

UNIT 8

ENVIRONMENTAL APPRAISAL OF PROJECTS

1. MEANING OF ENVIRONMENT AND POLLUTION

A. Environment

The environment refers to the sum total of all biotic (living) and abiotic (non-living) factors that surround an organism or a population and influence their survival, development, and evolution. In a project context, it encompasses the natural resources (air, water, land, flora, fauna) and the socio-economic context affected by the project.

Everything that exists around us—nature, people, cities, and the air we breathe—is the environment. Environmental appraisal checks how a new project will interact with this surrounding system.

B. Pollution

Pollution is the introduction of contaminants into the natural environment that cause adverse change. It results from undesirable alterations in the physical, chemical, or biological characteristics of air, water, and soil.

Pollution is simply making the environment dirty or unhealthy by adding waste products (contaminants) from human activities, particularly industrial projects.

2. POLLUTION CREATED BY DIFFERENT INDUSTRIES

The nature and severity of pollution depend heavily on the industrial sector.

Industry Sector	Primary Pollutants	Affected Media
Manufacturing/Heavy Industry (Steel, Cement, Chemical)	Sulfur Dioxide (SO_2), Nitrogen Oxides (NO_x), Particulate Matter, heavy metals, toxic chemical effluent.	Air (acid rain, smog), Water (surface and groundwater contamination), Land (toxic waste dumps).
Power Generation (Thermal Plants)	Carbon Dioxide (CO_2), Fly Ash, Sulfur Dioxide (SO_2), thermal discharge (hot water).	Air (Greenhouse Gases, smog), Water (thermal pollution disturbing aquatic life).
Textile and Dyeing Industry	Organic and inorganic dyes, highly alkaline and acidic effluent, non-biodegradable chemicals.	Water (colour pollution, increased salinity), Land (soil degradation).
Mining and Quarrying	Soil erosion, suspended particulate matter, chemical runoff from mineral extraction, mine tailings (waste rock).	Land (habitat destruction, deforestation), Air (dust), Water (siltation, acid mine drainage).

Construction and Infrastructure	Construction dust, noise and vibration, solid construction debris, habitat fragmentation.	Air, Land, Noise environment.
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3. METHODS OF PREVENTING POLLUTION

Pollution control focuses on strategies implemented at the source (prevention) and at the discharge point (treatment).

A. Source Reduction and Prevention (Best Approach)

- **Waste Minimization:** Redesigning processes to produce less waste (e.g., lean manufacturing).
- **Process Modification:** Replacing hazardous chemicals or energy-intensive methods with safer, cleaner alternatives (e.g., shifting from coal to natural gas).
- **Closed-Loop Systems:** Recycling and reusing water or solvents within the industrial process itself to prevent any discharge.
- **Green Technology Adoption:** Utilizing renewable energy (solar, wind) and implementing energy-efficient machinery.

B. End-of-Pipe Treatment (Mitigation)

These are methods used to clean up pollutants *before* they are released into the environment.

- **Air Pollution Control:** Installing equipment like scrubbers (to remove SO₂), electrostatic precipitators (to remove particulate matter), and catalytic converters.
- **Water Pollution Treatment:** Using effluent treatment plants (ETPs) and sewage treatment plants (STPs) involving physical, chemical (e.g., coagulation, flocculation), and biological (e.g., activated sludge) processes to clean wastewater.
- **Solid Waste Management:** Proper segregation, composting, incineration with energy recovery, and secure landfill disposal.

4. ENVIRONMENTAL REGULATION IN INDIA

Environmental regulations provide the legal framework for compliance and enforcement, ensuring projects operate sustainably.

Act	Year	Focus
Water (Prevention and Control of Pollution) Act	1974	Establishes Central and State Pollution Control Boards (CPCB/SPCB) and gives them powers to regulate water pollution.
Air (Prevention and Control of Pollution) Act	1981	Aims to control and abate air pollution through ambient air quality standards and controlling emissions from vehicles and industries.

Environment (Protection) Act (EPA)	1986	The overarching legislation giving the central government broad powers to take measures to protect and improve the environment, including notification of standards for emissions and waste.
Hazardous and Other Wastes (Management and Transboundary Movement) Rules	2016 (updated)	Governs the generation, storage, treatment, transport, and disposal of hazardous waste.

Regulatory Bodies

- **Ministry of Environment, Forest and Climate Change (MoEFCC):** The central agency responsible for framing environmental policy and granting clearances.
- **Central Pollution Control Board (CPCB):** Monitors pollution levels and advises the government on control measures.
- **State Pollution Control Boards (SPCBs):** Implement central and state environmental regulations at the ground level and issue "Consent to Establish" and "Consent to Operate" permits.

5. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR PROJECTS

Environmental Impact Assessment (EIA) is a formal process, mandated by law, used to predict the environmental consequences (positive and negative) of a proposed project *before* a decision is made to proceed. It aims to integrate environmental considerations into project planning and development.

EIA is a detailed study required by the government before you can start a large project (like a highway or a factory). It is essentially a **"future damage report"** that asks: What will this project do to the air, water, land, and people nearby, and how can we minimize the bad effects?

Key Steps in the EIA Process

Step	Description	Purpose
Screening	Determines if the proposed project requires a full EIA. Based on the project size, location, and type.	To filter out projects with negligible environmental impact.
Scoping	Identifies the key environmental issues and impacts that need to be studied in depth. Determines the boundaries of the EIA.	To focus the study on the most relevant and significant potential impacts.

Baseline Data Collection	Collecting existing information on the current environmental state (air quality, biodiversity, socio-economic conditions) of the project site.	To establish a reference point against which the project's future impact can be measured.
Impact Prediction & Assessment	Forecasting the likely negative and positive effects of the project during construction, operation, and decommissioning phases.	To quantify the magnitude and likelihood of each impact.
Mitigation Measures	Recommending specific actions, technologies, or design changes to prevent, reduce, or offset adverse environmental impacts.	To minimize harm and ensure project viability.
EIA Report Preparation	Documenting all findings, predictions, and recommended mitigation measures. This is the main document submitted to authorities.	To provide comprehensive information for decision-makers.
Public Hearing (MoEFCC Requirement)	Consulting with the public and stakeholders who may be affected by the project to capture their concerns.	To ensure transparency and public participation in the approval process.
Decision Making	The regulatory authority (MoEFCC/SEIAA) reviews the EIA report and public concerns to grant or deny the Environmental Clearance (EC).	To determine if the project is environmentally acceptable.

Mandatory Clearance

In India, the MoEFCC has defined categories of projects that *must* undergo EIA and receive Environmental Clearance (EC) before beginning construction.