

Introduction

EIA can be defined as the study to predict the effect of a proposed activity/project on the environment.

EIA compares various alternatives for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits.

EIA integrates the environmental concerns in the developmental activities right at the time of initiating for preparing the feasibility report. It enables the integration of environmental concerns and mitigation measures in project development.

EIA can often prevent future liabilities or expensive alterations in project design.

3 Core values of EIA

- Integrity: the EIA process should be fair, objective, unbiased and balanced.
- Utility: the EIA process should provide balanced, credible **information for decision making**.
- Sustainability: the EIA process should result in **Environmental Safeguard**.

Environmental Assessment has many **benefits**:

- Protection of Environment
- Optimum utilization of resources
- Saves overall time and cost of the project
- Promotes community participation
- Informs decision makers
- Lays base for environmentally sound projects.

EVOLUTION & HISTORY OF EIA:

Environmental Impact Assessment started as a mandatory regulatory procedure originated in the early 1970's with the implementation of the **National Environmental Policy act (NEPA) 1969 in the US.**

EIA process took off after the mid 1980's, after **World Bank adopted EIA for major development projects**, in which borrower country had to undertake the EIA under the Bank's supervision.

Now EIA is a formal process in **more than 100 countries.**

Environmental Clearance from central government is required for 32 categories of development projects – under industrial sectors:

- Mining
- Thermal power plants
- River valley
- Infrastructure (road, highways, ports, harbors, and airports)
- Industries including very small electroplating in foundry units

History & Evolution of EIA

Law, policy and institutional arrangements for EIA systems

- EIA takes place within **the legal and/or policy frameworks** established by individual countries.
- Explicit basis in **law and regulation**;
- **Clear statement of** objective(s) and requirement(s);
- Mandatory compliance and enforcement;
- Comprehensive scope of application to proposals with potentially significant impacts;
- Prescribed process of steps and activities;
- **Provision for public consultation and access to information**; and
- Linkage **to project authorization, permitting and condition** setting.

- The **designation of an authority responsible** for overseeing the implementation of EIA procedure;
- The requirement for **public participation**, and whether it is a mandatory or discretionary procedure; and
- Procedural checks and balances for EIA quality control, comprising key stages of the EIA process (outlined in the flow chart).

Important key points

- **EIA legislation, regulations, orders and directives** that are used in the country or region;
- **Information** on any proposed changes to these;
- **Guidelines, agreements or memoranda of understanding** that apply to EIA;
- **Agreements or means of resolving conflicts** where more than one set of EIA arrangements apply to the project;
- **Information about how the EIA system addresses any responsibilities** that the country has under the international environmental agreements;
- **Reviews and analyses of the strengths and weaknesses** of applicable legal, policy and institutional arrangements;
- **Contact names and telephone numbers of people, agencies, organizations** and environmental information/data resource centres able to provide assistance and information regarding national EIA arrangements and developments; and
- Other resources that may be available such as videos, journal articles, computer programmes, lists of speakers, case studies.

Public Involvement

- **Public involvement** is a fundamental principle of **EIA**. The inclusion of the views of the affected and interested **public helps** to ensure the decision making process is equitable and fair and leads to more informed choice and better environmental outcomes. Three to four hours (not including training activity).

PUBLIC PARTICIPATION IN EIA PROCESS

- Identification of issues and impacts.
- Conduction of baseline studies of environment.
- Prediction and evaluation of impacts.
- Mitigation planning
- Comparison of alternatives
- Decision making relative to the proposed action.
- Study documentation through preparation of environmental assessment or EIS

SUMMARY OF OBJECTIVES OF PUBLIC INVOLVEMENT IN EIA

Stage of EIA process	Objectives of public involvement
<u>Screening</u>	Identification of significant impacts <ul style="list-style-type: none">• Identification of public's interest and values
<u>Scoping</u>	<ul style="list-style-type: none">• Identification of priorities for assessment• Encouraging public understanding of the proposed project• The public can contribute local knowledge and values to the prediction, evaluation and mitigation of impacts• Improvement in quality and acceptability of EIA report
<u>Assessment</u>	Public contribute to evaluation of quality and acceptability of report
<u>EIA Report Review</u>	Public comment on acceptability of project impacts
<u>Decision</u>	Public evaluate impacts that occur and support project environmental management process
<u>Monitoring</u>	



Environmental Impact Assessment – Cycle & Procedure

The EIA process in India is made of the following phases :-

- Screening
- Scoping & consideration of alternatives
- Baseline data collection
- Impact Analysis
- Mitigation and Environmental Impact statement
- Public hearing
- Environmental Management Plan
- Decision Making
- Monitoring the Clearance Condition

Screening:

First stage of EIA, which **determines whether the proposed project requires an EIA** and if it requires EIA, then the level of assessment required.

Screening criteria for determining the level of review required are relatively well defined.

Screening criteria are based upon:

- Scales of investment
- Type of development
- Location of development

Project Category 'A' :

Projects in this **category typically require an EIA**. The project type, scale and location determine this designation.

The potentially significant environmental issues for these projects may lead to **changes in land-use, as well as changes to social, physical, and biological environment**.

Screening:

Project Category 'B' :

Only difference between projects in this category and those in Category 'A' is the scale. Larger Power plants fall under category 'A', Medium Sized Power Plants projects are in category 'B'.

These projects are not located in environmentally sensitive area. Mitigation measures for these projects are more easily prescribed.

Project Category 'C':

This category is for projects that typically do not require an environmental assessment. These projects are unlikely to have adverse environmental impacts.

Scoping:

This stage identifies **key issues** and **impact** that should be further investigated. This stage also **defines the boundary and the time limit of the study.**

It is done by consultant in consultation with the project proponent and guidance by the agency.

Quantifiable impacts are to be assessed on the **basis of magnitude, prevalence frequency and duration and non quantifiable impact** (aesthetic or recreational value). Significance is usually determined through the **socio-economic criteria.**

After the areas, where the project could have significant impact, are identified, the **Baseline status** of these should be monitored and **then the likely changes** in these on account of the construction and operation of the proposed project should be predicted.

Impact analysis

- To provide an overview of the tools and methods used to identify, predict and evaluate different types of impacts.
- To understand how these methods can be used in EIA practice, and their relative strengths and weaknesses.

Baseline Data:

Impact prediction is a way of 'mapping' the environmental consequences of the significant aspects of the projects and its alternatives.

Environmental impact can never be predicted with absolute certainty, and this is all the more reason to consider all possible factors and take all possible precautions for reducing the degree of uncertainty.

The following impacts of the projects should be assessed:

AIR:

- Changes in the ambient level and the ground level concentrations due to emissions from point, line and area source.
- Effects on soils, materials, vegetations and human health.

NOISE:

- Changes in the ambient level due to noise generated from equipment and movement of vehicles.
- Effects on fauna and human health.

Baseline Data:

WATER

- Availability to competing users
- Changes in the quality
- Sediment transport
- Ingress of saline water

LAND

- Changes in the land-use and drainage pattern
- Changes in land quality including effects of waste disposal
- Changes in shoreline/riverbank and their stability.

BIOLOGICAL

- Deforestation and shrinkage of animal habitat
- Impact on flora and fauna due to contaminants/pollutants.
- Impact on rare and endangered species, endemic species and migratory path of animals including birds.
- Impact on breeding and nesting grounds

SOCIO-ECONOMIC

- Impact on the local community including demographic changes
- Impact on economic status
- Impact on human health
- Impact of increased traffic.

Assessment of Alternatives,
Delineation of Mitigation Measure and
Environmental Impact Assessment Report

For every project **possible alternative** should be identified and **environmental attributes compared**.

Alternatives for **project location & process technologies**

Alternative of '**no project**' should also be considered.

Based on the best environmental option for **optimum economic benefits to the community at large**, alternatives should be ranked.

Mitigation plan for the selected option have to be drawn, and is supplemented with the **Environmental Management Plan (EMP)** to guide towards, Environmental Improvement.

EMP is critical for monitoring the clearance conditions, and henceforth details of monitoring should be included.

Thus the EIA Report prepared should provide the decision maker with the information on different environmental scenarios like:

- With the project
- Without the project
- With project alternatives
- Uncertainties should also be reflected in the EIA report.

Public Hearing after EIA report is made public must be informed and consulted on the proposed development.

Summary of the EIA report have to be provided to the people affected due to the proposed project:

- Bonafied local resident
- Local associations
- Environmental groups active in the area
- Any other person located at the project site/sites of displacement

Mitigation and Impact Assessment

- **Mitigation** refers to minimizing or avoiding the described impacts. Overall, **mitigation measures are a response to the findings of impact assessment**; they need to cover all the areas identified. The key focus of mitigation actions should be on:
 - Preventive measures that avoid the occurrence of impacts and thus avoid harm or even produce positive outcomes.
 - Measures that focus on limiting the severity and the duration of the impacts.
 - Compensation mechanisms for those impacts that are unavoidable and cannot be reduced further.

Key impacts and potential mitigation actions often relate to land. Almost all development proposals involve disturbance of the land surface. This is usually extensive for major linear projects (roads, pipelines, etc.), dams and reservoirs, and large-scale mining, agriculture, forestry and housing schemes. Environmental impacts of particular concern can include drainage of wetlands, conversion of natural areas, or expansion into areas that are vulnerable to natural hazards.

Mitigation and Impact Assessment

- **Impact assessment** refers to the detailed evaluation of the environmental and social impacts of the planned project and identified alternatives, compared to the baseline conditions. This includes qualitative descriptions such as measuring high, medium and low impacts, and quantitative descriptions, such as indicating the cubic meters of water withdrawn, sewage produced, and pollutants released.
- This is done for the planned project as well as the identified alternatives, allowing for comparisons. Once the detailed assessment is complete, mitigation measures to reduce or avoid impacts are identified.
- The purpose of conducting an EIA is to clearly, identify and understand (assess), and then prevent or minimize (mitigate) the adverse impacts of the planned project on the environment and people.

Mitigation and Impact Assessment

These are the key steps for conducting impact assessment and related mitigation:

- Perform a detailed assessment of impacts of all project phases on the environment, socio-economic systems and other areas as requested by the designated agency's guidelines and legislation, taking into consideration regional and international best practices.
- Based on the completed analyses, conduct an assessment of cumulative impacts.
- Compile similar impacts into groups in order to make the impact analyses easier to understand.
- Identify mitigation actions to eliminate and/or reduce the identified impacts.
- Identify specific mitigation measures to reduce cumulative impacts.

Reporting

- **Reporting** is an important part of the **EIA process** in order to convey the outcomes of the assessment and proposed mitigation actions, and thereby provide information for decision making. An **EIA report** should be complete, easily understood, objective, factual and internally consistent.
- A quality EIA Report has the following characteristics:
 - It is **well-structured** and uses non-technical language supported by data and well-executed analyses.
 - It **provides information that is helpful and relevant** to decision making.
 - It **results in the satisfactory prediction of the adverse effects of the proposed actions** and their mitigation using conventional and customized techniques.

Review of EIA Quality

- The **review** of the **quality** of an **EIA** report is conducted to ensure that **the report addresses issues raised during scoping and is sufficient for decision-making**. A systematic, open **review** process assures decision-makers that the information is credible.

The key objectives of EIA review are to:

- Assess the adequacy and quality of an EIA report;
- Take account of public comment;
- Determine if the information is sufficient for a final decision to be made; and
- Identify the deficiencies in the EIA report.

Decision making

Decision-Making in the **EIA** Process **EIA** is part of a larger process of **decision-making** to approve a major proposal. **Decision making** is the process of choosing between alternatives courses of action.

Decision Making

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 & EMP**

Monitoring The Clearance Conditions:

- Monitoring should be done during **both construction and operation phase** of a project.
- This ensure that the **commitments made are compiled** and the if the prediction made in the **EIA report are correct**.
- Corrective actions** should be taken if the impact exceeds the predicted levels.

Implementation and Follow up

- After project approval, **implementation and follow up complete** the EIA process. Monitoring, auditing and other tools are used to 'close the loop' of impact prediction and condition setting.
- They are important for several reasons: to identify the impacts that occur; to check that these are within the levels predicted and required by legislation; to determine that mitigation measures are properly implemented and work effectively; to ensure the environmental benefits expected are being achieved; and to provide feedback to improve future applications of the EIA process.

Implementation and Follow up

- Carry out conditions of approval
 - Ensure they work effectively
 - Verify impacts are as predicted or permitted
 - Take action to manage unforeseen changes
 - Optimize environmental benefits
 - Improve EIA practice in the future
- Surveillance and supervision
 - Effects or impact monitoring
 - Compliance monitoring
 - Environmental auditing
 - Evaluation of EIA effectiveness and performance
 - Post-project analysis

EIA Project Management

- The main purpose of **EIA project management** is to plan, organize and coordinate the tasks necessary to carry out each phase of the **EIA** process effectively. **EIA project management** encompasses a number of functions.
- EIA project management is complex and demanding.
- It requires a combination of specialist and managerial skills, and commitment to the task.
- Not all practitioners are suited to the role of Project Manager, nor can the work be done in isolation.
- All practitioners, however, require an understanding of what EIA project management entails and how different roles, responsibilities and interests are addressed and accommodated.

Strategic Environmental Assessment

Strategic environmental assessment (SEA) is a systematic decision support process, aiming to ensure that **environmental** and possibly other sustainability aspects are considered effectively in policy, plan and program making.

- a structured, rigorous, participative, open and transparent [environmental impact](#) assessment (EIA) based process, applied particularly to plans and programmes, prepared by public planning authorities and at times private bodies,
- a participative, open and transparent, possibly non-EIA-based process, applied in a more flexible manner to policies, prepared by public planning authorities and at times private bodies,
- a flexible non-EIA based process, applied to legislative proposals and other policies, plans and programmes in political/cabinet decision-making.



Strategic Environmental Assessment

- **Identify Sustainability Objectives** – Ensures that issues of ESD are incorporated at the earliest stage of decision making in the process
- **Identify Targets and Indicators** – Determines whether the objectives of the strategic action are achieved
- **Describe Environmental Baseline** – Illustrates the existing environmental/sustainability conditions in the context of the strategic action
- **Predict and Evaluate Impacts** – Determines the sustainability impacts of the strategic action alternatives and identifies opportunities for mitigation
- **Mitigate Impacts** – An ongoing process to ensure the strategic action is sustainable and the impacts of the proposed strategic action are minimized
- **Write SEA Report** – Documents the strategic action, and the Strategic Environmental Assessment process, results and decision making
- **Establish Environmental Guidelines**
- **Monitor Environmental Impacts**

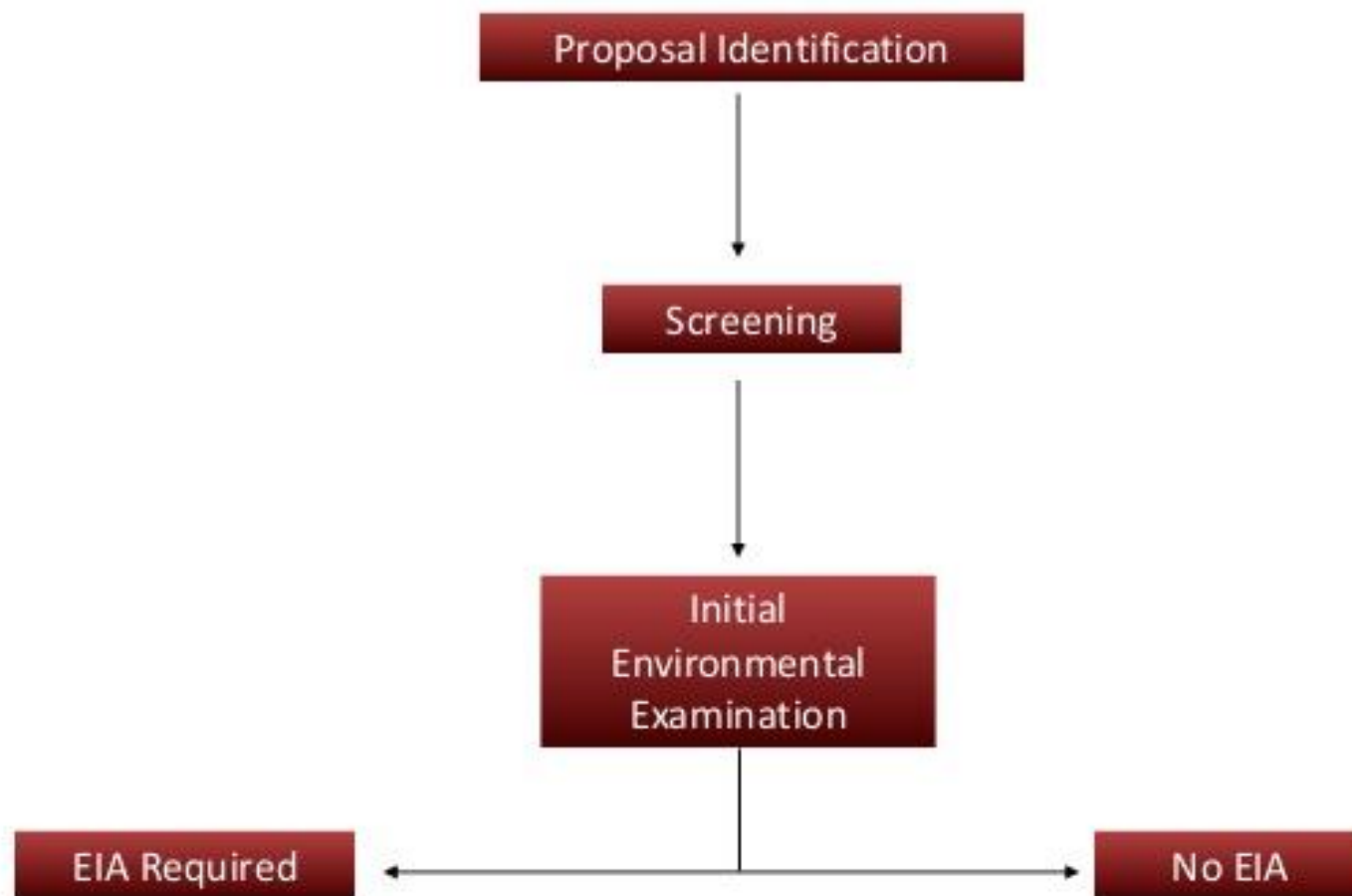
Strategic Environmental Assessment

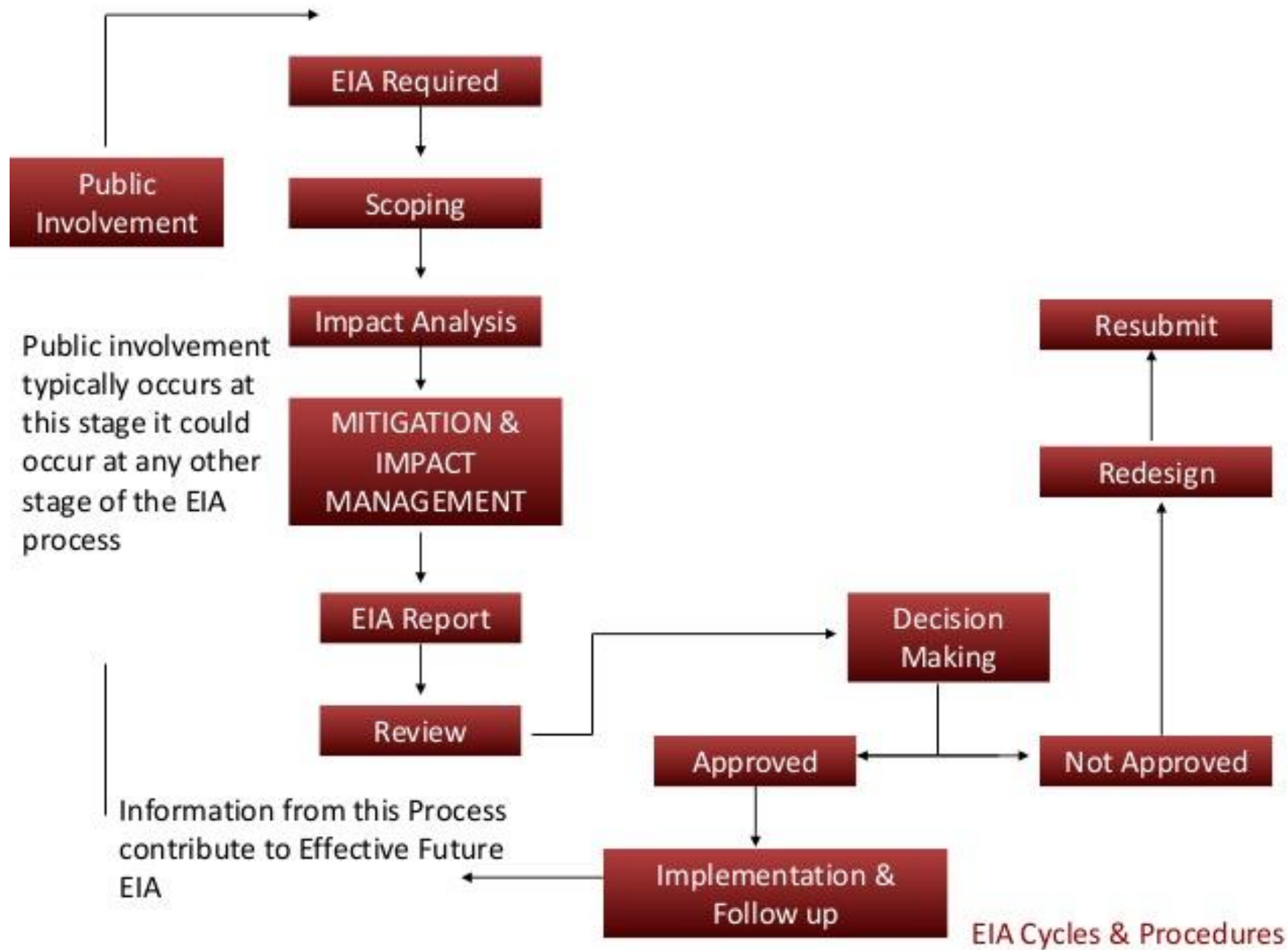
- Takes place at earlier stages of decision-making cycle: aims to prevent impacts
- Pro-active approach to development proposals
- Considers broad range of potential alternatives
- Cumulative effects assessment is key to SEA
- Emphasis on meeting environmental objectives, maintaining natural systems
- Broad perspective, lower level of detail to provide a vision and overall framework
- Multi-stage process, overlapping components, policy level is continuing, iterative
- Focuses on sustainability agenda, gets at sources of environmental deterioration

Environmental Impact Assessment

- Takes place near the end of decision-making cycle: aims to minimize impacts
- Reactive approach to development proposal
- Considers limited number of feasible alternatives
- Limited review of cumulative effects
- Emphasis on mitigating and minimizing impacts
- Narrow perspective, high level of detail
- Well-defined process, clear beginning and end
- Focuses on standard agenda, treats systems of environmental deterioration

EIA Process:





EIA Cycles & Procedures

Components of EIA

Comprehensive EIA and Rapid EIA vary only in the time scale of the data supplied. i.e.

- Rapid EIA is for speedier appraisal process.
- Rapid EIA achieves this through the collection of 'one season' data, which ever is stressful for the project, only to reduce the time required.
- But this is acceptable only if it does not compromise on the quality of decision making.

Depending on the **nature, location and the scale of the project** EIA report should contain all or some of the following components:

- AIR ENVIRONMENT
- NOISE ENVIRONMENT
- WATER ENVIRONMENT
- BIOLOGICAL ENVIRONMENT
- LAND ENVIRONMENT
- SOCIO-ECONOMIC & HEALTH ENVIRONMENT
- RISK ASSESSMENT
- ENVIRONMENT MANAGEMENT PLAN

AIR ENVIRONMENT:

- Determination of the **impact zone** and developing a monitoring network.
- Monitoring the **existing status of ambient air** quality within the impacted region (7-10 km from the periphery)
- Monitoring site specific meteorological data – **wind speed, wind direction, humidity, ambient temperature** and environmental lapse rate.
- Estimation of **qualities of air emission** from the proposed site.
- Identification and quantification and evaluation of **other potential emissions** within the impact zone.
- **Prediction of the changes** in the ambient air quality through air quality model.
- **Evaluation of the adequacy of the proposed pollution control devices** to meet gaseous emission and ambient air quality standards.
- Delineation of **mitigation measures at source, pathways and receptors**.

NOISE ENVIRONMENT:

- **Monitoring the present status** of noise levels within the impact zone.
- **Predicting the future noise levels** resulted from the proposed project, including the vehicular movement.
- **Identification of impacts** due to any anticipated rise in noise levels on the surrounding environment
- **Recommendations on mitigation measures** for noise pollution

WATER ENVIRONMENT:

- Study of existing ground and surface water resources with respect to quality and the quantity within the impact zone of the proposed project.
- Prediction if the impact on the water resources due to may be pumping/ use of water in the project.
- Quantification and characteristics of the waste water including toxic, organic from the proposed activity.
- Evaluation of the proposed pollution prevention and waste water treatment system if required.
- Prediction of impacts of effluents discharge on the quality of the receiving water body using appropriate models.
- Assessment of the feasibility of water recycling and reuse and delineation of detailed plan in this regard.

BIOLOGICAL ENVIRONMENT:

- Survey of flora and fauna clearly delineating season and duration.
- Assessment of the flora and fauna within the impact zone of the project
- Assessment of the potential damage to terrestrial and aquatic flora and fauna due to discharge of effluent and gaseous emissions from the projects.
- Assessment of damage to terrestrial flora and fauna due to air pollution and land-use and landscape changes.
- Assessment of damage to aquatic and marine flora and fauna due to physical disturbance and alternations
- Prediction of biological stresses within the impact zone of the proposed project
- Delineation of mitigation measures to prevent and/or reduce the damage.

LAND ENVIRONMENT:

- Studies on soil characteristics, existing land use and topography, landscape and drainage pattern within the impact zone.
- Estimation of impacts of projects on land-use, landscape, topography, drainage and hydrology.
- Identification of potential utility of treated effluent in land application and subsequent impacts.
- Estimation and characterization of solid wastes and delineation of management options for minimization of waste and environmentally compatible disposal.

SOCIO-ECONOMIC AND HEALTH ENVIRONMENT:

- Collection of **demographic and related socio-economic data**.
- Collection of epidemiological data, including studies on prominent **endemic diseases and morbidity rates among population** within the impact zone.
- Projection of anticipated **changes in the socio-economic and health** due to the project and related activities
- **Delineation of measures to minimize adverse impacts**.
- Assessment of impact on **significant historical, cultural and archeological sites places in the area**.
- Assessment of **economic benefits** arising out of the projects
- Assessment of **rehabilitation requirements** with special emphasis on scheduled areas.

RISK ASSESSMENT:

Hazard identification taking recourse to hazard indices, inventory analysis, dam breaking probability, natural hazard probability.

Maximum credible accidents analysis to identify potential hazardous scenarios.

Consequences analysis of failures and accidents resulting in fire, explosion, hazardous releases and dam breaks etc.

Hazard & operability studies

Assessment of risks on the basis of the above evaluations.

Preparations of an onsite and off site Disaster Management Plan

ENVIRONMENT MANAGEMENT PLAN:

- Delineation of **mitigation measures** including **prevention and control** for each **environmental component and rehabilitation and resettlement plan**.
- Delineation of **monitoring scheme** for compliance of conditions
- Delineation of **implementation plan** including scheduling and resource allocations.

EIA benefits and flaws

BENEFITS:	FLAWS:
<ul style="list-style-type: none"> • Provides systematic method of impact assessment 	Time consuming
<ul style="list-style-type: none"> • Estimates the cost/benefit trade-off of alternative actions. 	Costly
<ul style="list-style-type: none"> • Facilitates the public participation 	Little public participation in actual implementation
<ul style="list-style-type: none"> • Provides an effective mechanism for <ol style="list-style-type: none"> 1. Coordination 2. Environmental integration 3. Negotiations 4. Feed back 	Unavailability for reliable data (mostly in developing countries)
<ul style="list-style-type: none"> • Top- level decision making 	Too focused to scientific analysis (sometime)
<ul style="list-style-type: none"> • Achieves a balance between the impact of development and environmental concern 	Compliance monitoring after EIA is seldom carried out.

