UNIT-4

ENVIRONMENTAL IMPACT ASSESSMENT

Definition :

Environmental Impact Assessment can be defined as: The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.

UNEP defines Environmental Impact Assessment (EIA) as a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers.

Scope of EIA

EIA is a good tool for prudent environment management.

It is government-policy that any industrial project in India has to secure EIA clearance from the Environment Ministry before approval for the project itself.

Objectives of EIA

• To ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process;

• To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of development proposals;

• To protect the productivity and capacity of natural systems and the ecological processes which maintain their functions; and

• To promote development that is sustainable and optimizes resource use and management opportunities.

Basic EIA Principles :

Purposive - the process should inform decision making and result in appropriate levels of environmental protection and community well-being.

Rigorous - the process should apply "best practicable" science, employing methodologies and techniques appropriate to address the problems being investigated.

Practical - the process should result in information and outputs which assist with problem solving and are acceptable to and able to be implemented by proponents.

Relevant - the process should provide sufficient, reliable and usable information for development planning and decision making.

Cost-effective - the process should achieve the objectives of EIA within the limits of available information, time, resources and methodology.

Efficient - the process should impose the minimum cost burdens in terms of time and finance on proponents and participants consistent with meeting accepted requirements and objectives of EIA.

Focused - the process should concentrate on significant environmental effects and key issues; i.e., the matters that need to be taken into account in making decisions.

Adaptive - the process should be adjusted to the realities, issues and circumstances of the proposals under review without compromising the integrity of the process, and be iterative, incorporating lessons learned throughout the proposal's life cycle.

Participative - the process should provide appropriate opportunities to inform and involve the interested and affected publics, and their inputs and concerns should be addressed explicitly in the documentation and decision making. Interdisciplinary - the process should ensure that the appropriate techniques and experts in the relevant bio-physical and socio-economic disciplines are employed, including use of traditional knowledge as relevant.

Credible - the process should be carried out with professionalism, rigor, fairness, objectivity, impartiality and balance, and be subject to independent checks and verification.

Integrated - the process should address the interrelationships of social, economic and biophysical aspects.

Transparent - the process should have clear, easily understood requirements for EIA content; ensure public access to information; identify the factors that are to be taken into account in decision making; and acknowledge limitations and difficulties.

Systematic - the process should result in full consideration of all relevant information on the affected environment, of proposed alternatives and their impacts, and of the measures necessary to monitor and investigate residual effects

Classification of EIA

EIA can be classified based on the purpose and the theme of development. EIA can be climate impact assessment, demographic impact assessment, development impact assessment, ecological impact assessment, economic and fiscal impact assessment, health impact assessment, risk assessment, social impact assessment, strategic impact assessment, technology assessment.

In addition to this list, EIA is also categorised based on systematic analysis of environmental parameters, geographical region, carrying capacity limitations and sectoral planning. They are strategic EIA, regional EIA, sectoral EIA, project level EIA and life cycle assessment.

Strategic EIA (SEIA):

Strategic EIA refers to systematic analysis of the environmental effects of development policies, plans, programs and other proposed strategic actions. This process extends the aims and principles of EIA upstream in the decision- making process, beyond the project level and when major alternatives are still open. Strategic EIA represents a proactive approach to integrate environmental considerations into the higher level of decision-making.

Regional EIA:

EIA in the context of regional planning integrates environmental concerns into development planning for a geographic region, normally at the sub- country level. Such an approach is referred to as the economic-cum- environmental (EcE) development planning. This approach facilitates adequate integration of economic development with management of renewable natural resources within the carrying capacity limitation to achieve sustainable development.

It fulfills the need for macro-level environmental integration, which the project-oriented EIA is unable to address effectively. Regional EIA addresses the environmental impacts of regional development plans and thus, the context for project-level EIA of the subsequent projects, within the region. In addition, if environmental effects are considered at regional level, then cumulative environmental effects of all the projects within the region can be accounted.

Sectoral EIA:

Instead of project-level-EIA, an EIA should take place in the context of regional and sectoral level planning. Once sectoral level development plans have the integrated sectoral environmental concerns addressed, the scope of project-level EIA will be quite narrow. Sectoral EIA will help to address specific environmental problems that may be encountered in planning and implementing sectoral development projects.

Project Level EIA:

Project level EIA refers to the developmental activity in isolation and the impacts that it exerts on the receiving environment. Thus, it may not effectively integrate the cumulative effects of the development in a region.

Life Cycle Assessment :

A systematic set of procedures for compiling and examining the inputs and outputs of materials and energy and the associated environmental impacts directly attributable to the functioning of a product or service system throughout its life cycle.



Life Cycle Assessment (LCA) is a technique for assessing the potential environmental aspects and potential aspects associated with a product (or service), by:

compiling an inventory of relevant inputs and outputs,

evaluating the potential environmental impacts associated with those inputs and outputs,

interpreting the results of the inventory and impact phases in relation to the objectives of the study. The "life-cycle" impacts include the extraction of raw materials; the processing, manufacturing, and fabrication of the product; the transportation or distribution of the product to the consumer; the use of the product by the consumer; and the disposal or recovery of the product after its useful life. There are four linked components of LCA:

•Goal definition and scoping: identifying the LCA's purpose and the expected products of the study, and determining the boundaries (what is and is not included in the study) and assumptions based upon the goal definition;

•Life-cycle inventory: quantifying the energy and raw material inputs and environmental releases associated with each stage of production;

•Impact analysis: assessing the impacts on human health and the environment associated with energy and raw material inputs and environmental releases quantified by the inventory;

•Improvement analysis: evaluating opportunities to reduce energy, material inputs, or environmental impacts at each stage of the product life-cycle.

Environmental Policy of India

Environment policies of the Government of India includes legislations related to environment.

In the Directive Principles of State Policy, Article 48 says "the state shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country"; Article 51-A states that "it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures."

India is one of the parties of the Convention on Biological Diversity (CBD) treaty. Prior to the CBD, India had different laws to govern the environment. The Indian Wildlife Protection Act 1972 protected biodiversity. It was amended later multiple times. The 1988 National Forest Policy had conservation as its fundamental principle. In addition to these acts, the government passed the Environment (Protection) Act 1986 and Foreign Trade (Development and Regulation) Act 1992 for control of biodiversity.

Objectives and Strategies of National Environment Policy (2006) of India

There are different policies for forests, water, and environmental pollution. But the experience in implementing these policies over the years has brought out the need for a comprehensive policy approach to the management of the environment in the country. Therefore, a new national environment policy was announced in 2006.

Objectives of National Environment Policy (2006):

The following are the objectives of the national environment policy:

 Conservation of Critical Environmental Resources: To protect and conserve critical environmental resources and invaluable natural and man-made heritage which are essential for lifesupporting livelihoods and welfare of the society.

- 2. **Inter-generational Equity:** To ensure judicious use of environmental resources to meet the needs and aspirations of present and future generations.
- 3. Efficiency in Environmental Resources Use: To ensure efficient use of environmental resources in the sense of reduction in their use per unit of economic output and to minimize adverse environmental impacts on society.
- 4. Environmental Governance in the Management of Resources: To apply the principles of resources. To apply the principles of good governance (i.e. transparency, rationality, accountability, reduction in costs and time, and public participation) to the management of environmental resources.
- 5. Enhancement of Resources: Appropriate technology and traditional knowledge, managerial skills, and social capital will be used for the conservation and enhancement of resources.
- Livelihood Security for the Poor: To ensure equitable access to environmental resources for poor tribal communities, which are most dependent on environmental resources for their livelihood.
- 7. Integration of Environmental Concerns for Socio-economic Development; to integrate environmental concerns into policies, plans, programs, and projects for socio-economic development.

Strategy for Conservation of Environmental Resources

The following strategy will be adopted for conservation of environmental resources in India:

1. Land Degradation:

The following steps will be taken to reduce land degradation:

- Encourage adoption of science based and traditional sustainable land use practices through research and development.
- Pilot scale demonstrations and farmers' training.
- Promote reclamation of wasteland and degraded forest land through formulation and adoption of multi-stakeholder partnerships involving theland owning agency, local communities and investors.
- To reduce desertification through action plans.

2. Forests:

To formulate an innovative strategy for the increase of forest and tree cover from the present level of 23 percent of the country's land area, to 33 percent in 2012 through afforestation of degraded forest land, wasteland, and tree cover on private or revenue land.

Key elements of the strategy would include:

- The implementation of multi-stakeholder partnerships involving the forest department, local communities, and investors, with clearly defined obligations and entitlements for each partner, following good governance principles, to derive environmental livelihood, and financial benefits.
- 2. Rationalization of restrictions on the cultivation of forest species outside notified forest areas.
- 3. Enabling farmers to undertake social and farm forestry where their returns are more favorable than cropping.
- 4. Universalization of the Joint Forestry Management System throughout the country.

- 5. Formulating an appropriate methodology for reckoning and restoring the environmental values of forests that are unavoidably diverted to other uses.
- 6. Giving legal recognition of the traditional rights of forest-dwelling tribes and provide long-term incentives to the tribals to conserve the forests.

3. Wildlife:

In respect of wildlife conservation, the following steps would be pursued:

- 1. Expanding the Protected Area Network of the country. It must be ensured that the overall area of the network in each biogeographic zone would increase in the process.
- 2. Paralleling multi-stakeholder partnerships for afforestation.Further, formulating and implementing similar partnerships for enhancement of wildlife habit in conservation and community reserves.
- 3. Encouraging eco-tourism at wildlife sites.
- 4. Implementing measures for captive breeding and release into the wild identified endangered species.

4. Biodiversity:

According to the National Environment Policy, a large- scale exercise has been already completed for providing inputs towards a National Biodiversity Action Plan. However, following measures would be taken to protect biodiversity at national level.

1. Strengthen the protection of biodiversity hot spots.

- 2. Pay attention to the potential impacts of development projects on biodiversity resources and natural heritage.
- 3. The genetic material of threatened species of flora and fauna must be conserved on priority.
- 4. Conferring intellectual property rights for traditional knowledge.

5. Wetlands:

Wetlands, natural and man-made, freshwater or brackish, provide numerous ecological services. They provide habitat to aquatic flora and fauna. But now wetlands are under threat from drainage and conversion for agriculture and human settlements, besides pollution.

The key strategy for action will include the following steps:

- 1. To set up a legally enforceable regulatory mechanism for identified valuable wetlands to prevent their degradation and enhance their conservation.
- 2. To formulate and implement sustainable tourism strategies for identified wetlands thorough multi-stakeholder partnerships involving public agencies, and local communities.
- 3. To take explicit account of impacts on wetlands of significant development projects during environmental appraisal of such projects.

6. Conservation of Man-made Heritage:

Man-made heritage reflects the pre-history, ways of living and culture of people. In the case of India, such heritage is at the core of our national identity. At the same time, considerable economic value, and livelihoods may be derived from conservation of man- made heritage and their sustainable use.

The following action plans would be required for their sustainable use.

- 1. In setting ambient environmental standards, especially for air quality, the potential impacts on designated heritage sites must be taken into account.
- 2. Integrated regional development plans should be drawn up with participation of the local community with respect to shifting polluting activities and waste far away from sites.
- 3. Impacts on designated heritage sites must be considered at the stage of developing the terms of reference for environmental impact assessments of the projects.
- 7. Environmentally Sensitive Zones:

Environmentally sensitive zones may be defined as areas with identified environmental resources with incomparable values, which require special attention for their conservation. In order to conserve and enhance these resources, without impeding legitimate socio-economic development of these areas, the following actions will be taken.

- 1. Identify and give legal status to Environmentally Sensitive Zones in the country.
- 2. Formulate area development plans for these zones on a scientific basis with adequate participation by the local communities.
- 3. Create local institutions for the environmental management of such areas.

8. Strategy for Sustainable Mountain Development:

Mountain ecosystems play a key role in providing forest cover, feeding perennial river systems, conserving genetic diversity, and providing an immense resource base for livelihoods through sustainable tourism. There has been significant adverse impact on mountain ecosystems by way of deforestation, submergence of river valleys, pollution of freshwater resources, despoiling of landscapes, degradation of human habitat, loss of genetic diversity, retreat of glaciers, and pollution.

Keeping in view, the following action plan for sustainable mountain development would be taken up:

- Adopting best practice norms for infrastructure construction in mountain regions to avoid or minimize damage to sensitive ecosystems and despoiling of landscapes.
- 2. Encouraging cultivation of traditional varieties of crops and horticulture by promotion of organic farming and enabling farmers to realize a price premium.
- 3. Promoting sustainable tourism through adoption of best practice norms for tourism facilities and access to ecological resources.
- 4. Developing strategies or particular unique mountains capes.

9. Strategy for Sustainable Coastal Resources:

Coastal environmental resources provide habitats for marine species, which in turn comprise the resource base for large numbers of fisher folk, protection from extreme weather events, a resource base for sustainable tourism, agricultural and urban livelihoods.

In recent years, there has been significant degradation of coastal resources, for which the proximate causes include poorly planned human settlements, improper location of industries and infrastructure, pollution from industries, and settlements, and over exploitation of living natural resources.

In keeping with these adverse effects on coastal resources, the following measures would be tak-

- 1. To mainstream the sustainable management of mangroves into the forestry sector regulatory regime, ensuring that they continue to provide livelihoods to local communities.
- 2. To disseminate available techniques for regeneration of coral reefs, and support activities based on application of such techniques.
- 3. To embody considerations of sea-level rise in coastal management plans.
- 4. India has passed Coastal Regulation Zone (CRZ) notification in February 1991 and Integrated Coastal Zone Management (ICZM) to ensure protection to coastal environmental in India. Their rules and regulations are firmly founded on scientific principles. Specific projects should be consistent with the approval of ICZM plans.

10. Strategy for Conservation of Freshwater Resources:

The fresh water resources comprise the river systems, groundwater and wetlands. Each of these has a unique role and characteristic linkage to other environmental entities.

River Management:

The following comprise elements of an action plan for river management:

1. Promoting integrated approaches to management of river basins by the concerned river authorities, considering upstream and downstream inflows and withdrawals by reason.

Environmental Inventory :

"Environmental inventory" is a complete description of the environment as it exists in an area where a particular proposed action is being considered.

The inventory is compiled from a checklist of descriptors for the physical – chemical, biological, cultural, and socioeconomic environments. The "physical-chemical environment" includes such major areas as soils, geology topography surface-water and groundwater resources, water quality, air quality, and climatology.

The "biological environment" refers to the flora and fauna of the area, including species of trees, grasses, fish, herpetofauna, birds, and mammals. Specific reference must be made to any threatened and/or endangered plant or animal species. General biological features such as species diversity and overall ecosystem stability should also be presented. Items in the "cultural environment" include historic and archaeological sites, and aesthetic resources such as visual quality.

The "socioeconomic environment" refers to a range of considerations related to humans in the environment, including population trends and population distributions; economic indicators of human welfare; educational systems; transportation networks and other infrastructure concerns such as water supply, wastewater disposal, and solid-waste management; public services such as police and fire protection and medical facilities; and many others.

The physical-chemical and biological environments can be referred to as the "natural environment," or the "biophysical environment," while the cultural and socioeconomic environments represent the "man-made environment."

The health impacts of projects, plans, programs, or policies should be considered in the decision-making process. Because of the importance of these concerns, particularly in developing countries, an environmental health impact assessment process has been proposed (WHO, 1987). For certain types of projects, such as nuclear power plants, it may be necessary to address psychological impacts on nearby residents ("Can Change Damage Your Mental Health," 1982).

The emphasis in environmental impact studies in the early 1970s was on the physical-chemical and biological environments; however, added attention was given to the cultural and socioeconomic environments as the decade progressed.

One reason for the attention to the socioeconomic environment was the emphasis on secondary impacts mentioned in the NEPA guidelines issued by the Council on Environmental Quality in 1973. Attention to health and ecological risks is increasing and this trend is expected to accelerate.

The environmental inventory serves as the basis for evaluating the potential impacts on the environment, both beneficial and adverse, of a proposed action. It is included in an environmental impact statement (EIS).

Development of the inventory represents an initial step in the environmental impact assessment process. The scope of the environmental inventory or baseline data acquisition includes a detailed characterization of the environment in an area of 10 Km radius around the proposed facility for environmental components viz., air, noise, water, land, ecology and socioeconomic environment.

Acquisition of baseline data is mainly:

(a) To assess the present status of air, noise, water, land, ecology and socio-economic components of the environment in an area of 10 Km radius around the proposed site, which is mandatory,

(b) To identify and quantify significant impacts of processing operations on environmental components,

(c) To prepare Environmental Management Plan (EMP) with pollution control technologies to be adopted for mitigation of adverse impacts and site specific remedial measures and

(d) To delineate future environmental quality monitoring programmes to be pursued by the proponents after commissioning the proposed project.

Baseline data collection required for EIA

Baseline data collection refers to collection of baseline information on biophysical, social and economic aspects of a project area.

Project area is defined as the area where environmental environmental effects effects and impacts impacts are felt during construction or operational stages of a project.

Collection of baseline information serves two purposes:

It provides a description of the status and trends of environmental factors (e.g., air pollutant concentrations) against which predicted changes can be compared and evaluated in terms of importance.

It provides a means of detecting actual change by monitoring once a project has been initiated.

Major environmental environmental parameters parameters to be considered in field are:

•Physical: topography, geology, soil types, surface and ground water condition, watershed condition, pollution levels etc.

•Biological: terrestrial and aquatic ecosystems, types flora and fauna, environmentally environmentally sensitive sensitive wetlands wetlands, prime agricultural land etc

•Socio-economic: demography, development needs and potential, infrastructure facilities, economic activities etc.

•Cultural: location and state of archeological, historical, religious sites

DATA SOURCES AND METHODS OF COLLECTION

Primary Sources: Result of the field and laboratory data collected and analyzed directly Secondary sources: Data collected indirectly from published records or documents such as project documents, village proFlie, maps,photos, internet sources etc Methods of data collection:

General methods: Literature review, map interpretation, checklists (e.g. scaling and questionnaire checklists, matrices etc)

Resource-based methods: methods: Scientific Scientific instruments instruments and techniques techniques(inventory, species area curve, sampling techniques, PRA, RRA)

Data Processing

Raw data is converted into knowledge and information that is more easily comprehensible. Tools such as tables, graphs, maps can be used for presentation.

1.For physical data: graphs, tables, enumeration

2.For biological data: species numbers, volume, density, biomass can be calculated.
3.Species diversity (No. of species/Area sampled) can also be used for processing processing biological biological data calculated calculated through through species richness of an area.
4.Socioeconomic data: Data such as male/female male/female, skilled/semi skilled/semi skilled skilled labor force for construction and operational activities can be presented through, graphs, tables, population pyramids etc. which can be collected through sampling (random, stratified or mixed).

Baseline studies in EIA may take a long time, hence EIA is blamed for higher costs and delays in project implementation.

Therefore, the studies should be focused on those aspects that are likely to be affected.

Four critical points exist project implementation

1. Decision on Project Project Approval Approval

2.Decision on the Location of Project

3.Decision on the Project Design

4.Decision on the Operation of Project

Rapid EIA

The Rapid Environmental Impact Assessment in Disaster (REA) is a tool to identify, define, and prioritize potential environmental impacts in disaster situations. A simple, consensus-based qualitative assessment process, involving narratives and rating tables, is used to identify and rank environmental issues and follow-up actions during a disaster. The REA is built around conducting simple analysis of information in the following areas:

- The general context of the disaster.
- Disaster related factors which may have an immediate impact on the environment.
- Possible immediate environmental impacts of disaster agents.
- Unmet basic needs of disaster survivors that could lead to adverse impact on the environment.
- Potential negative environmental consequences of relief operations.

The REA is designed for natural, technological or political disasters, and as a best practice tool for effective disaster assessment and management. The REA does not replace an EIA, but fills a gap until an EIA is appropriate. A REA can be use from shortly before a disaster up to 120 days after a disaster begins, or for any major stage-change in an extended crisis. The REA does not provide answers as to how to resolve environmental problems. It does provide sufficient information to allow those responding to a disaster to formulate common sense solutions to most issues identified. Where solutions are not evident, the REA provides sufficient information to request technical assistance or to advocate action by a third party. The REA contributes to activity and environmental M&E, but does not replace a formal M&E system. The REA does not require expert knowledge. Primary REA users are

people directly involved in disaster response operations, with a basic knowledge of the disaster management process but no background in environmental issues. The REA process can be used by disaster survivors with appropriate support. The best results are expected to come when the REA is completed with structured input from survivors and organizations providing relief assistance. Sections of the REA can also be used for needs assessment and environmental impact screening during relief project design and review.

REA Modules and Outcomes

Module	Outcomes
Organization Level Assessment	Identification of critical environmental issues related to the disaster from the perspective of organizations providing relief and recovery assistance.
Community Level Assessment	Identification of critical environmental issues related to the disaster from the perspective of communities and groups affected by a disaster.
Consolidation and Analysis	An identification and prioritization of environmentally-linked issues involving significant immediate threat to lives, well being and the environment.
Green Review of Relief Procurement	A screening of the procurement of relief commodities and services to minimize negative environmental impacts.

Normal & Disaster Environmental Assessments

Normal Conditions

Disasters

- Considerable lead time
- Legal requirement often exists (country &/or donor)
- Deliberate & pro-active
- Will take time, be thorough & extensive:
 comprehensive data collection
- "No project" option is a possible outcome
- Location chosen
- Duration planned
- Beneficiary population- identifiable & static Environmental goals may be made compatible with socioeconomic ones

- Sudden onset
- Rarely a legal requirement but some donor may ask for it
- ➤ Reactive
- May need to be partial in coverage
- ▹ "No project" outcome is not an option
- Unpredictable location
- Uncertain duration
- Beneficiary population- heterogeneous
 & dynamic
- Priority given to "life saving" activities sometime difficult to reconcile with environmental goals

NEED FOR REIA

Every anthropogenic activity has some impact on the environment. More often it is harmful to the environment than benign. However, mankind as it is developed today cannot live without taking up these activities for his food, security and other needs. Consequently, there is a need to harmonize developmental activities with the environmental concerns. Environmental impact assessment (REIA) is one of the tools available with the planners to achieve the above-mentioned goal. It is desirable to ensure that the development options under consideration are sustainable. In doing so, environmental consequences must be characterized early in the project cycle and accounted for in the project design. The objective of REIA is to foresee the potential environmental problems that would arise out of a proposed development and address them in the project's planning and design stage. The REIA process should then allow for the communication of this information to:

- o The project proponent;
- o The regulatory agencies; and,
- o All stakeholders and interested groups.

REIA integrates the environmental concerns in the developmental activities right at the time of initiating for preparing the feasibility report. In doing so it can facilitate the integration of environmental concerns and mitigation measures in project development. REIA can often prevent future liabilities or expensive alterations in project design.