ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Since the advent of industrial and technological revolutions, the ecological system has become unbalanced and natural resources has become overstrained due to greed and short sightedness of man, population explosion, environmental pollution, deforestation, habitat destruction, loss of biodiversity etc. Any development process is bound to have impact on the environment. Environmental degradation poses a direct threat to the quality of life. Thus, it became necessary to have awareness of the ecological and social cost of unrestrained technological progress and have an idea of possible impacts of any development plan. With this view, the "Earth Summit" was sponsored by United Nation Conference on Environmental and Development (UNCED), held at rio-de Janiero in 1992. The "Earth Summit" stressed on the following strategies-

1. Making development ecologically sustainable
2. Adopting environmental friendly technology
3. Effective regulatory provisions for environment protection.

Current environmental problems all over the world are related to imbalance development. Economic development can not succeed unless development planning includes environmental assessment in all economic decisions. Environmental Impact Assesment (EIA) is the study of the probable changes in socio-economic and biophysical characteristics of the environment which may result from a proposed development plan. EIA represents a means of evaluating and simultaneously controlling the quality of human environment. EIA can be considared to be a planning tool which assists planners in anticipating potential future impact of different development activities both beneficial and adverse with a view to select the 'optimal' alternative.

For efficient environmental management, EIA must be conducted for a wide range of projects and activities. The analysis must take place before the project actually produces the environmental impact. It is expected to produce and, therefore, EIA consists of the identification and the evaluation of the environmental factors that are likely to be adversly or beneficially affected by the proposed development plan. EIA is a valuable decision making tool indicating the:

1. Alternative routes of development
2. Alternate project sites
3. Alternate process technologies
4. Carrying capacity of the specific ecosystem
5. Quality of the environment before, during and after the proposed development activity

Goals of EIA

1. Resource conservation
2. Waste minimization
3. Recovery of by-product
4. Efficient equipment

- To ensure environment quality, measures must be taken before the damage occurs not after.

METHODOLOGY OF EIA

EIA consists of four phases namely

1. Organizing the job
2. Performing the assesment
3. Writing the environmental impact statement.
4. Review of the EIS

1. Organizing the job

This is the first step of EIA. In this step the project or plan is identified and an interdiscipli-

nary team is constituted to conduct the analysis. After analysis a form is prepared to document particulars concerning the project, its sponsors, the participants of the ID team, the activities that need to be complished and specify responsibilities, time frame, cost estimate etc. this form is distributed to each member of team.

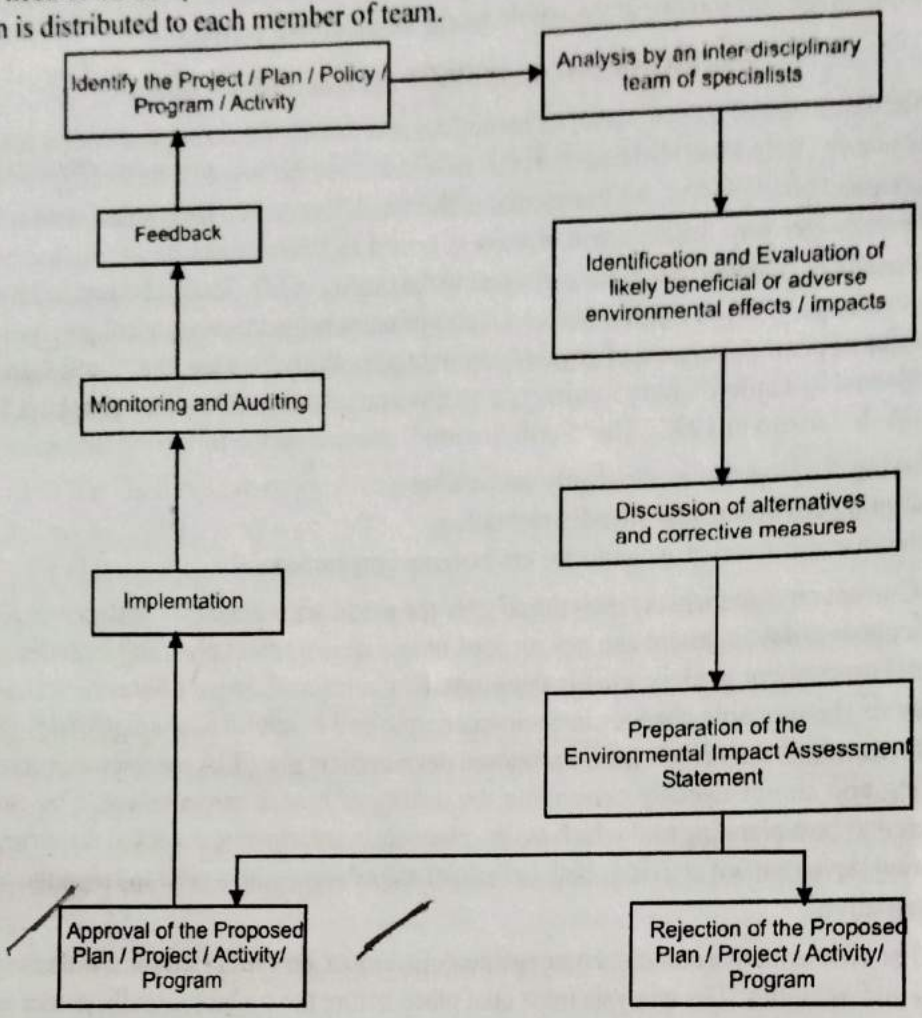

Fig. 1. 3. Methodology of EIA

2. Performing the assesment

This is the second step of EIA. It consists of the following steps-

(i). A site visit by interdisciplinary team to determine the possible environmental impact of the proposed plan or project and record the description of the environment as it exists prior to the proposed project.

(ii). Identification and evaluation of likely beneficial or adverse environmental affects of the proposed project.

(iii). Discussion of alternative and corrective measures.

(iv). Preparation of a checklist for EIA to ensure complete coverage of all possible conse quinces of the proposed activity so that it can be determined as to what administrative action be taken as a result of this activity.

3. Preparation of Environmental Impact Assesment (EIA)

EIS is the conclusion of EIA. All the conclusions or results of the assesment are reported through it. It is prepared by interdisciplinary team. The team reports the following-

(i). Description of the site where project is proposed.

(ii). Description of the proposed project, purpose of action, magnitude of the action, area,equipments, manpower and material requirement.

(iii). The environmental impact of the project (i.e. on air, water, land, ecosystem etc.)
(iv). The unavoidable adverse effects resulting from the activity.
(v). Alternatives of activity
(vi). Relastionship of the proposed activity to the existing land use plans
(vii). Identifying the measures that can be taken in order to minimize the adverse effects
(viii).Incorporating the modifications in the proposed project

Finally the EIS, written in clear and comprehension manner and is presented to the public competent authorities and independent experts.

4. Review of the EIA

The EIS written is then presented to the public participation more effective in the developmental planning processes. the proposed project is made available for public inspection by publicity through the press. This coupled with discussion session of the government opportunity for obtaining further information and comments from the public and competent authorities.

After the final review of benificial and adverse environmental impacts and cost benefit analysis etc. a discussion is ultimately taken to either to approve the most acceptable alternative in original or modified form. EIA of a project includes the following factors-

1. Air and water pollution including ground water pollution
2. Noise pollution
3. Deforestation and compensatory afforestation
4. Flora and fauna and loss of biological diversity
5. Effect on land including land degradation and subsidence
6. Recycling and reduction of waste
7. Risk analysis and disaster management
8. Socio-economic impact including human displacement, cultural loss and health aspects.

ROLE OF EIA IN SUSTAINABLE DEVELOPMENT

Ever since earth summit in Rio De Janiero in 1992, sustainable development has been emphasized for overall socio-economic development. According to United Nations World Commission of Environment and development, sustainable development must meet the needs of other generations without compromising the ability of the future generations to meet their own needs and aspirations. It is possible to have development without destroying the environment provided man ensures that any single use does not deplete the environment resources to such an extent that they are no longer capable of sustaining and other use. This requires a gradual shift from uncontrolled exploitation to efficient management of natural resources. To ensure sustainable development the depletion of renewable resources should not take place at a rate faster than their regeneration and environmental aspects should be included in the development policies and activities.

World organization have realized that economic development cannot succeed unless sufficient attention is given to the natural environment during development planning. Only those technological development with minimum environmental hazards should be adopted in order to sustain the environment for future generations.

ELEMENTS OF THE EIA PROCESS

The first step in the Environment Impact Assessment (EIA) process is to determine whether the project under consideration falls within the Jurisdiction of the relevant Acts/Regulations, and if so, whether it is likely to create a significant environmental disruption. If so, an EIA is undertaken and the Environmental Impact Statement (EIS) is prepared. In some countries, the EIS is open to public scrutiny and reviewed at public hearings. Eventually, a political decision is taken so as to whether the development project is (*a*) accepted or (*b*) accepted with amendments or (*c*) an alternative proposal is accepted or (*d*) rejected.

Participants in EIA process: The following persons/groups/agencies usually are involved in EIA process.

(1) Proponent : Government or Private Agency which initiates the project.

(2) Decision Maker : Designated individual or Group or Body.

(3) Assessor : Individual or Agency responsible for the preparation of EIS.

(4) Reviewer : Individual/Agency/Board entrusted with the responsibility for reviewing the EIS and assuring compliance with the relevant guidelines/regulations.

(5) Other Government Agencies having special interest in the project.

(6) Expert advisers.

(7) Media and Public at large.

(8) Special interest groups : Environmental Organisations, Professional Societies, Labour Union, Local Associations.

Contents of EIS : The EIS should contain the following information/ data:

(1) Description of proposed action and alternatives including that of no action:

It should include details of the construction phase, operation phase and the shut-down phase wherever applicable. Selection of alternatives to the proposed action *e.g.*, different ways of building and operating the project, alternative sites, etc.

(2) Estimation of the nature and magnitude of the likely environmental effects of the various alternatives proposed: This is mainly done under the following 3 broad categories.

(*a*) Physical factors (*e.g.*, possibility of earthquakes, possible effects on surface and groundwater quality, soil and air quality, etc.).

(*b*) Biological factors (*e.g.*, effects on vegetation, wild life, sport and commercial fish species, endangered species, etc.).

(*c*) Socio-economic factors (*e.g.*, economic, demographic, social values and attitudes).

(3) Identification of the relevant human concerns.

(4) Criteria to be used in measuring the significance of environmental changes including the relative weightages to be assigned in comparing different types of changes.

(5) Estimating the significance of the predicted environmental changes and thereby the impacts of the proposed action.

(6) Recommendations for acceptance of the Project/Remedial Action/Acceptance of one or more alternatives/rejection of the project.

(7) Recommendations regarding monitoring procedures to be followed during and after implementation of the project.

Determination as to which environmental changes (including even those which are not covered by laws/regulations) are relevant is critical to the validity and credibility of the EIA process. It is also important to limit the scope of the assessment in time, space, and number of factors in order to enable the usefulness of the EIS document.

When once the factors to be included in EIS have been determined, their future magnitudes must be predicted, though qualitatively. A weighting system may then be devised to enable comparison of different impacts.

One of the single approaches to provide a visual assessment of the effects and magnitudes of the selected factors in EIA is the Leopold matrix (Fig. 11.1). The steps for using the Leopold matrix are given below:

(*i*) Identify all such actions that are part of the proposed project and locate them across the top of the matrix (*e.g.*, *a*, *b*, *c*, vide Fig. 20).

(*ii*) List the relevant environmental characteristics or conditions down the side of the matrix. (*m*, *n*, ...).

(*iii*) Under each of the proposed actions (namely, *a*, *b*, ...), place a slash at the intersection with each item on the side of the matrix, if an impact is possible.

(*iv*) After completing the matrix, write, in the upper left-hand corner of each box with a slash, a number in the scale of 1 to 10, which indicates the *magnitude* of the possible impact. In the scale of 1 to 10 chosen above, number 10 represents the *greatest magnitude* of impact whereas number 1 represents the least. Before each number so placed, put + if the impact would be beneficial.

(*v*) In the lower-right-hand corner of each box with a slash, write a number, in the scale 1 to 10, which indicates the *importance* of the possible impact (*e.g.*, Regional vs. Local). Here also, number 10 represents the *greatest importance* of the impact, while number 1, represents the least importance.

(*vi*) The text that accompanies the matrix should provide discussion of the significant impacts, of those columns and rows with large numbers of boxes marked, and of those individual boxes which have larger numbers.

	a	b	c	d	e
m	4 / 2			7 / 3	8 / 5
n	6 / 1	8 / 8		+1 / +1	9 / 6
.	.	.	.	.	.

Fig. 11.1. Leopold matrix (Leopold *et al.* 1971)