

**Course Title: Environment and Development**

**Course No: GeES432      Cr.Hrs:2**

**Course Objective:**

To acquaint the students with basic concepts, principles and issues related to environmentally sustainable development.

**Course Description:**

The content includes the nature and broad characteristics of the environment; services of nature; sustainability, environment and development; population and environment issues; poverty and environment issues; current problems in environmental resource management; the conservation movement; environmental Impact assessment; environmental problems in developing and developed countries.

**Chapter One:** The Subject mater of Environment and Development.

**1.1 Environment Introductions.**

The environment means surroundings in which people, animals and plants develop and exist. The branch of biology investigating relationships between living beings and their environment is called ecology. It is a relatively new science which reflects the concern about the balance of nature.

Ecologists and environmentalists are well aware of the bad state of the environment and of the necessity of its protection. The most serious ecological problems of today are the pollution of air, water and soil, the destruction of ecosystems, disappearance of many species of animals and plants, the weather changes, acid rains, the warming up of the Earth's surface, the destruction of tropical rain forests and the breaking of the ozone layer.

Most of this damage, which proceeds faster and faster, has not been caused by natural catastrophes, but by the man himself. The technical progress, which enables him a more comfortable life, leads on the other hand to the degradation of the quality of the environment he lives in.

Factories produce large quantities of carbon dioxide, lead poisons, radioactive particles, dangerous compounds of Sulphur and nitrogen. They get into the air and some of them create in combination with water Sulphur acids, which fall in form of acid rain or snow. The acid kills trees, makes the soil infertile, pollutes the rivers and makes life disappear from them.

Factories directly increase water pollution because many of them are built near rivers into which they put their chemical waste. Farmers use amounts of pesticides and fertilizers which pollute the soil and most of them may have the worst effects on human health, too.

The building of dams causes flooding of large areas of nature and the disappearance of many typical animals, birds and plants of the region. Amounts of industrial and city waste are placed near the sea, lakes and rivers. They pollute soil, water and air, and spoil the natural scenery.

If the destruction of the environment continues, the life on this planet will be endangered. But in recent years many environmental organizations have been founded, some of them on international basis. They try to give their warnings through the mass media and public campaigns. Many of their activities have been successful and the wide public attention made the governments pass various useful laws aimed at the improvement of the environment.

All over the world there are clean air acts, water pollution acts and endangered species acts. Governments of all countries have ministries or departments concerned with environmental problems. The concern for the environment and the environmental activity should be a part of the people's lives. Therefore, there is a great need for the environmental education. Children of all ages should be taught about the man's relationship to nature.

### **1.2 Development and environment.**

The development has impact on environment In addition to economic and social issues, development has environmental impacts that affect the quality of life .These impacts include water quality and sewer issues, air quality and transportation issues, soil conservation and hillsides, noise pollution and the effect of barriers to protect houses from the noise, solid waste disposal, and loss of scenic resources, wildlife habitat, trees, and agricultural resources.

The impact of development on water, sewer and storm sewer systems is great. Clean water is essential for life, and is often taken for granted. Threatened by agricultural runoff and industrial discharges, water supply must be protected for people and wildlife. Worldwide, agriculture consumes 73% of off-stream fresh water, followed by industry at 21 % and residential at 6%. Standard home toilets account for 40% of that use with showers and sinks using another 35 %. The fresh water on earth is only 5 % of the total water on the planet and does not increase despite the increase in demand by increased development and populations. Development also increases the demand on the already overburdened sewer and storm sewer systems.

Air pollution affects the health of many residents. It comes from burning gasoline in our cars, from igniting coal and oil, from burning trash, medical and other hazardous materials, and from factories. Transportation is the fastest growing source of global air pollution with millions of new cars on the road each year. created in large part by the expansion and development in the outlying areas.

With additional development, there is an increase in solid waste production. More landfill space is needed which results in requests for landfill expansions and permits for new landfills. Options that have been suggested include sending to other places waste to landfills is greatly reducing the amount of waste we create through pollution prevention.

### **1.3 Characteristics of environment.**

The environment has variety of characteristics it can be renewable, and non renewable. The environment needs some time to replenish, for example to form a cm layer of soil it takes 50 years hence the regenerative time of the environment is some extent long if use the resource in accordance with natural regeneration capacity of the environment then there will be no question of environmental degradation.

The present situation is not favorable to self regeneration of the environment i.e the excessive use of environmental resource with out considering its capacity is leading to a serious environmental degradation which altimetry affecting the self regenerative capacity of the environment.

The poor resource management is making some of the renewable resources to non-renewable, wise management of soil and water resource can make them renewable otherwise they may loose their nature of renewability. The concept of sustainable development is a great idea which came in to the scene in 1987, but to implement it in developing world will be billion dollar question. Hence at present the human intervention in to the nature by more population and more demand for the resource and extraction resources with out considering its future availability is greatly influencing the natural characteristics of nature

### **1.4 Services of Nature.**

Nature's services is an umbrella term for the ways in which nature benefits humans, particularly those benefits that can be measured in economic terms. Robert Costanza and other theorists of natural capital conducted extensive economic analysis of nature's services to humanity in the 1990s. The economic contribution of seventeen of these was found to be approximately US\$33 trillion per year, greater than the activities in the inter-human economy, which totaled about US\$25 trillion. This was based on estimated costs of replacing the services nature provides, with equivalent services using methods wholly based on human infrastructure.

When you step outside, whether heading for your car or for a walk around the block, you expect to be able to breathe the air. When planting flowers in the window box or tomatoes in the raised bed in your backyard, you expect those plants to grow, flower, and produce seeds or fruit. When perusing the grocery shelves, you expect to find fresh

produce, and affordable fish and meat. When you turn on the tap, you expect to be able to drink the water.

Ecosystem services are the processes through which natural ecosystems, and the plants, animals and microbes that live in those environments, sustain human life. Ecosystem services produce goods, timber, and fibers, medicines and fuels. Ecosystem services even conduct life-support activities, like filtering water and recycling all kinds of wastes. The natural services that for millennia have purified the water and air, supported the growth and reproduction of food plants, controlled pests, and even moderated the weather and its impacts are declining rapidly. Land clearing for agriculture, industry and mining, and development is affecting ecosystems worldwide. As habitats become fragmented, with only pockets left here and there, the services those natural systems provide become less effective.

**Wetlands: Water Purification System and Natural Flood Control**

Most wetlands are linked intricately with our groundwater and surface water supplies. By the end of the 20th century, the United States had lost about 30 percent of its historic wetlands to draining, development, and agriculture. Over 85 percent of the inland surface water was controlled artificially and more than half the nation's fish populations were suffering from the effects of water pollution and high temperatures. Yet, wetlands continue to provide crucial ecological services, including filtering and conserving water, flood control, and shelter and food for fish and wildlife. Wetlands also help maintain cycles essential for life on earth, such as the carbon, methane, nitrogen, and sulfur cycles. Resource managers now realize that preservation and restoration of wetlands and natural waterways may be a more cost-effective means of maintaining drinking water quality than expensive water treatment technologies.

Communities across the nation and worldwide are facing similar choices between protecting natural resources that provide services humans need or implementing expensive technological solutions. The city of Arcata, California, rejected a costly plan to pipe waste from the community's wastewater treatment plant across Humboldt Bay, and dump it directly into the Pacific Ocean. Instead, they chose the natural processes provided by wetlands to filter their wastewater. The Arcata Marsh and Wildlife Sanctuary was created in 1981 and wastewater treatment was added in 1986. Both humans and wildlife benefit from the wetland's water purification and habitat services.

**Forests: Our Carbon Reserves**

Natural services provided by forests go beyond shade, timber, and wildlife habitat. The vast tracts of deciduous and evergreen trees that cover more than 25 percent of the ice-free land on the planet help stabilize landscapes by protecting soils and retaining moisture. Although forests today cover only about half what they did historically, they

remain major sites for carbon storage, are important for nutrient cycling, and help moderate local and regional climate through rainfall. Carbon-storing forests may even moderate global warming.

We lose a lot more than carbon storage when we clear cut forests. Huge amounts of soil are lost when forests are cleared and erosion escalates. In Nepal, where trees are needed to stabilize steep slopes, between 30 to 75 tons of soil wash from each hectare of cleared land each year. Nepal may contribute as much as 240 million cubic meters of soil each year to neighboring India's lowlands and waterways. In Africa, the deforestation of Ethiopia's forests from about 10 percent of land cover to only 3 percent has resulted in topsoil flowing from the country's high lands into the Blue Nile River. There, it silts up the Roseires Dam, hundreds of miles downriver in Sudan.

Forests also help regulate the water cycle when tree roots soak up rainfall; stems, trunks and roots slow runoff; and tree leaves release water back into the atmosphere. In addition, plant and animal biodiversity depends on intact, mature forests. In some cases, even human health may rely on that biodiversity. Many medicines have been isolated from plant compounds. Deforestation can contribute to a resurgence or redistribution of infectious disease, when the ecosystem processes that allow natural pest control is disturbed. In South America, insecticide-resistance, declining investments in public health programs, and forest clearing have contributed to a resurgence in malaria. Malaria-carrying mosquitoes are normally consumed by a wide variety of reptiles, birds, bats, and fish. Forest clearing removes habitat for these creatures, but clears the way for standing water where mosquitoes can breed freely.

### **1.5 Valuing Nature.**

How much would you pay to save a local wetland or a tract of tropical rain forest? How much would your neighbor pay? You and your neighbor may not agree about what's important in that wetland or forest. It's not easy to put a price tag on a wetland and every wetland probably has a different value. It's important, however, to understand the value of a natural resource if it's to be preserved, continue functioning and effectively providing ecological services.

How do economists and environmental scientists calculate the value of the products and services provided by a natural resource? Think about the services provided by a large freshwater or saltwater wetland, perhaps one near you. Many types of fish spawn in wetlands and the young fish spend the beginning of their lives there. The annual worldwide fish catch is about 100 million tons and is worth \$50-100 billion. That wetland may help contribute to this very lucrative commodity. What dollar value would you put on your local wetland's contribution to the global fish catch? The fish from freshwater sport fishing in the United States alone may be worth as much as \$16 billion.

Another \$46 billion is generated employing people associated with that sport fishing industry. So, in addition to providing a nursery area for the fish you eat, a local wetland may indirectly employ someone in your community. But that isn't all a wetland provides. Flood control; water treatment and purification; nutrient cycling; wildlife habitat for hunting, viewing and photography; or other recreational opportunities, like boating and hiking, are on the short list of wetland amenities and services.

The basic categories of services and benefits, with some easier to price than others. Products, like fish or timber, are fairly easy to quantify, compared with services like nutrient cycling or water purification. Even harder to grasp in terms of economic value are the recreational, aesthetic and spiritual benefits humans gain from the natural world.

### **1.6 Worth of Biodiversity.**

The value of biodiversity is a good example of just how difficult placing a price tag on ecological services can be. Many environmentalists and experts use "biodiversity prospecting" as a significant reason for saving the world's rain forests. Tropical rain forests harbor the greatest biological diversity of species and ecosystems. Diversity of species, in turn, houses an immense variety of genes. Since 25 percent of prescription medicines contain active ingredients derived from plants, it's likely that the diversity of plants in a tropical rain forest will continue to offer new cures.

As the use of biotechnology escalates, genes to improve agricultural, industrial, and pharmaceutical products will continue to be harvested from plants and animals. It seems reasonable to think biodiversity should carry a hefty price tag. But, Resources for the Future researcher R. David Simpson considers the contribution of biodiversity on the economic margin. Although there is no substitute for biodiversity as a whole, nature tends to create redundancy, so the benefits from saving an individual species or local habitat may be small. In the end, from an economic viewpoint, pharmaceutical companies show little willingness to pay to preserve tropical rain forests worldwide.

### **Forecasting the Future of Nature's Services**

If current trends continue, humans could dramatically and irreparably alter the planet's remaining natural ecosystems within decades. To determine what should be saved or restored now, politicians and resource managers need to know how their actions (or failure to act) may affect the future. Although actually forecasting specifics is currently difficult, modeling the activities within small-scale geographic regions that provide a series of services is feasible. Forecasting can determine at what point an ecosystem's ability to provide services may break down .

Global changes, from climate warming and sea level rise, to shifts in land use and population growth, will affect the flow of ecosystem goods and services. Reliable forecasting of how these changes will alter the supply and flow of ecosystem benefits requires extensive taxonomic, ecologic, economic and sociologic understanding. Accurate forecasting models require, not only understanding how the ecosystem works, but also placing a value on its functions and products, as well as predicting how things might change over time. Long-term data and strategies for future monitoring of both the environment and the economy are needed to provide an index of change.

Probably the best-known example of forecasting based on computer modeling is the weather. Predictions of local weather conditions often are fairly accurate. Longer-term forecasts, for even the next week, are less accurate. And when it comes to predicting the next year's weather, the Farmer's Almanac is probably consulted as often as the National Weather Service. Scientists are not deterred, however, and forecasting tools that integrate societal aspects, like food production and health, are probably just on the horizon. A recently developed model that examines the effects of climate change on rice production offers detailed scenarios of how increased carbon dioxide levels and temperature could affect major rice-producing countries in Asia. Such forecasting could give governments and farmers time to adapt their planting dates, experiment with rice varieties, and research other cropping practices to accommodate long-term changes in weather and climate.

Forecasting the future is mostly still in the future. But, the data-gathering and technology development conducted today will help create reliable models for future forecasting.

## **Chapter Two: Sustainability**

The increasing stress people, businesses and organizations put on resources and environmental systems such as water, land and air cannot go on forever. To tackle this challenge we need to make sure that we live within environmental limits.

### **What is sustainable development?**

**Sustainable development** is a socio-ecological process characterized by the fulfillment of human needs while maintaining the quality of the natural environment indefinitely. The linkage between environment and development was globally recognized in 1980, when the International Union for the Conservation of Nature published the *World Conservation Strategy* and used the term "sustainable development."

The concept came into general usage following publication of the 1987 report of the Brundtland Commission — formally, the World Commission on Environment and Development. Set up by the United Nations General Assembly, the Brundtland

Commission coined what was to become the most often-quoted definition of sustainable development as development that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs."

This definition is not operational and has created much antagonism and cognitive dissonance. This arises because sustainability is often taken to refer to processes that can be maintained indefinitely. This is, of course, not the case for economic growth and development, just as the world's exponential population growth is unsustainable. Development is thus *unsustainable* in this sense. If it were to mean *development of sustainability* rather than *sustainability of development*, there would be no contradiction, but sustainability is clearly being used as an adjective here. The issue is resolved when it is realized that 'sustainable' has a different meaning in this context; something like 'that which meets the needs of the present without compromising the needs of the future'.

The field of sustainable development can be conceptually broken into three constituent parts: environmental sustainability, economic sustainability and social-political sustainability.

Sustainable development means a better quality of life now and for generations to come. A widely-used definition of 'sustainable development' is: 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs'. It means not using up resources faster than the planet can replenish, or re-stock them and joining up economic, social and environmental goals.

It also influences decision making within organisations, and therefore can go towards forming principles and business 'values' - for example, providing information to the public in an open and accessible way and involving people and communities who are affected by those decisions. Or in openly reporting how they run their business and the care they take about the local environment and the people that work for them.

These principles can also apply to government policies – for example, in planning regulations for green buildings and technologies.

It is also about being clear and responsible about the use of scientific, and other, evidence – for example, about levels of pollution or carbon emissions.

#### **The four key areas of activity**

Sustainable development covers a very wide range of activities. In the UK, four key areas have been identified:

**Sustainable consumption and production:** changing the way products and services are designed, produced, used and disposed of – in short, achieving more with less

**climate change and energy** – reducing greenhouse gas emissions in the UK and worldwide whilst at the same time preparing for the climate change that cannot be avoided

**natural resources** – understanding the limits of the natural resources that sustain life, such as water, air and soil

**sustainable communities** – looking after the places people live and work, for example, by developing green, open spaces and building energy-efficient homes

Sustainable production and use of products and services

From manufacturing and transport to packaging and use, the everyday things we buy can have a significant impact on the environment - companies and organisations have a role to play too.

### **Chapter Three: Population and Environmental Issues.**

#### **Introduction**

Population dynamics, poverty and environmental change are linked in many ways and through multiple social and economic mechanisms, at various geographic levels. But not all those linkages have relevance for policy formulation in one of the three domains thus interconnected. We try to identify policy issues among the array of conceivable linkages, placing emphasis on environmental policy. It considers both the environmental issues regarding the management of natural resources and those regarding the pollution of humankind's living quarters. These groups, which broadly correspond to the respective concerns of the rural and the urban environment - the "green" and "brown" agendas - differ in nature, and population dynamics plays different roles in them.

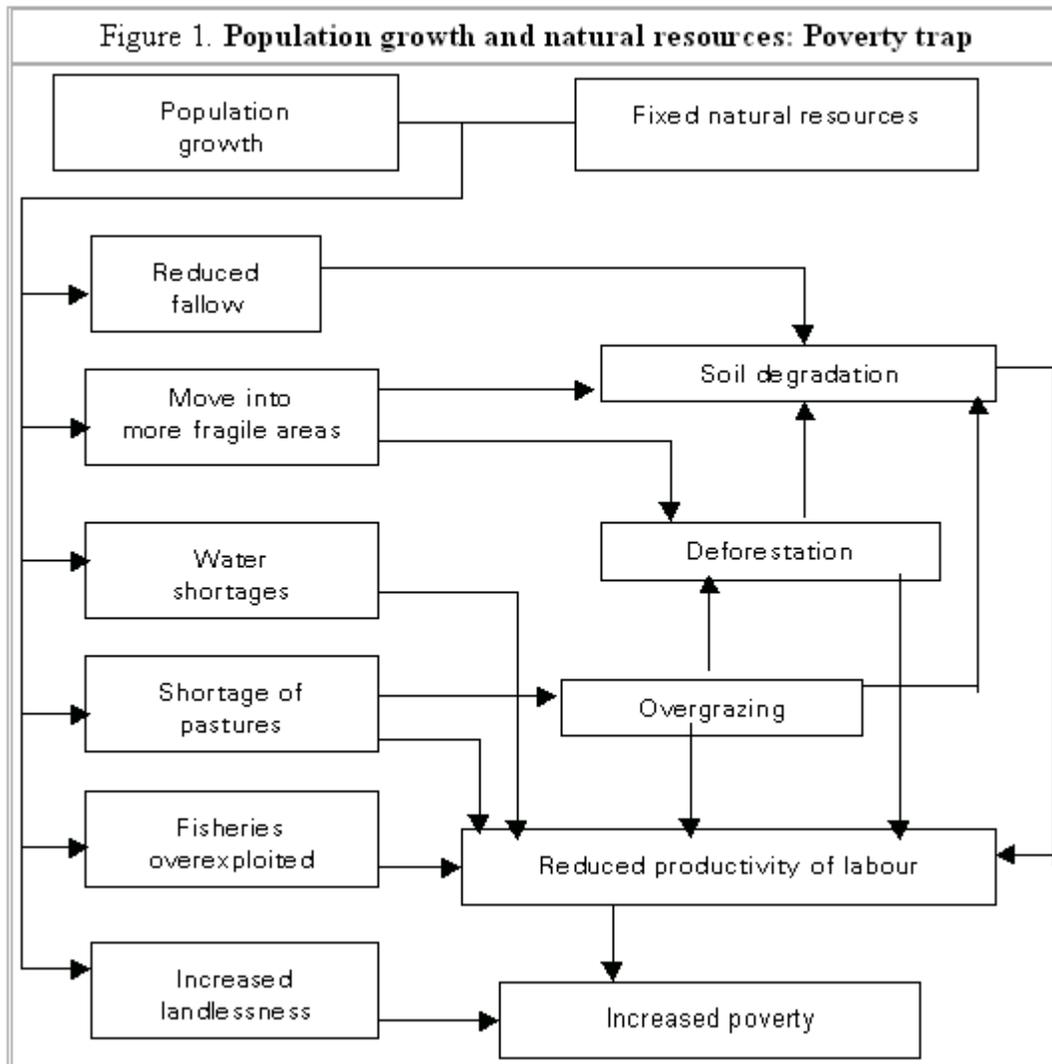
Like in all sectors, the search for policies that address population-poverty-environment linkages must be based on some representation of the nature of those linkages. But - like with population and development - there exist various, conflicting representations. I first quickly review the main perspectives and their general policy implications <sup>[1]</sup>. Then I offer some leads for a discussion on how population programmes and professionals can concretely operate within the context thus sketched.

#### **3.1 Alternative views on population-environment linkages.**

Most theories of population and environment are expounded primarily in relation to agricultural resource usage, but they can be applied *mutandis mutatis* to all types of natural resources.

For the *natural science* perspective humankind is one of the many species competing for the resources of the biosphere. As the resources of any ecosystem are finite, so is the

latter's carrying capacity; hence, beyond a point, each additional inhabitant has a negative impact on the productivity of resources; this in turn depresses labour productivity and incomes (see Figure 1). Policy-wise, this perspective leads to advocate population stabilization. At first sight, it thus seems redundant with policy prescriptions that emphasize the need to slow down population growth for the sake of enabling more productive investment and a higher rate of economic growth.



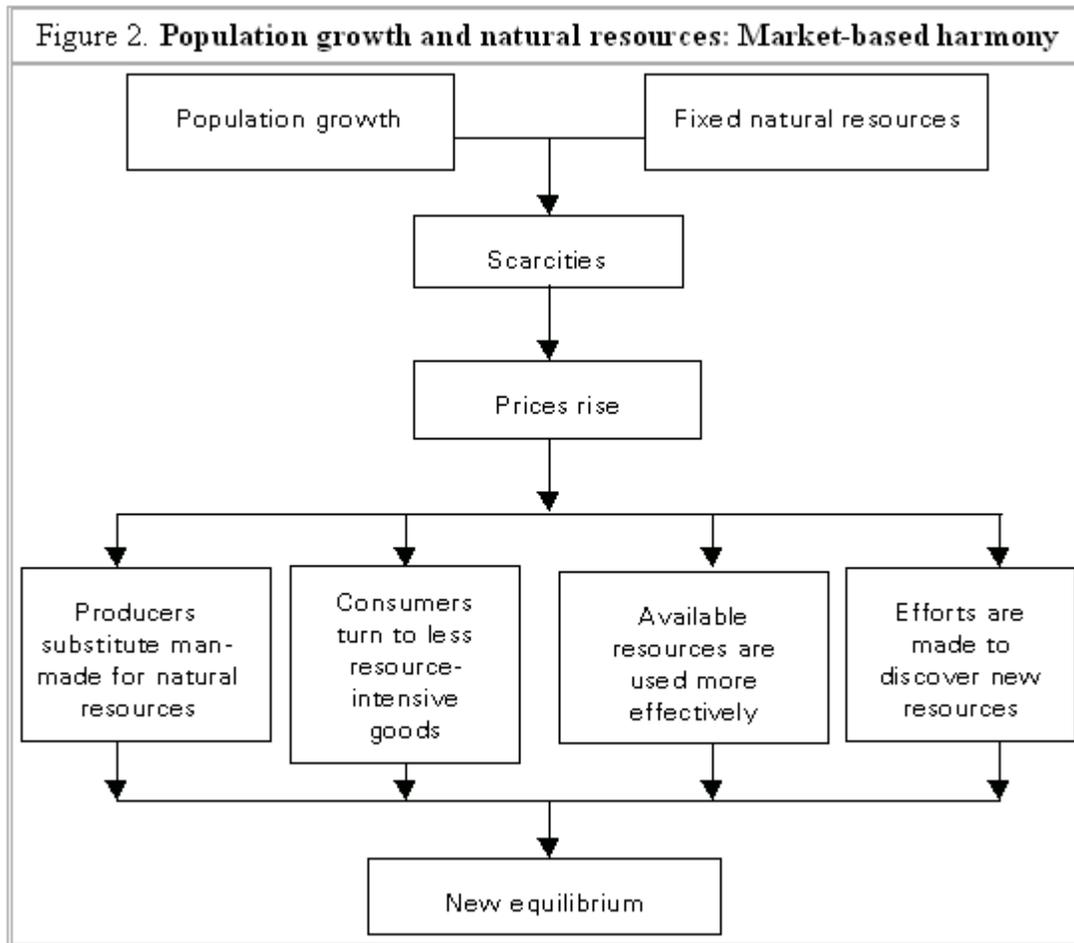
That, however, is not exactly the case. This perspective proposes that population growth must be stopped as soon as possible: this drastic goal is a logical consequence of explicitly raising the issue of the scale of human interaction with the environment (and therefore of limits to economic growth). Such a goal is not much on national agendas yet. The largely accepted policy merely seeks a slowdown; in fact, many of its proponents concede that slow population growth helps stimulate the economy, and they avoid to address the long-term view and the difficult question of an eventual upper

limit to population size. The fate of natural resources and the environment is absent from this perspective, but the concept of sustainable development now imposes a re-examination of the problem.

In fact, the two ideas (stabilizing population to protect the environment versus slowing population growth to foster more rapid economic growth) are at sharp variance. The problem is that economic growth, even coupled with slower population growth or even population stabilization, other things being equal, brings about greater environmental damage. The ICPD Programme of Action (henceforth PoA) does evoke repeatedly "sustained economic growth in the context of sustainable development", but the two concepts are mutually contradictory. In conclusion, this perspective does add a dimension to the "population slowdown" doctrine, but it is a thorny dimension that does not necessarily facilitate advocacy work.

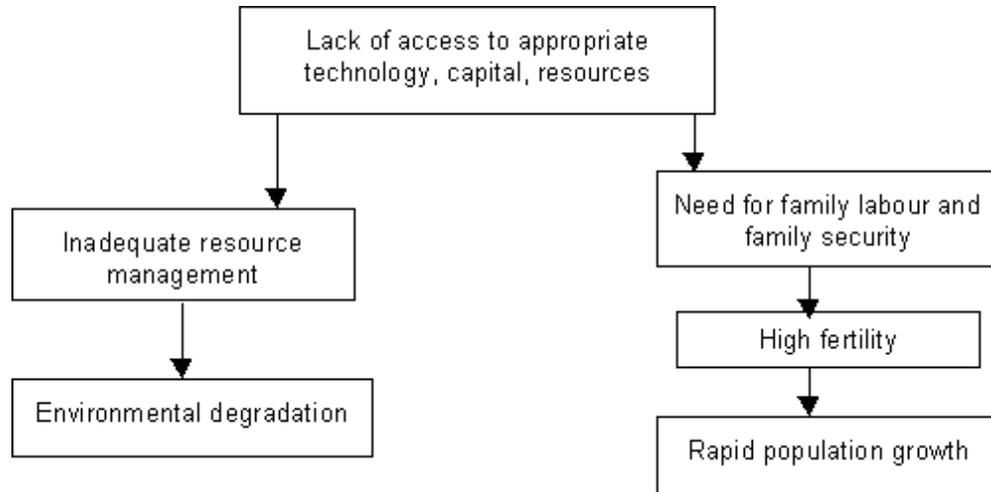
This view also recommends a balanced population distribution, i.e. a more even pressure on natural resources. It is difficult to make much of that policy-wise. First of all, the population of a given territory can exert very different degrees of pressure on land, water, biomass, and other resources, because those may be present in different quantities and qualities. Some concepts may be of help here, for instance the "potential population-supporting capacity" (PPSC) . But human pressure also depends on resource-specific patterns of use, which also vary across space, cultures etc. Equalizing degrees of resources exploitation depends on much more than population distribution, because non-resident populations participate in that exploitation (e.g. urban dwellers require agricultural products or water - in greater quantities than rural people - so they too exert a pressure on rural resources). In sum, this policy recommendation is potentially very relevant, but it requires conceptual deepening and the development of appropriate methods of analysis.

A major source of criticism to the natural science view is based on neo-classical economics and market-based adjustment mechanisms (see Figure 2). In this framework natural resources degradation is not necessarily a problem, since resources can be depleted at an acceptable rate, i.e. one that allows the market to replace those resources by alternative ones for the future ("efficient depletion"). Excessive degradation also may happen, either as a temporary consequence of population growth while adaptations take place, or as a structural problem where markets do not work efficiently (because some resources are not privately held and because prices do not reflect the scarcities and "sustainable values").



The policy prescription deriving from the neo-classical perspective is to give full efficiency to the market, meaning: define and price the use of common property resources; do not subsidize the exploitation of natural resources; and let the market, not the government, allocate resources. In this view population policy may "buy time", but it is not a "proper solution". This perspective leaves no role for population policies and programmes (else, of course, than their health value).

A third perspective (sometimes labelled *political ecology*) argues that environmental degradation and rapid population growth are both consequences of poverty (see Figure 3). In this framework, resource degradation is the result of poor farmers eking out a living in marginal areas, with few resources and an inappropriate technology. Distortions in social structures, particularly unequal land distribution, inequitable relationships between landowner and tenants, limited access to credit, and biases in technology against small peasants, are designated as culprits.

Figure 3. **Population growth and natural resources: Dual effect of poverty**

Policy-wise, this line of thought sees usefulness neither in population policy nor in mere technical interventions (such as terracing to fight land degradation), that it regards as inefficient as long as the "real" factors of degradation are not addressed. Therefore, it advocates poverty alleviation, through a more equitable distribution of resources and the redressing of distorted relations both within developing societies and between countries. This policy conclusion is entirely redundant, since the objective of poverty alleviation imposes itself on mere grounds of human rights, without any need to assume that it is the single most effective manner of tackling environmental problems.

Unlike natural resource degradation issues, there has been little analysis of the role of population dynamics in pollution. Soil, air and water pollution is mostly urbanization- and industry-related: rural pollution by agricultural chemicals (or local mining or industrial activities) is limited if compared to industrial wastes from urban areas <sup>[4]</sup>; domestic wastes are a much more serious problem in urban areas than in rural ones because they are emitted in much higher quantities on a per caput basis; and population concentration plays a specific role in that it physically makes the dispersion of pollutants in the air or water much more difficult.

These problems cannot be much alleviated by population policies. They have to do mostly with [a] economic and technological models that favour mass production and place paramount value on GDP and income considerations, downplaying quality of life (including health) and the importance of a clean and pleasant environment; and [b] careless individual and household behaviour. Population composition has been shown to play a small part, in that household structure affects greenhouse gas emissions, but it is not likely to be a policy variable for emission reduction policies <sup>[5]</sup>. As for population

concentration, it is the very substance of urbanization; of course, one may seek to keep population and housing densities within ecologically (and socially) acceptable limits.

Some policies have attempted to reduce the rate of growth of urban agglomerations, but clearly the margins for intervention are limited in this domain. It is sensible to aim to harmonize urban population growth rates with the rates of growth of productive employment in cities, just like national policies aim to moderate overall population growth in order to enable tackling investment and equipment needs in a more progressive and orderly way. But this should be done by reducing the "push" factors in rural areas, especially when this leads to redressing unjustifiable inequities.

Finally, population has been viewed as an *intermediate variable*: technical, economic or social variables (e.g. poverty, defective markets, polluting technologies, distortionary policies etc.) would work "through" population growth, which merely "exacerbates" the effects of these processes. Of course the broad policy conclusion then is that measures are needed to attack the "root causes". However, population policy in this framework is accepted, as it "buys time". Further, the population variable is viewed by some as more tractable than some other factors, especially those more politically charged such as the urban bias, land mismanagement or distortionary fiscal and price policies <sup>[6]</sup>. Accordingly, it has been for instance recommended to focus population policies on the more ecologically problematic areas, or to focus family planning efforts on landless families (thus also contributing to improve human capital).

The above review seems to tell us that single-minded perspectives do not help very much in understanding the issues - nor in designing appropriate policies in response. In section 4, I shall propose some ideas for going further in policy analysis. Beforehand, however, I wish to take for a brief moment the advocacy viewpoint and offer a general defiance of the relevance of the population variable.

### **3.2 Environmental issues: relevance of population dynamics.**

How do we enter the debate between the conflicting theoretical and policy perspectives when it comes to providing advice on their application at the country level? I think we have a duty to say that population dynamics do matter, and to show why and how.

- Opponents of the natural science perspective stress the static character of the model. In reality, this perspective does not ignore the role of technological change in enabling adaptations, and therefore in accommodating more population. But in this view technology merely "buys time": it is a temporary remedy, with increasing costs, and an ultimately limited capacity to solve problems. Critics reply that this underrates the adaptive capacities of humankind, and point for instance to the record of technological successes of

the last century. But, in turn, the natural science perspective asks: must we mobilize ever more technological ingenuity and resources simply to crowd up the ecosystem with human beings?

- The neo-classical perspective underrates the importance of population growth, whose place in the theory is flawed in two manners: (a) population growth is not a one-time event, but a continuous process: therefore, the necessary adaptations must be continuous also and their failures cannot be regarded as a temporary inconvenience; and (b) "true prices" reflecting expected future values would be affected by the rate of population growth, as the latter increases competition for resources - hence discount rates - and raises amortization costs. Conversely, this perspective overrates the capacity of markets to generate a sustainable use of resources. If anything, markets have been shown not to adequately take into account the long-term view. Intergenerational equity can only be entrusted to a collective entity, also because decisions based on private utility functions usually ignore the ecological and social functions of the environment (e.g. aquifer recharge, flood control, health protection). Indeed, private property does not guarantee that resources will be managed with a concern for long-term sustainability.
- The "political ecology" analysis does provide an explanation for situations in which the outcome contradicts expectations based on the mere population-resources ratio, but it also has limitations. One of those is the rejection of a territory's carrying capacity as a significant factor in ecological outcomes - a view contradicted by empirical data, since population/PPSC ratios are rather well correlated with the incidence of land degradation . Another is the simplification of the poverty-fertility linkage (there is high fertility in a number of high-income populations, while in certain institutional and cultural contexts poverty may trigger a fertility transition) . Yet another is the neglect of the influence of population dynamics on poverty. Access to natural resources is affected, among others, by population density: population pressure "is an important and reinforcing link in reducing that access to sectors of an agrarian population" so that, while not causing inevitably land degradation, it "may almost inevitably lead to extreme poverty when it occurs in underdeveloped, mainly rural, countries". And inequality reduction is insufficient as a remedy when that pressure is strong .

Besides, the idea of a causal linkage between poverty and environmental degradation is questionable. Poverty has been seen as contributing much to resource overuse in developing countries: "poor households are often virtually forced to overuse natural resources for daily subsistence. Thus, landless farmers colonize tropical forests, or [cultivate] highly erodible hillsides. Rural households in fuelwood-deficit countries strip foliage and burn crop and animal residues for fuel rather than using them for fertilizer and this contributes to desertification. Underemployed men in coastal villages overexploit already depleted inshore

fisheries". But this view seems to be an illusion caused by the fact that the damage caused by the poor - unlike that caused by the affluent - is immediately visible at their doorsteps. The poor "possess neither fields nor livestock. Since they have no access to land, they cannot degrade it"; overall, "consumption and waste per person is also lowest among the poorest ... all in all, the poor probably tread lightest of all upon the earth, and do less damage to the environment than any other group. They are victims, not perpetrators" .

- The view of population as an intermediate variable recognizes the value of policies that slow down population growth. On the other hand it is conceptually poor - it contains no useful economic or social analysis and offers no guidance on key possible policy variables and linkages between those.

The pressure of human activities on natural resources can arise from a host of factors: a large or growing population; outside market demands; the nature of agricultural activities; or institutional, social and economic conditions which lead to the extraction of surpluses from the land managers, forcing them in turn to extract from the resources more than is sustainable. Such conditions may be: heavy tax or tribute; very low wages; denial of access to CPRs; low commodity prices due to state intervention or market distortions; indebtedness; and so on.

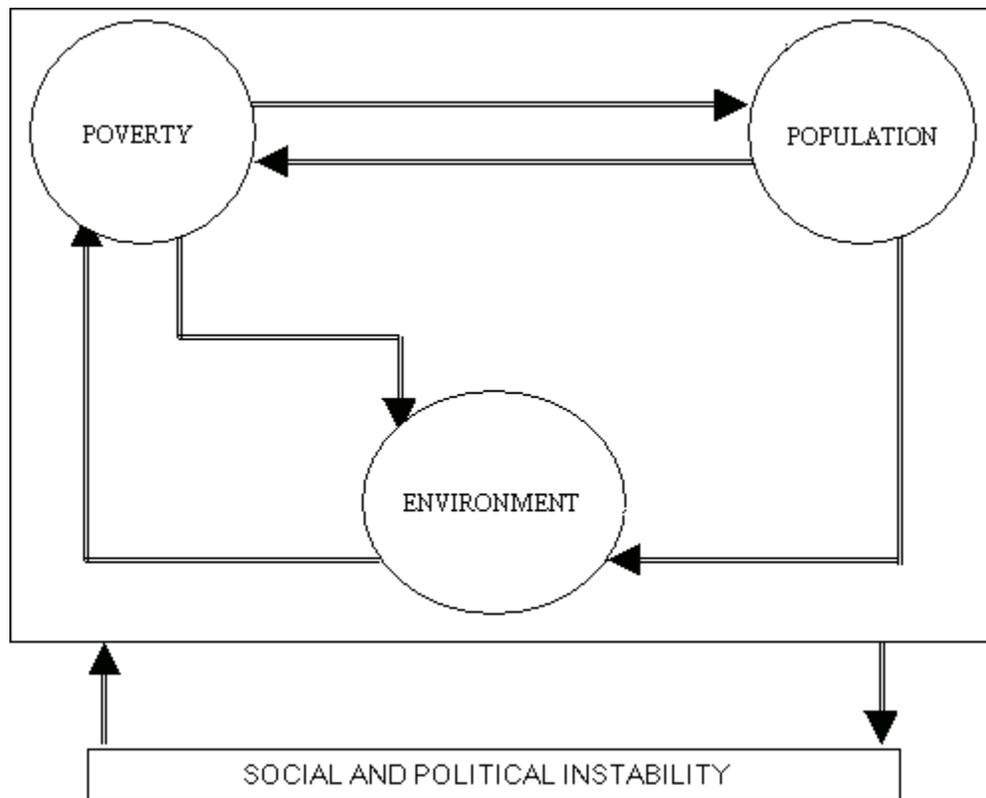
In this context, population factors appear both as part of the basic conditions within which the socio-economic system operates (population density with regard to resources) and of the forces that affect its patterns of change (population growth, urbanization, migration). Density is relevant to the level of direct pressure on resources; population growth and urbanization affect the volume of market demands; urbanization absorbs land, and is conducive to biased pricing policies; a large and growing rural labour force contributes to low wages; excess demand for access to CPRs may shut out part of the population.

Population dynamics must be taken into account, and it must be regarded as more than an exogenous variable: two-way linkages between population change and other elements of the system must be recognized. A systemic view of the "linkages" is therefore needed. This being said, what specific, self-standing policy recommendations can we reasonably sustain?

### **3.3 A policy analysis perspective.**

How should policy analysis orient itself in the "population-poverty-environment nexus"? The negative view of a nexus is that the elements are linked in a vicious circle, so that people are caught in a deadlock if not in a downward spiral. Figure 4 is a simplified image of one such nexus.

Figure 4. "The P-P-E spiral"



The detailed linkages in Figure 4 are as follows:

- **"Poverty" affects "population" through:**
  - High child death rates lead parents to compensate or insure by having more children.
  - Lack of water supply, fuel and labour-saving devices increases the need for children to help in fields and homes.

- Lack of security in illness and old age increases the need for many children.
- Lack of education means less awareness of family planning methods and benefits, less use of clinics.
- Lack of confidence in future and control over circumstances does not encourage planning - including family planning.
- Low status of women, often associated with poverty, means women often uneducated, without power to control fertility.
- 
- **"Population" affects "poverty" through:**
  - Unemployment, low wages for those in work, dilution of economic gain.
  - Increasing landlessness - inherited plots divided and subdivided among many children.
  - Overstretching of social services, schools, health centres, family planning clinics, water and sanitation services.
- 
- **"Poverty" affects "environment" through:**
  - Difficulty in meeting today's needs means that short-term exploitation of the environment must take priority over long-term protection.
  - Lack of knowledge about environmental issues and long-term consequences of today's actions.
- **"Environment" affects "poverty" through:**
  - Soil erosion, salination, and flooding cause declining yields, declining employment and incomes, loss of fish catches.
  - Poor housing, poor services and overcrowding exacerbate disease problems and lower productivity.
- **"Population" affects "environment" through:**
  - Increasing pressure on marginal lands, over-exploitation of soils, overgrazing, over cutting of wood.
  - Soil erosion, silting, flooding.
  - Increased use of pesticides, fertilizer, water for irrigation- increased salination, pollution of fisheries.
  - Migration to overcrowded slums, problems of water supply and sanitation, industrial waste dangers, indoor air pollution, mud slides.

The positive view of a nexus is that progress in one of the interlinked sectors is likely to generate positive effects on the others. For instance: "[e]fforts to slow down population growth, to reduce poverty, to achieve economic progress, to improve environmental protection, and to reduce unsustainable consumption patterns are mutually reinforcing" (ICPD PoA).

But, since efforts in one sector will meet constraints rooted in the other sectors, the question arises: if there are vicious circles of population-poverty-environmental change,

how much do conventional policy formulations help? For instance, the ICPD PoA states that "eradication of poverty will contribute to slowing population growth and to achieving early population stabilization". But it also adheres to the common wisdom that sustained economic growth "is essential to eradicate poverty". On the other hand, rapid population growth is an obstacle to sustained economic growth.

Ostensibly ignoring this vicious circle implies a belief that it can be broken simply by cumulating classical sectoral policies. Thus the ICPD's "comprehensive" view of population, development, poverty and environment did not produce any new policy perspective - because it contained no paradigm of the nature of the articulations between key phenomena. But in policy analysis work we cannot content ourselves with assuming general synergies: we must seek specific sectoral approaches that strengthen, and benefit from, those adopted in the connected sectors. In order to do that, we need to identify and address key articulation points of the single issues.

Taking as a starting point the need for improving environmental policy, here follow a few ideas derived from the preceding considerations.

- A basic step is the identification of the country's or region's *priority environmental issues*. One sensible approach to that identification, from our viewpoint, would be to quantitatively assess and compare the impacts of the various issues on human populations. The task of assessing, comparing and classifying those impacts is complex, but probably no more than other valuation and decision problems that are tackled in various fields of human activity through multicriteria analysis techniques. The criteria should not be only economic, but include for instance labour use and health indicators, with a gender dimension. The size of populations affected would be an important consideration in assessing priorities. This would go some way towards recommendation to "assess human vulnerability in ecologically sensitive areas and centres of population to determine the priorities for action at all levels, taking full account of community-defined needs".
- When the possibilities for designing broad strategies from scratch are limited - because there exist on-going sectoral strategies and programs with their institutional stakes - the problem is to provide advice as to how to redirect existing policies to seek [a] greater *internal efficiency* and [b] greater *synergies*.
- The efficiency concern points to the need to address the *processes* that underlie specific demographic, poverty and environmental outcomes (creating an overall favourable context through legislation, IEC and macro-economic measures is not enough). For example, abating high rural fertility entails an understanding of the economic and social functions of large family sizes in rural societies. It also entails synergetic economic and social policies that modify those functions. Likewise, improving environmental outcomes requires addressing the various actors in those outcomes and their rationales.

- On this latter point, when looking for policy variables, it may be useful to think in terms of *chains of explanation*: with the land degradation issue, for instance, the chain "starts with the land managers and their direct relations with the land ... [The] next link concerns their relations with each other, other land users, and groups in the wider society who affect them in any way ... The state and the world economy constitute the last links in the chain".
- The operationally important processes will often be *location or group-specific*: their causes (and consequences) differ from one ecological, economic and socio-cultural context to another. Environmental problems are known to be highly location-specific. Demographic dynamics and patterns can vary significantly among groups of population defined e.g. along socio-economic or cultural lines. Likewise, constraints differ among categories of poor (urban/rural, with/without access to land, early/late in the family life cycle, etc.). Across-the-board policies in these conditions are far less than optimal instruments, and disaggregated scales of analysis (in the geographic sense but also in the social sense) are useful.
- The concern for synergies points to the need for identifying sectoral policies that are most likely to have a positive effect on a connected sector (and possibly positive feedbacks on the sector directly concerned). This requires a sensible representation of the key linkages in the context at hand (territory and population). In forming such a representation, the theoretical perspectives reviewed above can be useful, but probably no more than as hypotheses, because the respective relevance of population pressure, market failures, will vary from one place to another .
- Policies should be built upon an understanding of the rationality of *households* - where migration, labour use, mixes of economic activities, production techniques etc. are decided. The household is the right locus to seek policy measures that facilitate population-poverty-environment adaptations.
- A central concern should be the *productivity of labour* . Women's labour is of special relevance, not only on equity and health grounds, but also because children's labour often is a complement or substitute for it. In such situations, low female productivity has been shown to be an incentive to high "demand" for children. Progress in this respect reduces the need for large families, improves health conditions, alleviates poverty and, if it increases flexibility of time use, enables better management of the local resources and environment. But from the viewpoint of sustainability it is important that this does not bring about a higher rate of exploitation of the resources. Hence, the priority should be on implementing productivity-raising measures in areas least at risk of resource degradation.

### 3.4 Consumption.

The existing corpus of research on P-P-E linkages is disappointing. Methods often are questionable - like with much research on population and development in general - and "findings" often are contentious. It is fair to note that population specialists have not participated much in these efforts so far. Yet, they can contribute significantly to the advancement not of an abstract "knowledge" of the linkages, but of policy making.

For that, efforts should be targeted to shed light on specific decision problems. Initiatives could be taken in the context of population and development strategy support programmes, to illustrate to policy makers the potential practical value of the oft-repeated proposition about integrating demographic factors in the study of environment and formulation of related policies.

Examples of this would be:

- Study current or contemplated environmental, economic and anti-poverty policies with a view to assess their possible effects on demographic dynamics.
- Detect possible environmental crises. This has much to do with the *Agenda 21* idea of identifying areas at risk and populations at risk, and the articulation of these two types of study has very interesting aspects.
- Study the possible consequences of specific courses of action: e.g. [a] identify populations at risk given the trends in resources exploitation (including risks of population displacement), or [b] identify potential migration flows linked to the development of new areas. This kind of work may improve resource management, or help trigger and orient government intervention where the latter has not been completely banned.
- Do scenario analyses on a "desirable" national population distribution, e.g. to define an economically efficient distribution, or to assess the economic implications of achieving a desirable distribution according to non-economic criteria (social, strategic etc.).
- Assess the environmental implications of the current population distribution.
- Study the dynamics of migrant and resettled populations.

In all cases, a necessary ingredient of this type of efforts would be experimentation on a variety of assessment and scenario analysis methods applicable to the substantive questions discussed here.

Do large populations affect and put stress on the environment, society and resources? Populations do affect and put stress on the environment. However, some claim that overpopulation is the major cause of environmental degradation. Is that so?

While populations no doubt are large in many countries, and demands on resources are obviously large, it is only one of many other causes and some of those other issues such as over-consumption based, unsustainable development may have an even larger impact. Our choice of how to use those resources (i.e. our economic policies) and for

what purposes (i.e. our political directions and policies) are critical issues as well on the resulting impact on the environment to meet those uses and purposes.

Existing consumption patterns as seen in Europe and North America can put strain on the environment and natural resources, which can have serious impacts on society. But, how much of the environmental degradation we see today is as a result of over-population and how much is due to over-exploitation due to consumerism and geopolitical interests?

Though most societies were efficient for the time in which they were formed, powerful nations disintegrated when too large a share of their labor was diverted to unnecessary tasks. Some societies, such as the European aristocratic structures, needlessly expended labor, resources, and capital to support militaristic elite bent on plundering neighbors and their own workers. Each of these societies became locked into a wasteful system of production and distribution. The United States is also locked into a wasteful expenditure of labor, resources, and industry.

Some suggest that the industrialized nations need to drastically change their consumption patterns that are currently seen, as this is depleting resources more than the demands from large populations as seen in many developing nations.

Even the 1998 Human Development Report from the United Nations politely suggested similar things:

Today's consumption is undermining the environmental resource base. It is exacerbating inequalities. And the dynamics of the consumption-poverty-inequality-environment nexus are accelerating. If the trends continue without change - not redistributing from high-income to low-income consumers, not shifting from polluting to cleaner goods and production technologies, not promoting goods that empower poor producers, not shifting priority from consumption for conspicuous display to meeting basic needs-today's problems of consumption and human development will worsen.

... The real issue is not consumption itself but its patterns and effects.

... Inequalities in consumption are stark. Globally, the 20% of the world's people in the highest-income countries account for 86% of total private consumption expenditures - the

- poorest 20% a minuscule 1.3%. More specifically,
- the richest fifth Consume 45% of all meat and fish, the poorest fifth 5%.
- Consume 58% of total energy, the poorest fifth less than 4%.
- Have 74% of all telephone lines, the poorest fifth 1.5%.
- The richest Consume 84% of all paper, the poorest fifth 1.1%.
- Own 87% of the world's vehicle fleet, the poorest fifth less than 1%.
- Runaway growth in consumption in the past 50 years is putting strains on the environment never before seen.

Take for example the United States. With around 5 percent of the world's population, the US consumes about 40% of the world's resources and emits around 21% of the world's carbon dioxide, a greenhouse-causing gas. The United States, however, is not over-populated, but the consumption-based life style does have its effects.

That is not to say that there are no problems in developing countries! In India for example, Delhi is a good example of a growing city. However, with this development come serious growing pains, such as pollution and unsustainable resource management. Consumption patterns driven by current growth-based economics promote production and purchase of more and more material wealth and satisfaction. The impact on the environment from the increased need to obtain inputs such as raw materials and use of the environment, as well as increased waste, is considerable. The consumption levels of all people around the world are not the same. Take the following for example that compares consumption levels:

The wealthy have been able to influence the economic conditions to benefit them and maintain dependency and poverty in the poorer nations. Reducing populations in poorer countries without addressing economic justice issues and so on could lead to further poverty and marginalization of other people while giving a rest bit to the environment, further legitimizing calls that the poor are to blame for most environmental degradation.

#### **Chapter Four: Poverty and environmental Issues.**

The environmental degradation and poverty alleviation are urgent global issues that have a lot in common, but are often treated separately. This article explores some of these linkages.

Both environmental degradation and poverty alleviation are urgent global issues that have a lot in common, but are often treated separately. Consider the following:

- Human activities are resulting in mass species extinction rates higher than ever before, currently approaching 1000 times the normal rate;
- Human-induced climate change is threatening an even bleaker future;
- At the same time, the inequality of human societies is extreme:
  - The United Nations Human Development Report reveals that, “Globally, the 20% of the world’s people in the highest-income countries account for 86% of total private consumption expenditures—the poorest 20% a minuscule 1.3%”

- To highlight this inequality further, consider that approximately 1 billion people suffer from hunger and some 2 to 3.5 billion people have a deficiency of vitamins and minerals
- Yet, some 1.2 billion suffer from obesity
- One billion people live on less than a dollar a day, the official measure of poverty
- However, half the world — nearly three billion people — lives on less than two dollars a day.
- Yet, just a few hundred millionaires now own as much wealth as the world's poorest 2.5 billion people.

Issues about environment, economics and politics are inter-related through the way humans interact with their surroundings and with each other.

Biological diversity allows a variety of species to all work together to help maintain the environment without costly human intervention. We benefit because the environment sustains us with the variety of resources produced.

However, there is often a mainstream belief that for poor countries to develop, environmental concerns have to be sacrificed, or is a luxury to address once poverty is alleviated.

Therefore, the approaches to such issues require rethinking. The overloaded phrase “sustainable development” must recognize the interconnectedness between human beings and the environment if true environmental and social justice is to be obtained.

As Delhi-based environment organization, the Centre for Science and Environment, points out, if the poor world were to develop and consume in the same manner as the West to achieve the same living standards, “we would need two additional planet Earths to produce resources and absorb wastes ... and good planets are hard to find!”

#### **4.1 Impact of Poverty on the Environment.**

Poverty and third world debt has been shown to result in resource stripping just to survive or pay off debts.

For example, Nepal and Bangladesh have suffered from various environmental problems such as increasingly devastating floods, often believed to be resulting from large-scale deforestation.

Forests around the world face increased pressures from timber companies, agricultural businesses, and local populations that use forest resources.

Some environmentalists, from rich nations especially, also raise concerns about increasing populations placing excessive burdens on the world's resources as the current major source of environmental problems.

This makes for a worrying situation for third world development and poverty alleviation. However, an environment-only approach risks "blaming the victims." While humans are largely responsible for many problems of the planet today, not all humans have the same impact on the environment. It is important to consider, for example, that the consumption of just the world's wealthiest fifth of humanity is so much more than the rest of the world, as highlighted at the beginning.



Thus, putting emphasis on population growth in this way is perhaps over-simplistic. However, this does not mean we can be complacent about future population burdens. Sustainability is critical for the world's majority to develop without following the environmentally damaging processes of the world's currently industrialized nations.

Also adding to the complexity is that resource usage is not necessarily fixed. That is, while there may be a finite amount of say oil in the ground, we may have not discovered it all, and further, overtime the use of those resources may increase in efficiency (or inefficiency). This means a planet could sustain a high population (probably within some limits) but it is a combination of things like how we use resources, for what purpose, how many, how the use of those resources change over time, etc, that defines whether they are used inefficiently or not and whether we will run out of them or not.

#### **4.2 Impact of Richer Nations on the Environment.**

Economic growth—meaning a sustained expansion in the resources available to meet society's needs—provides the best setting for meeting environmental challenges. Typically, the greatest obstacle in overcoming familiar environmental problems such as air and water pollution is simply a lack of resources. However, growth alone is not enough, since some patterns of economic growth are environmentally damaging,

especially when polluters do not have to bear the full costs of their activities. The proper response in such cases is to improve the pattern of growth, not to abandon growth as an objective.

Poverty can both aggravate and be aggravated by environmental problems. For example, poverty may combine with population pressures to cause forests and other natural resources to be exploited inefficiently and unsustainably. Equally, many environmental problems bear heavily on the poor. Because they tend to live in less favored locations, poor people may be the greatest sufferers from air and water pollution and the effects of natural disasters.

Ideally, the environment benefits from virtuous circles in which sustainable economic growth reduces poverty, increases resources available to improve the environment, and is itself reinforced by these trends.

The relationship between the rich and poor, and the impacts on the environment go deep. Economics is meant to be about efficient allocation of resources to meet everyone's needs. However, international power politics and ideologies have continued to influence policies in such a way that decision-making remains concentrated in the hands of a few narrow interests. The result is that the world's resources are allocated to meet a few people's wants, not everyone's needs.

Indian activist and scientist, Vandana Shiva, shows in her work that many people have been forced into poverty due to politics and economics such as concentrated land rights, pressure from industry to exploit the environment in ways that destroy diversity and affect local populations, etc. Shiva also highlights that the poor often have a lot of knowledge about their environment and are often sustainers and efficient users of it, as they recognize their link to it for their survival.

Excessive third world debt burden has meant that it has been harder to prioritize on sustainable development. Unfair debt, imposed on the third world for decades by the global institutions, the International Monetary Fund (IMF) and World Bank through their harsh Structural Adjustment programmes (SAPs) have opened up of economies rapidly, in socially, politically, environmentally and economically destructive ways, while requiring a prioritization on debt repayment and cut backs on health, education and other critical services. They have encouraged concentration on producing just a few cash crops and other commodities primarily for export, using very environmentally damaging "industrial agriculture", which reduces biodiversity, requiring costly inputs such as environmentally damaging pesticides and fertilizers to make up for the loss of free services a diverse farm ecosystem would provide, and as Vandana Shiva charges,

has destroyed diverse sources of food, and it has stolen food from other species to bring larger quantities of specific commodities to the market, using huge quantities of fossil

fuels and water and toxic chemicals in the process. ... Since cattle and earthworms are our partners in food production, stealing food from them makes it impossible to maintain food production over time....

... More grain from two or three commodities arrived on national and international markets, but less food was eaten by farm families in the Third World.

The gain in “yields” of industrially produced crops is based on a theft of food from other species and the rural poor in the Third World. That is why, as more grain is produced and traded globally, more people go hungry in the Third World. Global markets have more commodities for trading because food has been robbed from nature and the poor.

Mainstream economists and politicians have long been criticized for concentrating on economic growth in ways that ignores humanity and the environmental costs. Perhaps one of the harshest ironies is how food and farm products flow from areas of hunger and need, to areas where money and demand is concentrated. Farm workers, and women especially, are amongst the worlds most hungry.

It is not just a problem in agriculture but other industries too. In 1991, then Chief Economist for the World Bank, Larry Summers, (and later U.S. Treasury Secretary, under the Clinton Administration), had been a strong backer of the disastrous SAPs. He wrote a leaked internal memo in 1992, revealing the extent to which international policies have an impact on nations around the world when it comes to environmental and other considerations:

Just between you and me, shouldn't the World Bank be encouraging more migration of dirty industries to the LDCs [less developed countries]? ... The economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable, and we should face up to that... Under-populated countries in Africa are vastly under-polluted; their air quality is probably vastly inefficiently low compared to Los Angeles or Mexico City... The concern over an agent that causes a one in a million change in the odds of prostate cancer is obviously going to be much higher in a country where people survive to get prostate cancer than in a country where under-five mortality is 200 per thousand.

For years, rich countries have been migrating some polluting industries to poor countries, but still producing primarily for rich countries. This has been possible insofar as it is cheaper than to pay for costly environmentally clean technologies that people demand.

### **Diverting Resources to Non-Productive Uses**

It is perhaps natural to assume that we are growing food to feed people, but are struggling to keep up. Reasons are frequently attributed to the effects that rapid

population growth places of poor countries as the ultimate cause. However, we make more than enough food to keep up with population growth, although environmentally damaging industrial agriculture threatens future sustainability.

Yet how is it that there is so much hunger, and that farm workers are usually the hungriest people in the world?

An indication of the answer lies in what is less discussed in the mainstream: the purpose of agriculture in today's world. Like many other markets, food is available to those who can afford it, not necessarily those who need it. Most food is therefore produced to meet consumer demands, not the needs of the poor or hungry. When money talks, the poor have no voice.

This leads to a major diversion, and even wastage, of environmental resources from productive uses to non-productive uses. For poor countries that need to earn foreign exchange to pay off huge debts, cash crops offer the chance of money. For elite landowners, this is the only way they can make money, as the poor have little. As professor of anthropology, Richard Robbins, summarizes:

To understand why people go hungry you must stop thinking about food as something farmers grow for others to eat, and begin thinking about it as something companies produce for other people to buy.

- Food is a commodity. ...
- Much of the best agricultural land in the world is used to grow commodities such as cotton, sisal, tea, tobacco, sugar cane, and cocoa, items which are non-food products or are marginally nutritious, but for which there is a large market.
- Millions of acres of potentially productive farmland is used to pasture cattle, an extremely inefficient use of land, water and energy, but one for which there is a market in wealthy countries.
- More than half the grain grown in the United States (requiring half the water used in the U.S.) is fed to livestock, grain that would feed far more people than would the livestock to which it is fed. ...

The problem, of course, is that people who don't have enough money to buy food (and more than one billion people earn less than \$1.00 a day), simply don't count in the food equation.

- In other words, if you don't have the money to buy food, no one is going to grow it for you.
- Put yet another way, you would not expect The Gap to manufacture clothes, Adidas to manufacture sneakers, or IBM to provide computers for those people

earning \$1.00 a day or less; likewise, you would not expect ADM (“Supermarket to the World”) [A large food processing company] to produce food for them.

- What this means is that ending hunger requires doing away with poverty, or, at the very least, ensuring that people have enough money or the means to acquire it, to buy, and hence create a market demand for food.

In addition to minor nutritional quality, or damaging consumer’s health, some major agricultural products also involve production practices that damage the health and safety of workers and the environment.

For example, rainforests are often cleared to make way for grazing animals to be slaughtered for unhealthy fast food meat consumption, while prime land and the surrounding environment is often degraded when producing cash crops for the wealthier parts of the world. The effects are numerous.

Industries such as the fast food industry benefit from people consuming more fast food meats and sugar-based products. Excessive consumption of coffee, alcohol, tobacco, etc, place an extra burden on the poor and on environmental resources, both in production of these products as well as at the other end, where health departments are already strained.

Yet this all contributes to economic measures such as Gross National Product. Economists and politicians look at these to see how well their policies are faring. Selling more sugary products or fast foods to children and adults results in more sales! Many environmental costs are either not accounted for or only partly so. For example, if the full cost of water by the meat industry in the United States was accounted for, common hamburger meat would cost \$35 a pound!

We end up in a situation where 1 billion suffer from hunger, while another billion suffer from obesity.

### ***Environment and Poverty are Related Issues***

The above just scratches the surface, but highlights the interconnectedness of humanity, the environment and all other forms of life. We cannot take the environment for granted. Humanity has a responsibility not only to each other, but to the environment as well, as the environment has long sustained us and can only continue to do so if we do not destroy it.

Technological solutions, such as more environmentally friendly technologies, while extremely important, do not address underlying political, social and economic causes. Just as doctors highlight the need to prevent illnesses in the first place, and resort to cures when needed, so too do we need to understand these deeper issues in a more

holistic manner. The interconnectedness needs more recognition if environmental degradation, poverty and other global problems can begin to be addressed.

Concentrating on one dimension without others is similar to those blind men looking at just a part of the elephant. A form of environmentalism that ignores humanity as an integral part of the solution, of economic dogma that forgets about our basic needs, and of forms of development that ignore environmental concerns all add up to numerous problems for the world's people and fragile ecosystems. Some of these problems are so big we do not even see them even when we think our eyes are open.

## **8. Environmental resource management**

**Soil Management:** the basis of all scientific agriculture, which involves six essential practices: proper tillage; Traditional tillage may harm the soil if practised continuously over many years, especially if the fertile topsoil layer is thin. Today, many farmers use a programme of minimum or reduced tillage to conserve the soil. In this form of tillage, any dead plant material that remains on the ground after the crop is harvested is left on or near the surface of the soil, rather than being ploughed deeply into the ground as in traditional tillage; this helps to keep moisture within the ground, and protects the soil from erosion.

**Maintenance of a proper supply of organic matter in the soil**  
Organic matter is an important element in maintaining good physical conditions in the soil; it contains the entire soil reserve of nitrogen and significant amounts of other nutrients, such as phosphorus and Sulphur. Soil productivity is thus markedly affected by the organic-matter balance maintained in the soil. Because most cultivated vegetation is harvested instead of being left to decay, organic materials that would ordinarily enter the soil upon plant decomposition are lost. To compensate for this loss, various standardized methods are employed. The two most important of these methods are crop rotation and artificial fertilization.

**Maintenance of a proper nutrient supply:** Among soil deficiencies that affect productivity, deficiency of nutrients is especially problematic. The nutrients most necessary for proper plant growth are nitrogen, potassium, phosphorus, iron, calcium, sulphur, and magnesium, all of which usually exist in most soils in varying quantities. In addition, most plants require minute amounts of substances known as *trace elements*, which are present in the soil in very small quantities and include manganese, zinc, copper, and boron. Nutrients often occur in the soil in compounds that cannot be readily utilized by plants. For example, phosphorus combined with calcium or magnesium can be used by plants, but phosphorus combined with iron or aluminium usually cannot. Enrichment with artificial fertilizers and by treatments hastening the breakdown of complex compounds often increases the supply of usable minerals in soil. The supply of available phosphorus, for example, is often increased by the addition of *superphosphate* fertilizers. Adding calcium to soils also decreases soil acidity and makes

phosphorus more readily available to vegetation. The existence of phosphorus in several unavailable forms is sometimes advantageous, however, as it helps to conserve the phosphorus supply in the soil and makes the effects of superphosphate applications last for several years. Copper and sulphur are often added to the soil through the use of spray solutions. Other elements are added by direct application or by the use of specific artificial fertilizers.

**Control of soil pollution:** Soil pollution is defined as the build-up in soils of persistent toxic compounds, chemicals, salts, radioactive materials, or disease-causing agents, which have adverse effects on plant growth and animal health. The increasing amounts of fertilizers and other agricultural chemicals that were applied to soils following the end of World War II, plus industrial and domestic waste-disposal practices, led to increasing concern over soil pollution by the mid-1960s. Although the application of fertilizers containing the primary nutrients—nitrogen, phosphorus, and potassium—has not led to soil pollution, the application of trace elements has. The irrigation of arid lands often leads to pollution with salts. Sulphur from industrial waste has polluted soils in the past, as has the accumulation of arsenic compounds in soils following years of spraying crops with lead arsenate. The application of pesticides has also led to short-term soil pollution

**Maintenance of the correct soil acidity:** Maintenance of specific soil acidities is important in soil management in order to control the adaptation of various crops and native vegetation to different soils. For example, cranberries can be successfully grown only in moderately to strongly acid soils, whereas alfalfa and other legumes are successful only in weakly acid or slightly alkaline soils. The ordinary procedure for correcting excess soil acidity is the application of lime in the form of limestone, dolomitic limestone, or burnt lime. When lime is added, the hydrogen of the complex soil colloid is exchanged for the calcium of lime. Acid soils are found predominantly in regions of high rainfall; in arid regions, the soil is usually alkaline.

**Control of erosion:** The mechanical loss of fertile topsoil is one of the gravest problems of agriculture. Such loss is almost always caused by erosion resulting from the action of water or wind. For a discussion of the problem and the various methods for combating erosion

**Forest management:**

Traditional forest management systems in many forested areas have sustained the yields of many products over centuries, such as the procedure of coppicing, practised in Britain since medieval times, which managed small areas of woodland for the production of charcoal and small-scale wood products such as fencing materials. This involved regular cutting back and thinning of the trees, but also ensured the continuation of the whole ecosystem by limiting use to levels which could be compensated for by gradual and continual regeneration. Many such areas are now

under economic pressure and deforestation is increasing. Scientific approaches, to bring a natural forest to a state of sustained yield on a much larger scale than coppicing, developed in central Europe in the 18th and 19th centuries.

Forest management encompasses various activities of planning, operations, and monitoring: site quality assessment; forest stock and growth measurement; forest plan preparation; road and infrastructure provision; soil and water management to prepare and improve the site; silviculture (the tending of woodland) to alter the forest stock characteristics (tending, thinning out, felling, regenerating, or planting trees, and fertilization, to result in stands of desired species, age, and size composition); harvesting operations; yield control measures to keep outputs at sustained levels; and protection from pests, diseases, fire, and extreme climatic events.

**Water management :**

The problem of water is more a case of distribution and quality than one of quantity. All regions have some problems related to either groundwater or surface water resources. The development and efficient management of water resources is of particular concern in the Middle East and parts of Africa, particularly the Sudano-Sahelian belt and the Horn of Africa. Not only is there relative scarcity of water resources, but these locations also face high evaporation rates and high levels of anticipated future demands. In some cases, competition for water may lead to conflicts where rivers, lakes, or aquifers span international borders. Measured against the future requirements of urban centres, agriculture, and industry, access to water of adequate quantity and quality will soon become problematic in those areas of Africa, the Middle East, and parts of Latin America where new mega-cities are developing.

The development and efficient management of water resources is a priority concern in the Middle East, Africa, Asia, and the Pacific. Water supply in the rapidly urbanizing regions of Latin America, Asia, and Africa is also an issue, particularly with regard to serving the burgeoning squatter settlements and other low-income urban communities. In Europe and North America, the protection of water resources from contamination, acidification, and eutrophication is highest on the policy agenda.

### **A to Z of water saving tips**

The challenges facing the world in the provision of clean water may be daunting, but here are 26 ways you can play your part in conserving water.

#### **Water wise campaign.**

A dripping tap could waste as much as 90 liters a week.

Brushing your teeth with the tap running wastes almost 9 liters a minute. Rinse out from a tumbler instead. Cool water kept in the fridge means you won't have to run the tap for ages to get a cold drink. Don't use your washing machine until you've got a full load. The average wash needs about 95 liters. A full load uses less water than 2 half loads.

Every time you boil an egg save the cooled water for your houseplants. They'll benefit from the nutrients released from the shell.

Fit a water saving device in your cistern and save up to three liters a flush.

Grow your grass a little longer. It will stay greener than a close mown lawn and need less watering.

Hoing stimulates the growth of plants, reduces water loss from the soil surface and removes weeds that take up valuable water and nutrients.

Installing a water meter can save you water and money by monitoring how much you use.

Just taking a five-minute shower every day, instead of a bath, will use a third of the water, saving up to 400 liters a week.

Kettles should be filled with enough water for your needs but not to the brim. This will reduce your fuel bills too.

Lag your pipes to avoid bursts and leave your heating on a low setting while you are out in cold weather to prevent pipes freezing.

Mulch for moisture in the garden. Adding a layer of tree bark, compost, coconut husks or even newspaper keeps the sun off the soil and retains precious moisture.

No further watering is usually required for established trees and shrubs.

Once a week is all the watering your lawn needs even in the hottest weather. Over-watering can weaken your lawn by encouraging roots to seek the surface.

Purchasing a water butt will help you to collect rain water for use on the garden.

Question your local garden centre about the water requirements of different plants.

Some thrive in drier conditions. Replacing a toilet cistern can save water. Toilets manufactured after 1993 use less water per flush.

Sprinklers can be wasteful. It doesn't take long for a sprinkler to soak your lawn thoroughly. A sprinkler can use as much water in an hour as a family of four will use in a day!

Trigger nozzles can save water by using it only when needed. This can save up to 225 litres a week.

Use the dirty water when cleaning a fish tank on your houseplants. It's rich in nitrogen and phosphorus, which provides an excellent fertiliser.

Very 'water efficient' washing machines and dishwashers are now manufactured. Machines with 'A' ratings are the most economical.

You'll find that they save on energy too.

Water your garden at the coolest part of the day to reduce evaporation.

Xeriscape means 'to landscape for water conservation.' The idea is to use plants that require less water. You can also utilise objects for decorative effect such as rocks, bricks, benches and gravel.

### **Air pollution management:**

Air Pollution, contamination of the atmosphere by gaseous, liquid, or solid wastes or by-products that can endanger human health and the health and welfare of plants and animals, can attack materials, reduce visibility, or produce undesirable odors. Among air pollutants emitted by natural sources, only the radioactive gas radon is recognized as a widespread major health threat, although gases and particles from volcanic eruptions

can cause serious more localized problems. A by-product of the radioactive decay of uranium minerals in certain kinds of rock, radon seeps into the basements of homes built on these rocks, posing a risk of lung cancer to residents.

Various countries have set standards in legislation in the form of concentration levels that are believed to be low enough to protect public health. Source emission standards are also specified to limit the discharge of pollutants into the air so that air-quality standards will be achieved. However, the nature of the problem requires the implementation of international environmental treaties, and to these end 49 countries agreed in March 1985 on a United Nations convention to protect the ozone layer. This "Montreal Protocol", which was renegotiated in 1990 and 1992, called for the phase out of certain chlorocarbons and fluorocarbons by the end of the century and provides aid to developing countries in making this transition. In addition, several international protocols have been aimed specifically at reducing the incidence of acid rain. In December 1999 the Montreal Protocol announced that almost all production and consumption of virgin ozone depleting substances had been phased out in the developed world. Similar control measures were introduced for developing countries in July 1999, and it was anticipated that all developing countries would be able to meet their freeze targets and subsequent obligations under the protocol.

Concern over trans-boundary air pollution, including acid rain, in Europe has led to the United Nations Economic Commission for Europe (UNECE) developing air quality guidelines, called Critical Loads and Levels, which represent thresholds below which it is believed that damage will not occur to different ecological systems. Critical Loads are based on the amount of acidity that an ecosystem can tolerate being deposited indefinitely. Critical Levels are concentrations of ozone, sulphur dioxide, and nitrogen oxides over different averaging times and applicable to different categories of vegetation. Massive cuts are being made in emissions in Europe in order to move towards these thresholds. In contrast, in many developing countries, pollutant concentrations are rising very rapidly due to increased industrialization and motor traffic; concern in such places is primarily with impacts on human health in cities. The World Health Organization has published air quality guidelines .

We understand that economists often missed the real measure of poverty. We needed to understand poverty not as a lack of cash, but as a lack of access to natural resources. This was because millions of people lived within what he called the biomass-based subsistence economy. For these millions, the Gross Nature Product was more important than the Gross National Product. For them, environmental degradation was not a matter of luxury, but a matter of survival. Development was not possible without environmental management. In fact, what was needed was to regenerate the environment for development. He made us look beyond "pretty trees and tigers" to see

environmental issues not as people versus nature — a conservation perspective — but as people versus people.

... Sustainable development was, therefore, not about technology but about a political framework, which developed power and gave people — the victims of environmental degradation — rights over natural resources. The involvement of local communities in environmental management was a prerequisite for sustainable development.

... We have not made environment into a development challenge. Because we have still not learnt how to use it with sustainability. Therefore, environmental protection becomes an invariable conflict with development. A conflict between nature and jobs. Instead, what we need is policies and practices to use the environment for the greater enterprise of jobs and prosperity. Build green futures from the use of forests, land, water and fisheries. But we don't know how.

We don't know how because we refuse to learn the most basic lesson. We have to really trust people and communities. As yet, all we have done is use bureaucratic tricks to stall and obfuscate. We will have to make changes — effective and earnest — to devolve powers in the practice of managing the environment.

#### **9. The Conservation movement:**

Conservation, sustainable use and protection of natural resources including plants, animals, mineral deposits, soils, clean water, clean air, and fossil fuels such as coal, petroleum, and natural gas. Natural resources are grouped into two categories, renewable and nonrenewable. A renewable resource is one that may be replaced over time by natural processes, such as fish populations or natural vegetation, or is inexhaustible, such as solar energy. The goal of renewable resource conservation is to ensure that such resources are not consumed faster than they are replaced. Nonrenewable resources are those in limited supply that cannot be replaced or can be replaced only over extremely long periods of time. Nonrenewable resources include fossil fuels and mineral deposits, such as iron ore and gold ore. Conservation activities for nonrenewable resources focus on maintaining an adequate supply of these resources well into the future.

Natural resources are conserved for their biological, economic, and recreational values, as well as their natural beauty and importance to local cultures. For example, tropical rain forests are protected for their important role in both global ecology and the economic livelihood of the local culture; a coral reef may be protected for its recreational value for scuba divers; and a scenic river may be protected for its natural beauty.

**History of conversation movement:**

Until the advent and spread of Christianity and Islam in the 4th and 5th centuries, there were many religions based on animism, the belief that all objects have a spiritual being. This belief led to careful stewardship, or protection, of natural resources out of fear or respect for these spiritual beings. Moreover, early agricultural lifestyles, dependent on nature to provide good crops and growing conditions, also encouraged sound land-use practices. Ancient Phoenicians, Greeks, and Romans developed irrigation, crop rotation, and terraced hillsides as early methods of water, nutrient, and soil conservation.

In Europe, the relationship between humanity and nature became strained with the beginning of the Industrial Revolution in the 19th and early 20th centuries. Industrialization stifled traditional agricultural lifestyles and encouraged urbanization and the marriage of science and technology to control nature and extract resources. The Industrial Revolution led to environmental damage on a grand scale as European technology spread around the globe. Coal-burning and iron-smelting produced waste that contaminated air and water, the concentrated populations in urban areas produced huge amounts of unconfined raw sewage that contaminated drinking water, and vast forests and plains were cleared for agriculture.

The modern conservation movement of the United States began in the mid-19th century when resource depletion and pollution were first becoming serious problems. Westward expansion was encouraged by the government—the Homestead Act of 1862 provided free land to settlers willing to clear it. Because land ownership required land-clearing, the rapid migration often resulted in barren landscapes. The extensive land-clearing and the rapid depletion of wildlife resources such as buffalo and beaver heralded a public outcry. This concern was reflected in the writings of public figures such as American essayist Ralph Waldo Emerson and naturalist author Henry David Thoreau.

The nature conservation movement received a boost from the environmental interest of the 1960s. The National and Provincial Parks Association of Canada was established in 1963, the Sierra Club in Canada in 1970 and, in 1971, the Canadian Audubon Society, and several of its affiliates established the Canadian Nature Federation, a national assembly of naturalist groups from across the country. Scientific biological associations and groups traditionally less active in conservation issues, such as game and fish associations, also increased their emphasis on environmental issues.

During this period, the concern for nature conservation centered on preserving wilderness and protecting unique areas or ecosystems as ecological reserves. Each province experienced a burst in the growth of local groups focusing on local conservation and environmental issues, and provincial naturalist and conservation federations became increasingly active and vocal. In a single decade, federal and

provincial governments established ministries or departments of the environment, environmental protection Acts and environmental assessment legislation.

Acts to protect endangered species, such as that passed in Ontario in 1971, were unique in the world because they sought to protect rare or endangered species of all plants and animals (including insects). In 1978 the intergovernmental Committee on the Status of Endangered Wildlife in Canada began to define a national list of species at risk.

In 1972 the United Nations convened in Stockholm an international Conference on the Human Environment. Canada was well represented and, as a result, Canadian conservation concern became increasingly international through participation in agencies such as the Convention on International Trade in Endangered Species and the International Union for the Conservation of Nature and Natural Resources. Environmental concerns are now seen in a global context as awareness grows that all people depend on clean air and water and healthy ecosystems.

Conservation conflicts arise when natural-resource shortages develop in the face of steadily increasing demands from a growing human population. Controversy frequently surrounds how a resource should be used, or allocated, and for whom. For example, a river may supply water for agricultural irrigation, habitat for fish, and water-generated electricity for a factory. Farmers, fishers, and industry leaders vie for unrestricted access to this river, but such freedom could destroy the resource, and conservation methods are necessary to protect the river for future use.

Conflicts worsen when a natural resource crosses political boundaries. For example, the headwaters, or source, of a major river may be located in a different country than the country through which the river flows. There is no guarantee that the river source will be protected to accommodate resource needs downstream. In addition, the way in which one natural resource is managed has a direct effect upon other natural resources. Cutting down a forest near a river, for instance, increases erosion, the wearing away of topsoil, and can lead to flooding. Eroded soil and silt cloud the river and adversely affect many organisms such as fish and important aquatic plants that require clean, clear freshwater for survival.

Ethiopia's resources are primarily agricultural. The plateau area is fertile and still not fully developed. The diversity of soil, climate, and elevation allows production of a wide range of agricultural commodities. There is a variety of mineral deposits; iron, copper, zinc, lead, potash, gold, and platinum are the principal ones that have been commercially exploited.

Vegetation also reflects the great variety in elevation. The lower areas of the tropical zone are sparsely covered with desert shrubs, thornbushes, and coarse savannah grasses. In the valleys and ravines, almost every form of African vegetation grows in

luxurious profusion. The temperate zone is mainly grassland. Afro-alpine vegetation is found on the highest slopes.

The larger species of African wildlife are native to most parts of the country. These include the giraffe, leopard, hippopotamus, lion, elephant, antelope, and rhinoceros. The lynx, jackal, hyena, and various species of monkey are common. Birds of prey include the eagle, hawk, and vulture. The heron, parrot, and such game birds as the snipe, partridge, teal, pigeon, and bustard are found in abundance. Among the many varieties of insects are the locust and tsetse fly, which causes sleeping sickness (trypanosomiasis).

Only 25 per cent (1990-1998) of Ethiopia's population has access to safe drinking water. Soil erosion is a major problem in the country; and deforestation, overgrazing, and poor land management accelerated the rate of erosion during the 1970s and 1980s. An extremely high percentage—89 per cent (1995)—of Ethiopia's workforce is involved in agriculture, mostly subsistence farming. Many farmers in Ethiopia's highlands cultivate sloped or hilly land, causing topsoil to wash away during flash floods. The presence of mosquitoes carrying malaria has kept many farmers from developing parts of Ethiopia's potentially productive lowlands. Deforestation and desertification are worsened by the widespread use of traditional fuels such as firewood, which represent 93 per cent of total energy consumption.

Ethiopia's government began organizing conservation efforts in rural areas during the 1970s, encouraging farmers to combat erosion by building terraces and planting tree seedlings. The government also closed some hilly areas to agricultural development. About 5.5 per cent (1997) of Ethiopia's land is officially protected, although the country's system of national parks and reserves suffers from poaching and illegal logging. The country is home to 813 (1996) bird species, such as eagles, hawks, herons, and parrots. Of Ethiopia's animal species, 60 (1996) are threatened. Ethiopia has ratified international agreements intended to protect biodiversity, endangered species, and the ozone layer.

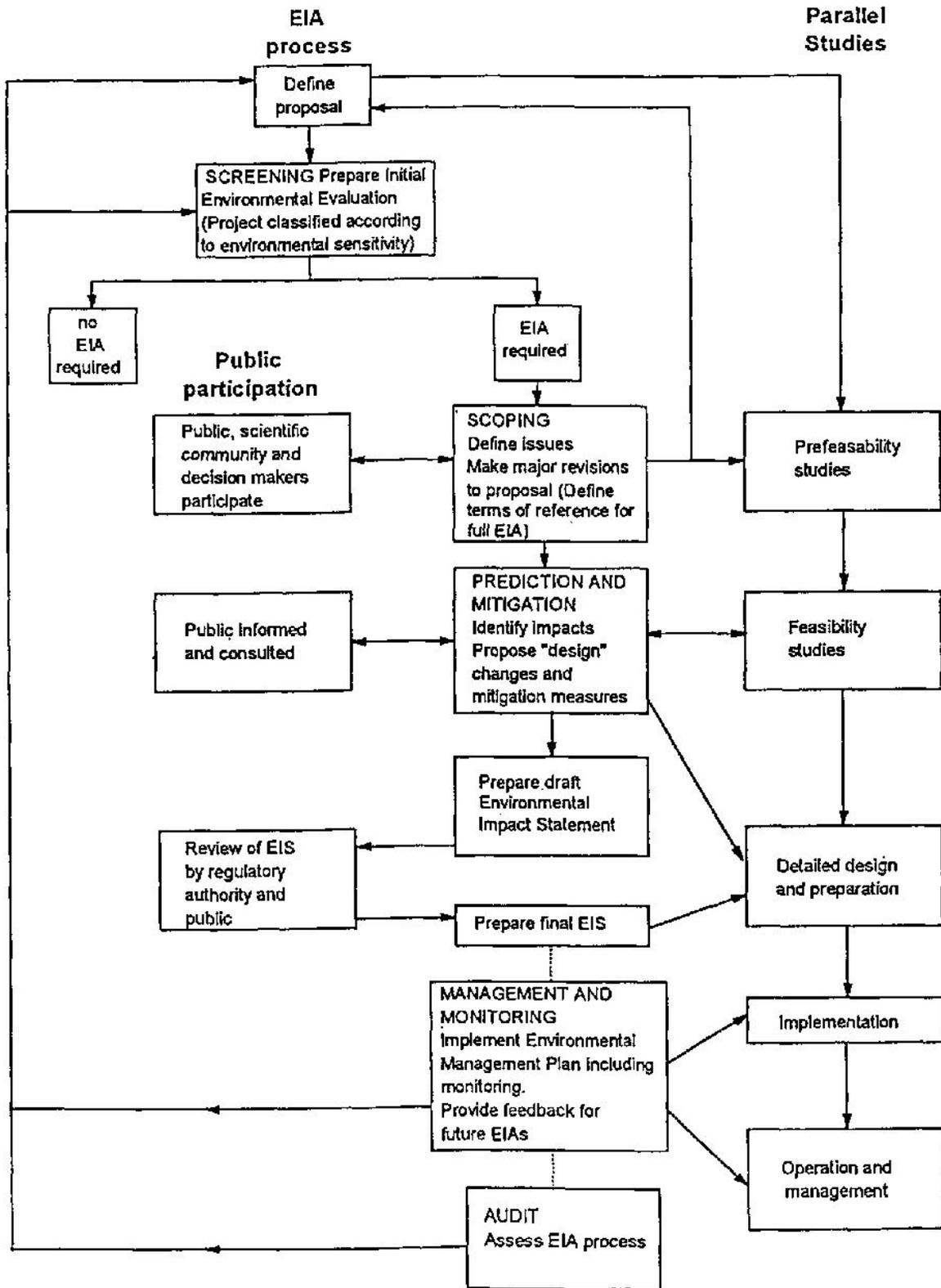
#### **10. Environmental Impact Assessment:**

An **Environmental Impact Assessment** (EIA) is an assessment of the likely positive and/or negative influence a project may have on the environment. "Environmental Impact Assessment can be defined as: The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made." The purpose of the assessment is to ensure that decision-makers consider environmental impacts before deciding whether to proceed with new projects.

A description of the work to be undertaken should give a general set of requirements for determining the potential impacts of, and impacts on, the proposed project. The terms of reference should require the consultants to cover the following points:

- whether a range of proposals should be considered and if so whether they would be less environmentally damaging;
- the main environmental effects of the proposed project, both in the project area and in the surrounding area and the timescale of the impacts;
- the size and extent of the impacts based as much as possible on quantitative data rather than qualitative assessment. In some cases it may be necessary to highlight certain topics when a particular issue is known to be of concern. In most cases, however, it may be preferable not to mention any specific topic and make the consultant responsible for a complete review of all topics;
- those groups that will benefit and those disadvantaged by the project;
- the impact on any rare species of plant or animal in the area;
- the impact on human health;
- the control and management aspects of the project to determine if they will be effective;
  - ✎ the need for further baseline data collection or other specialist studies;
  - ✎ the present policy, institutional and legislative situation and future needs;
  - ✎ the mitigating measures needed and how they should be incorporated into the project design;
  - ✎ the monitoring and evaluation activities that are required to ensure that mitigating measures are implemented and future problems are avoided.

The EIA process is



The US Environmental Protection Agency pioneered the use of pathway analysis to determine the likely human health impact of environmental factors. The technology for performing such analysis is properly labeled *environmental science*. The principal phenomena or pathways of impact are: soil contamination impacts, air pollution impacts, noise health effects, ecology impacts including endangered species assessment, geological hazards assessment and water pollution impacts. Pathway analysis and The Natural Step definitions subsequently became the basis of the global ISO 14000 series of environmental management standards and the more recent ISO 19011 auditing standard; however, these ISO standards are not in common use in the U.S. and most other countries.

### **EIA - China**

The Environmental Impact Assessment Law (EIA Law) requires an environmental impact assessment to be completed prior to project construction. However, if a developer completely ignores this requirement and builds a project without submitting an environmental impact statement, the only penalty is that the environmental protection bureau (EPB) may require the developer to do a make-up environmental assessment. If the developer does not complete this make-up assessment within the designated time, only then is the EPB authorized to fine the developer. Even so, the possible fine is capped at a maximum of about US\$25,000, a fraction of the overall cost of most major projects. The lack of more stringent enforcement mechanisms has resulted in a significant percentage of projects not completing legally required environmental impact assessments prior to construction..

China's State Environmental Protection Administration (SEPA) used the legislation to halt 30 projects in 2004, including three hydro-power plants under the Three Gorges Project Company. Although one month later (Note as a point of reference, that the typical EIA for a major project in the USA takes one to two years.), most of the 30 halted projects resumed their construction, reportedly having passed the environmental assessment, the fact that these key projects' construction was ever suspended was notable.

A joint investigation by SEPA and the Ministry of Land and Resources in 2004 showed that 30 to 40 per cent of the mining construction projects went through the procedure of environment impact assessment as required, while in some areas only 6 to 7 per cent did so. This partly explains why China has witnessed so many mining accidents in recent years.

### **EIA - EU**

The EIA Directive on Environmental Impact Assessment of the effects of projects on the environment was first introduced in 1985 and was amended in 1997. The directive was amended again in 2003 following the 1998 signature by the EU of the Aarhus Convention on public participation in environmental matters. The issue was enlarged to the assessment of plans and programmes by the so called EU -Directive in 2001 which is now in force and establishes a mix of mandatory and discretionary procedures for assessing environmental impacts.

Under the EU directive, an EIA must provide certain information to comply. There are seven key areas that are required:

**1. Description of the project**

Description of actual project and site description

Break the project down into its key components, ie construction, operations, decommissioning

For each component list all of the sources of environmental disturbance

For each component all the inputs and outputs must be listed, eg, air pollution, noise, hydrology

**2. Alternatives that have been considered**

Examine alternatives that have been considered

Example: in a biomass power station, will the fuel be sourced locally or nationally?

**3. Description of the environment**

List of all aspects of the environment that may be effected by the development

Example: populations, fauna, flora, air, soil, water, humans, landscape, cultural heritage

This section is best carried out with the help of local experts, eg the RSPB in the

**4. Description of the significant effects on the environment**

The word significant is crucial here as the definition can vary

'Significant' needs to be defined

The most frequent method used here is use of the Leopold matrix

The matrix is a tool used in the systematic examination of potential interactions

Example: in a wind farm development a significant impact may be collisions with birds

**5. Mitigation**

This is where EIA is most useful

Once section 4 has been completed it will be obvious where the impacts will be greatest

Using this information ways to avoid negative impacts should be developed

Best working with the developer with this section as they know the project best

Using the wind farm example again construction could be out of bird nesting seasons

**6. Non-technical summary**

The EIA will be in the public domain and be used in the decision making process

It is important that the information is available to the public

This section is a summary that does not include jargon or complicated diagrams

It should be understood by the informed lay-person

7. Lack of know-how/technical difficulties

This section is to advise any areas of weakness in knowledge

It can be used to focus areas of future research

Some developers see the EIA as a starting block for good environmental management.

**See - Annexure I EIA Check list**

**11. Environmental Problems**

**Environment**

Environment, thin layer of life and life-supports called the biosphere, including the Earth's air, soil, water, and living organisms.

The human population was remained small and human technology modest, their impact on the environment was localized. As populations increased and technology improved and expanded, however, more significant and widespread problems arose. Rapid technological advances after the Middle Ages culminated in the Industrial Revolution, which involved the discovery, use, and exploitation of fossil fuels, as well as the extensive exploitation of the Earth's mineral resources. With the Industrial Revolution, humans began in earnest to change the face of the Earth, the nature of its atmosphere, and the quality of its water. Today, unprecedented demands on the environment from a rapidly expanding human population and from advancing technology are causing a continuing and accelerating decline in the quality of the environment and its ability to sustain life.

**Carbon Dioxide**

One impact that the burning of fossil fuels has had on the Earth's environment has been the increase of carbon dioxide (CO<sub>2</sub>) in the Earth's atmosphere. The amount of atmospheric CO<sub>2</sub> apparently remained stable for millennia, at about 260 ppm (parts per million), but over the past 100 years it has increased to 350 ppm. The significance of this change is its potential for raising the temperature of the Earth through the process known as the greenhouse effect. Carbon dioxide in the atmosphere prevents the escape of outgoing long-wave radiation from the Earth to outer space; as more heat is produced and less escapes, the temperature of the Earth increases.

A significant global warming of the atmosphere would have profound environmental effects. It would speed the melting of polar ice caps, raise sea levels, change the climate regionally and globally, alter natural vegetation, and affect crop production. These

changes would, in turn, have an enormous impact on human civilization. Since 1850 there has been a mean rise in global temperature of about 1° C (1.8° F). Most scientists have predicted that rising levels of CO<sub>2</sub> and other “greenhouse gases” will cause temperatures to continue to increase, with estimates ranging from 2° to 6° C (4° to 11° F) by the mid-21st century. However, some scientists who research climate effects and trends dispute the theories of global warming, and attribute the most recent rise to normal temperature fluctuations.

### **Acid Deposition**

The acid depositions associated with the burning of fossil fuels , which is caused by the emission of sulphur dioxide and nitrous oxides into the air from power plants and motor vehicles. These chemicals interact with sunlight, moisture, and oxidants to produce sulphuric and nitric acids, which are carried with the atmospheric circulation and come to Earth in rainfall and snowfall, commonly referred to as acid rain, and as dry deposits in the form of dry particles and atmospheric gases.

Acid rain is a localized problem. The acidity of some precipitation in northern North America and Europe is equivalent to that of vinegar. Acid rain corrodes metals, weathers stone buildings and monuments, injures and kills vegetation, and acidifies lakes, streams, and soils, especially in the poorly buffered regions of north-eastern North America and northern Europe. In these regions, lake acidification has killed some fish populations. It is also now a problem in the south-eastern and western United States. Acid rain can also slow forest growth, and forest die-back has been major problem. It is associated with forest decline at high elevations in both North America and Europe.

### **Ozone Layer Destruction**

During the 1980s, scientists began to find that human activity was having a detrimental effect on the global ozone layer, a region of the atmosphere that shields the Earth from the Sun’s harmful ultraviolet rays. Without this gaseous layer, which is found at about 40 km (25 mi) above sea level, no life could survive on the planet. Studies showed the ozone layer was being damaged by the increasing use of industrial chemicals called chlorofluorocarbons (CFCs, compounds of fluorine) that are used in refrigeration, air-conditioning, cleaning solvents, packing materials, and aerosol sprays. Chlorine, a chemical by-product of CFCs, attacks ozone, which consists of three molecules of oxygen, by taking one molecule away to form chlorine monoxide. Chlorine monoxide then reacts with oxygen atoms to form oxygen molecules, releasing chlorine molecules that break up other molecules of ozone.

It was initially thought that the ozone layer was being reduced gradually all over the globe. In 1985, however, further research revealed a growing ozone hole concentrated above Antarctica; 50 per cent or more of the ozone above this area of the Earth was

being depleted seasonally (beginning each October). By late 2000 this hole had grown to 28.3 million sq km (11 million sq mi) in area. A thinning of the ozone layer is the key factor in the greenhouse effect, and exposes life on Earth to excessive ultraviolet radiation, which can increase skin cancer and cataracts, reduce immune-system responses, interfere with the photosynthetic process of plants, and affect the growth of oceanic phytoplankton. Because of the growing threat of these dangerous environmental effects, many nations are working towards eliminating the manufacture and use of CFCs. However, CFCs can remain in the atmosphere for more than 100 years, so ozone destruction will continue to pose a threat for decades to come.

### **Chlorinated Hydrocarbons**

Extensive use of synthetic pesticides derived from chlorinated hydrocarbons in pest control has had disastrous environmental side effects. These organochlorine pesticides are highly persistent and resist biological degradation. Relatively insoluble in water, they cling to plant tissues and accumulate in soils, the bottom mud of streams and ponds, and the atmosphere. Once volatilized, the pesticides are distributed worldwide, contaminating wilderness areas far removed from agricultural regions, and even the Antarctic and Arctic zones.

Although these synthetic chemicals are not found in nature, they nevertheless enter the food chain. The pesticides are either taken in by plant eaters or absorbed directly through the skin by such aquatic organisms as fish and various invertebrates. The pesticide is further concentrated as it passes from herbivores (plant eaters) to carnivores (meat eaters). It becomes highly concentrated in the tissues of animals at the end of the food chain, such as the peregrine falcon, bald eagle, and osprey. Chlorinated hydrocarbons interfere in the calcium metabolism of birds, causing thinning of egg shells and subsequent reproductive failure. As a result, some large predatory and fish-eating birds have been brought close to extinction. Because of the dangers of pesticides to wildlife and to humans, and because insects have acquired resistance to them, the use of halogenated hydrocarbons such as DDT is declining rapidly in the Western world, although large quantities are still used in developing countries. In the early 1980s, the halogenated pesticide EDB, or Ethylene Dibromide, also aroused great concern as a potential carcinogen, and was eventually banned.

Closely related to DDT is another group of compounds: the polychlorinated biphenyls, or PCBs. For years these compounds have been used in industrial production, and eventually they found their way into the environment. Their impact on humans and wildlife has been similar to that of pesticides. Because of their extreme toxicity, the use of PCBs is now restricted to insulators in electrical transformers and capacitors.

PCDD is the most toxic of another related group of highly toxic compounds, the dioxins, or polychlorinated dibenzo-para-dioxins. The extent of toxicity of these carcinogenic compounds in humans has not yet been proved. PCDD may be found as an impurity in

wood and paper preservatives and in herbicides. Agent Orange, a defoliant widely used in jungle warfare, contains minute traces of dioxin.

With the enforcement in 2004 of the 2001 Stockholm Convention, 12 of the worst chemical pollutants (persistent organic pollutants or POPs) were universally banned or phased out. These were dioxins, PCBs, furans, aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, and toxaphene. DDT was also on this list but it is not yet banned because it is an effective and relatively cheap insecticide used to combat malaria.

**Other Toxic Substances:**

Toxic substances are chemicals and mixtures of chemicals the manufacturing, processing, distribution, use, and disposal of which present an unreasonable risk to human health and the environment. Most of these toxic substances are synthetic chemicals that enter the environment and persist there for long periods of time. Major concentrations of toxic substances occur in chemical dump sites. If they seep into soil and water, the chemicals can contaminate water supplies, air, crops, and domestic animals, and have been associated with human birth defects, miscarriages, and organic diseases. Despite known dangers, the problem is not lessening. In a recent 15-year period, more than 70,000 new synthetic chemicals were manufactured, and new ones are being created at the rate of 500 to 1,000 each year.

**Radiation**

Although atmospheric testing of nuclear weapons has been banned by most countries, eliminating a large source of radioactive fallout, nuclear radiation still remains an environmental problem. Power plants always release some amount of radioactive waste into the air and water, but the main danger is the possibility of nuclear accidents, in which massive amounts of radiation are released into the environment—as happened at Chernobyl, Ukraine, in 1986. In fact, since the break-up of the Union of Soviet Socialist Republics (USSR), the world has learned that contamination of that region from nuclear accidents and nuclear wastes is far more extensive than had been realized. A greater problem facing the nuclear industry is the storage of nuclear wastes, which remain toxic for 700 to 1 million years, depending on the type. Safe storage for geological periods of time is problematic; meanwhile nuclear wastes accumulate, threatening the environment.

**Loss of Wild Lands**

Increasing numbers of human beings are encroaching on remaining wild lands—even in those areas once considered relatively safe from exploitation, degradation, and pollution. Insatiable demands for energy are forcing the development of Arctic regions for oil and gas and threatening the delicate ecological balance of tundra ecosystems and their wildlife. Tropical forests, especially in south-eastern Asia and the Amazon River Basin, are being destroyed at an alarming rate for timber, conversion to crop and

grazing lands, pine plantations, and settlements. It was estimated at one point in the 1980s that such forest lands were being cleared or converted at the rate of 20 hectares (nearly 50 acres) a minute; another estimate put the rate at more than 200,000 sq km (78,000 sq mi) a year. In 1993 satellite data provided a rate of about 15,000 sq km (5,800 sq mi) a year in the Amazon Basin area alone. This tropical deforestation has already resulted in the extinction of as many as 750,000 species, and is likely to eliminate millions if allowed to continue unchecked. This would mean the loss of a multiplicity of products: food, fibres, medical drugs, dyes, gums, and resins. In addition, the expansion of croplands and grazing areas for domestic livestock in Africa, and illegal trade in endangered species and wildlife products, could mean the end of Africa's large mammals. In North America, wild areas are being threatened by agricultural expansion and widespread pollution.

### **Soil Erosion**

Soil erosion is accelerating on every continent but Antarctica and is degrading one fifth to one third of the cropland of the world, posing a significant threat to the food supply. For example, erosion is undermining the productivity of approximately 35 per cent of all cropland in the United States. In the developing world, increasing needs for food and firewood have resulted in the deforestation and cultivation of steep slopes, causing severe erosion. Adding to the problem is the loss of prime cropland to industry, dams, urban sprawl, and highways. The amount of topsoil lost each year is at least 25 million tonnes, which is enough, in principle, to grow 9 million tonnes of wheat. About half of all erosion is in the United States, the former Soviet Union, India, and China. Soil erosion and the loss of cropland and forests also reduce the moisture-holding capacity of soils and add sediments to streams, lakes, and reservoirs.

### **Demands on Water and Air**

The erosion problems described above are aggravating a growing world water problem. Expanding human populations need irrigation systems and water for industry; this is so depleting underground aquifers that salt water is intruding into them along coastal areas of the United States, Israel, Syria, and the Arabian Gulf states. In inland areas, porous rocks and sediments are compacting when drained of water, causing surface subsidence problems; this subsidence is already a serious problem in Texas, Florida, and California.

The world is also experiencing a steady decline in water quality and availability. Human beings already use 55 per cent of available freshwater run-off. This level of consumption will be an increasing problem as the population rises. About 75 per cent of the world's rural population and 20 per cent of its urban population have no ready access to uncontaminated water. In many regions, water supplies are contaminated with toxic chemicals and nitrates. Waterborne disease debilitates one third of humanity and kills 10 million people a year.

During the 1980s and early 1990s, some industrialized countries improved air quality by reducing particulate matter and toxic chemicals, such as lead, but emissions of sulphur dioxide and nitrous oxides, the precursors of acid deposition, still remain. Massive air pollution occurs over much of Eastern Europe and the former Soviet Union. As much as 15 per cent of the former Soviet Union is so badly polluted that there are significant and widespread threats to human health, agriculture, and biotas.

### **The Earth Summit**

In June 1992 the United Nations Conference on Environment and Development, commonly known as the Earth Summit, convened for 12 days on the outskirts of Rio de Janeiro, Brazil. The Earth Summit developed and legitimized a broad agenda for environmental, economic, and political change. The purposes of the conference were to identify long-term environmental reforms and to initiate processes for their implementation and supervision. Conventions were held to discuss and adopt documents on the environment. The major topics covered by these conventions included climate change, biodiversity, forest protection, Agenda 21 (a 900-page blueprint for environmental development), and the Rio Declaration (a six-page statement that called for integrating the environment with economic development). The Climate Convention and the Biodiversity Convention were legal agreements. The Earth Summit was an historic event of great significance. Not only did it make the environment a priority on the world's agenda, but delegates from 178 countries attended, including many prime ministers and presidents, making it the largest conference ever held up until that time.

### **Outlook**

The environmental outlook for the future is mixed. In spite of economic and political changes, interest in and concern about the environment remains high. Air quality has improved in some areas in the developed world but has deteriorated in many developing countries, and problems of acid deposition, chlorofluorocarbons and ozone depletion, and heavy air pollution in Eastern Europe still seek solutions and concerted action. Until acid deposition is diminished, loss of aquatic life in northern lakes and streams will continue, and forest growth will be affected. Water pollution will remain a growing problem as increasing human populations put additional stress on the environment. Infiltration of toxic wastes into underground aquifers and intrusion of saline waters into coastal freshwater aquifers have not been stopped.

Depletion of aquifers in many parts of the world and growing demand for water will bring agricultural, industrial, and urban use of water into conflict. This shortage will force water-usage restrictions and will increase the cost of water consumption. Water could become the "energy crisis" of the first decades of the 21st century. Pollution of coastal and fresh water along with over-harvesting has so depleted fishery resources

that five to ten years of little or no fishing will be required for stocks to recover. Without concerted efforts to save habitats and reduce poaching and the illegal worldwide wildlife trade, many wildlife species will become extinct. In spite of our knowledge of how to reduce soil erosion, it continues to be a worldwide problem, largely because too many agriculturalists and developers show little interest in controlling it. Finally, the destruction of wild lands, in both temperate and tropical regions, could result in massive extinctions of animal and plant life.

To reduce environmental degradation and for humanity to save its habitat, societies must recognize that the environment is finite. Environmentalists believe that, as populations and their demands increase, the idea of continuous growth must give way to a more rational use, sustainable exploitation, of the environment, but that this can be accomplished only by a dramatic change in the attitude of the human species. Many of these concerns were addressed by the 2002 World Summit, held in Johannesburg, South Africa, although compromise on key issues disappointed many. The human attack on the environment has been compared to the dramatic upheavals of the Earth in the geological past; whatever a society's attitude may be towards continuous growth, humanity should recognize that this attack threatens human survival.

### **Role of NGOs in Development( *Third world development* )**

What does an ever-increasing number of non-governmental organizations (NGOs) mean? NGOs are non-profit organizations filling the gap where governments will not, or cannot function. In the past however, some NGOs from the wealthy nations have received a bad reputation in some developing nations because of things like arrogance, imposition of their views, being a foreign policy arm or tool of the original country and so on. Even in recent years some of these criticisms still hold. However, recently some new and old NGOs alike, have started to become more participatory and grassroots-oriented to help empower the people they are trying to help, to help themselves. This is in general a positive turn. Yet, the fact that there are so many NGOs popping up everywhere perhaps points to failures of international systems of politics, economics, markets, and basic rights

NGO (non-governmental organizations). Example: Oxfam (Oxford Famine Relief)

Includes the following in its definition of development:

- ✎ Enables people to meet their essential needs.
- ✎ Reverses the process of impoverishment(something to be poor or poorer).
- ✎ Enhances democracy.
- ✎ Makes possible a balance between populations and resources.
- ✎ Improves the well-being and status of women.
- ✎ Respects local cultures.
- ✎ Sustains the natural environment.

- ✎ Measures progress in human, not just monetary terms.
- ✎ Requires the empowerment of the poor