification.

(4) The State Government may, after consultation with the Sate Board, by notification in the Official Gazette, direct that with effect fr6m such date as may be specified therein, no appliance, other than an approved appliance, shall be used in the premises situated in an air pollution control area :

Provided that different dates may be specified for different parts of an air pollution control area or for the use of different appliances.

(5) If the State Government, after consultation with the State Board, is of opinion that the burning of any material (not being fuel) in any air pollution control area or part thereof may cause or is likely to cause air pollution, it may, by notification in the Official Gazette, prohibit the burning of such material in such area or part thereof.

Power to give instructions for ensuring standards for emission from automobiles.

With a view to ensuring that the standards for emission of air pollutants from automobiles laid down by the State Board tinder clause (g) of sub-section (1) of section 17 are complied with, the State Government shall, in consultation with the State Board, give such instructions as may be deemed necessary to the concerned authority in charge of registration of motor vehicles under the Motor Vehicles Act, 1939 (Act 4 of 1939), and such authority shall, notwithstanding anything contained in that Act or the rules made thereunder be bound to comply with such instructions.

Restrictions on use of certain industrial plants.

(1)Subject to the provisions of this section, no person shall, without the previous consent of the State Board, establish or operate any industrial plant in an air pollution control area :

Provided that a person operating any industrial plant in any air pollution control area, immediately before the commencement of section 9 of the Air (Prevention and Control of Pollution) Amendment Act, 1987, for which no consent was necessary prior to such commencement, may continue to do so for a period of three months from such commencement or, if he has made an application for such consent within the said period of three months, till the disposal of such application.]

(2) An application for consent of the State Board under sub-section (1) shall be accompanied by such fees as may bc prescribed 'and shall be made in the prescribed form and shall contain the particulars of the industrial plant and such other particulars as may be prescribed :

Provided that where any person, immediately before the declaration of any area as an air pollution control area, operates in such area any industrial plant, 16*** such person shall make the application under this sub-section within such period (being not less than three months from the date of such declaration) as may be prescribed and where such person makes such application, he shall be deemed to be operating such industrial plant with the consent of the State Board until the consent applied for has been refused,

(3) The State Board may make such inquiry as it may deem fit in respect of the application for consent referred to in sub-section (1) and in making any such inquiry, shall follow such procedure as may be prescribed.

(4) Within a period of four months after the receipt of the application for consent referred to in sub-section (1), the State Board shall, by order in writing, [and for reasons to be recorded in the order, grant the consent applied for subject to such conditions and for such period as may be specified in the order, or refuse consent:]

18[Provided that it shall be open to the State Board to cancel such consent before the expiry of the period for which it is granted or refuse further consent after such expiry if the conditions subject to which such consent has been granted are not fulfilled:

Provided further that before cancelling a consent or refusing a further consent under the first provision, a reasonable opportunity of being heard shall be given to the person concerned.

(5) Every person to whom consent has been granted by the State Board under sub-section (4), shall comply with the following conditions, namely -

(i) the control equipment of such specifications as the State Board may approve in this behalf shall be installed and operated in the premises where the industry is carried on or proposed to be carried on;

(ii) the existing control equipment, if any, shall be altered or replaced in accordance with the directions of the State Board;

(iii) the control equipment referred to in clause (i) or clause (ii) shall be kept at all times in good running condition;

(iv) chimney, wherever necessary, of such specifications as the State Board may approve in this behalf shall be erected or re-erected in such premises; .and

(v) such other conditions as the State Board, may specify in this behalf,

(vi) the conditions referred to in clauses (i), (ii) and (iv) shall be complied with within such period as the State Board may specify in this behalf-

Provided that in the case of a person operating any industrial plant 19*** in an air pollution control area immediately before the date of declaration of such area as an air pollution control area, the period so specified shall not be less than six months :

Provided further that-

(a) after the installation of any control equipment in accordance with the specifications under clause (i), or

(b) after the alteration or replacement of any control equipment in accordance with the directions of the State Board under clause (ii), or

(c) after the erection or re-erection of any chimney under clause (iv), no control equipment or chimney shall be altered or replaced or, as the case may be, erected or re-created except with the previous approval of the State Board.

(6) If due to any technological improvement or otherwise the State Board is of opinion that all or any of the conditions referred to in sub-section (5) require or requires variation (including the change of any control equipment, either in whole or in part), the State Board shall, after giving the person to whom consent has been granted an opportunity of being heard, vary all or any of such conditions and thereupon such person shall be bound to comply with the conditions as so varied.

(7) Where a person to whom consent has been granted by the State Board under sub-section (4) transfers his interest in the industry to any other person, such consent shall be deemed to have been granted to such other person and he shall be bound to comply with all the conditions subject to which it was granted as if the consent was granted to him originally.

22. Persons carrying on industry, etc., and to allow emission of air pollutants in excess of the standard laid down by State Board.

No person operating any industrial plant, in any air pollution control area shall discharge or cause or permit to be discharged the emission of any air pollutant in excess of the standards laid down by the State Board under clause (g) of sub-section (1) of section 17.

Power of Board to make application to court for restraining person from causing air pollution.

(1) Where it is apprehended by a Board that emission of any air pollutant, in excess of the standards laid down by the State Board under clause (g) of sub-section (1) of section 17, is likely to occur by reason of any person operating an industrial plant or otherwise in any air pollution control area, the Board may make an application to a court, not inferior to that of a Metropolitan Magistrate or a Judicial Magistrate of the first class for restraining such person from emitting such air pollutant.

(2) On receipt of the application under sub-section (1), the court may make such order as it deems fit.

(3) Where under sub-section (2), the court makes an order restraining any person from discharging or causing or permitting to be discharged the emission of any air pollutant, it may, in that order,-

(a) direct such person to desist from taking such action as is likely to cause emission;

(b) authorise the Board, if the direction under clause (a) is no , t complied with by the person to whom such direction is issued, to implement the direction in such manner as may be specified by the court.

(4) All expenses incurred by the Board in implementing the directions of the court under clause (b) of sub-section (3) shall be recoverable from the person concerned as an-ears of land revenue or of public demand.

23. Furnishing, of information to State Board and other agencies in certain cases.

(1) Where in any area the emission of any air pollutant into the atmosphere in excess of the standards laid down by the State Board occurs or is apprehended to occur due to accident or other unforeseen act or event, the person in charge of the premises from where which emission occurs or is apprehended to occur shall forthwith intimate the fact of such occurrence or the apprehension of such occurrence to the State Board and to such authorities or agencies as may be prescribed.

(2) On receipt of information with respect to the fact or the apprehension of any occurrence of the nature referred to in sub-section (1), whether through intimation under that sub-section or otherwise, the State Board and the authorities or agencies shall, as early as practicable, cause such remedial measure to be I taken as are necessary to mitigate the emission of such air pollutants.

(3) Expenses, if any, incurred by the State Board, authority or agency with respect to the remedial measures referred to in sub-section (2) together with interest ("t such reasonable rate, as the State Government may, by order, fix) from the date when a demand for the expenses is made until it is paid, may be recovered by that Board, authority or agency from the person concerned, as arrears of land revenue, or of public demand.

Power of entry and inspection.

(1) Subject to the provisions of this section, any person empowered by a State Board in this behalf shall have a right to enter, at all reasonable times with such assistance as he considers necessary, any place---

(a) for the purpose of performing any of the functions of the State Board entrusted to him:

(b) for the purpose of determining whether and if so in what manner, any such functions are to be performed or whether any provisions of this Act or the rules made there under or any notice, order, direction or authorisation served, made, given or granted under this Act is being or has been complied with;

(c) for the purpose of examining and testing any control equipment, industrial plant, record, register, document or any other material object or for conducting a search of any place in which he has reason to believe that an offence under this Act or the rules made has been or is being or is about to be committed and for seizing any such control equipment, industrial plant, record, register, document or other material object if he has reasons to believe that it may furnish evidence of the commission of an offence punishable under this Act or the rules made there under.

(2) Every person operating any control equipment or any industrial plant, in an air pollution control area shall be bound to render all assistance to the person empowered by the State Board under sub-section (1) for carrying out the functions under that sub-section and if he fails to do so without any reasonable cause or excuse, he shall be guilty of an offence under this Act.

(3) If any person willfully delays or obstructs any person empowered by the State Board under sub-section (1) in the discharge of his duties, he shall be guilty of an offence under this Act.

(4) The provisions of the Code of Criminal Procedure, 1973, or, in relation to the State of Jammu and Kashmir, or any area, in which that Code is not in force, the provisions of any corresponding law in force in that State or area, shall, so far as may be, apply to any search or seizure under this section as they apply to any search or seizure made under the authority of a warrant issued under section 94 of the said Code or, as the case may be, under the corresponding provisions of the said law.

Power to obtain information.

For the purposes of carrying out the functions entrusted to it, the State Board or any officer empowered by it in Ns behalf may call for any information (including information regarding the types of air pollutants emitted into the atmosphere and the level of the emission of such air pollutants) from the occupier or any other person carrying oil any industry or operating any control equipment or industrial plant and for the purpose of verifying the correctness of such information, the State Board or such officer shall have the right to inspect the premises where such industry, control equipment or industrial plant is being carried on or operated.

Power to take samples of air or emission and procedure to be followed in connection therewith.

(1) A State Board or any officer empowered by it in this behalf shall have power to take, for the purpose of analysis, samples of air or emission from any chimney, flue or duct or any other outlet in such manner as may be prescribed.

(2) The result of any analysis of a sample of emission taken under subsection (1) shall not be admissible in evidence in any legal proceeding unless the provisions of sub-sections (3) and (4) are complied with.

(3) Subject to the provisions of sub-section (4), when a sample of emission is taken for analysis under sub-section (1), the person taking the sample shall-

(a) serve on the occupier or his agent, a notice, then and there, in such form as may be prescribed, of his intention to have it so analysed;

(b) in the presence of the occupier or his agent, collect a sample of emission for analysis;

(c) cause the sample to be placed in a container or containers which shall be marked and sealed and shall also be signed both by the person taking the sample and the occupier or his agent;

(d) send, without delay, the container to the laboratory established or recognised by the State Board under section 17 or, if a request in that behalf is made by the occupier or his agent when the notice is served on him under clause (a), to the laboratory established or specified under sub-section (1) of section 28.

(4) When a sample of emission is taken for analysis under sub-section (1) and the person taking the sample serves on the occupier or his agent, a notice under clause (a) of sub-section (3), then,-

(a) in a case where the occupier or his agent willfully absents himself, the person taking the sample shall collect the sample of emission for analysis to be placed in a container or containers which shall be marked and sealed and shall also be signed by the person taking the sample, and

(b) in a case where the occupier or his agent is present at the time of taking the sample but refuses to sign the marked and scaled container or containers of the sample of emission as required under clause (c) of subsection (3), the marked and sealed container or containers shall be signed by the person taking the sample,

and the container or containers shall be sent without delay by the person 'Caking the sample for analysis to the laboratory established or specified under sub-section (7) of section 28 and such person shall inform the Government analyst appointed under sub-section (1) of section 29, in writing, about the wilfull absence of the occupier or his agent, or, as the case may be, his refusal to sing the container or containers.

Reports of the result of analysis on samples taken under section 26.

(1) Where a sample of emission has been sent for analysis to the laboratory established or recognised by the State Board, the Board analyst appointed under sub-section (2) of section 29 shall analyse the sample and submit a report in the prescribed form of such analysis in triplicate to the State Board.

(2) On receipt of the report under sub-section (1), one copy of the report shall be sent by the State Board to the occupier or his agent referred to in section 26, another copy shall be preserved for production before the court in case any legal proceedings are taken against him and the other copy shall be kept by the State Board.

(3) Where a sample has been sent for analysis under clause (a~ of sub-section (3) or sub-section (4) of section 26 to any laboratory mentioned therein, the Government analyst referred to in the said sub-section (4) shall analyse the sample and submit a report in the prescribed form of the result of the analysis in triplicate to the State Board which shall comply with the provisions of sub-section (2).

(4) Any cost incurred in getting any sample analysed at the request of the occupier or his agent as provided in clause (d) of sub-section (3) of section 26 or when he wilfully absents himself or refuses to sing the marked and scaled container or containers of sample of emission under sub-section (4) of that section, shall be payable by such occupier or his agent and in case of default the same shall be recoverable from him as arrears of land revenue or of public demand.

State Air Laboratory.

(1) The State Government may, by notification in the Official Gazette,-

(a) establish one or more State Air Laboratories; or

(b) specify one or more laboratories or institutes as State Air Laboratories to carry out the functions entrusted to the State Air Laboratory under this Act.

(2) The State Government may, after consultation with the State Board, make rules prescribing-

(a) the functions of the State Air Laboratory;

(b) the procedure for the submission to the said Laboratory of samples of air or emission for analysis or tests, the form of the Laboratory's report thereon and the fees payable in respect of such report;

(c) such other matters as may be necessary or expedient to enable that Laboratory to carry out its functions.

Analysis.

(1) The State Government may, by notification in the Official Gazette, appoint such persons as it thinks fit and having the prescribed qualifications to be government analysts for the purpose of analysis of samples of air or emission sent for analysis to any laboratory established or specified under sub-section (1) of section 28.

(2) Without prejudice to the provisions of section 14, the State Board may, by notification in the Official Gazette, and with the approval of the State Government, appoint such persons as it thinks fit and having the prescribed qualifications to be Board analysts for the purpose of analysis of samples of air or emission sent for analysis to any laboratory established or recognised under section 17.

Reports of analysis.

Any document purporting to be a report signed by a Government analyst or, as the case may be, a Statc Board analyst may be used as evidence of the facts stated therein in any proceeding under this Act.

Appeals,

(1) Any person aggrieved by an order made by the State Board under this Act may, within thirty day from the date on which the order is communicated to him, prefer an appeal to such authority (hereinafter referred to as the Appellate Authority) as the State government may think fit to constitute :

Provided that the Appellate Authority may entertain the appeal after tile expiry of the said period of thirty days if such authority is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.

(2). The Appellate Authority shall consist of a single person or three persons as the State Government may think fit to be appoint by the State Government.

(3) The form and the manner in which an appeal may be preferred under subsection (1), the fees payable for such appeal and the procedure to be followed by the Appellate Authority shall be such as may be prescribed.

(4) On receipt of an appeal preferred under sub-section (1), the Appellate Authority shall, after giving the appellant and the State Board an opportunity of being heard, dispose of the appeal as expeditiously as possible.

Power to give directions

Notwithstanding anything contained in any other law, subject to the provisions of this Act, and to any directions that the Central Government may give in this behalf, a Board may, in the exercise of its powers and performance of its functions under this Act, issue any directions in writing to any person, officer or authority, and such person, officer or authority shall be bound to comply with such directions.

Explanation.-For the avoidance of doubts, it is hereby declared that tile power to issue directions under this section, includes the power to direct-

(a) the closure, prohibition or regulation of any industry, operation or

(b) the stoppage or regulation of supply of electricity, water or any other service.]

THE FOREST (CONSERVATION) ACT, 1980 ACT NO. 69 OF 1980 [27th December, 1980.] An Act to provide for the conservation of forests and for matters connected therewith or ancillary or incidental thereto. Be it enacted by Parliament in the Thirty-first Year of the Republic of India as follows:- 1. Short title, extent and commencement. 1. Short title, extent and commencement.(1) This Act may be called the Forest (Conservation) Act, 1980. (2) It extends to the whole of India except the State of Jammu and Kashmir. (3) It shall be deemed to have come into force on the 25th day of October, 1980. 2. Restriction on the deforestation of forests or use of forest land for non-forest purpose. 2. Restriction on the deforestation of forests or use of forest land for non-forest purpose. Notwithstanding anything contained in any other law for the time being in force in a State, no State Government or other authority shall make, except with the prior approval of the Central Government, any order directing- (i) that any reserved forest (within the meaning of the expression "reserved forest" in any law for the time being in force in that State) or any portion thereof, shall cease to be reserved; (ii) that any forest land or any portion thereof may be used for any non-forest purpose. [(iii) that any forest land or any portion thereof may be assigned by way of lease or otherwise to any private person or to any authority, corporation, agency or any other organisation not owned, managed or controlled by Government; (iv) that any forest land or any portion thereof may be cleared of trees which have grown naturally in that land or portion, for the purpose of using it for reafforestation.] 1*[Explanation. --For the purpose of this section "non-forest purpose" means the breaking up or clearing of any forest land or portion thereof for- (a) the cultivation of tea, coffee, spices, rubber, palms, oil-bearing plants, horticultural crops or medicinal plants; (b) any purpose other than reafforestation, but does not include any work relating or ancillary to conservation, development and management of forests and wild life, namely, the establishment of check-posts, fire lines, wireless communications and construction of fencing, bridges and culverts, dams, waterholes, trench marks, boundary marks, pipeline or other like purposes] 3. Constitution of Advisory Committee. 3. Constitution of Advisory committee. The Central government may constitute consisting of such number of persons as it may deem fit to advise that Government with regard to- (i) the grant of approval under section 2; and (ii) any other matter connected with the conservation of forests which may be referred to it by the Central Government. 3A. Penalty for contravention of the provisions of the Act. 2*[3A. Penalty for contravention of the provisions of the Act. Whoever contravenes or abets the contravention of any of the provisions of section 2, shall be punishable with simple imprisonment for a period which may extend to fifteen days. 3B. Offences by authorities and Government departments. 3B. Offences by authorities and Government departments. (1) Where any offence under this Act has been committed- (a) by any department of Government the head of the department; or (b) by any authority, every person

who, at the time the offence was committed, was directly in charge of, and was responsible to, the authority for the conduct of the business of the authority as well as the authority; shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly: Provided that nothing contained in this sub-section shall render the head of the department or any person referred to in clause (b), liable to any punishment if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence. (2) Notwithstanding anything contained in sub-section (1), where an offence punishable under the Act has been committed by a department of Government or any authority referred to in clause (b) of sub- section (1) and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any officer, other than the head of the department, or in the case of an authority, any person other than the persons referred to in clause (b) of sub-section (1), such officer or persons shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.] 4. Power to make rules. 4. Power to make rules. (1) The Central Government may, by notification in the Official Gazette, make rules for carrying out the provisions of this Act.

Unit IV [Communicating Human Welfare]

POPULATION GROWTH, VARIATION AMONG NATIONS

Our global human population, 6 billion at present, will cross the 7 billion mark by 2015.

The needs of this huge number of human beings cannot be supported by the Earth's natural resources, without degrading the quality of human life.

In the near future, fossil fuel from oil fields will run dry. It will be impossible to meet the demands for food from existing agro systems. Pastures will be overgrazed by domestic animals and industrial growth will create ever-greater problems due to pollution of soil, water and air. Seas will not have enough fish. Larger ozone holes will develop due to the discharge of industrial chemicals into the atmosphere, which will affect human health. Global warming due to industrial gases will lead to a rise in sea levels and flood all low-lying areas, submerging coastal agriculture as well as towns and cities. Water

'famines' due to the depletion of fresh water, will create unrest and eventually make countries go to war. The control over regional biological diversity, which is vital for producing new medicinal and industrial products, will lead to grave economic conflicts between biotechnologically advanced nations and the bio rich countries. Degradation of ecosystems will lead to extinction of thousands of species, destabilizing natural ecosystems of great value.

These are only some of the environmental problems related to an increasing human population and more intensive use of resources that we are likely to face in future. These effects can be

averted by creating a mass environmental awareness movement that will bring about a change in people's way of life.

Increase in production per capita of agricultural produce at a global level ceased during the 1980's. In some countries, food shortage has become a permanent feature. Two of every three children in South Africa are underweight.

In other regions famines due to drought have become more frequent. Present development strategies have not been able to successfully address these problems related to hunger and malnutrition. On the other hand, only 15% of the world's population in the developed world is earning 79% of income! Thus the disparity in the extent of per capita resources that are used by people who live in a 'developed' country as against those who live in a 'developing' country is extremely large. Similarly, the disparity between the rich and the poor in India is also growing.

The increasing pressures on resources place great demands on the in-built buffering action of nature that has a certain ability to maintain a balance in our environment. However, current development strategies that essentially lead to short-term gains have led to a breakdown of our Earth's ability to replenish the resources on which we depend.

Population explosion

Population explosion is the most serious problem facing our country today. With 16 per cent of the world's population, India is toady the second largest populations' country in the world. As on March 1.1991, when the last census was conducted, the country's population stood at 846.30 million, with 439.23 males and 407.07 females. The country's population is currently estimated at about 950 millions. The population growth has been extremely rapid in the last 50 years. The phenomenal growth is now more appropriately termed as "population explosion".

The phenomenal growth rate in population is largely because of the industrial and technological revolutions that had taken place in the recent times. The new technologies have not only brought down the death rate because of the vastly improved Medicare resulting in increased life expectancies, but had also facilitated increased food production to take care of food needs of the increasing population.

Though population explosion is a major problem being faced by several other countries too, with the world population estimated to reach 7 billion by the beginning of the 21st century, the problem is much more severe in India because of the increasing pressure on the limited resources of the country. With the growth of food grains not keeping pace with the increase in population during some years because of the unfavourable weather conditions, the specter of hunger hunts millions of households in the country.

Even when the country is fortunate enough to have a bumper crop, these hungry households do not have the economic strength or purchasing power to buy the required food grains. The phenomenal population growth exerts immense pressure on other basic necessities like education, health, housing, clothing, employment opportunities etc.

With employment opportunities in the rural areas becoming scarce, population explosion is resulting in increasing migration of rural poor to the urban areas in search of jobs. The increasing pressure on the urban areas is giving rise to more number of slums and this is multiplying the problems in the urban areas as health is the first casualty in slums.

To check ill-effects of population growth on the socio-economic front, the Indian government had lunched the Family Planning Programme in 1951. This was later rechristened as the Family Welfare Programme. This programme promotes on a voluntary basis, responsible Planned Parenthood, through independent choice of family planning methods best suited to the people.

Though the Family Welfare Programme has resulted in significant declines in death rates and infant mortality besides almost doubling life expectancy, a lot more needs to be done if the population explosion is to be effectively checked. For this, we have to improve the literacy rate, female education and the socio-economic status of the families as population growth is directly linked to these factors. The fact that Kerala could make a lot of progress in checking population growth testifies to the impact of literacy on population explosion.

The government should also intensify its efforts to educate the people on the adverse effects of population explosion. The population explosion can be effectively checked only when the people are inclined towards smaller families. With increasing literacy rate and improved socio-economic status, the people can be educated to adopt a favorable attitude towards smaller families. When this happens, the population explosion can be checked.

Environment and Human Health

Harms of Smoking and Health Benefits of Quitting: Smoking and Cancer

Key Points

- Tobacco smoke is harmful to smokers and nonsmokers.
- Cigarette smoking causes many types of cancer, including cancers of the lung, esophagus, larynx (voice box), mouth, throat, kidney, bladder, pancreas, stomach, and cervix, as well as acute myeloid leukemia.
- Quitting smoking reduces the health risks caused by exposure to tobacco smoke.

1. **Does tobacco smoke contain harmful chemicals?**

Yes. Tobacco smoke contains chemicals that are harmful to both smokers and nonsmokers. Breathing even a little tobacco smoke can be harmful.

Of the more than 7,000 chemicals in tobacco smoke, at least 250 are known to be harmful, including hydrogen cyanide, carbon monoxide, and ammonia.

Among the 250 known harmful chemicals in tobacco smoke, at least 69 can cause cancer. These cancer-causing chemicals include the following:

- Arsenic
- Benzene
- Beryllium (a toxic metal)
- 1,3–Butadiene (a hazardous gas)
- Cadmium (a toxic metal)
- Chromium (a metallic element)
- Ethylene oxide
- Nickel (a metallic element)
- Polonium-210 (a radioactive chemical element)
- Vinyl chloride

Other toxic chemicals in tobacco smoke are suspected to cause cancer, including the following:

- Formaldehyde
- Benzo[α]pyrene
- Toluene

2. What are some of the health problems caused by smoking?

Smoking harms nearly every organ of the body and diminishes a person's overall health. Millions of Americans have health problems caused by smoking.

Smoking is a leading cause of cancer and death from cancer. It causes cancers of the lung, esophagus, larynx, mouth, throat, kidney, bladder, pancreas, stomach, and cervix, as well as acute myeloid leukemia.

Smoking also causes heart disease, stroke, aortic aneurysm (a balloon-like bulge in an artery in the chest), chronic obstructive pulmonary disease (COPD)

(chronic bronchitis and emphysema), asthma, hip fractures, and cataracts. Smokers are at higher risk of developing pneumonia and other airway infections.

A pregnant smoker is at higher risk of having her baby born too early and with an abnormally low birth weight. A woman who smokes during or after pregnancy increases her infant's risk of death from Sudden Infant Death Syndrome (SIDS) . Men who smoke are at greater risk of erectile dysfunction.

Cigarette smoking and exposure to tobacco smoke cause more than 440,000 premature deaths each year in the United States. Of these premature deaths, about 40 percent are from cancer, 35 percent are from heart disease and stroke, and 25 percent are from lung disease. Smoking is the leading cause of premature, preventable death in this country.

Regardless of their age, smokers can substantially reduce their risk of disease, including cancer, by quitting.

3. What are the risks of tobacco smoke to nonsmokers?

Secondhand smoke (also called environmental tobacco smoke, involuntary smoking, and passive smoking) is the combination of "sidestream" smoke (the smoke given off by a burning tobacco product) and "mainstream" smoke (the smoke exhaled by a smoker) . The U.S. Environmental Protection Agency, the U.S. National Toxicology Program, the U.S. Surgeon General, and the International Agency for Research on Cancer have classified secondhand smoke as a known human carcinogen (cancer-causing agent). Inhaling secondhand smoke causes lung cancer in nonsmoking adults. Approximately 3,000 lung cancer deaths occur each year among adult nonsmokers in the United States as a result of exposure to secondhand smoke .The U.S. Surgeon General estimates that living with a smoker increases a nonsmoker's chances of developing lung cancer by 20 to 30 percent.

Secondhand smoke causes disease and premature death in nonsmoking adults and children . Exposure to secondhand smoke may increase the risk of heart disease by an estimated 25 to 30 percent. In the United States, exposure to secondhand smoke is thought to cause about 46,000 deaths from heart disease each year. Pregnant women exposed to secondhand smoke are at risk of having a baby with low birth weight. Children exposed to secondhand smoke are at an increased risk of SIDS, ear infections, colds, pneumonia, bronchitis, and more severe asthma. Being exposed to secondhand smoke slows the growth of children's lungs and can cause them to cough, wheeze, and feel breathless .

4. Is smoking addictive?

Yes. Nicotine is a drug that is naturally present in the tobacco plant and is primarily responsible for a person's addiction to tobacco products, including cigarettes. During

smoking, nicotine enters the lungs and is absorbed quickly into the bloodstream and travels to the brain in a matter of seconds. Nicotine causes addiction to cigarettes and other tobacco products that is similar to the addiction produced by using drugs such as heroin and cocaine.

5. **How much nicotine is in cigarettes and cigars?**

Cigarettes, cigars, and other tobacco products vary widely in their content of nicotine, cancer-causing substances, and other toxicants. In a cigarette (which contains less than 1 gram of tobacco), the nicotine content can vary between 13.7 and 23.2 milligrams per gram of dry tobacco. In a cigar (which can contain as many as 20 grams of tobacco), the nicotine content can vary between 5.9 and 335.2 milligrams per gram of tobacco.

The way a person smokes a tobacco product is more important than the nicotine content of the product in determining how much nicotine gets into the body. Nicotine is absorbed in the lungs and through the lining of the mouth. Increased levels of nicotine are absorbed by inhaling the smoke into the lungs and taking frequent and deep puffs.

6. **Are other tobacco products, such as smokeless tobacco or pipe tobacco, harmful and addictive?**

Yes. All forms of tobacco are harmful and addictive. There is no safe tobacco product.

In addition to regular cigarettes and cigars, other forms of tobacco include smokeless tobacco (also called chewing tobacco, snuff, and snus), pipes, hookahs (waterpipes), bidis, and kreteks. Although most research has focused on the harms of cigarette smoking, all forms of tobacco are harmful.

All tobacco products contain nicotine and cancer-causing substances. Both smokeless tobacco and smoking tobacco are known to cause cancer in humans. These products may also cause heart attacks, mouth problems, and other diseases.

Pipes: Pipe smoking causes lung cancer and increases the risk of cancers of the mouth, throat, larynx, and esophagus.

Hookahs or waterpipes (other names include argileh, ghelyoon, hubble bubble, shisha, boory, goza, and narghile): A hookah is a device used to smoke tobacco. The smoke passes through a partially filled water bowl before being inhaled by the smoker. Some people think hookah smoking is less harmful and addictive than smoking regular cigarettes, but all forms of tobacco smoking are harmful and addictive. Tobacco smoke, including the smoke produced by a hookah, contains harmful chemicals such as carbon monoxide and cancer-causing substances.

Bidis: A bidi is a flavored cigarette made by rolling tobacco in a dried leaf from the tendu tree, which is native to India. Bidi use is associated with heart attacks and cancers of the mouth, throat, larynx, esophagus, and lung.

Kreteks: A kretek is a cigarette made with a mixture of tobacco and cloves. Smoking kreteks is associated with lung cancer and other lung diseases.

7. Is there a tobacco product that is less hazardous than cigarettes?

All tobacco products are harmful and cause cancer, and the use of these products is strongly discouraged. There is no safe level of tobacco use. People who use any type of tobacco product should be urged to quit. For help with quitting, refer to the NCI fact sheet

What are the immediate benefits of quitting smoking?

The immediate health benefits of quitting smoking are substantial:

Heart rate and blood pressure, which are abnormally high while smoking, begin to return to normal. Within a few hours, the level of carbon monoxide in the blood begins to decline. (Carbon monoxide reduces the blood's ability to carry oxygen.) Within a few weeks, people who quit smoking have improved circulation, produce less phlegm, and don't cough or wheeze as often. Within several months of quitting, people can expect substantial improvements in lung function. In addition, people who quit smoking will have an improved sense of smell, and food will taste better.

8. What are the long-term benefits of quitting smoking?

Quitting smoking reduces the risk of cancer and other diseases, such as heart disease and COPD, caused by smoking. People who quit smoking, regardless of their age, are less likely than those who continue to smoke to die from smoking-related illness:

Quitting at age 30: Studies have shown that smokers who quit at about age 30 reduce their chance of dying prematurely from smoking-related diseases by more than 90 percent.

Quitting at age 50: People who quit at about age 50 reduce their risk of dying prematurely by 50 percent compared with those who continue to smoke.

Quitting at age 60: Even people who quit at about age 60 or older live longer than those who continue to smoke.

9. Does quitting smoking lower the risk of cancer?

Yes. Quitting smoking reduces the risk of developing and dying from cancer. However, it takes a number of years after quitting for the risk of cancer to start to decline. This benefit increases the longer a person remains smoke free.

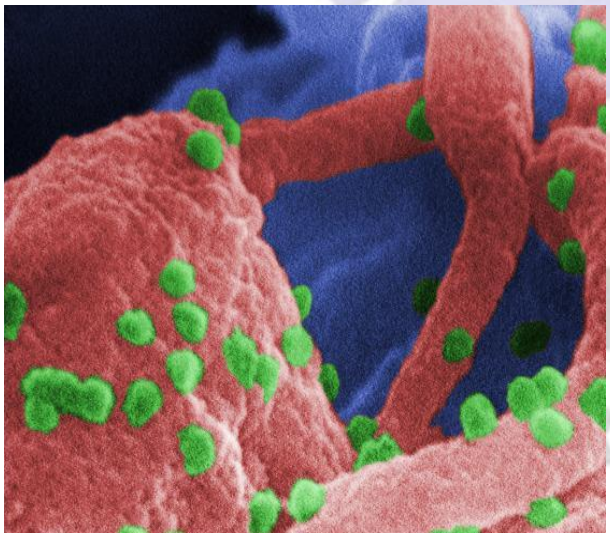
The risk of premature death and the chance of developing cancer from smoking cigarettes depend on many factors, including the number of years person smokes, the number of cigarettes he or she smokes per day, the age at which he or she began smoking, and whether or not he or she was already ill at the time of quitting. For people who have already developed cancer, quitting smoking reduces the risk of developing a second cancer.

10. Should someone already diagnosed with cancer bother to quit smoking?

Yes. There are many reasons that people diagnosed with cancer should quit smoking. For those having surgery, chemotherapy, or other treatments, quitting smoking helps improve the body's ability to heal and respond to therapy. It also lowers the risk of pneumonia and respiratory failure. Moreover, quitting smoking may lower the risk of the cancer returning or a second cancer developing.

HIV/AIDS

AIDS stands for acquired immune deficiency syndrome and is the final stage of the infection caused by the virus called HIV or Human Immunodeficiency Virus. The virus causes severe damage to the immune system.



A retrovirus, the Human Immunodeficiency Virus (HIV) was identified in 1983 as the pathogen responsible for the Acquired Immunodeficiency Syndrome (AIDS). AIDS is characterized by changes in the population of T-cell lymphocytes that play a key role in the immune defense system. In the infected individual, the virus causes a depletion of T-cells, called "T-helper cells", which leaves these patients susceptible to opportunistic infections, and certain malignancies. Credit: CDC/ C. Goldsmith, P. Feorino, E. L. Palmer, W. R. McManus

How many people does HIV/AIDS affect?

AIDS is the sixth leading cause of death among people aged 25 - 44 in the United States. This is an improvement since it was the number one killer in 1995.

At the end of 2010, an estimated 91,500 people in the UK were living with HIV. Of these, around 1 in 4 (22,000 in total) did not know they were infected.

The World Health Organization (WHO) estimates that around 34 million people in the world are living with HIV. The virus is particularly widespread in sub-Saharan African countries, such as South Africa, Zimbabwe and Mozambique.

Cause of AIDS

AIDS is caused by HIV infection. The virus attacks the immune system leaving the individual susceptible to life-threatening infections and cancers. Common bacteria, yeast, parasites, and viruses that usually do not cause serious disease in people with healthy immune systems can turn deadly for AIDS patients.

How is HIV transmitted

HIV is found in all the body fluids including saliva, nervous system tissue and spinal fluid, blood, semen, pre-seminal fluid, which is the liquid that comes out before ejaculation, vaginal secretions, tears and breast milk. Only blood, semen, and breast milk have been shown to transmit infection to others.

The virus is transmitted by sexual contact including unprotected oral, vaginal, and anal sex and via transfusion of contaminated blood that contains HIV.

Another mode of transmission is sharing needles or injections with HIV infected individuals.

A pregnant woman can transmit the virus to her unborn baby through their shared blood circulation, or a nursing mother can transmit it to her baby in her breast milk.

HIV infection does not spread by casual contact, mosquitoes, touching or hugging.

Who is at risk?

Those at highest risk include injection drug users who share needles, babies born to mothers with HIV (especially if the mother had not received anti- HIV therapy during pregnancy), those engaging in unprotected vaginal or anal sex with HIV positive individuals, and those who received blood transfusions or clotting products between 1977 and 1985 (before screening for HIV became standard practice).

Symptoms of HIV/AIDS

HIV infection may cause no symptoms for a decade or longer. At this stage carriers may transmit the infection to others unknowingly. If the infection is not detected and treated, the immune system gradually weakens and AIDS develops.

Acute HIV infection takes a few weeks to months to become a non-symptomatic HIV infection. Then it becomes early symptomatic HIV infection and later it progresses to AIDS.

How is the progress of the disease marked?

With advancing HIV infection the blood shows higher viral load and CD4 T-cell count drops below 200 cells/mm3. CD4 cells are a type of T cell. T cells are cells of the immune system. They are also called "helper cells."

There is a small group of patients who develop AIDS very slowly, or never at all. These patients are called non progressors, and many seem to have a genetic difference that prevents the virus from significantly damaging their immune system.

Opportunistic infections

These are infections that normally do not affect an individual with a healthy immune system but AIDS patients are susceptible to these infections. These include viral infections like:

- herpes simplex virus
- herpes zoster infection
- cancers like Kaposi sarcoma, non-Hodgkin's lymphoma
- fungal infections like candidiasis
- bacterial infections like tuberculosis

Other infections include Bacillary angiomatosis, Candida esophagitis, Pneumocystic jiroveci pneumonia, AIDS dementia, Cryptosporidium diarrhea, cryptococcal meningigits and Toxoplasma encephalitis.

Treatment of AIDS

There is no cure for AIDS once it develops. There are agents available that can help keep symptoms at bay and improve the quality and length of life for those who have already developed symptoms.

Drugs against HIV include antiretroviral therapy. These prevent the replication of the HIV virus in the body. A combination of several antiretroviral drugs, called highly active antiretroviral therapy (HAART), has been very effective in reducing the number of HIV particles in the bloodstream. Preventing the virus from replicating can improve T-cell counts or CD4 cell counts and help the immune system recover from the HIV infection.

Medicines are also prescribed to prevent opportunistic infections if the CD4 counts are low.

Outcome of HIV

AIDS is almost always fatal without treatment. HAART however has dramatically increased the amount of time people with HIV remain alive.

Prevention of HIV

Safe sex measures with use of condoms, shunning use of illicit drugs or shared needles or syringes, avoidance of contact with blood and fluids by wearing protective clothing, masks, and goggles etc. helps prevent transmission.

HIV-positive women who wish to become pregnant may need therapy while they are pregnant to prevent transmission to their babies. The Public Health Service recommends that HIV-infected women in the United States avoid breastfeeding to prevent transmitting HIV to their infants through breast milk.

List of abbreviations
AIDS: Acquired immune deficiency syndrome

HIV: Human immunodeficiency virus

CD4+: CD4+ T helper cells

CCR5: Chemokine (C-C motif) receptor 5

CDC: Centers for Disease Control and Prevention

WHO: World Health Organization

PCP: Pneumocystis pneumonia

TB: Tuberculosis

MTCT: Mother-to-child transmission

HAART: Highly active antiretroviral therapy

STI/STD: Sexually transmitted infection/disease

Woman and Child Welfare

There are several environmental factors that are closely linked to the welfare of women and children. Each year, close to eleven million children worldwide are estimated to have died from the effects of disease and inadequate nutrition. Most of these deaths are in the developing world. In some countries, more than one in five children die before they are 5 years old. Seven out of ten childhood deaths in developing countries can be attributed to five main causes, or a combination of them. These are: pneumonia, diarrhea, measles, malaria and malnutrition. Around the world, three out of every four children suffer from at least one of these conditions. The diagnosis of common childhood disease conditions

Complaint/ symptom	Possible cause or associated condition
Cough and/or fast breathing	Pneumonia Severe anemia P. falciparum malaria
Lethargy or unconsciousness	Cerebral malaria Meningitis Severe dehydration Very severe pneumonia
Measles rash	Pneumonia Diarrhea Ear infection
"Very sick" young infant	Pneumonia Meningitis Sepsis

Respiratory conditions: Most respiratory diseases are caused by or are worsened by polluted air. Living in crowded, ill-ventilated homes with smoky, open fires can trigger respiratory conditions, especially in children.

Pneumonia: Acute respiratory infections (ARI), most frequently pneumonia, is a major cause of death in children under five years, killing over two million children annually. Up to 40% of children seen in health centers suffer from respiratory conditions and many deaths attributed to other causes are, in fact, 'hidden' ARI deaths. Children may die very quickly from the infection and thus need treatment urgently. Most patients of pneumonia can be treated with oral antibiotics. Correct management could save over 1 million lives every year globally.

Gastrointestinal conditions: Contaminated water and food causes widespread ill health especially in children.

Diarrhea: Diarrhea is caused by a wide variety of infections. Quick diagnosis and treatment of diarrhea is a priority for saving a child's life. Treating the malnutrition that often accompanies diarrhea can further reduce mortality. Increasing vigilance to detect other diseases that can occur concurrently with diarrhea, such as measles or malaria, is another important measure. Increased breastfeeding and administering measles vaccination have also been observed to have reduced the number of diarrhea cases.

Measles: Measles is a rash that appears with fever and body ache in children and is caused by a virus. It infects over 40 million children and kills over 800,000 children under the age of five. Its prevention includes wider immunization coverage, rapid referral of serious cases, prompt recognition of conditions that occur in association with measles, and improved nutrition, including breastfeeding, and vitamin A supplements. Measles can be prevented by a vaccine. Young children with measles often develop other diseases like acute respiratory infections, diarrhea and malnutrition that are all linked to poor environmental conditions in their surroundings. Children who survive an attack of measles are more vulnerable to other dangerous infections for several months. Effective prevention and treatment could save 800,000 lives per year.

Malaria: This condition is closely linked to pooling and stagnation of water in tropical environments. Malaria is a widespread tropical disease, which is caused by a parasite transmitted to humans by mosquitoes. It has proved difficult to control because mosquitoes have become resistant to insecticides used against them and because the parasite has developed resistance in some areas to the cheap and effective drugs that used to provide good protection in the past. However, alternative newer drug therapies have been developed for use in areas where resistant parasites are found. Correct management could save 500,000 lives per year. Approximately 700,000 children die of malaria globally each year, most of them in sub-Saharan Africa. Young children are particularly vulnerable because they have not developed the partial immunity that results from surviving repeated infections.

Poverty-environment-malnutrition: There is a close association between poverty, a degraded environment, and malnutrition. This is further aggravated by a lack of awareness on how children become malnourished.

Malnutrition: Although malnutrition is rarely listed as the direct cause of death, it contributes to about half of all childhood deaths. Lack of access to food, poor feeding practices and infection, or a combination of the two, are the major causes of mortality. Infection, particularly frequent or persistent diarrhea, pneumonia, measles and malaria, undermines nutritional status. Poor feeding practices - inadequate breastfeeding, providing the wrong food, or insufficient food - contribute to malnutrition. Malnourished children are more vulnerable to disease. Promoting breastfeeding, improving feeding practices, and providing micronutrient supplements routinely for children who need them are measures that reduce mortality.

Role of Media awareness in environment and Human Health Isuues

Children between 6 months and 2 years of age are at increased risk of malnutrition, when there is a transition between breastfeeding and sharing fully in the family diet. Changing family habits and the kinds of food offered to children is an important measure. Talking to mothers individually about home care and their child's feeding, with relatively simple changes to better feeding practices, such as helping them to eat rather than leaving them to fend for themselves, can ensure that a child gets enough to eat.

A minor increase in breastfeeding could prevent up to 10% of all deaths of children under five. When mother's breastfeed exclusively during at least the first four months and, if possible, six months of life, there is a decrease in episodes of diarrhea and, to a lesser extent, respiratory infections. Even small amounts of water-based drinks decrease the breast milk intake and lead to lowered weight gain; this increases the risk of diarrhea. Continuing to breastfeed as long as possible maintains good nutritional status.

Mothers often give their babies other food and fluids before six months because they doubt their breast milk supply is adequate. A one-on-one counseling with mothers on breastfeeding techniques and its benefits will help reduce the incidence of malnutrition. There are strong connections between the status of the environment and the welfare of women and children in India. Women, especially in lower-income groups, both in the rural and urban sector, work longer hours than men. Their work pattern differs and is more prone to health hazards. The daily collection of water, fuel wood and fodder is an arduous task for rural women. In urban areas, where lower economic group women live in crowded smoke-filled shanties in unhygienic slums, they spend long hours indoors, leading to respiratory diseases. In urban centers, a number of women eke out a living by garbage picking. They separate plastics, metal and other recyclable material from the waste. During this process, they can get several infections. They are provide an environmental service of great value, but earn a pittance from this work and are exposed to various infections.

Women and girls are often the last to eat, as their role in traditional society is to cook the family meal and feed their husband and sons first. This leads to malnutrition and anemia due to inadequate nutrition. The girl child is given less attention and educational facilities as compared to boys in India. Thus, they are unable to compete with men in later life. This social-environmental divide is a major concern that needs to be corrected throughout the country.

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