

# Lecture 3

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## Environmental Impact Assessment (EIA)

### STRUCTURE

#### Overview

#### Learning Objectives

- 3.1 Introduction to EIA**
    - 3.1.1 Purposes of EIA**
    - 3.1.2 Steps in EIA process**
    - 3.1.3 Hierarchy in EIA**
    - 3.1.4 Environmental impact statement (EIS)**
    - 3.1.5 Impact indicators**
  - 3.2 Evolution of EIA**
    - 3.2.1 Evolution of EIA worldwide**
    - 3.2.2 Evolution of EIA in India**
  - 3.3 Forecasting Environmental Changes**
  - 3.4 Strategic Environmental Assessment (SEA)**
    - 3.4.1 Rationale and scope**
    - 3.4.2 Overview of SEA process**
    - 3.4.3 Benefits and constraints**
  - 3.5 Environmental Clearance Procedure in India**
- Summary**
- Suggested Readings**
- Model Answers to Learning Activities**

### OVERVIEW

In Unit 1, we introduced you to some of the environmental management tools. One such tool we mentioned in that context was environmental impact assessment (EIA). In the present Unit, i.e., Unit 3, we will discuss EIA in detail. We will begin the Unit by explaining what EIA entails. We will then give you an account of EIA evolution in the world over. We will also discuss how EIA can be used to predict environmental changes and introduce strategic environmental assessment (SEA). We will close the Unit by listing

some of the environmental clearance procedures in practice in India.

## **LEARNING OBJECTIVES**

After completing this Unit, you should be able to:

- discuss environmental impact assessment (EIA) as an environmental management tool;
- trace the evolution of EIA;
- discuss what forecasting of environmental changes entails;
- explain strategic environmental assessment (SEA);
- list and comply with the environmental clearance procedures in India;
- plan and carry out an environmental impact assessment study.

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### **3.1 INTRODUCTION TO EIA**

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Environment assessment involves a study to determine any unique environmental attributes from endangered species to existing hazardous waste to historical significance. Environment Assessment procedure ensures consideration of environmental implications before making a final decision of assessing the environmental attribute. Process of assessment analyses the effects on environment and is useful for reporting those effects undertaking a public consultation exercise and lastly it reveals decision to public after reviewing the comment of the report. One of the main strengths of environmental assessment (EA) is its flexibility. Project planning processes can integrate EA as

essential step giving sensitivity to the social and economic as well as environmental impacts of projects. In this way project managers can compensate shortcomings in the project planning process.

For example, a project which failed to adequately consult the community at the outset can take advantage of the Environment Assessment to involve the community in a necessary exchange of ideas and views. The EA can help establish and strengthen decision-making and communication mechanisms within a project. It can also pave the way for introducing innovations. An EA may reveal sound environmental, social or economic reasons for shifting a project's direction. In view of the primacy accorded the opinions and aspirations of local people, the EA process may also function as a project control mechanism. While the EA should not be expected to correct all the weaknesses of a flawed planning process, when properly designed and executed, it can be a valuable tool for project implementation. When the role of the EA is more restricted, the situation can work in reverse. Other project planning activities can be used to gather necessary information for the EA and to create support for the EA process. Each project manager must decide how much importance to accord each planning.

Duration for EA will hinge on [<http://www.gdrc.org/uem/e-mgmt/2.html>]:

- The size and complexity of the proposed project.
- The extent of co-operation received from the project sponsor and third parties such as local government.
- The level of interest and support demonstrated by the community.
- The ability of the project team to sustain interest in the EA.

- The skills of the EA team.
- The EA techniques employed.

In principle, environmental assessment can be undertaken for

- Individual projects such as a dam, motorway, airport or factory and call it as 'Environmental Impact Assessment' (EIA).
- Plans, programs and policies and call it as 'Strategic Environmental Assessment'(SEA).

These two sections are discussed in detail in the further sections

In recent years, there has been a remarkable growth of interest in environmental issues, sustainability and the better management of development in harmony with the environment. Associated with this growth of interest has been the introduction of new legislation, emanating from national and international agencies (e.g., the European Commission) that seek to influence the relationship between development and environment. Environmental impact assessment (EIA) is an important example. It is defined as an activity designed to identify and predict the impact of legislative proposals, policies, programmes, projects and operational procedures on the bio-geophysical environment and on the health and well being of human beings and to interpret and communicate information about the impact.

That is to say, EIA focuses on problems, conflicts or natural resource constraints that could affect the viability of a project. It also examines implications of a project that might harm people, their homeland or their livelihoods, or other nearby developments. After predicting the problems, a EIA identifies measures to minimise the problems and outlines ways to improve the project's suitability for its proposed environment. In the last three decades,

EIA has been recognised as the most valuable, inter-disciplinary and objective decision-making tool with respect to alternate routes for development, process technologies and project sites. It is considered an ideal anticipatory mechanism allowing measures that ensure environmental compatibility in our quest for socio-economic development.

EIA is generally wider in scope and less quantitative than other techniques, such as cost-benefit analysis. EIA has the potential to be a basis for negotiation among the developers, public interest groups and planning regulators.

### ***The Benefits of Environmental Assessment***

Most governments and donor agencies acknowledge the contribution of EA to improved project design. The weakness of EA in the past has been largely due to poor techniques and the failure to pay attention to findings at the implementation stage (ESSA Technologies 1994). A review of current environmental practices found the major benefits of the EA process for project sponsors to be (ESSA Technologies 1994: 16):

- Reduced cost and time of project implementation.
- Cost-saving modifications in project design.
- Increased project acceptance.
- Avoided impacts and violations of laws and regulations.
- Improved project performance.
- Avoided treatment/clean up costs.

The benefits to local communities from taking part in environmental assessments include:

- A healthier local environment (forests, water sources, agricultural potential, recreational potential, aesthetic values, and clean living in urban areas).

- Improved human health.
- Maintenance of biodiversity.
- Decreased resource use.
- Fewer conflicts over natural resource use.
- Increased community skills, knowledge and pride.

### **Principle of EIA**

It is important to recognise that there is a general principle of assessment that applies to EIA, and to other assessment processes. There are several other processes that relate closely to the review of environmental impacts that may result from a proposed project. The following are well recognised processes:

- Social Impact Assessment
- Risk Assessment
- Life Cycle Analysis
- Energy Analysis
- Health Impact Assessment
- Regulatory Impact Assessment
- Species Impact Assessment
- Technology Assessment
- Economic Assessment
- Cumulative Impact Assessment
- Strategic Environmental Assessment
- Integrated Impact Assessment

Some, like Energy Analysis, focus on a particular part of the environment. Others, like Life Cycle Analysis, enable the consideration of all those parts of the environment that are relevant to the assessment. Also, depending on how the terms, like health, are defined for the study you may find that it is covering most of the issues that would be found in an EIA. For example a Technology Assessment does include

review of the impacts on ecosystems, air quality and the like. Similarly, if the definition of environmental is taken broadly for an EIA, then the EIA may cover the issues of the other assessment processes; for example:

- Social aspects (such as impacts on employment, community interaction);
- Risks (such as threats to native animals, water supplies);
- Life cycle (such as the impacts at each stage of the project design through to operation and closure); and
- Energy (such as use of non-renewable energy sources, Greenhouse gas emissions), etc

So there is the potential for a lot of connections between the different forms of assessment. The essential difference between them is how the terms, or scope of assessment, are defined narrowly, or broadly. Otherwise they all follow the same general principle.

With all the assessment approaches noted above, they are designed to identify potential impacts of a development, action or project. To do this the assessor needs to use personal experience and the experiences of others (including available knowledge) to think broadly about the changes that are possible, and whether those impacts will be positive or negative.

Particular approaches emphasis specific types of impacts (i.e. on health, on social groups). All have basically the same approach, although each may have its own individual language and detailed techniques.

Most of the assessment processes also include a second step. After identifying the impacts, they also consider what may be needed to avoid or reduce adverse impacts.

### **3.1.1 Purposes of EIA**

EIA is a process with several important purposes, which can be categorised as follows:

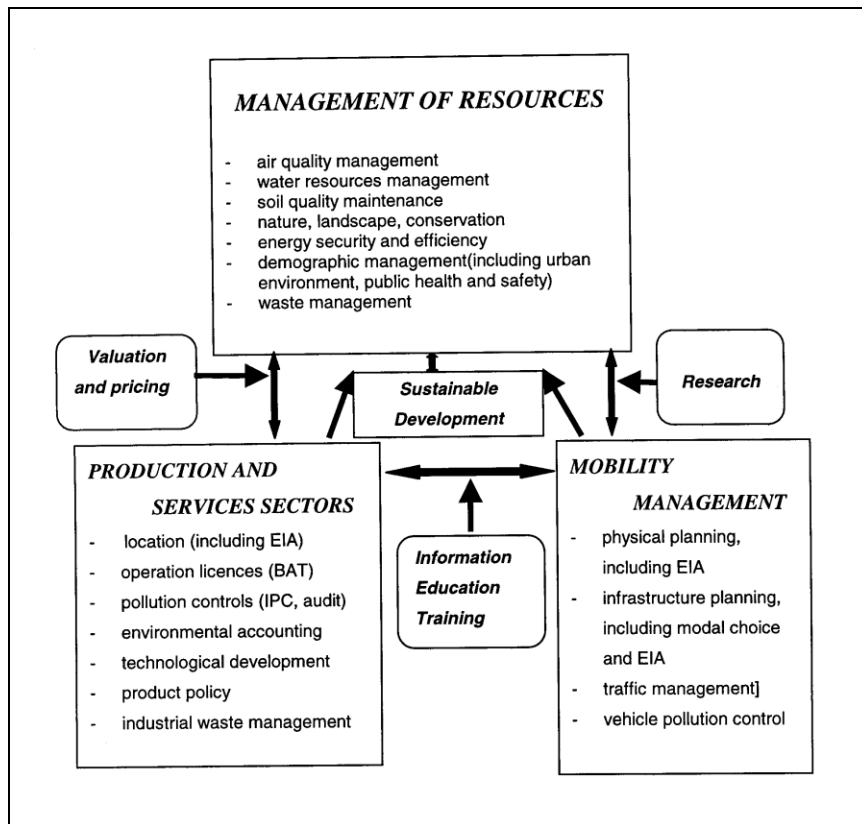
- **To facilitate decision-making:** For the decision-maker, for example the local authority, it provides a systematic examination of the environmental implications of a proposed action, and sometimes alternatives, before a decision is taken. The decision-maker along with other documentation relating to the planned activity can consider the environment impact statement (EIS).
- **To aid in the formation of development:** Many developers see EIA as another set of hurdles for them to cross in order to proceed with their various activities. They may also see the process involved in obtaining the permission from various authorities as costly and time-consuming. In reality, however, EIA can be of great benefit to them, since it can provide a framework for considering location and design issues and environmental issues in parallel. It can be an aid to the formulation of developmental actions, indicating areas where the project can be modified to minimise or eliminate altogether the adverse impacts on the environment. The consideration of environmental impacts early in the planning life of a development can lead to environmentally sensitive development; to improved relations between the developer, the planning authority and the local communities; to a smoother planning permission process and sometimes to a worthwhile financial return on the expenditure incurred.
- **To be an instrument for sustainable development:** The key characteristics of sustainable development include maintaining the overall quality of life, maintaining continuing access to natural resources and avoiding lasting environmental damage. Institutional responses to sustainable development are,



therefore, required at several levels. For example, issues of global concern, such as ozone-layer depletion, climate change, deforestation and biodiversity loss, require a global political commitment to action. The United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 was an example of international concern and also of the problems of securing concerted action to deal with such issues. Governments have recognised the interaction of economic and social development and the ecosystems, and the reciprocal impact between human actions and the biogeophysical world. While there are attempts to manage this interaction better, investigation reveal disquieting trends that could have devastating consequences for the quality of the environment. These trends are likely to be more pronounced in developing countries where, because of greater rates of population growth and lower current living standards, there is more pressure on environmental resources.

In short, an interaction among the resources, sectors and policies is necessary for sustainable development as illustrated in Figure 3.1 below, and EIA contributes to this process:

**Figure 3.1**  
**Sustainable Development: An Illustration**



### 3.1.2 Steps in EIA process

EIA represents a systematic process that examines the environmental consequences of the development actions, in advance. The emphasis of a EIA is on prevention and, therefore, is more proactive than reactive in nature. The EIA process involves a number of steps, some of which are listed below:

- **Project screening:** This entails the application of EIA to those projects that may have significant environmental impacts. It is quite likely, however, that screening is done partly by the EIA regulations, operating in a country at the time of assessment.
- **Scoping:** This step seeks to identify, at an early stage, the key, significant environmental issues from among a host of possible impacts of a project and all the available alternatives.

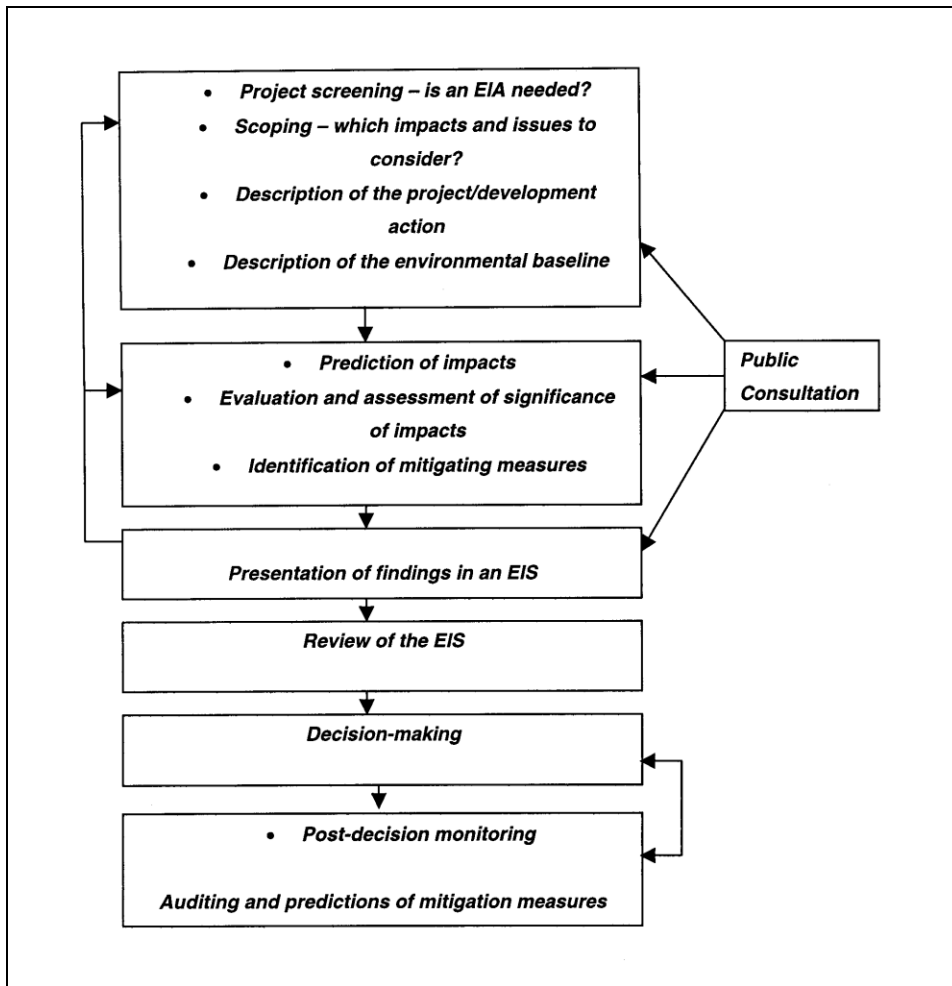
- **Consideration of alternatives:** This seeks to ensure that the proponent has considered other feasible approaches, including alternative project locations, scales, processes, layouts, operating condition and the *no-action* option.
- **Description of the project/development action:** This step seeks to clarify the purpose and rationale of the project and understand its various characteristics, including the stages of development, location and processes.
- **Description of the environmental baseline:** This includes the establishment of both the present and future state of the environment, in the absence of the project, taking into account the changes resulting from natural events and from other human activities.
- **Identification of key impacts:** This brings together the previous steps with a view to ensuring that all potentially significant environmental impacts (adverse and beneficial) are identified and taken into account in the process.
- **The prediction of impacts:** This step aims to identify the likely magnitude of the change (i.e., impact) in the environment when the project is implemented in comparison with the situation when the project is not carried out.
- **Evaluation and assessment of significance:** This seeks to assess the relative **significance** of the predicted impacts to allow a focus on key adverse impacts. Formal definition of significance is the product of consequence and likelihood as
$$\text{Significance} = \text{consequence} \times \text{Likelihood}$$
- **Mitigation:** This involves the introduction of measures to avoid, reduce, remedy or compensate for any significant adverse impacts.
- **Public consultation and participation:** This aims to assure the quality, comprehensiveness and effectiveness of the EIA,

as well as to ensure that the public's views are adequately taken into consideration in the decision-making process.

- **EIS presentation:** This is a vital step in the process. If done badly, much good work in the EIA may be negated.
- **Review:** This involves a systematic appraisal of the quality of the EIS, as a contribution to the decision-making process.
- **Decision-making:** At this stage, decisions are made by the relevant authority of the EIS (including consultation responses) together with other material considerations as to whether to accept, defer or reject the project.
- **Post-decision monitoring:** This involves the recording of outcomes associated with development impacts, after the decision to proceed with the project. It can contribute to effective project management.
- **Auditing:** This follows monitoring and involves comparing actual outcomes with predicted outcomes, and can be used to assess the quality of predictions and the effectiveness of mitigation. It provides a vital step in the EIA learning process.

Figure 3.2 illustrates the steps involved in the EIA process:

**Figure 3.2**  
**Steps in a EIA Process**



Note that the actual EIA process is not so linear and sequential as Figure 3.2 seems to suggest. In other words, it is a cyclical process involving feedback and interaction among the various steps and the sequence of the steps may also vary. Note also that we will discuss the steps involved in detail in Unit 4.



### LEARNING ACTIVITY 3.1

Define the EIA process.

**Note:**

- a) Write your answer in the space given below.
- b) Check your answer with the one given at the end of this Unit.

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#### 3.1.3 Hierarchy in EIA

The EIA studies are broadly categorised as:

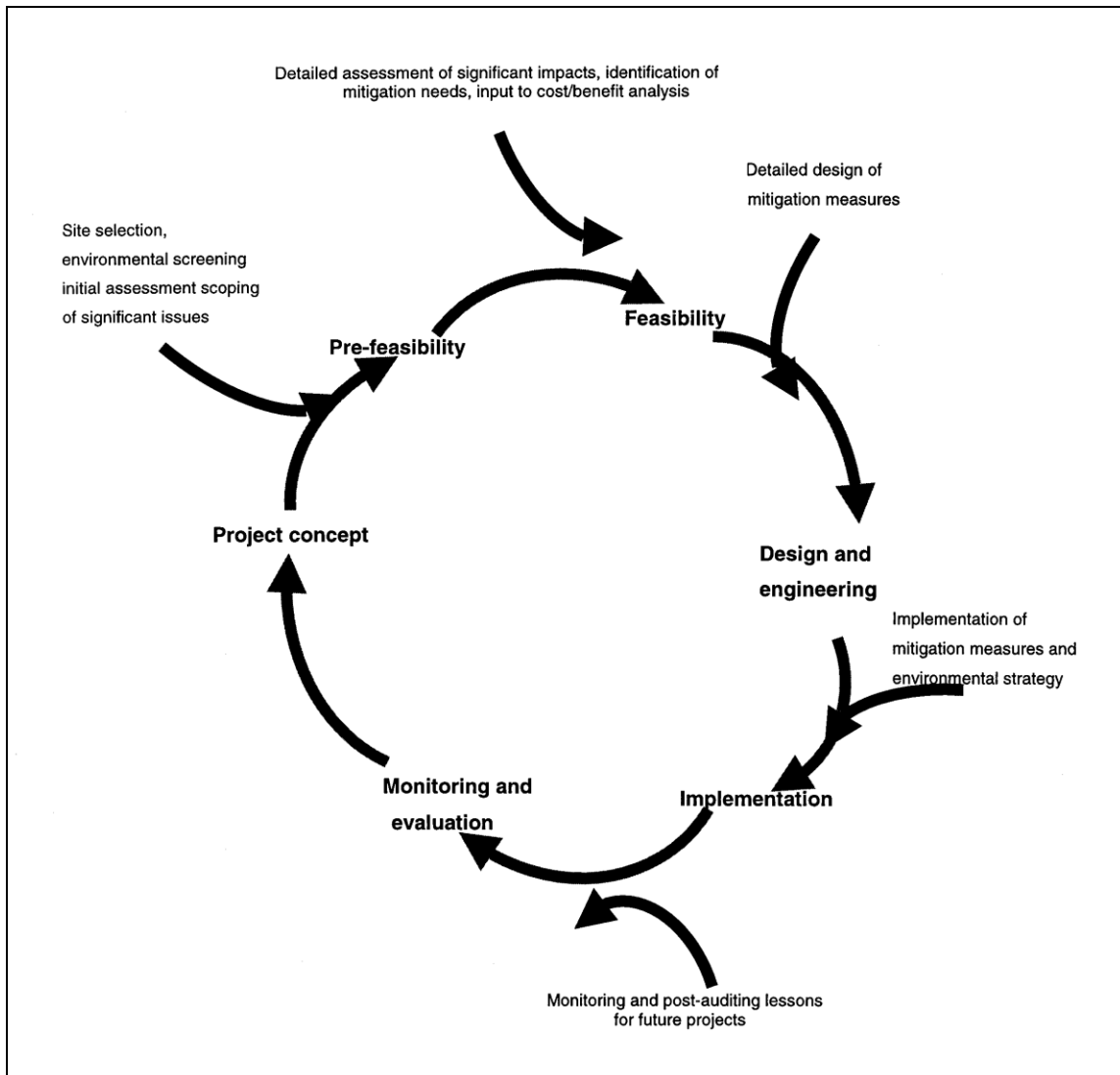
- (i) **Site selection studies:** These studies involve an evaluation of the alternative sites with respect to environmental and project attributes such as proximity to raw materials, infrastructure facilities, markets, etc. These studies aim at ranking site alternatives for objective decision-making.
- (ii) **Rapid or comprehensive studies:** Rapid studies refer to the assessment based on a one-season monitoring (i.e., 3-month period), whereas comprehensive studies relate to the assessment based on a three-seasons monitoring (i.e., 9-month period) of baseline data. Rapid EIA facilitates

decision-making in situations where a fair amount of knowledge exists about the proposed site or the impacts of the proposed development. It also helps in identifying significant issues for comprehensive EIA. Essentially, rapid and comprehensive studies differ with respect to timeframes required for baseline data collection.

- (iii) **Regional studies:** These relate to the development in/of a region based on seasonal data collection and address themselves to the analysis of assimilative capacity of air, water and land components of the environment.
- (iv) **Carrying capacity studies:** The scope of a carrying capacity study is extended to the analysis of supportive capacity in the region with respect to resource availability/ utilisation, supply/demand, infrastructure/congestion and assimilative capacity/residuals. Carrying capacity has been discussed in detail in Unit 9.

In the last two decades, national governments and also financial institutions have realised that EIA has to be an integral part of the project life cycle: from project conceptualisation to post implementation corrective action. Figure 3.3 illustrates this cycle:

**Figure 3.3**  
**EIA Cycle**



A EIA exercise culminates in an environmental impact statement (EIS), which we will study, next.

### 3.1.4 Environmental impact statement (EIS)

The environmental impact statement (EIS) provides documentation of the information and estimates derived from the various steps in the EIA process. The information contained in a



EIS provides the decision-makers/regulators with valuable information that could ultimately contribute to either the abandonment or substantial modification of a proposed development action. A typical EIS contains the following three parts:

- **Part 1 – Methods and key issues:** This part deals with the statement of methods used and a summary of key issues.
- **Part 2 – Background to the proposed development:** This part deals with preliminary studies (i.e., need, planning, alternatives, site selection, etc.), site description/baseline conditions, description of proposed development and construction activities and programmes.
- **Part 3 – Environmental impact assessments on topic areas:** This part deals with land use, landscape and visual quality, geology, topography and soils, hydrology and water quality, air quality and climate, terrestrial and aquatic ecology, noise, transport, socio-economic and interrelationships between effects.



### LEARNING ACTIVITY 3.2

Write 3 ways in which EIA will help in Business Management.

**Note:**

- Write your answer in the space given below.
- Check your answer with the one given at the end of this Unit.

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### 3.1.5 Impact indicators

An impact indicator is an element or a parameter that provides a measure (in at least some qualitative sense) of the significance of the effect, i.e., the magnitude of an environmental impact. Some indicators such as morbidity and mortality statistics and crop yields have associated numerical scales. Other impact indicators, however, can only be ranked as 'good', 'better', 'best' or 'acceptable', 'unacceptable', etc. The selection of a set of indicators is often a crucial step in the impact assessment process, requiring input from the decision-maker. In the absence of relevant goals or policies, the assessor himself or herself may suggest some indicators and scales, but he or she should not proceed with the assessment until his or her proposals are accepted.

The most widely used impact indicators are those within statutory laws, acts, i.e., indicators such as air and water quality standards that have statutory authority. For example, the problem of designing an environmentally acceptable oil-fired generating station is simplified for the engineers, if they are given one or both of the following:

- Emission standards for various pollutants.
- Air and water quality standards.

These standards integrate the worth that a jurisdiction places on clean air and clear water. The numerical values that have been derived from examination of the available toxicological matter are data relating polluting dosages to health and vegetation effects, combined with a consideration of the best practical technology. Factors such as the displacement of arable land by industry are

also equally important. A EIA that ignores these other components is incomplete and sometimes misleading (Munn, 1979).

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## **3.2 EVOLUTION OF EIA**

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To understand the use of EIA as a tool for environmental management, let us discuss how EIA has evolved over the years.

### **3.2.1 Evolution of EIA worldwide**

United States of America was the first country to assign mandatory status to EIA through its National Environmental Protection Act (NEPA) of 1969. A host of industrialised countries have since implemented EIA procedures. Canada, Australia, the Netherlands and Japan adopted EIA legislation in 1973, 1974, 1981 and 1984, respectively. In July 1985, the European Community (EC) issued a directive making environmental assessments mandatory for certain categories of projects (Wood, 1994).

Among the developing countries, Columbia was the first Latin American country to institute a system of EIA in 1974. In Asia and the Pacific region, Thailand and the Philippines have long established procedures for EIA. EIA was made mandatory in Sri Lanka in 1984. The EIA process in Africa is sketchy, although a number of nations including Rwanda, Botswana and Sudan have some experience of EIA (Wathern, 1988).

Bilateral and multilateral agencies have also recognised the value of EIA as a decision-making tool. The Organisation for Economic Co-Operation and Development (OECD) issued recommendations on EIA to its constituent States in 1974 and 1979, and for

development aid projects in 1986. OECD issued guidelines for good practices in EIA in 1992 (OECD, 1992). United Nations Environment Programme (UNEP) in 1980 provided guidance on EIA of the development proposals (UNEP, 1980) and supported research on EIA in developing countries (Ahmad and Swamy, 1985). UNEP, in 1987, set out goals and principles of EIA for the member countries and provided guidance on basic procedures for EIA in 1988.

The World Conservation Strategy pinpointed the need to integrate environmental considerations with development in 1980 (IUCN, 1980). EIA became an integral part of World Bank policy in 1987 which states that environmental issues must be addressed as part of overall economic policy. In 1989, the World Bank issued the Operational Directive on Environmental Assessment (O.D. 4.00), which was revised and updated in October 1991 (O.D. 4.01). Asian Development Bank in 1990 published guidelines for EIA (ADB, 1990). Importance of EIA was echoed in the Brundtland Report (WCED, 1987), and at United Nations Earth Summit on environment and development held at Rio de Janeiro in 1992 (UNCED, 1992). As foreseen by Garner and O'Riordan (1982) development of EIA, as a tool for decision-making world-over, has emerged through the following stages:

- No formal accounting, decisions made on interest group lobbying and engineering feasibility; primary emphasis on economic development.
- Conventional cost-benefit analysis; emphasis on efficiency criterion and engineering feasibility; major concern still on economic development.
- Innovative cost-benefit analysis, use of multiple objectives and discount rates, imaginative proxy pricing mechanisms; economic development as one of the objectives.

- EIA mainly concerned with describing the repercussions of the proposals on bio-physical processes; economic development still primary objective.
- EIA with more attention paid to socio-cultural as well as bio-physical systems, economic development but not the sole objective.

The summary of evolution of EIA in various countries is presented in Table 3.1 below:

**Table 3.1**  
**Evolution of EIA Worldwide**

Australia	Environmental Protection (Impact of Proposals) Act 1974, Commonwealth of Australia
Bangladesh	No specific EIA legislation, however there was a Declaration that Environmental Impact Assessments should be carried out for all major development projects, 1995
China	Environmental Protection Law, 1979
USA (California)	California Environmental Quality Act (CEQA) of 1971
Canada	Federal Environmental Assessment and Review Process Guidelines Order 1984, Canada
France	Law on Protection de la Nature, 1978
India	Notifications dated May 5, 1994 under the Environment Protection Act, 1986
Japan	Principles for Implementing EIA by Environmental Agency, 1984
Malaysia	Environmental Quality (Prescribed Activity) (EIA) Order, 1987
New Zealand	Resource Management Act 1991, New Zealand
Philippines	Presidential Decree (PD) 1151 Philippines Environment Policy, 1975 PD 1586 Establishing the Environmental Impact Statement (EIS), 1978 Rules and Regulations to Implement the EIS System, 1987
Sri Lanka	National Environmental Act 1980, amended in 1986
Thailand	Improvement and Conservation of National Environmental Quality Act 1975, amended in 1978
The Netherlands	EIA Policy, 1986
United States	US Environmental Policy Act, 1969
Vietnam	Environmental Protection Law, 1994
Western Australia	Environmental Protection Act 1986
West Germany	Cabinet Resolution, 1975

Let us now work out Learning Activity 3.3.



### LEARNING ACTIVITY 3.3

List 3 Asian countries where law requires EIA and also name the relevant law.

**Note:**

- a) Write your answer in the space given below.
- b) Check your answer with the one given at the end of this Unit.

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### 3.2.2 Evolution of EIA in India

EIA in India was started in 1976-77, when the Planning Commission asked the then Department of Science and Technology to examine the river-valley projects from the environmental angle. This was subsequently extended to cover those projects, which required approval of the Public Investment Board. These were administrative decisions, and lacked the legislative support. The Government of India enacted the Environment (Protection) Act on 23rd May 1986. To achieve the objectives of the Act, one of the decisions taken was to make EIA statutory. After following the legal procedure, a notification was issued on 27th January 1994 and subsequently amended on 4th May 1994, 10th April 1997 and 27th January 2000 making environmental impact assessment statutory for 30 activities. This is the principal piece of legislation governing EIA in India. Besides this, the Government of India under Environment (Protection) Act 1986 issued a number of notifications, which are related to

environmental impact assessment. These are limited to specific geographical areas, and are summarised below:

- Prohibiting location of industries except those related to Tourism in a belt of 1 km from high tide mark from the Revdanda Creek up to Devgarh Point (near Shrivardhan) as well as in 1 km belt along the banks of Rajpuri Creek in Murud Janjira area in the Raigarh district of Maharashtra (6th January 1989).
- Restricting location of industries, mining operations and regulating other activities in Doon Valley (1st February 1989).
- Regulating activities in the coastal stretches of the country by classifying them as coastal regulation zone and prohibiting certain activities (19th February 1991).
- Restricting location of industries and regulating other activities in Dahanu Taluka in Maharashtra (6th June 91).
- Restricting certain activities in specified areas of Aravalli Range in the Gurgaon district of Haryana and Alwar district of Rajasthan (7th May 1992).
- Restricting industrial and other activities, which could lead to pollution and congestion in the north west of Numaligarh in Assam (July 1996).



### LEARNING ACTIVITY 3.4

List three major developmental projects in India funded by the World Bank, which required EIA and the main aspect assessed in each of these projects.

**Note:**

- Write your answer in the space given below.
- Check your answer with the one given at the end of this Unit.

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## 3.3 FORECASTING ENVIRONMENTAL CHANGES

A EIA should be able to, among others, predict the nature and extent of the impact of human activities on the environment. Table 3.2 gives a list of human-induced environmental changes, which can be either benign or malignant to the environment:

**Table 3.2**  
**Environmental Changes**

Environmental Changes	
Medium	Changes and Rates of Change in
Soil	Quality (e.g., depth, structure, fertility, degree of stalinisation or acidification, etc.) Stability Area of arable land
Air	Quality The climatic elements
Water	Quantity Quality



<b>Environmental Changes</b>	
<b>Medium</b>	<b>Changes and Rates of Change in</b>
	Season ability Area of human-made lakes Extent of irrigation canals
Biota	Abundance/scarcity of species or genetic resources Extent of crops, ecosystems, vegetation and forests Diversity of species Extent of provision of nesting grounds, etc., for migratory species Abundance/scarcity of pests and disease organisms.

Of importance here are not only estimates of changes in environmental quality but also estimates of rate of change. A slow change may be acceptable, especially if it leads to a new stability, whereas rapid change or large fluctuations may place intolerable burdens on ecosystems. Of equal or perhaps greater importance is the degree of irreversibility of an environmental change, which will be either absolute, as in the extinction of a species, or partly absolute in that the situation can only be reversed over long periods of time or with unacceptable expenditures of money and energy, as in the case of catastrophic erosion.

A typical EIA contains information on the following three areas, as they relate to environmental effects:

- (i) A determination of the initial reference state.
- (ii) An estimate of the future state without action.
- (iii) An estimate of the future state with action.

We will describe each of these, next.

### ***Establishment of the initial reference state***

An assessment of environmental change pre-supposes knowledge about the present state. It will be necessary, therefore, to select attributes that may be used to estimate this state. Some of these will be directly measurable; others will only be capable of being recorded within a series of defined categories, or ranked in ascending or descending order of approximate magnitude. Difficult decisions need to be made about the *population* (i.e., in a statistical sense), which is to be represented by the measured variables, and the extent to which the sub-division of this population into geographical regions, ecosystems, etc., is either feasible or necessary. In fact, it must be emphasised that the establishment of an initial reference state is difficult because not only are environmental systems dynamic but also they contain cyclical and random components.

### ***Predicting the future state in the absence of action***

In order to provide a fair basis for examining the impact of human activities on the environment, a EIA must estimate the future environmental states in the absence of action. As an example, the population of a species of animal or fish may already be declining, due to over-grazing or over-fishing, even before a smelter is built. This part of analysis is largely a scientific problem, requiring skills drawn from many disciplines. The prediction will often be uncertain but the degree of uncertainty should be indicated at least in qualitative terms. For example, forecasting of droughts 2 or 3 years in advance is not yet possible, although the statistical probability that a drought (of a given severity) will occur sometime in the next hundred years can be estimated with some confidence. The decision-maker should be aware of the degree of uncertainty, which surrounds the predicted state of the environment, and have some understanding of the methods by which this uncertainty is calculated.

### ***Predicting the future state in the presence of action***

For each of the proposed actions, and for admissible combinations of these actions, there will be an expected state of the environment, which is to be compared with the expected state in the absence of action. Consequently, predictions similar to those outlined above must be derived for each of the proposed alternatives.



#### **LEARNING ACTIVITY 3.5**

List at least 3 adverse impacts associated with a highway, hydro-electric and thermal power projects.

**Note:**

- a) Write your answer in the space given below.
- b) Check your answer with the one given at the end of this Unit.

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Table 3.3 presents the main areas of concern that may affect human beings with regard to forecasting the environmental state in the presence of actions:

**Table 3.3**  
**Areas of Human Concern**

<b>Areas of human concern (impact categories)</b>	
Economic and Occupational status	Displacement of population; relocation of population in response to employment opportunities; services and distribution patterns; property values.
Social pattern or life style	Resettlement; rural depopulation; change in population density; food; housing; material; agricultural; rural; urban.
Social amenities and relationships	Family life styles; schools; transportation; community feelings; participation vs. alienation; recreation; language.
Psychological features	Involvement; expectations; stress; frustration; Commitment.
Physical amenities (intellectual, cultural, aesthetic and sensual)	National parks; wildlife; art galleries; archaeological monuments; wilderness; clean air and water.
Health	Changes in health; medical services; medical standards.
Personal security	Freedom from molestation; freedom from natural disasters.
Regional and traditional beliefs	Symbols; taboos; values.
Technology	Security; hazards; safety measures; benefits; emission of wastes; congestion; density.
Cultural	Leisure; new values; heritage; traditional and religious rites.
Political	Authority; level and degree of involvement; priorities; structure of decision-making; responsibility and responsiveness; resource allocation; local and minority interests; defence needs.
Legal	Restructuring of administrative management; changes in taxes; public policy.
Aesthetic	Visual physical changes; moral conduct; sentimental values.
Statutory laws and acts	Air and water quality standards; safety standards; national building acts; noise-abatement by-laws.

Note that the nature of impact listed in Table 3.3 is likely to vary from place to place and from time to time, and there will be overlaps between classes (e.g., health depends in part on economic and occupational status).



### LEARNING ACTIVITY 3.6

Identify 3 stages in the implementation of a highway project and the environmental concerns at those stages.

**Note:**

- a) Write your answer in the space given below.
- b) Check your answer with the one given at the end of this Unit.

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In this Section, we explained the anthropogenic effect and their impacts in terms of environmental preservation. However, a specific parameter is necessary to provide a measure of the significance of an effect.

So far, we dealt with EIA, which is an indispensable tool for environmental engineers and managers alike. Now, let us introduce you to a new concept called *strategic environmental assessment*, which covers policies, plans and programmes at critical stages of development.

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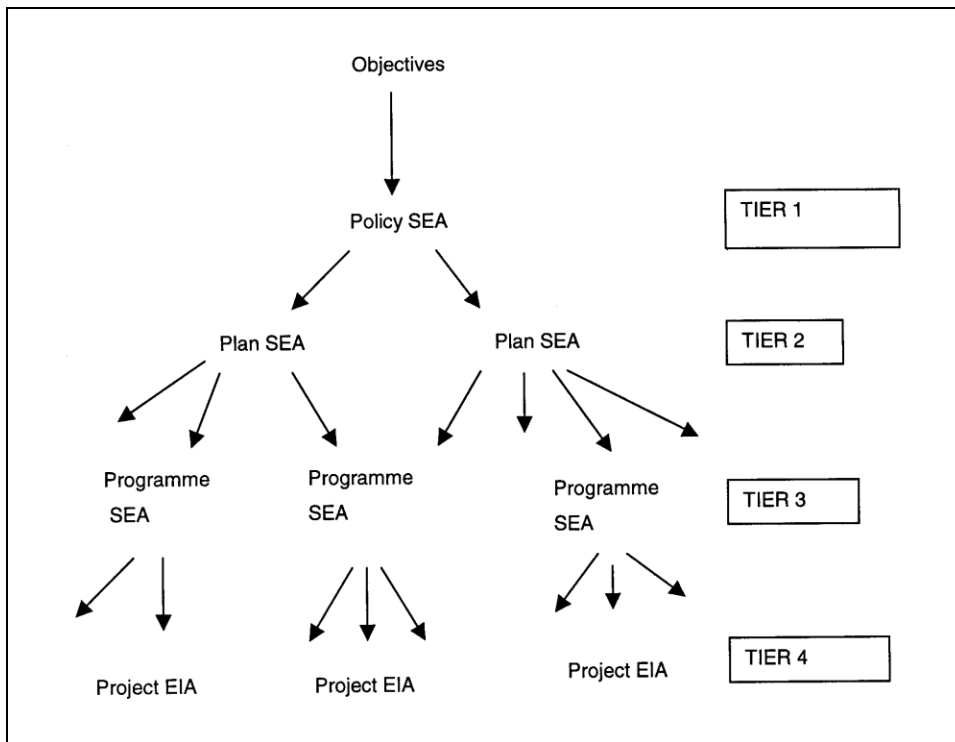
## 3.4 STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

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One of the most recent trends in EIA is its application at earlier, more strategic stages of development at the level of policies, plans and programmes, and is known as strategic environmental assessment (SEA). SEA is defined as the formalised, systematic

and comprehensive process of evaluating the environmental impacts of a policy, plan or programme (PPP) and its alternatives, including the preparation of a written report on the findings of that evaluation, and using the findings in publicly accountable decision-making (Therivel, et al., 1992). In other words, the EIA of policies, plans and programmes, keeping in mind that the process of evaluating environmental impacts at a strategic level, is not necessarily the same as that at a project level. In theory, PPPs are tiered – a policy provides a framework for the establishment of plans, plans provide frameworks for programmes and programmes lead to projects. The EIAs for these different PPP tiers can themselves be tiered as shown in Figure 3.4.1, and so the issues at higher tiers need not be reconsidered as the lower tiers:

**Figure 3.4.1**  
**Tiers in SEAs**



A hierarchy exists between policies, plans and programs with policies at the top level of conceptualization (Figure 3.4.2) and generality; plans are one level down from policies, and programs. Programs make plans more specific by including a time schedule for specific activities. Implementation of a program involves carrying out specific projects, which can be subjected to traditional EIA.

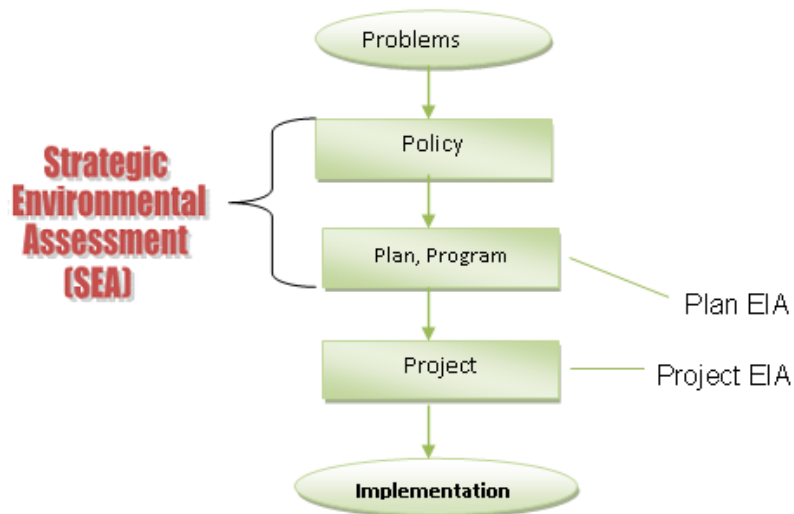


Figure 3.4.2 Policy Plan Program (PPP) and SEA

### 3.4.1 Rationale and scope

In broad terms, the rationale for SEA of policies, plans and programmes falls into three main categories: strengthening project EIA; advancing the sustainability agenda; and addressing cumulative and large-scale effects; (Jacobs & Sadler, 1989; Lee & Walsh, 1992; Sadler, 1994; Sadler & Verheem, 1996)

(<http://www.nssd.net/pdf/IIEDO2.pdf>). Let us discuss these, next.

The EIA practice is constrained by certain limitations and weaknesses. These include structural weaknesses centred on the relatively late stage at which EIA is usually applied in decision-making. Put differently, high-order questions of whether, where and what type of development should take place are decided, often with little or no environmental analysis. Project-by-project EIA is also an ineffective means of examining these issues. SEA, or an equivalent approach, can be used as a complement to project-level EIA to incorporate environmental considerations and alternatives directly into policy, plan and programme design. Thus, when applied systematically in the upstream part of the decision cycle and to the economic, fiscal and trade policies that guide the overall course of development, SEA can be a vector for a sustainability approach to planning and decision-making (Brundtland Commission of WCED, 1987 and Agenda 21 of UNCED, 1992). This upstream approach can also help in making EIA projects more consequential and reducing the time and effort involved in their preparation. SEA may yield significant other benefits, as well. For example, by ruling out certain kinds of development at the policy level, reducing the need for many project-level EIA and thus relieving pressure where institutional and/or skills capacity is limited.

Arguably, SEA offers a better opportunity than project-level impact assessment to address cumulative effects. Recently, considerable



efforts have been made to extend EIA-based frameworks to encompass certain types of cumulative effects. These deal reasonably well with the ancillary impacts of large-scale projects (e.g., dams, transport infrastructure) and the incremental effects of numerous, small-scale actions of a similar type (e.g., road realignment and improvement). However, more pervasive cumulative effects and large-scale environmental change (which are the end result of multiple actions and stresses that cut across policy and ecological boundaries) are difficult to address. In principle, these can be addressed best by SEA of policies, plans and programmes. In practice, however, this has not proven to be the case.

What then is the scope of SEA?

Most practitioners view SEA as a decision aiding rather than a decision-making process. In other words, it is seen as a tool for forward planning to be flexibly applied at various stages of the policy-making cycle. Under this broad perspective, SEA encompasses assessments of both broad policy initiatives and more concrete programmes and plans that have physical and spatial references (e.g., town and regional plans, regional development programmes, etc). With this scope of coverage, one problem becomes evident, and that is, the methodologies to be applied at the opposite ends of the decision-making spectrum differ markedly. However, the principles of EIA apply at all levels.

Table 3.4.1 compares EIA and the evolving processes of SEA.

**Table 3.4.1**  
**Comparison of EIA and SEA**

<b>EIA</b>	<b>SEA</b>
Is usually reactive to a development proposal.	Is pro-active and informs development proposals.
Assesses the effect of a proposed development on the environment.	Assesses the effect of a policy, plan or programme on the environment, or the effect of the environment on development needs and opportunities.
Addresses a specific project.	Addresses areas, regions or sectors of development.
Assesses direct impacts and benefits.	Assesses cumulative impacts and identifies implications and issues for sustainable development.
Focuses on the mitigation of impacts.	Focuses on maintaining a chosen level of environmental quality.
Narrow perspective and a high level of detail.	Wide perspective and a low level of detail to provide a vision and overall framework.
Focuses on project-specific impacts.	Creates a framework against which impacts and benefits can be measured.

Tiered planning system for EIA and SEA is shown in Table 3.4.2 given below

**Table 3.4.2 Tiered planning system for EIA and SEA**

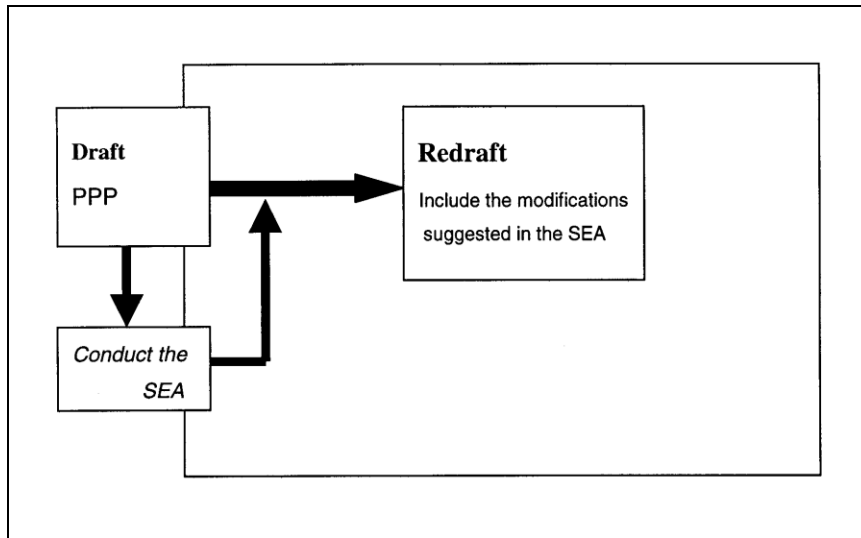
Level of government	Land-use plans (SEA)	Category of action and type of assessment (in parenthesis) Sectoral and multi-sectoral actions			
		Policies (SEA)	Plans (SEA)	Programs (SEA)	Projects (EIA)
National / Federal	National land-use plan	National transport policy ⇒ National economic policy	Long term national roads plan ⇒ Regional strategic plan	5-year road building program ⇒ Sub-regional investment program	Construction of highway section ⇒ Local infrastructure project
Regional / State	Regional land-use plan				
Sub-regional	Sub-regional land-use plan				
Local	Local land-use plan				

SEA process is as comprehensive as EIA, if not as exhaustive. We will discuss this, next.

### **3.4.2 SEA process**

In project EIA, impact mitigation, i.e., avoiding or reducing the project's impacts, restoring the affected environment or compensating for adverse effects, is often considered a separate stage in the process. In SEA, instead, the focus of the project is on reconsidering the PPP from a cross-cutting perspective, leading to an improved understanding of the PPP and possibly changes to the PPP: each stage considers whether and how the PPP can be changed and improved. These changes mostly involve rewriting the PPP to minimise any negative environmental/sustainability impacts but could also involve establishing management guidelines for the implementation of the PPP, placing constraints on lower-tier PPP. (For instance, establishing criteria for identifying future developments away from sensitive sites or requiring SEA/EIA for lower-tier PPPs and projects). Or, developing environmentally beneficial shadow PPPs or projects. As such, mitigation in SEA is an ongoing process as illustrated in Figure 3.5:

**Figure 3.5**  
**Mitigation in SEA**



An SEA process involves the following stages:

- (i) **Screening:** At this stage, responsible agencies carry out an appropriate assessment of all strategic decisions with significant environmental consequences.
- (ii) **Timing:** At this stage, results of the assessment are available sufficiently early for use in the preparation of the strategic decision.
- (iii) **Environmental scoping:** At this stage, all relevant information is provided to judge whether an initiative should proceed and objectives could be achieved in a more environmentally friendly way (i.e., through alternative initiatives or approaches).
- (iv) **Other factors:** At this stage, sufficient information is available on other factors, including socio-economic considerations, either parallel to, or integrated in, the assessment.

- (v) **Review:** At this stage, the quality of the process and information is safeguarded by an effective review mechanism.
- (vi) **Participation:** At this stage, sufficient information on the views of all legitimate stakeholders (including the public affected) is available early enough to be used effectively in the preparation of the strategic decision.
- (vii) **Documentation:** At this stage, results are identifiable, understandable and available to all parties affected by the decision.
- (viii) **Decision-making and accountability:** At this stage, it should be clear to all stakeholders and all parties affected how the results were taken into account in decision-making.
- (ix) **Post-decision:** At this stage, sufficient information on the actual impacts of implementing the decision is gained to judge whether or not the decision should be amended.  
(Adapted from Sadler, 1998b and Tonk & Verheem, 1998).

Note that though the stages are listed in a particular order, it does not mean that they occur in that very sequence. In other words, stages do overlap.

#### **Methodological difference between EIA and SEA are**

- Scale of SEA is wider than EIA as there would be number of activities involved, larger extent of impacts to be assessed, and greater range of alternatives defined and also wider area of significance.
- Time interval is longer in SEA this is between planning, approval, and implementation. Even data collection in SEA is time consuming stage.

Alternatives chosen at project level can be easily differentiated and they are abstract in nature such as policy, not technical.

An SEA report should be regarded as a documentation of the processes used and available, where necessary, for later review. The real value in SEA is as a creative tool in the design cycle of the formulation and reformulation of PPPs, modifying them where necessary to respond to environmental/sustainability objective.



### LEARNING ACTIVITY 3.7

Name 5 stakeholders in a highway project.

**Note:**

- a) Write your answer in the space given below.
- b) Check your answer with the one given at the end of this Unit.

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Like every tool, an SEA also has its benefits and constraints. We will now list them in Subsection 3.4.3.

### 3.4.3 Benefits and constraints of SEA

Some of the benefits of SEA include the following:

- (i) promoting integrated environment and development decision-making;
- (ii) facilitating the design of environmentally-sustainable policies and plans;

- (iii) providing for consideration of a larger range of alternatives than is normally possible in project EIA;
- (iv) taking account, where possible, of cumulative effects (particularly by focusing on the consequences of sectoral or regional-level developments) and global change;
- (v) enhancing institutional efficiency (particularly, where EIA related skills, operational funds and institutional capacities are limited) by obviating the need for unnecessary project-level EAs;
- (vi) strengthening and streamlining project EA by incorporating environmental goals and principles into policies, plans and programmes that shape individual projects; identifying in advance the impacts and information requirements; resolving strategic issues and information requirements and reducing time and effort taken to conduct reviews.
- (vii) providing a mechanism for public engagement in discussions relevant to sustainability at a strategic level.

Some of the constraints of SEA include the following:

- A level of institutional maturity is necessary, which allows for effective inter-sectoral dialogue, for environmental considerations to be taken into account in formulating, revising and implementing policies, plans and programmes effectively, and to influence decision-making.
- Appropriate skills are needed, within government departments/ agencies and private sectors (e.g., industry, environmental consulting companies) and amongst academics and NGOs.

- There is a need for adequate capacity in these sectors (both human and financial resources).

In practice, the extent to which the benefits of SEA are achieved will also depend on a number of other important factors such as:

- provisions made for SEA, e.g., legal versus administrative;
- prior record of implementation and acceptance by decision-makers;
- degree to which overall strategies of sustainable development are in place;
- scope and level(s) of process application; with the broadest range of benefits being gained from SEA systems that include review of policies as well as plans and programmes. (Adapted from Dalal-Clayton and Sadler, 1995 and Sadler & Baxter, 1997.)

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### **3.5 ENVIRONMENTAL CLEARANCE PROCEDURE IN INDIA**

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As the utility of EIA became clear, there was need to establish project clearance procedure. The first step in that direction was to define the EIA process. The EIA process in India is made up of the following phases:

- Screening.
- Scoping and consideration of alternatives.
- Baseline data collection.
- Impact prediction.



- Assessment of alternatives, delineation of mitigation measures and environmental impact statement.
- Public hearing.
- Environment management plan (EMP).
- Decision-making.
- Monitoring the clearance conditions.

The Ministry of Environment and Forests (MOEF) has published guidelines for different sectors, which outline the significant issues to be addressed in the EIA studies. In general, the following impacts of the project need to be assessed:

- **Air:** The changes in ambient levels and ground level concentrations due to total emissions from point, line and area sources, effects on soils, materials, vegetation and human health are to be assessed.
- **Noise:** The changes in ambient levels, due to noise generated from equipment and movement of vehicles, and their impact on fauna and human health are to be assessed.
- **Water:** The availability to competing users, changes in quality, sediment transport and ingress of saline water are to be assessed.
- **Land:** The changes in land use and drainage pattern, land quality including effects of waste disposal, shoreline/riverbank and their stability are to be assessed.
- **Biological:** The level of deforestation/tree-cutting and shrinkage of animal habitat, the impact on fauna and flora (including aquatic species, if any) due to contaminants/pollutants and the impact on rare and endangered species, endemic species, and migratory path/route of animals are to

be assessed, as also the impact on breeding and nesting grounds.

- **Socio-economic:** The impact on the local community including demographic changes, economic status, human health and increased traffic are to be assessed.

For every project, possible alternatives need to be identified and environmental attributes compared. The alternatives identified must cover project location and process technologies including the no-project option and the alternatives need to be ranked for selection on the basis of optimum economic benefits to the community at large.

Once the alternatives have been reviewed, a mitigation plan supplemented with an environmental management plan (EMP) needs to be drawn up for the selected option to guide the proponent towards environmental improvements. Note that the EMP is a crucial input to monitoring the clearance conditions, and therefore, it must contain the details of monitoring. A EIA report, thus, needs to provide clear information to the decision-maker on the different environmental scenarios without the project, with the project and with project alternatives. This includes uncertainties. MOEF has issued sectoral guidelines and environmental appraisal questionnaires for obtaining the clearance and seeks the following documents:

- Filled in application form (as per Schedule II of EIA Notification).
- A summary of the project/feasibility report (1 copy).
- EIA (EIS)/EMP report (20 copies).
- Risk analysis on on-site emergency preparedness plan (20 copies) in case of projects involving hazardous substances.

- Site clearance from MOEF for site-specific projects mentioned in the EIA notification.
- Consent to establish from SPCB.
- NOC from the local authorities (e.g., District Collector).
- Commitment regarding the availability of water and electricity from the appropriate agencies.
- Approval of the Chief Controller of Explosives under the Petroleum Act and Rules for layout and storage of hazardous substances and from the Directorate of Industrial Safety and Health under the Factories Act and Rules.
- Comments/Observations/Recommendations of the Chief Wildlife Warden in case a wildlife habitat/migration path exists within 25 km of project site.
- Comprehensive summary rehabilitation plan, where displacement of more than 1,000 people is anticipated.
- Copy of the application forwarded to the state government, in case of diversion of forest land.
- Copy of the application forwarded to the state government in case the CRZ notification applies.
- Clearance from the Airport Authority of India, if applicable.
- Details of the public hearing conducted by SPCB and copies of the advertisements issued for public hearing.
- Filled-in environmental appraisal questionnaires issued by MOEF, along with the attachments (mentioned in the questionnaire).

MOEF has issued different questionnaires for different projects, and the law requires that the public must be informed and consulted on a proposed development after the completion of EIA report. Any one is entitled to have access to the executive

summary of the EIA, and the affected persons such as bona fide local residents, local associations, environmental groups active in the area and any other person located at the project site/sites of displacement must be given an opportunity to make oral/written suggestions to the State Pollution Control Board (SPCB).

The decision-making process involves consultation between the project proponent (assisted by a consultant) and the impact assessment authority (assisted by an expert group, if necessary). The decision on environmental clearance is arrived at through a number of steps including evaluation of EIA and the environmental management plan (EMP). In India, the project proponent during the project planning stage decides the type of projects, i.e., new establishment, expansion or modernisation. Later, the project proponent prepares a detailed project report/feasibility report and submits to the authorities concerned the executive summary containing the project details and findings of the EIA study, which is to be made available to the concerned public.

Where a proponent is required to obtain environmental clearance, the Impact Assessment Agency (IAA) evaluates and assesses the EIA report. In this process, the project proponent is given a chance to present his or her proposal. If a project is accepted, the IAA prepares a set of recommendations and conditions for its implementation based on this assessment. Environmental clearance conditions and recommendations of IAA are made available to the public on request through SPCB and through a web site <<http://envfor.nic.in>>. During the implementation and operation of the project, the IAA is also responsible for the environmental monitoring process.



- Poor quality of EIA studies by consultants
- Delays by other concerned agencies

Due to these reasons re engineering was done of the EIA process implementation based on project chosen.

Background of this reengineering is that; MoEF conducted a review on previous EC process which is comprehensive under the Environmental Management Capacity Building Project in 2001, reformation in investment approvals and implementation procedures was set up by central government with the help of Govindarajan committee. Due to consistency in studies with both the organizations there was a strong necessity for reforms in the EIA notification 1994.

### **Objectives of EIA notification 2006**

To formulate a transparent, decentralized and efficient regulatory mechanism to:

- Incorporate necessary environmental safeguards at planning stage.
- Involve stakeholders in the public consultation process.
- Identify developmental projects based on impact potential instead of the investment criteria.

It also stated that; all new projects listed in schedule, expansion and modernisation of existing projects and those activities that show change in product mix require environmental clearance before setting up.

According to the 1994 clearance procedure the MOEF has issued sectoral guidelines and environmental appraisal questionnaires and needed following documents:

- Filled in application form (as per Schedule II of EIA Notification).
- A summary of the project/feasibility report (1 copy).

- EIA (EIS)/EMP report (20 copies).
- Risk analysis on on-site emergency preparedness plan (20 copies) in case of projects involving hazardous substances.
- Site clearance from MOEF for site-specific projects mentioned in the EIA notification.
- Consent to establish from SPCB.
- NOC from the local authorities (e.g., District Collector).
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- Comprehensive summary rehabilitation plan, where displacement of more than 1,000 people is anticipated.
- Copy of the application forwarded to the state government, in case of diversion of forest land.
- Copy of the application forwarded to the state government in case the CRZ notification applies.
- Clearance from the Airport Authority of India, if applicable.
- Details of the public hearing conducted by SPCB and copies of the advertisements issued for public hearing.
- Filled-in environmental appraisal questionnaires issued by MOEF, along with the attachments (mentioned in the questionnaire).

#### **Differences between the EIA notification 1994 and 2006**

- No NOC for EC

- Revised Schedule based on potential impacts instead of investment criteria
- Categorization into A and B1 & B2 (given in annexure)
- Category A at Central level, Category B1, B2 at State Level (with exceptions)
- Check-list information in Form-1/Form-1-A
- Scoping to determine TORs for EIA, if required;
- Finality of TORs
- Scoping stage incorporate site clearance – No separate site clearance is required.
- Public consultation structured; to be conducted by SPCB and presided by DM (within 45 days); proceedings to be video graphed; MoEF to intervene if PH not held in time.
- Time limits with consequences at each stage
- State Level Environment Impact Assessment Authority (SEIAA), Expert Appraisal Committees (EAC) are also required.

State Level Environment Impact Assessment Authority (SEIAA) is an independent body members of which should be notified by MoEF on receiving nominations from all concerned states and UTs. Chairman and other member shall be experts fulfilling the eligibility criteria given in Appendix VI of Notification 2006. Chairman shall be an expert in EIA process. Member Secretary familiar with environmental laws shall be a serving officer of the State Government. MoEF must notify SEIAAs within a time limit of 30 days from the date of receipt of nominations. Time period for Authority defined (3 years). Decision of the Authority shall be on the basis of consensus and lastly there would not be any funding from MoEF.

Steps in prior Environmental clearance process include Screening, Scoping, Public consultation, and Appraisal





The Environmental Clearance procedure was thoroughly restructured through issuance of said Environmental Clearance Notification by MoEF, New Delhi for making the environmental clearance procedure more transparent, less time consuming and decentralized as much as possible. Under this restructured Environmental Clearance notification, the industrial/ developmental activities, which may cause serious spatial and temporal environmental impacts, have been scheduled to obtain prior Environmental Clearance. And also it has been decided that such activities shall be classified as category A or category B type projects. The existing Expert Appraisal Committees at central level at Ministry of Environment & Forests, New Delhi, shall screen - scope - appraise category A projects. Each state shall constitute State Environment Impact Assessment Authority (SEIAA) and the State Expert Appraisal Committee (SEAC) for carry out similar environmental procedure at State level. The SEIAA shall grant or refuse Environmental Clearance to any B type project after screening - scoping – appraisal of Environmental Clearance applications at state level.

In short, an environmental impact assessment is an integral part of any project planning and must be understood with respect to the requirement of each project. A project proponent has to first determine whether the activity requires environmental clearance and undertake EIA studies to meet the requirements of MOEF. In case of joint venture projects (with a foreign company) and/or for seeking funds from an international financial institution, an environment impact statement has to conform to the environmental assessment guidelines. You must have a fairly good knowledge of, and must be capable of anticipating, the requirements and implications on project schedules and cost. It is

an inescapable fact today that a EIA report needs to be prepared in a manner that conforms to national and international regulations and guidelines. It must be seen as a proactive, rather than a purely conformist document.

## **SUMMARY**

In this Unit, we introduced you to the concept of environmental impact assessment (EIA). We began the Unit by giving an overview of what EIA entails, and in this context, touched upon the purpose of EIA, the processes involved in EIA, etc. Subsequently, we gave an account of the evolution of EIA both in India and in other countries. We also discussed how prediction or forecasting of environmental change is vital for EIA. We then discussed strategic environmental assessment (SEA) and described the overlaps and differences between SEA and EIA. Finally, we closed the Unit by describing some of the environmental clearance procedures in practice in India.

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# Lecture 3

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## Model Answers to Learning Activities

### LEARNING ACTIVITY 3.1

Environmental Impact Assessment (EIA) is a formal study process used to predict the environmental consequences of a proposed development project. Such projects may include, for example, building a hydroelectric dam or a factory, irrigating a large valley, or developing a harbour.

### LEARNING ACTIVITY 3.2

- Selection of site for locating new industry which is not in an ecologically sensitive area.
- Selection of manufacturing technology which results in minimum environmental impacts.
- Involving project affected population in the process of project development.

### LEARNING ACTIVITY 3.3

Country	Law
Thailand	Improvement and Conservation of National Environmental Quality Act 1975, amended in 1978.
India	Notifications dated May 5, 1994 under the Environment Protection Act, 1986.
Sri Lanka	National Environmental Act 1980, amended in 1986.

### LEARNING ACTIVITY 3.4

Project	Main Aspect Assessed
Sardar Sarovar	Resettlement & rehabilitation of the project affected population.
Bombay Sewage Disposal Project	Impact of length on marine outfall on coastal water quality.
Chennai Water Supply	Impact of laying raw water pipeline on agricultural land Project and forests.

### LEARNING ACTIVITY 3.5

Highway project:

- Change in land use.
- Deforestation.
- Increase in air pollution.

Hydro electric project:

- Displacement of population in catchments area.
- Reservoir induced seismicity.
- Impact on terrestrial ecosystem.

Thermal power:

- Increase in ambient air pollution level.
- Increase in water demand due to cooling water requirements.
- Land pollution due to fly ash disposal.

### LEARNING ACTIVITY 3.6



Stages	Concerns
Route selection	Deforestation.
Construction	Transportation and storage of road construction material.
Operations	Increase in air pollution and noise levels.

### LEARNING ACTIVITY 3.7

Stakeholders in a highway project are:

- Land use planner.
- Department of road transport.
- Industrial development department.
- Persons affected due to land acquisition.
- Settlements along the proposed route or highway.

### LEARNING ACTIVITY 3.8

The stakeholders that are required to be consulted, during public hearing of a coal-based thermal power project, are:

- (i) Land owners whose land would be acquired.
- (ii) Farmers in the surrounding area.
- (iii) Fishermen who depend on fish yield of the water body from where the water would be extracted for the proposed unit.

Coal-based thermal power plant involves:

- (i) Land acquisition for setting up the plant and ash disposal.

- (ii) Impact on agricultural production due to the fly ash emission from the stack that increases the sulphur dioxide levels.
- (iii) Impact on fish yields as a result of the cooling water disposal that increases the temperature of water body and toxic chemical levels (due to antifouling chemicals used in cooling water).

<http://www.financialexpress.com/news/moef-seeking-to-centralise-clearance-of-projects/159140/>