JECRC Foundation

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE,JAIPUR

Year & Sem – IV Yr   VII Sem

Subject –Environment Impact Analysis(**7CE6-60.1**)

Unit – Introduction to Environmental Impact Assessment

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Course Outcomes

- **CO1**-Understand and evaluate create the basic concept of Environmental impact assessment, Flow of EIA, EIA Product and Process, Step wise structure of EIA, types of environmental impacts, significance and criteria for selection.

- **CO2**-Select methodology for identification of environmental impacts, environmental indices and indicators

- **CO3**-Apply the skill and knowledge of predicting impact of proposed project on air , water ,Noise, Soil, Biological and Socio-economic conditions and also acquire the skills of preparing environment management plans and EIA reports

Objectives of EIA

- to identify, predict and evaluate the economic, environmental and social impact of development activities
- to provide information on the environmental consequences for decision making and
- to promote environmentally sound and sustainable development through the identification of appropriate alternatives and mitigation measures.

Purpose of EIA

- To facilitate decision-making
- To aid in the formation of development
- To be an instrument for sustainable development.

Introduction of EIA

- Environmental Impact Assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

- 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.

- Environment Impact Assessment in India is statutorily backed by **the Environment Protection Act, 1986** which contains various provisions on EIA methodology and process.

Environment assessment involves a study to determine any unique environmental attributes from endangered species to existing hazardous waste to historical significance.

- Environmental Impact Assessment is defined as an activity designed to identify the impact on the biogeophysical environment, on man and well-being of legislative proposals, projects, policies, operational procedures and to interpret and communicate information.

- EIA is a systematic process of identifying future consequences of a current or proposed action.

One of the main strengths of environmental assessment (EA) is its flexibility.

Duration for EA depends upon:

- ➢ size and complexity of the proposed project.

- ➢ extent of co-operation received from the project sponsor and third parties such as local government.

- ➢ level of interest and support demonstrated by the community.

- ➢ ability of the project team to sustain interest in the EA.

- ➢ skills of the EA team.

- ➢ EA techniques employed.

Benefits of EIA

- 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.

Apart from these benefits EIA has some benefits to local environment

- 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 recognize 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.

- Social Impact Assessment –Impact of community

- Risk Assessment - threats to native animals, water supplies

- Life Cycle Analysis –review of each and every stage of process

- Energy Analysis –use of non-renewable energy resources, greenhouse gas emissions

- Health Impact Assessment

- Regulatory Impact Assessment

- Species Impact Assessment

- Technology Assessment Economic Assessment - review of the impacts on ecosystems, air quality

- Cumulative Impact Assessment

- Strategic Environmental Assessment

- Integrated Impact Assessment

EIA is a process with several important purposes, which can be categorized 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.

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
Significance =consequence X 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.

Effect of Human Activity on Environment

- Human impact on the environment or anthropogenic impact on the environment includes changes to

  ➢ biophysical environments and ecosystems,

  ➢ biodiversity, and

  ➢ natural resources caused directly or indirectly by humans,

  ➢ global warming

  ➢ environmental degradation

ocean acidification, mass extinction and biodiversity loss ecological crisis, and ecological collapse

Land Loss and Soil Erosion

The Ministry of Agriculture, Government of India has reported about the serious problem of land degradation and soil erosion ,174 million hectares (i.e., 53 per cent of the total land area) of land in India is facing the serious problem of land degradation out of which a 144 million hectares is subjected to soil erosion through water and wind and the rest 30 million hectares is subjected to other problems. Moreover, heavy population pressure has led to conversion of forest and permanent pastures into crop lands leading to indiscriminate grazing.

Energy Industry

- The environmental impact of energy harvesting and consumption is diverse. In the real world, consumption of fossil fuel resources leads to global warming and climate change.

- more explorations of viable alternative energy sources could minimize the environmental impact of human energy demands, leading to a more 'environmentally friend' resource consumption.

- In recent years there has been a trend towards the increased commercialization of various renewable energy sources. Rapidly advancing technologies can achieve a transition of energy generation, water and waste management, and food production towards better environmental and energy usage practices using methods of systems ecology and industrial ecology.

Invasive Species

- Introductions of species, particularly plants into new areas, by whatever means and for whatever reasons have brought about major and permanent changes to the environment over large areas. Examples include the introduction of *Caulerpa taxifolia* into the Mediterranean, the introduction of oat species into the California grasslands, and the introduction of privet, kudzu, and purple loosestrife to North America. Rats, cats, and goats have radically altered biodiversity in many islands. Additionally, introductions have resulted in genetic changes to native fauna where interbreeding has taken place, as with buffalo with domestic cattle, and wolves with domestic dogs.

Transport

- The environmental impact of transport is significant because it is a major user of energy, and burns most of the world's petroleum. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emission of carbon dioxide, for which transport is the fastest-growing emission sector. By subsector, road transport is the largest contributor to global warming.

Deforestation:
Large scale deforestation has been continuing since independence due to overexploitation

and mismanagement of forest resources. During the first two decades of planning (i.e., from 1951 to 1972) India lost about 3.4 million hectares of forestland out of which about 70 per cent of that area was lost to river valley projects, roads and communications and industries. Deforestation is still continuing at a rapid scale and the problem has reached to such a proportion that it has totally disturbed the ecological balance of the country.

Faulty Utilization of Water Resources

Being one of the wettest country of the world India is still suffering from flood and droughts due to faulty utilization of water resources. Since independence, too much importance was laid on the development of big dams. But these Gigantic dams have displaced cores of tribal people, drowned million hectares of rich forest areas, failed to prevent and control floods and often created destructive flash flood in the downstream valley.

Environmental Problems from Faulty Mining Practices:

- In India large scale extraction of minerals are creating serious environmental problems,ruining the country's land, water, forest and air. Large scale mining has resulted in conversion of agricultural and forest land into stockyards townships, roads, railway lines etc. and removed vegetation and top soil.The disposal of mining waste, mineral dust from mines are constantly polluting air and also reducing agricultural productivity. Underground mines are often creating subsidence of land due to it's over exploitation. Mining activity is also polluting water resources as the rain waters, passing through mineral wastes, are flowing into rivers and streams.Mining operation has also resulted large scale deforestation, soil erosion and is also responsible for various health hazards to human beings in the form of respiratory problem and other illness. Thus in the new Mineral Policy, 1993, attempts have been made to check this environmental pollution arising out of mining operations and to follow some reclamation measures.

Industrial and Atmospheric Pollution
In India, unplanned and uncontrolled growth of industries and ill-maintained automobiles are creating huge atmospheric pollution regularly leading to huge environmental problems. The main atmospheric pollutants include carbon dioxide, carbon monoxide, oxides of nitrogen, sulphur dioxide, hydrocarbon and metallic traces. Besides some specific pollutants are also being mixed with atmosphere which include lead from automobile emission, urea dust from fertilizer factory, cement and lime dust from cement factories, increasing radiation of nuclear power stations etc.
Moreover, industrial wastes coming out of fertiliser factories, paper mills, and leather factories are constantly being discharged in rivers, lakes and seas, creating huge health hazards for the population of the country.

ECOLOGY

Ecology is the science that deals with the relationships between living organisms with their physical environment and with each other. Ecology can be approached from the viewpoints of

 (1) the environment and the demands it places on the organisms in it or

(2) organisms and how they adapt to their environmental conditions.

An *ecosystem* consists of an assembly of mutually interacting organisms and their environment in which materials are interchanged in a largely cyclical manner. An ecosystem has physical, chemical, and biological components along with energy sources and pathways of energy and materials interchange. The environment in which a particular organism lives is called its habitat. The role of an organism in a habitat is called its niche.

For the study of ecology it is often convenient to divide the environment into four broad categories.

1. Terrestrial environment - The terrestrial environment is based on land and consists of biomes, such as grasslands, one of several kinds of forests, savannas, or deserts.

2. Freshwater environment - The freshwater environment can be further subdivided between standing-water habitats (lakes, reservoirs) and running-water habitats (streams, rivers).

3. Oceanic marine environment - The oceanic marine environment is characterized by saltwater and may be divided broadly into the shallow waters of the continental shelf composing the neritic zone

4. Oceanic region - The deeper waters of the ocean that constitute the oceanic region.

Two major subdivisions of modern ecology are

• Ecosystem ecology - which views ecosystems as large units, and

• Population ecology - which attempts to explain ecosystem behavior from the properties of individual units.

Ecosystem has processes which sustain ecological balance:

- The cyclic flow of materials from abiotic environment to the biosphere and then back to the abiotic environment.

- Upholding the equilibrium of interaction inside food webs.

Causes of ECOSYSTEM IMBALANCE

Changing Hydrology

Overgrazing

Plant and Animal Breeding

Loss of GeneticResources

Mining Activities

Industrialization

Urbanization

Large-Scale Use of Fertilizers

Large-Scale Use of Pesticides

Acid Rain

Changes in Earth's Surface

Clearance of Forests

Green-House Effect

Forest Fires

- **Ecosystems** are organized in a state of balance where species coexist with other species. If something happens in an ecosystem, it can shift from a state of balance to a state of imbalance.

- **Ecological imbalance** is when a natural or human-caused disturbance disrupts the natural balance of an ecosystem. A disturbance is any change that causes a disruption in the balance of an ecosystem.

  Examples of natural disturbances are

- Volcanic eruptions

- Floods

- Natural fires

  Examples of human-caused disturbances are

- The introduction of a new species

- Logging a forest

- Pollution

- Overhunting of a species

EIS

- **Environmental Impact Statement (EIS) should contain the following information's/data:**

1. Description of proposed action (construction, operation and shut down phase) and selection of alternatives to the proposed action.

2. Nature and magnitude of the likely environmental effects.

3. Possibility of earthquakes and cyclones.

4. Possible effects on surface and ground water quality, soil and air quality.

5. Effects on vegetation, wild life and endangered species.

6. Economic and demographic factors.

7. Identification of relevant human concerns.

8. Noise pollution. Efficient use of inputs.

9. Recycling and reduction of waste.

10. Risk analysis and disaster management.

Environmental Management Plan (EMP)

An Environmental Management Plan (EMP) is a detailed plan and schedule of measures necessary to minimize, mitigate, etc. any potential environmental impacts identified by the EIA (World Bank 1999). Once the EIA the significant impacts have been identified, it is necessary to prepare an Environmental Management Plan.

An EMP should consist of a set of mitigation, monitoring and institutional measures to be taken during the implementation and operation of the proposed project to eliminate adverse environmental impacts, offset them or reduce them to acceptable levels.

The EMP should also include the actions needed to implement these measures, including the following features: Mitigation based on the environmental impacts reported in the EIA, the EMP should describe with technical details each mitigation measure.

The EMP should then include monitoring objectives that specifies the type of monitoring activities that will be linked to the mitigation measures.

Monitoring System

- A specific description, and technical details, of monitoring measures that includes the parameters to be measured, the methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions;

- Monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and to furnish information on the progress and results of mitigation.

- The EMP should also provide a specific description of institutional arrangements i.e. who is responsible for carrying out the mitigating and monitoring measures (for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training).

Additionally, the EMP should include an estimate of the costs of the measures and activities recommended. It should consider compensatory measures if mitigation measures are not feasible or cost effective. EMP must be operative throughout the whole Project Cycle

Environmental monitoring is the systematic measurement of key environmental indicators over time within a particular geographic area (World Bank, 1999).

Monitoring should focus on the most significant impacts identified in the EIA.

Various types of monitoring activity are currently in practice.

Baseline Monitoring: A survey should be conducted on basic environmental parameters in the area surrounding the proposed project before construction begins.

Subsequent monitoring can assess the changes in those parameters over time against the baseline.

Impact Monitoring: The biophysical and socio-economical (including public health) parameters within the project area, must be measured during the project construction and operational phases in order to detect environmental changes, which may have occurred as a result of project implementation e.g. air emission, dust, noise, water pollution etc (European Commission, 1999)

Compliance Monitoring: This form of monitoring employs a periodic sampling method, or continuous recording of specific environmental quality indicators or pollution levels to ensure project compliance with recommended environmental protection standards. Monitoring should be regular and performed over a long period of duration. Interruptions in monitoring may result in generating insufficient data to draw accurate conclusion concerning project impact.

- The main aim of EIA monitoring is to provide the information required to ensure that project implementation has the least possible negative environmental impacts on the people and environment.

- What to avoid in monitoring:

- Overestimation of data needed as this can lead to drowning in data without information. Under-estimation of time and cost for data analysis Weak coordination between the data collection with project time table and seasonal factors Ignoring requirements for baselines

Ideally the EIS should include:

- Executive Summary Policy,

- Legal and Administrative Framework Description of the environment

- Description of the Proposed Project in detail

- Significant Environmental Impacts Socio-economic analysis of Project Impacts

- Identification and Analysis of Alternatives

- Mitigation Action/Mitigation Management Plan

- Environmental Management Plan

- Monitoring Program Knowledge gaps Public Involvement

- List of References

- Appendices including

- Reference documents, photographs, unpublished data

- Terms of Reference

- Consulting team composition

- Notes of Public Consultation sessions

Industrial policy by Government

- Industrial policy is a document that sets the tone in implementing, promoting the regulatory roles of the government. It was an effort to expand the industrialization and uplift the economy to its deserved heights. It signified the involvement of the Indian government in the development of the industrial sector.

- At the time of Independence, the Indian economy was facing severe problems of illiteracy, poverty, low per capita income, industrial backwardness, and unemployment. After India attained its Independence in 1947, a sincere effort was made to begin an era of industrial development. The government adopted rules and regulations for the various industries. This industrial policy introduction proved to be the turning point in Indian Industrial history.

- The quest for industrial development started soon after independence in 1947. The Industrial Policy Resolution of 1948 defined the broad contours of the policy delineating the role of the State in industrial development both as an entrepreneur and authority. This was followed by comprehensive enactment of Industries (Development & Regulation) Act,

1951 (referred as IDR Act) that provides for the necessary framework for implementing the Industrial Policy and enables the Union Government to direct investment into desired channels of industrial activity *inter alia* through the mechanism of licensing keeping with national development objectives and goals.

Main objectives of Industrial policy:

- to maintain a sustained growth in productivity;

- to enhance gainful employment;

- to achieve optimal utilisation of human resources;

- to attain international competitiveness; and

- to transform India into a major partner and player in the global arena.

- To achieve these objectives, the Policy focus is on

- deregulating Indian industry;

- allowing freedom and flexibility to the industry in responding to market forces;

- providing a policy regime that facilitates and fosters growth. Economic reforms initiated since 1991 envisages a significantly bigger role for private initiatives.

- Policy has been progressively liberalized over years to at present, as would be evident in subsequent paragraphs.

- It classified industries into four broad areas:
  Strategic Industries (Public Sector): It included three industries in which Central Government had monopoly. These included Arms and ammunition, Atomic energy and Rail transport.

- Basic/Key Industries (Public-cum-Private Sector): 6 industries viz. coal, iron & steel, aircraft manufacturing, ship-building, manufacture of telephone, telegraph & wireless apparatus, and mineral oil were designated as "Key Industries" or "Basic Industries". These industries were to be set-up by the Central Government.However, the existing private sector enterprises were allowed to continue.

  - Important Industries (Controlled Private Sector): It included 18 industries including heavy chemicals, sugar, cotton textile & woollen industry, cement, paper, salt, machine tools, fertiliser, rubber, air and sea transport, motor, tractor, electricity   etc.

These industries continue to remain under private sector however, the central government, in consultation with the state government, had general control over them.

Other Industries (Private and Cooperative Sector): All other industries which were not included in the above mentioned three categories were left open for the private sector.

The Industries (Development and Regulation) Act was passed in 1951 to implement the Industrial Policy Resolution, 1948.

It was regarded as the "Economic Constitution of India" or "The Bible of State Capitalism".

The 1956 Policy emphasised the need to expand the public sector, to build up a large and growing cooperative sector and to encourage the separation of ownership and management in private industries and, above all, prevent the rise of private monopolies.

It provided the basic framework for the government's policy in regard to industries till June 1991.

IPR, 1956 classified industries into three categories

Schedule A consisting of 17 industries was the exclusive responsibility of the State. Out of these 17 industries, four industries, namely arms and ammunition, atomic energy, railways and air transport had Central Government monopolies; new units in the remaining industries were developed by the State Governments.

Schedule B, consisting of 12 industries, was open to both the private and public sectors; however, such industries were progressively State-owned.

Schedule C- All the other industries not included in these two Schedules constituted the third category which was left open to the private sector. However, the State reserved the right to undertake any type of industrial production.

The IPR 1956, stressed the importance of cottage and small scale industries for expanding employment opportunities and for wider decentralization of economic power and activity

The Resolution also called for efforts to maintain industrial peace; a fair share of the proceeds of production was to be given to the toiling mass in keeping with the avowed objectives of democratic socialism.

Criticism: The IPR 1956 came in for sharp criticism from the private sector since this Resolution reduced the scope for the expansion of the private sector significantly. The sector was kept under state control through a system of licenses.

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