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# 7 Environmental Appraisal

## 7.1 INTRODUCTION

Environmental appraisal of a project is a process for identifying and evaluating the potential benefits as well as adverse impacts of a project on the surrounding environment. It provides a clear, well-structured and rational analysis of the consequences of proposed actions, and assists in selecting the most environment-friendly option. It also helps in reducing the project cost associated with avoidable subsequent delays.

The insatiable demands of modern society on our environment have exceeded dangerously since the 1970s. As a result, the planet's resources are being exhausted posing threats to our health and welfare. It is high time that environmental analysis is given appropriate importance prior to the selection of a project for implementation.

The process of environmental analysis originated in the United States of America in the late 1960s and the early 1970s, and has since been used increasingly around the world. Initially, it was largely adopted in a few high-income countries like Canada, Australia and New Zealand (1971–1974), followed by some developing countries like Columbia (1974) and Philippines (1978). As awareness among more people increased, the issue became a common topic for debate and discussion. Consequently, the average person became increasingly more concerned about the impact of environment. In the 1980s, World Bank and other international agencies introduced environmental requirements for compliance in all projects. Gradually in most countries (including less developed countries), these became important considerations while evaluating the feasibility of a project along with technical and financial viability. Currently, environmental analysis is an accepted procedure for utilizing the natural resources available within the system. It is now a prerequisite for funding by international agencies like World Bank, United Nations Industrial Development Organization and Asian Development Bank. It is normally carried out if a project is likely to have a significant impact on environment because of its *prima facie* nature.

## 7.2 PROJECT TYPES

Projects may be divided broadly into two types, viz., production-oriented and service-oriented. The former category includes chemical plants, metal industry, refineries and cement plants. These production-oriented projects are involved in transforming natural resources to saleable goods and have direct impact on the environmental and ecological balance. The second type of projects involve rendering various services, such as education, health, law, defense and land reforms. These categories of projects do not have an immediate impact on the environment. However, these may create far-reaching outcome in the future on values, lifestyles and social links leading to promoting consumerism in the society and consequently indirectly encouraging manufacturing projects. Thus, there is a link between the two types of projects.

### 7.3 MEANING AND SCOPE OF ENVIRONMENT

According to Concise Oxford Dictionary, the word 'environment' means 'the surroundings or conditions in which a person, animal or plant lives or operates'. In other words, it comprises the land, air and water bodies in the neighborhood of the project, and covers all items that inhabit in the surroundings, as well as the social, economic and political systems in which people function. World Bank's broad definition of environment as 'The natural and social conditions surrounding all mankind, including future generations' is pertinent in this context (World Bank, 1992, quoted by Peter Abelson).

Basically, environment may be classified into two categories, viz., organic and inorganic. First, the organic setting consists of animate elements such as human beings, animals, plants and also other living organisms like bacteria and viruses. The second category comprises inorganic elements like land, water and atmosphere.

The environment boundary stretches beyond the legal boundary of a project and covers the areas which are likely to be 'environmentally' affected by various natural factors such as direction and speed of wind and elevation. Thus, it varies from project to project as well as from location to location.

### 7.4 MAIN ENVIRONMENTAL ISSUES

The aspects concerning impact of a project on the environment which should be considered prior to discussion of the main issues may be broadly identified as follows:

- The existing environmental and socioeconomic conditions of the site;
- Effects of the proposed project on these conditions;
- Examination of the impact of the proposed project *vis-à-vis* the existing environmental regulations. Any impact that exceeds the regulations should be eliminated to avoid environmental hazard.

The main issues concerning environmental analysis are discussed in the sections that follow.

#### 7.4.1 POPULATION GROWTH

During the past 50 years, earth's population has grown at an unprecedented rate. As a result, there has been enormous pressure on both renewable and nonrenewable resources. This has resulted in a reduction in the amount of investment as well as productivity per worker, leading to an increase in the inequality of income and also crowding and congestion. According to World Bank's prediction, global population will double to around 10.5 billion by 2050, and a vast majority of this growth will be in the developing countries. Also, urban population (which currently exceeds the rural population) will double itself by 2030. As a result, the demand for food is expected to increase threefold. Simultaneously demand for goods and services will also rise enormously. Also, the increase of waste material will be an added burden to the waste disposal system.

## **7.4.2 GLOBAL ATMOSPHERIC CHANGES**

During the past two decades of the 20th century, there have been instances of atmospheric changes in many parts of the world, such as depletion of ozone concentration and increase in carbon dioxide emission causing global warming (greenhouse effect).

It is difficult to accurately quantify ozone concentration in the atmosphere. However, it appears that ozone has depleted dramatically over large parts of the world causing a hole in the ozone layer above Antarctica. The reduced ozone is likely to increase ultraviolet radiation reaching the earth, and cause health hazards to human race (e.g., skin cancer, eye damage, depletion of immune response system)

Carbon dioxide and other greenhouse gases increase the atmospheric temperature considerably. Global warming is likely to affect low-lying coastal properties adversely (by flooding), agricultural productivity, water supply, electricity requirements, etc. Other examples of damage are disruption in marine food chain, threat to biodiversity and ecological impacts.

## **7.4.3 POLLUTION**

Pollution is the environmental degradation caused by the introduction of harmful substances into the natural environment beyond a level that causes instability, harm or discomfort to the systems living therein. These can be naturally occurring substances, or energy such as noise, heat or light. These are considered as contaminants when these are in excess of natural levels. The major forms of pollution are briefly discussed in the following paragraphs.

### **7.4.3.1 Air Pollution**

Air pollution has a serious impact on health, particularly in urban areas where risks of respiratory disorders are common. In such areas, high levels of sulfur dioxide and lead substantially reduce the intelligent quotient (IQ) level of children and increase hypertension disorders, including heart attacks and strokes in adults. These pollutants emanate mostly from traffic, industrial plants and power-generating plants. Dust, smoke and other dry particles also damage the cleanliness of the sky resulting in fog, mist, haze, smoke, smog, etc. Smog causes headaches, irritations in the eyes, nose and throat and reduced visibility, and can indirectly affect lung function also. Air pollution may also lead to damage to crops and corrosion to buildings.

Another aspect of air pollution is 'acid rain' or 'acid precipitation'. These terms are commonly used to mean deposition of acid components in rain, snow, fog, dew, etc. Acid rain originates from sulfur and nitrogen oxides from power stations and motor vehicles. Generally, clouds carry these pollutants and deposit these in rain and snow. Acid rain causes considerable harm to natural areas like lakes, rivers, forests, as well as to crops and fish population.

Indoor air in workplace is sometimes more polluted than outdoor air. Often smoky indoor air causes greater health hazard than the outside environment. Most indoor pollution is caused by use of coal, wood, etc. These produce pollutants like sulfur dioxide, carbon monoxide and lead. There are instances when indoor air pollution remains undetected and unreported causing sickness or even death. Appropriate

ventilation required for diluting the contaminants, filtration and control of the source could improve air quality in most dwellings.

#### 7.4.3.2 Water Pollution

In many parts of the world, including India, China and Australia, the demand for pollution-free (clean) water resources greatly exceeds the supply. As a result, a large number of people are forced to consume unclean water, thereby exposing themselves to various kinds of diseases, such as diarrhea, typhoid, paratyphoid and cholera.

Water pollution is largely caused by discharge of wastewater from industrial or commercial waste into surface waters, discharge of untreated chemical contaminants (e.g., fertilizers and pesticides), domestic sewage, etc. Urban runoff and agricultural runoff (which may contain chemical fertilizers and pesticides), waste disposal and removal of specific soluble substance from water are other causes of water pollution. Also, marine oil spill, i.e., release of liquid crude oil or petroleum product into the ocean or coastal waters, may create heavy water pollution. It may take several months to clean up the degradation. Oil spill often occurs in marine environment, where oil is released into the ocean or coastal waters. Oil may be crude oil, petrol or diesel. Man-made oil pollution mostly originates from land-based activities, although public focus is mostly on sea-going oil tankers. A type of water pollution is termed *eutrophication*. This is a natural process in which inland water bodies receive plant nutrients as a result of natural erosion and draining away of water from surrounding land. *Hypoxia* or oxygen depletion is another type of water pollution, in which the dissolved oxygen in the water is reduced in concentration causing detriment to the aquatic organisms living in the system. Apart from health hazard, water pollution and scarcity is likely to restrict economic output seriously and cause decline of fishery industry, boating, swimming, etc. It also will make safe water costlier.

One other aspect needs special attention. Risks of water pollution and costs for avoiding it may increase because of deterioration of available infrastructure.

#### 7.4.3.3 Solid and Hazardous Wastes

Environmental degradation due to solid and hazardous wastes presents a massive problem worldwide.

As regards solid wastes, in many developing countries, industries and households receive waste disposal service. Landfilling, composting and recycling plants and incinerators are the usual methods of disposal. But unfortunately, that is not the case in many developing countries. Quite often, there are no official waste disposal services and solid wastes are randomly dumped at informal sites, causing major health risks due to breeding of rats, flies and mosquitos. These cause air pollution and also water pollution by leaching of chemicals into the surface and groundwater system. Thus, routine disposal of solid wastes is likely to cause water or air pollution. Also, dumping of solid wastes in waterways blocks drains and causes flooding.

Hazardous wastes comprise toxic, infections and corrosive wastes, and cause major health risk to the society. These wastes originate primarily from mining, petroleum, metallurgical industries, and tanneries, car battery recycling outlets, etc. Routine nuclear waste is another hazard that has a huge geographical impact. With increasing number of nuclear reactors, nuclear weapons research, manufacture and

deployment worldwide, this hazard carries a chronic risk. Continuous disposal of hazardous waste may cause severe water and air pollution. Furthermore, instances of industrial and nuclear radiation accidents are very much there. Examples are Bhopal, India, and Chernobyl, Russia, where large-scale catastrophes took place causing loss of life and other serious damages.

#### 7.4.3.4 Noise Pollution

Globally, millions of people live in crowded conditions and are exposed to unsatisfactory acoustic environment. The condition has been deteriorating during the past three decades due to increase of road and air traffic. Thus, in modern society, noise pollution is an inbred phenomenon and is very difficult to get rid of.

Noise pollution is measured in decibel (dB), a logarithmic unit of measurement of sound intensity relative to a reference level. Since this is a ratio of two same-unit quantities, it is a dimensionless unit. Excessive loud or high-pitched sound can cause discomfort and damage the hearing capacity of the ear. Thus, people living near airports or working in noisy industrial units may suffer from these effects of noise pollution. Also, the crew members of public transport system are often affected by prolonged exposure to honking and other damaging noise pollution. This may impair the hearing capacity of the driver and lead to future road accidents because of his failure to hear horns.

#### 7.4.3.5 Other forms of Pollution

Other forms of pollution include the following:

- *Thermal pollution*: temperature change in natural water bodies for mainly industrial purpose, e.g., use of water as cooling agent in power plants (cooling towers).
- *Visual pollution*: highway advertisement boards, overhead cable lines, open storage of trash, municipal solid waste, etc.
- *Light pollution*: highway luminal advertisements etc.
- *Plastic pollution*: stock piling of plastic products in the neighborhood that adversely affects wildlife, as well as human society.

#### 7.4.4 SOILS AND FORESTS

Depletion of soil productivity is caused generally by nutrient deficiency, soil erosion, desertification, water pollution, salinization, etc. Increased use of fertilizers may increase soil productivity, but that is only a temporary solution. Soil productivity loss has decreased agricultural productivity in many countries. Salt deposited from irrigation water is another problem affecting soil productivity. In order to maximize output from limited farming lands, extensive use of fertilizers and pesticides is often resorted to. This, in turn, exhausts soil nutrients and affects soil productivity adversely. This also pollutes waterways.

Desertification is a major problem in sub-Saharan Africa and China where productive semi-arid areas are being turned into deserts. This phenomenon occurs due to natural droughts, overgrazing and soil erosion. Also, there are instances where desertification has been caused not only by natural droughts, but also by soil erosion.

Deforestation activity is often undertaken in order to increase agricultural productive land. This leads to reduction of forest products and direct income of the affected community. On the other hand, deforestation increases erosion of the soil, especially in the hilly arrears, and adversely affects ecological balance with impacts on regional and global climates. It is therefore imperative that deforestation is carried out systematically so that forest resources are increased without hampering the ecological balance.

## 7.5 CONCLUDING REMARKS

In the foregoing sections, several instances of possible environmental degradation due to new projects have been discussed. However, it should be understood that in parallel with these disruptive effects, quite often projects have positive impacts on the society. These may help to introduce new resources by inducting new technologies in the field and thereby utilize skill of people. For example, a river valley project may cause flooding of vast areas of habitation and agricultural land, but certainly helps in irrigation and generation of hydroelectric power, thereby indirectly helping industrialization of the area and its socioeconomic development in the long run.

The other aspect that needs to be mentioned is uncertainty and lack of knowledge about the consequences of environmental degradation. The impact of air and water pollution on public health, of acid rain on crop productivity, of greenhouse gases on global warming and of deforestation on climate change, to name a few examples, is clouded with uncertainty. Thus, it is very difficult to make precise estimates of the impact of these examples of environmental degradation on the health and productivity of the community.

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