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IL&FS | Environment

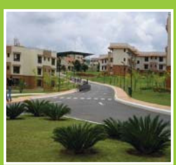
TECHNICAL EIA GUIDANCE MANUAL

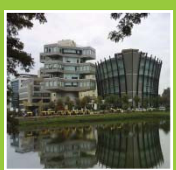
FOR

INDUSTRIAL ESTATES

Prepared for

The Ministry of Environment and Forests
Government of India





by

IL&FS Ecosmart Limited
Hyderabad

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ACRONYMS

AAQ	Ambient Air Quality
CFE	Consent for Establishment
CPCB	Central Pollution Control Board
CRZ	Coastal Regulatory Zone
DA	Developmental Authorities
EAC	Expert Appraisal Committee
EBM	Environmental Baseline Monitoring
EcE	Economic-cum-Environmental
ECI	Environmental Condition Indicators
EIA	Environmental Impact Assessment
EIP	Eco – industrial Parks
EIS	Environmental Information system
EOUs	Export Oriented Units
EPI	Environmental performance indicators
EPZ	Export Processing Zones
EMS	Environmental Management System
EMP	Environmental Management Plan
ETP	Effluent Treatment Plant
FCA	Full Cost Assessment
GC	General Condition
HTL	High Tide Line
IE	Industrial Estate
IL&FS	Infrastructure Leasing and Financial Services
INFOTERRA	Global Environmental Information Exchange Network of UNEP
ISO	International Standard Organization
LDAR	Leak Detection and Repair
LCA	Life Cycle Assessment
MFA	Material Flow Accounting
MoEF	Ministry of Environment & Forests
MSW	Municipal Solid Waste
NAQM	National Air Quality Monitoring
NGO	Non-Government Organizations
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
PCC	Pollution Control Committee
R&R	Resettlement and Rehabilitation

QA/QC	Quality Assurance/Quality Control
QRA	Quantitative Risk Assessment
SEAC	State Level Expert Appraisal Committee
SEIAA	State Level Environment Impact Assessment Authority
SEZ	Special Economic Zone
SIDC	State Industrial Development Corporations
SME	Small and Medium Scale Enterprises
SPCB	State Pollution Control Board
SSI	Small-Scale Industries
TA	Technology Assessment
TCA	Total Cost Assessment
TEQM	Total Environmental Quality Movement
TGM	Technical EIA Guidance Manuals
UTEIAA	Union Territory Environment Impact Assessment Authority
UTPCC	Union Territory Pollution Control Committee
VEC	Valued Environmental Components

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Acknowledgement

The Notification issued on the prior environmental clearance process by the Ministry of Environment and Forests (MoEF) on September 14, 2006 delegated substantial powers to the State Level Environment Impact Assessment Authorities (SEIAA) to grant environmental clearance for certain categories of developmental activities/projects. It was felt that proper guidance to the stakeholders would enhance appreciation of environmental impacts of proposed projects and possible mitigation measures. Further, such a guidance would also help ensure that decision making authorities across different States and Union Territories could adopt similar considerations and norms with due weightage for site-specific considerations.

We feel privileged to be part of the interventions being spearheaded by Sh. Jairam Ramesh, Hon'ble Minister, MoEF, Government of India, to mainstream environmental considerations in the decision making process. IL&FS Ecosmart as part of this important initiative, prepared Technical EIA Guidance Manuals for 27 identified development activities. In view of the diversity of 27 developmental activities entrusted to IL&FS Ecosmart Ltd., in consultation with the MoEF, an expert Peer and Core Committee was constituted to review and finalize each of the draft Manuals. The Manuals prepared by IL&FS were technically reviewed and up-dated by the respective sector-specific expert resource persons.

The Manuals designed by the Expert Committee have benefitted from the advise and feedback received from MoEF. The Manuals are designed to provide readers with an in-depth understanding of the environmental clearance mechanism, developmental activity specific environmental impacts with possible mitigation measures, environmentally compliant manufacturing/ production processes and pollution control technologies, etc.

IL&FS Ecosmart hopes that these Manuals are a step forward to realize the MoEF's desired objective of enhancing functional efficiency and effectiveness in the environmental clearance process. We hope the stakeholders will find the Manuals useful.

We take this opportunity to convey our appreciation to the MoEF team under the leadership of Mr. J.M. Mauskar, Additional Secretary, for the technical inputs, guidance and support extended throughout the project period for successful completion of the project. The technical guidance and support extended by the Expert Peer and Core Committee under the Chairmanship of Dr. V. Rajagopalan, former Chairman, Central Pollution Control Board and inputs of the sector-specific resource persons are gratefully acknowledged.

(Mahesh Babu)

15th November 2010

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FOREWORD

The Ministry of Environment & Forests (MOEF) introduced the Environmental Impact Assessment (EIA) Notification 2006 on 14th September 2006, which not only reengineered the entire environment clearance (EC) process specified under the EIA Notification 1994, but also introduced a number of new developmental sectors which would require prior environmental clearance. The EIA Notification 2006 has notified a list of 39 developmental sectors which have been further categorised as A or B based on their capacity and likely environmental impacts. Category B projects have been further categorised as B1 and B2. The EIA Notification 2006 has further introduced a system of screening, scoping and appraisal and for the setting up of Environment Impact Assessment Authority (EIAA) at the Central level and State Level Environment Impact Assessment Authorities (SEIAAs) to grant environmental clearances at the Central and State level respectively. The Ministry of Environment & Forests is the Environment Impact Assessment Authority at the Central level and 25 State Level Environment Impact Assessment Authorities (SEIAAS) have been set up in the various States/UTs. The EIA Notification 2006 also stipulates the constitution of a multi-disciplinary Expert Appraisal Committee (EAC) at the Centre and State level Expert Appraisal Committees (SEACs) at State/UT Level for appraisal of Category A or B projects respectively and to recommend grant/rejection of environmental clearance to each project/activities falling under the various sectors to the EIAA/SEIAAs respectively.

Although the process of obtaining environmental clearance consisting of Screening, Scoping and Appraisal and for undertaking public consultation including the process of conduct of Public Hearing has been elaborated under the EIA Notification 2006, the Notification itself provides for bringing out guidelines from time to time on the EIA Notification 2006 and the EC process with a view to bringing clarity on the EC process for expediting environmental clearance. This need was further reinforced after the constitution of SEIAAs and SEACs in various States, who were assigned the task for the first time and for addressing the concerns of standardization of the quality of appraisal and in reducing inconsistencies between SEACs/SEIAAs in granting ECs for similar projects in different States.

The Technical Guidance Manual of **"Industrial Estates"** sector describes types of process and pollution control, operational aspects of EIA with model TOR of that Sector, technological options with cleaner production and waste minimization techniques, monitoring of environmental quality, post clearance monitoring protocol, related regulations, and procedure of obtaining EC if linked to other clearances for e.g., CRZ, etc.

Industrial estates are specific areas zoned for industrial activity where infrastructure (like roads, power, and other utility services) is provided to facilitate the growth of industries, while minimizing the impacts to the environment. These may include effluent treatment; solid and hazardous waste collection, treatment, and disposal; air pollution and effluent monitoring; technical services on pollution prevention; quality management; and laboratory services. The selection sites for industrial estates should take into account social and environmental considerations. India's industrial competitiveness and environmental future depends on development of Industrial Estates adopting energy and resource efficient technologies. Recycling and reuse of materials is critical.

To keep pace with changing technologies and needs of sustainable development, the manual would require regular updating in the future. The manual will be available on the MoEF website and we would appreciate receiving responses from stakeholders for further improvements.

I congratulate the entire team of IL&FS Ecosmart Ltd., experts from the sector who were involved in the preparation of the Manuals, Chairman and members of the Core and Peer Committees of various sectors and various Resource Persons whose inputs were indeed valuable in the preparation and finalization of the Manuals.

Jairam Ramesh

(Jairam Ramesh)

1.
INTRODUCTION TO THE TECHNICAL EIA GUIDANCE MANUALS PROJECT

Environmental Impact Assessment (EIA) is a 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. These studies integrate the environmental concerns of developmental activities into the process of decision-making.

EIA has emerged as one of the successful policy innovations of the 20th Century in the process of ensuring sustained development. Today, EIA is formalized as a regulatory tool in more than 100 countries for effective integration of environmental concerns in the economic development process. The EIA process in India was made mandatory and was also given a legislative status through a Notification issued by the Ministry of Environment and Forests (MoEF) in January 1994. The Notification, however, covered only a few selected industrial developmental activities. While there are subsequent amendments, the Notification issued on September 14, 2006 supersedes all the earlier Notifications, and has brought out structural changes in the clearance mechanism.

The basic tenets of this EIA Notification could be summarized into the following:

- Pollution potential as the basis for prior environmental clearance based on pollution potential instead of investment criteria; and
- Decentralization of clearing powers to the State/Union Territory (UT) level Authorities for certain developmental activities to make the prior environmental clearance process quicker, transparent and effective.

Devolution of the power to grant clearances at the state level for certain category of the developmental activities / projects is a step forward to fulfill the basic tenets of the re-engineering *i.e.*, quicker, transparent and effective process but many issues impede /hinder its functional efficiency. These issues could be in technical and operational as listed below:

Technical issues

- Ensuring level playing ground to avoid arbitrariness in the decision-making process
- Classification of projects which do not require public hearing and detailed EIA (Category B2)
- Variations in drawing Terms of Reference (ToR) of EIA studies for a given developmental activity across the States/UTs
- Varying developmental-activity-specific expertise requirement for conducting EIA studies and their appraisal
- Availability of adequate sectoral experts and variations in competency levels
- Inadequate data verification, cross checking tools and supporting institutional framework

- Meeting time targets without compromising with the quality of assessments/ reviews
- Varying knowledge and skill levels of regulators, consultants and experts
- Newly added developmental activities for prior environmental clearance, *etc*.

Operational issues

- State level /UT level EIA Authorities (SEIAA/UTEIAA) are formulated for the first time and many are functioning
- Varying roles and responsibilities of involved organizations
- Varying supporting institutional strengths across the States/UTs
- Varying manpower availability, *etc*.

1.1 Purpose

The purpose of developing the sector-specific technical EIA guidance manuals (TGM) is to provide clear and concise information on EIA to all the stakeholders *i.e*., the project proponent, the consultant, the reviewer, and the public. The TGMs are organized to cover following:

Chapter 1 (Introduction): This chapter provides a brief introduction on the EIA, basic tenets of EIA Notification, technical & operational issues in the process of clearance, purpose of the TGMs, project implementation process and additional information.

Chapter 2 (Conceptual facets of an EIA): Provides an overall understanding to the conceptual aspects of control of pollution and EIA for the developmental projects. This basic understanding would set the readers at same level of understanding for proper interpretations and boundaries for identifying the environmental interactions of the developmental projects and their significance for taking mitigative measures. This chapter covers the discussion on environment in EIA context i.e sustainable development, pollution control strategies, preventive environmental management tools, Objectives of EIA, types and basic principles of EIA, project cycle for Industrial Estate, understanding on type of environmental impacts and the criteria for the significance analysis.

Chapter 3 (Industrial Estate): The purpose of this chapter is to provide the reader precise information on all the relevant aspects of the industry, which is essential to realize the likely interaction of such developmental activities on the receiving environment. Besides, this Chapter gives a holistic understanding on the sources of pollution and the opportunities of the source control.

The specific coverage which provides precise information on the industry include (i) Introduction - IE planning approach in India, Concept of managed/serviced work space (Industrial estates/parks/ complexes/areas, EPZs, SEZs, biotech parks, leather complexes), Advantages of IE, The developmental context, Types of IE, Various forms of IE, Characteristics / Components of IEs, (ii) IE Site Identification, Planning, Development and Management - Steps involved in identification of site, Site planning and development, IE management, (iii) Eco-industrial Parks - Tools to explore for converting existing IEs into EIPs, Stage-wise explorable programmes, and (iv) Summary of Applicable National Regulations - General description of major statutes, General standards for discharge of environmental pollutants, Industry-specific requirements.

Chapter 4 (Operational aspects): The purpose of this chapter is to facilitate the stakeholders to extend clear guidance on coverage of legislative requirements, sequence of procedures for obtaining the EIA clearance and each step-wise provisions and considerations.

The coverage of the Chapter include provisions in the EIA Notification regarding proposed industry, screening (criteria for categorization of B1 and B2, siting guidelines, *etc*.), scoping (pre-feasibility report, guidance for filling form 1, identification of valued environmental components, identification of impacts, *etc*.), arriving at terms of reference for EIA studies, impact assessment studies (EIA team, assessment of baseline quality of environment, impact prediction tools, significance of impacts), social impact assessment, risk assessment considerations, typical mitigation measures, designing considerations for environmental management plan, structure of EIA report for incorporation of study findings, process of public consultation, project appraisal, decision making process and post-clearance monitoring protocol.

Chapter 5 (Roles and responsibilities of various organizations involved in the process of prior environmental clearance): The purpose of this Chapter is to brief the stakeholders on the institutional mechanism and roles & responsibilities of the stakeholders involved in the process of prior environmental clearance. The Coverage of the Chapter include (i) roles and responsibilities of the stakeholders, (ii) organization specific functions, (iii) constitution, composition and decision making process of SEIAA and (iv) EAC & SEAC and (v) other conditions which may be considered

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue. Text within each section was researched from many sources, and was condensed from more detailed sources pertaining to specific topics.

The contents of the document are designed with a view to facilitate addressing of relevant technical and operational issues as mentioned in the earlier section. Besides, facilitates various stakeholders involved in the EIA clearance process *i.e.,*

- Project proponents will be fully aware of the procedures, common ToR for EIA studies, timelines, monitoring needs, *etc*., in order to plan the projects/studies appropriately.
- Consultants across India will gain similar understanding about a given sector, and also the procedure for EIA studies, so that the quality of the EIA reports gets improved and streamlined
- Reviewers across the States/UTs will have the same understanding about an industrial sector and would able to draw a benchmark in establishing the significant impacts for the purpose of prescribing the ToR for EIA studies and also in the process of review and appraisal.
- Public who are concerned about new or expansion projects, use this manual to get a basic idea about the manufacturing/production details, rejects/wastes from the operations, choice of cleaner/control technologies, regulatory requirements, likely environmental and social concerns, mitigation measures, *etc*., in order to seek clarifications appropriately in the process of public consultation. The procedural clarity in the document will further strengthen them to understand the stages involved in clearance and roles and responsibilities of various organizations.

- In addition, these manuals would substantially ease the pressure on reviewers at the scoping stage and would bring in functional efficiency at the central and state levels.

1.2 Project Implementation

The Ministry of Environment & Forests (MoEF), Government of India took up the task of developing sector-specific technical EIA guidance manuals for all the developmental activities listed in the re-engineered EIA Notification. The Infrastructure Leasing and Financial Services Ecosmart Limited (IL&FS Ecosmart), has been entrusted with the task of developing these manuals for 27 industrial and related sectors. Industrial Estate (IE) is one of these sectors, for which this manual is prepared.

The ability to design comprehensive EIA studies for specific industries depends on the knowledge of several interrelated topics. Therefore, it requires expert inputs from multiple dimensions *i.e.*, administrative, project management, technical, scientific, social, economic, risk *etc*., in order to comprehensively analyze the issues of concern and to draw logical interpretations. Thus, Ecosmart has designed a well-composed implementation framework to factor inputs of the experts and stakeholders in the process of finalization of these manuals.

The process of manual preparation involved collection & collation of the secondary available information, technical review by sectoral resource persons and critical review & finalization by a competent Expert Committee composed of core and sectoral peer members.

The MoEF appreciates the efforts of Ecosmart, Expert Core and Peer Committee, resource persons and all those who have directly and indirectly contributed to this Manual. .

1.3 Additional Information

This TGM is brought out by the MoEF to provide clarity to all the stakeholders involved in the 'Prior Environmental Clearance' process. As such, the contents and clarifications given in this document do not withstand in case of a conflict with the statutory provisions of the Notifications and Executive Orders issued by the MoEF from time-to-time.

TGMs are not regulatory documents. Instead these are the tools designed to assist in successful completion of an EIA.

For the purpose of this project, the key elements considered under TGMs are: conceptual aspects of EIA; developmental activity-specific information; operational aspects; and roles and responsibilities of involved stakeholders.

This manual is prepared considering the Notification issued on September 14, 2006 and latest amendment as on 1st December 2009. For recent updates, if any, may please refer the website of the MoEF, Government of India *i.e.,* http://moef.nic.in/index.php.

2.
CONCEPTUAL FACETS OF EIA

It is an imperative requirement to understand the basic concepts concerned to the pollution control and the environmental impact assessment in an overall objective of the sustainable development. This Chapter highlights the pollution control strategies and their tools besides the objectives, types & principles of EIA, type of impacts their significance analysis, in order to provide consistent understanding to the reader before assessing the development of activity-specific environmental concerns in Chapter 3 and identification & prediction of significant impacts in order to design mitigation measures as detailed in Chapter 4.

2.1 Environment in EIA Context

"Environment" in EIA context mainly focuses, but is not limited to physical, chemical, biological, geological, social, economical, and aesthetic dimensions along with their complex interactions, which affect individuals, communities and ultimately determines their forms, character, relationship, and survival. In EIA context, 'effect' and 'impact' can often be used interchangeably. However, 'impact' is considered as a value judgment of the significance of an effect.

Sustainable development is built on three basic premises *i.e.*, economic growth, ecological balance and social progress. Economic growth achieved in a way that does not consider the environmental concerns, will not be sustainable in the long run. Therefore, sustainable development needs careful integration of environmental, economic, and social needs in order to achieve both an increased standard of living in short term, and a net gain or equilibrium among human, natural, and economic resources to support future generations in the long term.

"It is necessary to understand the links between environment and development in order to make choices for development that will be economically efficient, socially equitable and responsible, as well as environmentally sound." Agenda 21

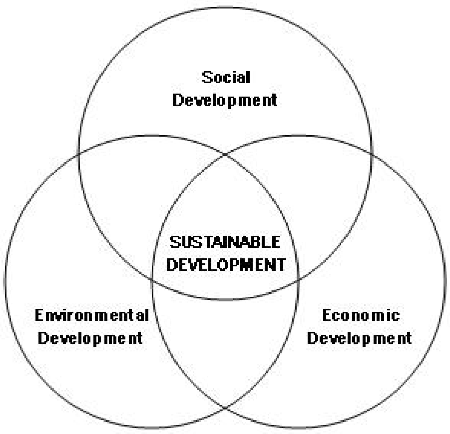


Figure 2-1: Inclusive Components of Sustainable Development

2.2 Pollution Control Strategies

Pollution control strategies can be broadly categorized in to preventive and reactive. The reactive strategy refers to the steps that may be applied once the wastes are generated or contamination of the receiving environment takes place. The control technology or a combination of technologies to minimize the impact due to the process rejects/wastes varies with quantity and characteristics, desired control efficiency and economics.

Many a number of combination of techniques could be adopted for treatment of a specific waste or the contaminated receiving environment, but are often judged based on techno-economic feasibility. Therefore, the best alternative is to take all possible steps to avoid pollution itself. This preventive approach refers to a hierarchy that involves i) prevention & reduction; ii) recycling and re-use; iii) treatment; and iv) disposal, respectively.

Therefore, there is a need to shift the emphasis from the reactive to preventive strategy *i.e.,* to promote preventive environmental management. Preventive environment management tools may be grouped into management based tools, process based tools and product based tools, which are given below:

Management Based Tools	Process Based Tools	Product Based Tools
Environmental Management System (EMS) Environmental Performance Evaluation Environmental Audits Environmental Reporting and Communication Total Cost Accounting Law and Policy Trade and Environment Environmental Economics	Environmental Technology Assessment Toxic Use Reduction Best Operating Practices Environmentally Best Practice Best Available Technology (BAT) Waste Minimization Pollution Prevention Cleaner Production 4-R Concept Cleaner Technology Eco-efficiency	Industrial Ecology Extended Producers Responsibility Eco-labeling Design for Environment Life Cycle Assessment (LCA)

2.3 Tools for Preventive Environmental Management

The tools for preventive environmental management can be broadly classified into following three groups.

- Tools for assessment and analysis - risk assessment, life cycle assessment, total cost assessment, environmental audit / statement, environmental benchmarking, environmental indicators
- Tools for action - environmental policy, market based economic instruments, innovative funding mechanism, EMS and ISO certification, total environmental quality movement, eco-labeling, cleaner production, eco-efficiency, industrial ecosystem or metabolism, voluntary agreements
- Tools for communication - state of environment, corporate environmental reporting

Specific tools under each group are discussed precisely in next sections.

2.3.1 Tools for assessment and analysis

2.3.1.1 Risk assessment

Risk is associated with the frequency of failure and consequence effect. Predicting such situations and evaluation of risk is essential to take appropriate preventive measures. The major concern of the assessment is to identify the activities falling in a matrix of high & low frequencies at which the failures occur and the degree of its impact. The high frequency, low impact activities can be managed by regular maintenance *i.e*,. LDAR (Leak detection and repair) programmes. Whereas, the low frequency, high impact activities (accidents) are of major concern in terms of risk assessment. As the frequency is low, often the required precautions are not realized or maintained. However, the risk assessment identifies the areas of major concerns, which require additional preventive measures; likely consequence distances considering domino effects, which will give the possible casualties and ecological loss in case of accidents. These magnitudes demand the attention for preventive and disaster management plans (DMP). Thus is an essential tool to ensure safety of operations.

2.3.1.2 Life cycle assessment

A broader approach followed to deal with environmental impacts during manufacturing is called LCA. This approach recognizes that environmental concerns are associated with every step of the processing w.r.t. manufacturing of products and also examines environmental impacts of the product at all stages of project life cycle. LCA includes the product design, development, manufacturing, packaging, distribution, usage and disposal. LCA is concerned with reducing environmental impacts at all stages and considering the total picture rather than just one stage of production process.

Industries/Firms may apply this concept to minimize costs incurred on the environmental conservation throughout the project life cycle.

2.3.1.3 Total cost assessment

Total Cost Assessment (TCA) is an enhanced financial analysis tool that is used to assess the profitability of alternative courses of action ex. raw material substitution to reduce the costs of managing the wastes generated by process; an energy retrofit to reduce the costs of energy consumption. This is particularly relevant for pollution prevention options. These options because of their nature, often produce financial savings that are overlooked in conventional financial analysis, either because they are misallocated, uncertain, hard to quantify, or occur more than three to five years after the initial investment. TCA includes all relevant costs and savings associated with an option so that it can compete for scarce capital resources fairly, on a level playing field. The assessments are often beneficial w.r.t the following:

- Identification of costly resource inefficiencies
- Financial analysis of environmental activities/projects such as investment in cleaner technologies
- Prioritization of environmental activities/projects
- Evaluation of product mix and product pricing
- Bench marking against the performance of other processes or against the competitors

A comparison of cost assessments is given below:

- Conventional cost accounting (CCA): Direct and indirect financial costs+ Recognized contingent costs
- Total Cost Assessment (TCA): A broader range of direct, indirect, contingent and less quantifiable costs
- Full Cost assessment (FCA): TCA + External social costs borne by society

2.3.1.4 Environmental audit/statement

Key objectives of an environmental audit include compliance verification, problem identification, environmental impact measurement, environmental performance measurement, conforming effectiveness of EMS, providing a database for corrective actions and future actions, developing company's environmental strategy, communication and formulating environmental policy.

The MoEF, Government of India (GoI) issued Notification on '*Environmental Statements*' (ES) in April, 1992 and further amended in April 1993 – As per the Notification, the industries are required to submit environmental statements to the respective State Pollution Control Boards (SPCBs). ES is a pro-active tool for self-examination of the industry to reduce/minimize pollution by adopting process modifications, recycling and reusing of the resources. The regular submission of ES will indicate the systematic improvement in environmental pollution control being achieved by the industry. In other way, specific points in ES may be used as environmental performance indicators for relative comparison, implementation and to promote better practices.

2.3.1.5 Environmental benchmarking

Environmental performance and operational indicators could be used to navigate, manage and communicate significant aspects and give enough evidence of good environmental house keeping. Besides the existing prescribed standards, an insight to identify the performance indicators and prescribing schedule for systematic improvement in performance of these indicators will yield better results.

Relative indicators may be identified for different industrial sectors and be integrated in companies and organizations to monitor and manage the different environmental aspects of the company, to benchmark and compare two or more companies from the same sector. These could cover water consumption, wastewater generation, energy consumption, solid/hazardous waste generation, chemical consumption *etc*., per tonne of final product. Once these bench marks are developed, the industries which are below them may be guided and enforced to reach them while those which are better than the benchmark may be encouraged further by giving incentives *etc*.

2.3.1.6 Environmental indicators

Indicators can be classified in to environmental performance indicators (EPI) and environmental condition indicators (ECI). The EPIs can be further divided into two categories *i.e.,* operational performance indicators and management performance indicators.

The operational performance indicators are related to the process and other operational activities of the organization. These would typically address the issue of raw material consumption, energy consumption, water consumption in the organization, the quantities of wastewater generated, other solid wastes & emissions generated from the organization *etc*.

Management performance indicators are related to management efforts to influence environmental performance of organizational operations.

The environmental condition indicators provide information about the environment. These indicators provide information about the local, regional, national or global condition of the environment. This information helps an organization to understand the environmental impacts of its activities and thus helps in taking decisions to improve the environmental performance.

Indicators basically used to evaluate environmental performance against the set standards and thus indicate the direction in which to proceed. Selection of type of indicators for a firm or project depends upon its relevance, clarity and realistic cost of collection and its development.

2.3.2 Tools for action

2.3.2.1 Environmental policy

An environmental policy is a statement of an organization's overall aim and principles of action w.r.t the environment, including compliance with all relevant regulatory requirements. It is a key tool in communicating an environmental priorities of the organizations to all its employees. To ensure organization's commitment towards a formulated environmental policy, it is essential for the top management to be involved in the process of formulating the policy and setting priorities. Therefore, the first step is to get the commitment from the higher levels of management. The organization should then conduct an initial environmental review and draft an environmental policy. This draft should be discussed and approved by the board of directors. The approved environmental policy statement should then be communicated internally among all its employees and should also be made available to the public.

2.3.2.2 Market-based economic instruments

Market based instruments are regulations that encourage behavior through market signals rather than through explicit directives regarding pollution control levels. These policy instruments such as tradable permits, pollution charge are often described as harnessing market forces. Market based instruments can be categorized into the following four major categories, which are discussed below:

- **Pollution charge:** Charge system will assess a fee or tax on the amount of pollution a firm or source generates. It is worthwhile for the firm to reduce emissions to the point, where its marginal abatement cost is equal to the tax rate. Thus firms control pollution to different degrees *i.e.* High cost controllers – less; low-cost controllers-more. The charge system encourages the industries to reduce the pollutants further. The collected charges can form a fund for restoration of the environment. Another form of pollution charge is a deposit refund system, where consumers pay a surcharge when purchasing a potentially polluting product, and receive a refund on return of the product after useful life span at appropriate centers. The concept of extended producers' responsibility brought in to avoid accumulation of dangerous products in the environment.

- **Tradable permits:** Under this system, firms that achieve the emission levels below their allotted level may sell the surplus permits. Similarly, the firms, which are required to spend more to attain the required degree of treatment/allotted levels, can purchase permits from others at lower costs and may be benefited.
- **Market barrier reductions:** Three known market barrier reduction types are as follows:
  - Market Creation: Measures that facilitate the voluntary exchange of water rights and thus promote more efficient allocation of scarce water supplies
  - Liability Concerns: Encourage firms to consider potential environmental damages of their decisions
  - Information Programmes: Eco-labeling and energy- efficiency product labeling requirements
- **Government subsidy reduction:** Subsidies are the mirror images of taxes and, in theory, can provide incentive to address environmental problems. However, it has been reported that the subsidies encourage economically inefficient and environmentally unsound practices, and often lead to market distortions due to differences in the area. However, these are important to sustain the expansion of production, in the national interests. In such cases, the subsidy may be comparable to the net social benefit.

2.3.2.3 Innovative funding mechanism

There are many forums under which the fund is made available for the issues which are of global/regional concern (GEF, OECD, Deutch green fund, *etc*.) *i.e.,* climate change, Basal convention and further fund sources are being explored for the Persistent Organic Pollutants Convention. Besides the global funding mechanism, there needs to be localized alternative mechanisms for boosting the investment in environmental pollution control. For example, in India the Government has established mechanism to fund the common effluent treatment plants, which are specifically serving the small and medium scale enterprises *i.e.,* 25% share by the State Government, matching grants from the Central Government and surety for 25% soft loan. It means that the industries need to invest only 25% initially, thus encouraging voluntary compliance.

There are some more options *i.e.,* if the pollution tax/charge is imposed on the residual pollution being caused by the industries, municipalities *etc*., fund will automatically be generated, which in turn, can be utilized for funding the environmental improvement programmes. The emerging concept of build-operate-transfer (BOT) is an encouraging development, where there is a possibility to generate revenue by application of advanced technologies. There are many opportunities which can be explored. However, what is required is the paradigm shift and focused efforts.

2.3.2.4 EMS and ISO certification

EMS is that part of the overall management system which includes an organizational structure, responsibilities, practices, procedures, process and resources for determining and implementing the forms of overall aims, principles of action w.r.t the environment. It encompasses the totality of organizational, administrative and policy provisions to be taken by a firm to control its environmental influences. Common elements of an EMS are the identification of the environmental impacts and legal obligations, the development of a plan for management & improvement, the assignment of the responsibilities and monitoring of the performance.

2.3.2.5 Total environmental quality movement (TEQM)

Quality is regarded as

- A product attribute that had to be set at an acceptable level and balanced against the cost
- Something delivered by technical systems engineered by experts rather than the organization as a whole
- Assured primarily through the findings and correction of mistakes at the end of the production process

One expression of the total environment quality movement (TEQM) is a system of control called Kaizen. The principles of Kaizen are

- Goal must be continuous improvement of quality instead of acceptable quality
- Responsibility of quality shall be shared by all members of an organization
- Efforts should be focused on improving the whole process and design of products

With some modifications, TEQM approach can be applied in improvement of corporate environmental performance in both process and product areas.

2.3.2.6 Eco-labeling

Eco-labeling is the practice of supplying information on the environmental characteristics of a product or service to the general public. These labeling schemes can be grouped into three types:

- Type I: Multiple criteria base; third party (Govt. or non-commercial private organizations) programme claims overall environmental preferability.
- Type II: Specific attribute of a product; often issued by a company/industrial association
- Type III: Agreed set of indices; provide quantified information; self declaration

Among the above, Type I are more reliable because they are established by a third party and consider the environmental impacts of a product from cradle to grave. However, the labeling program will only be effective if linked with complementary program of consumer education and up on restriction of umbrella claims by the producers.

2.3.2.7 Cleaner production

Cleaner production is one of the tools, which has lot of bearing on environmental pollution control. It is also seen that the approach is changing with time *i.e.,* dumping-to-control-to-recycle-to-prevention. Promotion of cleaner production principles involves an insight into the production processes not only to get desired yield but also to optimize on raw material consumption *i.e.,* resource conservation and implications of the waste treatment and disposal.

2.3.2.8 4-R concept

The concept endorses utilization of wastes as by-product to the extent possible *i.e.,* Re-cycle, Recover, Reuse, Recharge. Recycling refers to using wastes/by-products in the process again as a raw material to maximize production. Recovery refers to engineering means such as solvent extraction, distillation, precipitation, *etc*., to separate useful constituents of wastes, so that these recovered materials can be used. Reuse refers to the utilization of waste from one process as a raw material to other. Recharging is an option in which the natural systems are used for renovation of waste for further use.

2.3.2.9 Eco-efficiency

The World Business Council on Sustainable Development (WBCSD) defines eco-efficiency as "the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with earth's carrying capacity". The business implements the eco-efficiency on four levels *i.e.* optimized processes, recycling of wastes, eco-innovation and new services. Fussler (1995) defined six dimensions of eco efficiency, which are given below to understand/examine the system.

- **Mass:** There is an opportunity to significantly reduce mass burdens (raw materials, fuels, utilities consumed during the life cycle)
- **Reduce Energy Use:** The opportunity is to redesign the product or its use to provide significant energy savings
- **Reduce Environmental Toxins:** This is a concern to the environmental quality and human health. The opportunity here is to significantly control the dispersion of toxic elements.
- **Recycle when Practical:** Designing for recyclibility is important
- **Working with Mother Nature:** Materials are borrowed and returned to the nature without negatively affecting the balance of the ecosystem.
- **Make it Last Longer:** It relates to useful life and functions of products. Increasing the functionality of products also increases their eco efficiency.

The competitiveness among the companies and long-term survival will continue and the successful implementation of eco-efficiency will contribute to their success. There is a need to shift towards responsible consumerism equal to the efficiency gains made by corporations – doing more with less.

2.3.2.10 Industrial ecosystem or metabolism

Eco-industrial development is a new paradigm for achieving excellence in business and environmental performance. It opens up innovative new avenues for managing business and conducting economic development by creating linkages among local 'resources', including businesses, non-profit groups, governments, unions, educational institutions, and communities. They can creatively foster dynamic and responsible growth. Antiquated business strategies based on isolated enterprises are no longer responsive enough to market, environmental and community requirements.

Sustainable eco-industrial development looks systematically at development, business and environment, attempting to stretch the boundaries of current practice – on one level. It is as directly practical as making the right connections between the wastes and resources needed for production and at the other level, it is a whole new way of thinking about doing business and interacting with communities. At a most basic level, it is each organization seeking higher performance within itself. However, most eco-industrial activity is moving to a new level by increasing the inter connections between the companies.

Strategic partnership, networked manufacturing and performed supplier arrangements are all the examples of ways used by the businesses to ensure growth, contain costs and to reach out for new opportunities.

For most businesses, the two essentials for success are the responsive markets and access to cost-effective, quality resources for producing products or delivering services. In absence of these two factors, virtually, every other incentive becomes a minor consideration.

Transportation issues are important at two levels, the ability to get goods to market in an expeditious way is essential to success in this day of just in time inventories. The use of least impact transportation with due consideration of speed and cost supports business success and addresses concerned in the community.

Eco-industrial development works because it consciously mixes a range of targeted strategies shaped to the contours of the local community, most importantly, it works because the communities wants nothing less than the best possible in or near their neighborhoods. For companies, it provides a path towards significantly higher operating results and positive market presence. For our environment, it provides great hope that the waste will be transformed in to valued product and that the stewardship will be a joint pledge of both businesses and communities.

2.3.2.11 Voluntary agreements

Voluntary environmental agreements among the industries, government, public representatives, NGOs and other concerned towards attaining certain future demands of the environment are reported to be successful. Such agreements may be used as a tool where Government would like to make the standards stringent in future (phase-wise-stringent). These may be used when conditions are temporary and require timely replacements. Also these may be used as supplementary/ complimentary in implementation of the regulation. The agreements may include:

- Target objectives (emission limit values/standards)
- Performance objectives (operating procedures)
- R&D activities – Government and industry may have agreement to establish better control technologies.
- Monitoring & reporting of the agreement conditions by other agents (NGOs, public participants, civil Authority *etc*.)

In India, the MoEF, has organized such programme, popularly known as the corporate responsibility for environment protection (CREP) considering identified 17 categories of high pollution potential industrial sectors. Publication in this regard is available with Central Pollution Control Board (CPCB).

2.3.3 Tools for communication

2.3.3.1 State of environment

The Government of India has brought out the state of environment report for entire country and similar reports are available for many of the states. These reports are published at regular intervals to record trends and to identify the required interventions at various levels. These reports consider the internationally accepted DPSIR framework for the presentation of the information. DPSIR refers to

- D – Driving forces – causes of concern *i.e.* industries, transportation *etc.*
- P – Pressures – pollutants emanating from driving forces *i.e.* emission
- S – State – quality of environment *i.e.* air, water & soil quality
- I – Impact – Impact on health, ecosystem, materials, biodiversity, economic damage *etc.*
- R – Responses – action for cleaner production, policies (including standards/guidelines), targets *etc.*

Environment reports including the above elements gives a comprehensive picture of specific target area in order to take appropriate measures for improvement. Such reports capture the concerns, which could be considered in EIAs.

2.3.3.2 Corporate environmental reporting

Corporate environmental reports (CERs) are only one form of environmental reporting defined as publicly available, stand alone reports, issued voluntarily by the industries on their environmental activities (Borphy and Starkey-1996). CER is just are a means of environmental improvement and greater accountability, not an end in itself.

Three categories of environmental disclosure are:

- Involuntary Disclosure: Without its permission and against its will (env. Campaign, press *etc.*)
- Mandatory Disclosure: As required by law
- Voluntary Disclosure: The disclosure of information on a voluntary basis

2.4 Objectives of EIA

Objectives of EIA include the following:

- To ensure 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 as well as management opportunities.

2.5 Types of EIA

Environmental assessments could be classified into four types *i.e.* strategic environmental assessment, regional EIA, sectoral EIA and project level EIA. These are precisely discussed below:

Strategic environmental assessment

Strategic Environmental Assessment (SEA) refers to systematic analysis of the environmental effects of development policies, plans, programmes and other proposed strategic actions. SEA represents a proactive approach to integrate environmental considerations into the higher levels of decision-making – beyond the project level, when major alternatives are still open.

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 fulfils 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 minimal. Sectoral EIA will helps in addressing 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.

From the above discussion, it is clear that EIA shall be integrated at all the levels *i.e.* strategic, regional, sectoral and the project level. Whereas, the strategic EIA is a structural change in the way the things are evaluated for decision-making, the regional EIA refers to substantial information processing and drawing complex inferences. The project-level EIA is relatively simple and reaches to meaningful conclusions. Therefore in India, project-level EIA studies take place on a large-scale and are being considered. However, in the re-engineered Notification, provisions have been incorporated for giving a single clearance for the entire IE for *e.g.*, Leather parks, pharma cities *etc*., which is a step towards the regional approach.

As we progress and the resource planning concepts emerge in our decision-making process, the integration of overall regional issues will become part of the impact assessment studies.

2.6 Basic EIA Principles

By integrating the environmental impacts of the development activities and their mitigation early in the project planning cycle, the benefits of EIA could be realized in all stages of a project, from exploration and planning, through construction, operations, decommissioning, and beyond site closure.

A properly-conducted-EIA also lessens conflicts by promoting community participation, informing decision makers, and also helps in laying the base for environmentally sound projects. An EIA should meet at least three core values (EIA Training Resource Manual, UNEP 2002):

- 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 safeguards

Ideally an EIA process should be:

- Purposive- should inform decision makers and result in appropriate levels of environmental protection and community well-being.
- Rigorous- should apply ‘best practicable’ science, employing methodologies and techniques appropriate to address the problems being investigated.
- Practical- should result in providing information and acceptable and implementable solutions for problems faced by proponents.
- Relevant- should provide sufficient, reliable and usable information for development planning and decision making.
- Cost-effective- should impose minimum cost burdens in terms of time and finance on proponents and participants consistent with meeting accepted requirements and objectives of EIA.
- Efficient-. should achieve the objectives of EIA within the limits of available information, time, resources and methodology.
- Focused- should concentrate on significant environmental effects and key issues; *i.e.,* the matters that need to be taken into account in making decisions.
- Adaptive- 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 project life cycle.
- Participative- 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.
- Inter-disciplinary- should ensure that appropriate techniques and experts in relevant bio-physical and socio-economic disciplines are employed, including use of traditional knowledge as relevant.

- Credible- should be carried out with professionalism, rigor, fairness, objectivity, impartiality and balance, and be subject to independent checks and verification.
- Integrated- should address the interrelationships of social, economic and biophysical aspects.
- Transparent- 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- 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.

2.7 Project Cycle

The generic project cycle including that of the Industrial Estates has six main stages:

1. Project concept
2. Pre-feasibility
3. Feasibility
4. Design and engineering
5. Implementation
6. Monitoring and evaluation

It is important to consider the environmental factors on an equal basis with technical and economic factors throughout the project planning, assessment and implementation phases. Environmental considerations should be introduced at the earliest in the project cycle and must be an integral part of the project pre-feasibility and feasibility stage. If the EIA environmental considerations are given due respect in the site selection process by the project proponent, the subsequent stages of the environmental clearance process would get simplified and would also facilitate easy compliance to the mitigation measures throughout the project life cycle.

A project's feasibility study should include a detailed assessment of significant impacts and the EIA include a detailed prediction and quantification of impacts and delineation of Environmental Management Plan (EMP). Findings of the EIA study should preferably be incorporated in the project design stage so that the project is studied, the site alternatives are required and necessary changes, if required, are incorporated in the project sight at the design stage. This practice will also help the management in assessing the negative impacts and in designing cost-effective remedial measures. In general, EIA enhances the project quality and improves the project planning process.

2.8 Environmental Impacts

Environmental impacts resulting from proposed actions can be grouped into following categories:

- Beneficial or detrimental
- Naturally reversible or irreversible
- Repairable via management practices or irreparable
- Short term or long term

- Temporary or continuous
- Occurring during construction phase or operational phase
- Local, regional, national or global
- Accidental or planned (recognized before hand)
- Direct (primary) or Indirect (secondary)
- Cumulative or single

The category of impact as stated above, and the significance will facilitate the Expert Appraisal Committee (EAC)/State Level EAC (SEAC) to take a look at the ToR for EIA studies, as well as, in decision making process about the developmental activity.

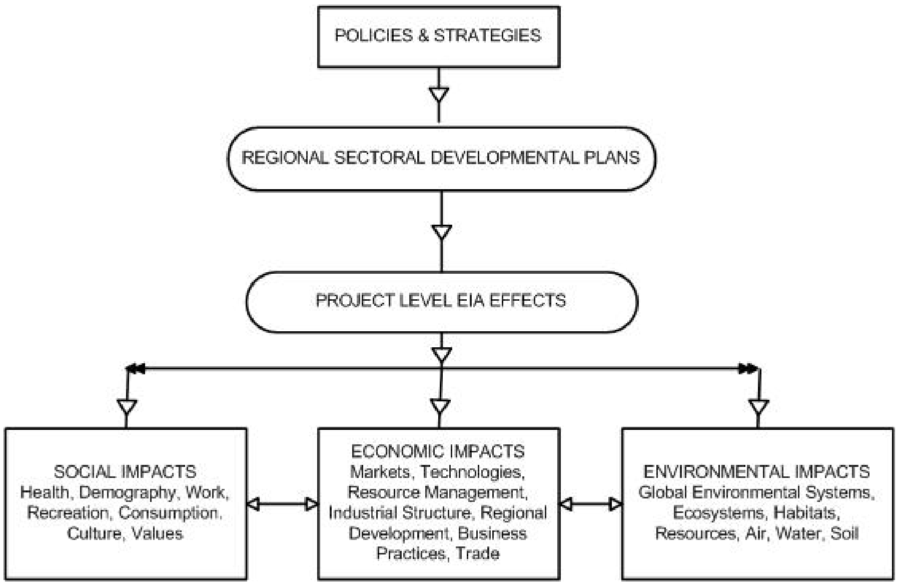


Figure 2-2: Types of Impacts

The nature of impacts could fall within three broad classifications *i.e.,* direct, indirect and cumulative, based on the characteristics of impacts. The assessment of direct, indirect and cumulative impacts should not be considered in isolation or considered as separate stages in the EIA. Ideally, the assessment of such impacts should form an integral part of all stages of the EIA. The TGM does not recommend a single method to assess the types of impacts, but suggests a practical framework/ approach that can be adapted and combined to suit a particular project and the nature of impacts.

2.8.1 Direct impacts

Direct impacts occur through direct interaction of an activity with an environmental, social, or economic component. For example, a discharge of industrial estate or an effluent from the Effluent Treatment Plant (ETP) into a river may lead to a decline in water quality in terms of high biochemical oxygen demand (BOD) or dissolved oxygen (DO) or rise of water toxins.

2.8.2 Indirect impacts

Indirect impacts on the environment are those which are not a direct result of the project, often produced away from or as a result of a complex impact pathway. The indirect impacts are also known as secondary or even tertiary level impacts. For example, secondary indirect impacts may also affect on aquatic flora in that water body and may further cause reduction in fish population. Reduction in fishing harvests, affecting the incomes of fishermen is a third level impact. Such impacts are characterized as socio-economic (third level) impacts. The indirect impacts may also include growth-inducing impacts and other effects related to induced changes to the pattern of land use or additional road network, population density or growth rate. In the process, air, water and other natural systems including the ecosystem may also be affected.

2.8.3 Cumulative impacts

Cumulative impact consists of an impact that is created as a result of the combination of the project evaluated in the EIA together with other projects in the same vicinity, causing related impacts. These impacts occur when the incremental impact of the project is combined with the cumulative effects of other past, present and reasonably foreseeable future projects. Figure 2-3 depicts the same. Respective EAC may exercise their discretion on a case-by-case basis for considering the cumulative impacts.

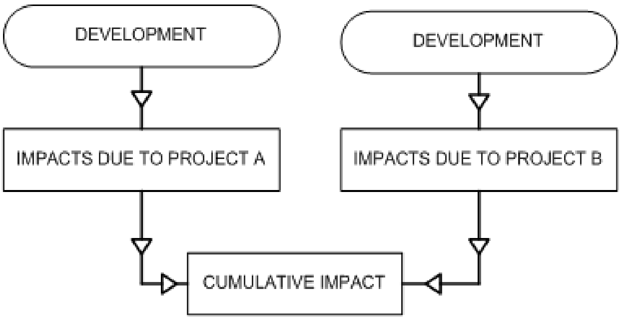


Figure 2-3: Cumulative Impact

2.8.4 Induced impact

The cumulative impacts can be due to induced actions of projects and activities that may occur if the action under assessment is implemented such as growth-inducing impacts and other effects related to induced changes to the pattern of future land use or additional road network, population density or growth rate (*e.g.*, excess growth may be induced in the zone of influence around a industrial estate, and in the process causing additional effects on air, water and other natural ecosystems). Induced actions may not be officially announced or be part of any official plan. Increase in workforce and nearby communities contributes to this effect.

They usually have no direct relationship with the action under assessment, and represent the growth-inducing potential of an action. New roads leading from those constructed for a project, increased recreational activities (*e.g.*, hunting, fishing), and construction of new service facilities are examples of induced actions.

However, the cumulative impacts due to induced development or third level or even secondary indirect impacts are difficult to be quantified. Because of higher levels of uncertainties, these impacts cannot normally be assessed over a long time horizon. An EIA practitioner usually can only guess as to what such induced impacts may be and the possible extent of their implications on the environmental factors. Respective EAC may exercise their discretion on a case-by-case basis for considering the induced impacts.

2.9 Significance of Impacts

This TGM establishes the significance of impacts first and proceeds to delineate the associated mitigation measures. So the significance here reflects the "worst-case scenario" before mitigation is applied, and therefore provides an understanding of what may happen if mitigation fails or is not as effective as predicted. For establishing significance of different impacts, understanding the responses and interaction of the environmental system is essential. Hence, the impact interactions and pathways are to be understood and established first. Such an understanding will help in the assessment process to quantify the impact as accurately as possible. Complex interactions, particularly in the case of certain indirect or cumulative impacts, may give rise to non-linear responses which are often difficult to understand and therefore their significance is difficult to assess. It is hence understood that indirect or cumulative impacts are more complex than the direct impacts. Currently the impact assessments are limited to direct impacts. In case mitigation measures are delineated before determining significance of the effect, the significance represents the residual effects.

However, the ultimate objective of an EIA is to achieve sustainable development. The development process shall invariably cause some residual impacts even after implementing an EMP effectively. Environmentalists today are faced with a vital, not-easy-to-answer question—"What is the tolerable level of environmental impact within the sustainable development framework?". As such, it has been recognized that every ecosystem has a threshold for absorbing deterioration and a certain capacity for self-regeneration. These thresholds based on concept of carrying capacity are as follows:

- Waste emissions from a project should be within the assimilative capacity of the local environment to absorb without unacceptable degradation of its future waste absorptive capacity or other important services.
- Harvest rates of renewable resource inputs should be within the regenerative capacity of the natural system that generates them; depletion rates of non-renewable inputs should be equal to the rate at which renewable substitutes are developed by human invention and investment.

The aim of this model is to curb over-consumption and unacceptable environmental degradation. But because of limitation in available scientific basis, this definition provides only general guidelines for determining the sustainable use of inputs and outputs. To establish, the level of significance for each identified impact, a three-stage analysis may be referred:

- First, an impact is qualified as being either negative or positive.
- Second, the nature of impacts such as direct, indirect, or cumulative is determined using the impact network
- Third, a scale is used to determine the severity of the effect; for example, an impact is of low, medium, or high significance.

It is not sufficient to simply state the significance of the effect. This determination must be justified, coherent and documented, notably by a determination methodology, which must be described in the methodology section of the report. There are many recognized methodologies to determine the significance of effects.

2.9.1 Criteria/methodology to determine the significance of the identified impacts

The criteria can be determined by answering some questions regarding the factors affecting the significance. This will help the EIA stake-holders, the practitioner in particular, to determine the significance of the identified impacts eventually. Typical examples of such factors include the following:

- Exceedance of a Threshold: Significance may increase if a threshold is exceeded. *e.g.*, Emissions of PM10 exceed the permissible threshold.
- Effectiveness of Mitigation: Significance may increase as the effectiveness of mitigation measures decreases. *e.g.*, control technologies, which may not assure consistent compliance to the requirements.
- Size of Study Area: Significance may increase as the zone of effects increases.
- Incremental Contribution of Effects from Action Under Review: Significance may increase as the relative contribution of an action increases.
- Relative Contribution of Effects of Other Actions: Significance may decrease as the significance of nearby larger actions increase.
- Relative Rarity of Species: Significance may increase as species becomes increasingly rare or threatened.
- Significance of Local Effects: Significance may increase as the significance of local effects is high.
- Magnitude of Change Relative to Natural Background Variability: Significance may decrease if effects are within natural assimilative capacity or variability.
- Creation of Induced Actions: Significance may increase as induced activities also highly significant.
- Degree of Existing Disturbance: Significance may increase if the surrounding environment is pristine:

For determining significance of impacts, it is important to remember that secondary and higher order effects can also occur as a result of a primary interaction between a project activity and the local environment. Wherever a primary effect is identified, the practitioner should always think if secondary or tertiary effects on other aspects of the environment could also arise.

The EIA should also consider the effects that could arise from the project due to induced developments, which take place as a consequence of the project. Ex. Population density and associated infrastructure and jobs for people attracted to the area by the project. It also requires consideration of cumulative effects that could arise from a combination of the effects due to other projects with those of other existing or planned developments in the surrounding area. So the necessity to formulate a qualitative checklist is suggested to test significance, in general.

3. ABOUT INDUSTRIAL ESTATES INCLUDING BEST PRACTICES AND POLLUTION CONTROL TECHNOLOGIES

3.1 Introduction

Industrial Estate (IE) Programme in India started in 1952 with the establishment of first estate at Hadapsar in Maharashtra. The main objective of the programme is to encourage and support the creation, expansion and modernization of small-scale industries (SSI) through the provision of factory accommodation, common service facilities and assistance and servicing through all stages of establishment and operation as well as developing sub-contracting relationships within the small-scale, large-scale industries and specialized manufacturing activities.

Subsequently, the programme has also assumed the role of regional development through provision of built-in factory accommodation with the requisite facilities and services in semi-urban, rural and backward areas.

For the purpose of EIA Notification, all the industrial estates/parks/complexes/area, Export Processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes will be treated at par as 'Industrial Estates'.

3.1.1 IE planning approach in India

The Ministry of Industry at both central and state level is responsible for industrial planning and development. The role of the Central Government in the establishment of IEs in India has been mainly that of laying down the guidelines for the State Governments, coordination, review and monitoring of the IE development programmes. In addition, sector-specific ministries for steel, petroleum, chemicals, textiles, mines, *etc*., were established in order to diversify and relegate policy and planning processes. The Commerce & Industries department at the State government level is responsible for establishment of industrial growth centers, IE and EPZs. The department also makes decisions regarding the license grants, land, power, finance and all related concessions. For the establishment of IEs the selection of sites for their location, development of the industrial areas, and provision of requisite infrastructural facilities lie within the jurisdiction of the State Government. In addition, states also have State Industrial Development Corporations (SIDCs), which create quality infrastructure, modernize existing infrastructure and develop partnerships with industry. It offers attractive fiscal incentives and invites private investments in infrastructure thrust sectors. The main purposes of developing these SIDCs are:

- to check the scattered growth of the industrial activity
- to encourage the industrial growth within geographical locations centrally linked by transport, communication, water and power supply
- to confine the industrial activities in restricted areas in order to ensure the industrial growth in an environmental-friendly manner

- to provide help to delimit social hazards caused by the industrial groups

The existing linkages between various agencies for planning and establishment of IE are highlighted in the following Figure 3-1.

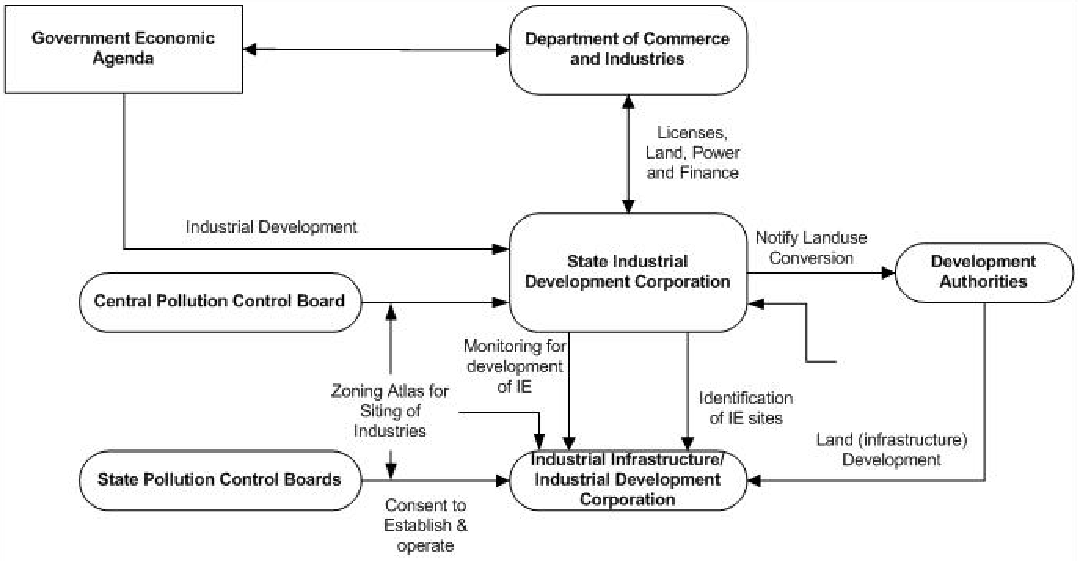


Figure 3-1: IE Planning Approach in India

Central pollution control board (CPCB)

CPCB's Zoning Atlas for siting of industries program aims to support and simplify decision-making process on siting of industries based on environmental considerations. This is an attempt to identify suitable areas district-wise for planned industrial development in various states. Using the Zoning Atlas, can identify environmentally sound sites for setting up an IE. These sites can be reviewed from economic considerations such as the availability of raw materials, transportation network, water supply, electricity, waste disposal facilities, *etc*., to identify the probable sites for which detailed micro-level investigations can be carried out to select the final sites (GIS Institute, 2002).

State industrial development corporation (SIDC)

SIDC identifies the potential sites for industrial development. The industrial sites are selected mainly on the basis of socio-economic considerations in accordance with the regional/state master plan. SIDCs approach the development authorities for Notification of the proposed sites for land use conversion. SIDC also monitors the development of IEs within the stipulated timeframe in order to prevent artificial escalation in land prices.

Development authorities (DA)

The DA plans the physical and infrastructural development of an IE. In many regions instead of the SIDCs, DA identifies the sites as well. The DA also notifies the landuse conversion once the site is selected. There are other institutions and government agencies that have started addressing various aspects of IE planning, but the attempts are in isolation.

The initiatives to be taken by the concerned agencies at each stage are elaborated below:

- **Identification of Site:** In addition to assessment of availability of raw materials, infrastructure and the market potential, SIDCs and DA with inputs from the pollution control boards (PCBs) assess the environmental risks to the exposed population and the natural surroundings in terms of impacts on air, water and land. EIA studies will identify the potential impacts associated with the site, in order to choose the most appropriate site.
- **Planning and Establishment:** The SIDCs and DA will identify the alternative sites and control the landuse in the region and within industrial complexes. Detailed master plan for the IE may be prepared indicating the phases of development and also in defining the landuse pattern for the surrounding buffer zone. This would ensure controlled development in future.
- **Operation and Maintenance (O&M):** In order to ensure efficient and eco-friendly O&M of the IE, the Industry Associations may take the overall responsibility for the management of IE. The Industry Associations may accordingly be empowered to take action against individual erring facilities. By virtue of this, these associations would be in a position to promote adoption of cleaner technologies more effectively.

3.1.2 Concept of managed/serviced work space (Industrial estates/parks/complexes/areas, EPZs, SEZs, biotech parks, leather complexes)

An IE can be defined as a tract of land developed and sub-divided into plots according to a comprehensive plan with provision for roads, transport and public utilities with or without built-up (advance) factories, sometimes with common facilities and sometimes without them, for the use of a group of industrialists.

The comprehensive plan here refers not only to the physical planning of the estate, but also to its immediate economic and social environment, and the role assigned to it in the regional or urban development plan. The common facilities mentioned may be needed to improve the productivity of tenant enterprises, to provide technical and non-technical services to clients, or to upgrade the social infrastructure and amenities in the area. While selecting and developing an IE, state/regional/urban/local level requirements are to be considered.

3.1.3 Advantages of IE

The following are some of the identified advantages of an IE.

- Firms benefit from economies of scale in terms of land development, construction, and common facilities.
- IEs offer managed/serviced workspace: workshops (or plots on which to build these) with collective access to utilities, roads and telecommunications. Other common facilities, which may be available include waste collection and effluent treatment; tool rooms; testing, quality control and heat treatment; and security services.
- Some IEs have technical libraries, recreation areas and housing for workers. Such facilities are particularly effective if firms are engaged in similar activities; IEs, however, usually have a mixture of industries.
- Close proximity may encourage cooperation among firms in an IE.

- IEs may not be necessarily used on a permanent basis. They may also serve as an incubator or nursery, a temporary start-up facility for new firms.
- The provision of common facilities, including centralized/common effluent treatment, pollution prevention and energy conservation measures, can be of particular value to small and medium scale enterprises (SMEs), which often cannot afford these on an individual basis. This is one way in which the IEs can make a contribution to equitable and sustainable development.
- Well-planned and equipped IEs stimulate the relocation of industries to peri-urban or rural areas, helping to relieve congestion and pollution in metropolitan areas, to strengthen the industrial base of small and medium-size towns and arrest rural-urban migration.
- Well-planned IE helps in reduction of commuter traffic, increased efficiency of urban landuse, and reduced costs of land development and the provision of utilities, *etc*.

3.1.4 The developmental context

The issue of regional and local development has become increasingly important in recent years. With the administrative decentralization, the focus of public-sector efforts to stimulate development has shifted to the local level and competition among localities has acquired a global character. As the traditional rural occupations no longer provide an adequate living, the better-educated rural youth is moving out to the urban areas leading to social disarray and congestion in metropolitan areas. IEs can be instrumental for the local authorities and business associations to tackle the above mentioned issues and stimulate local development, if they are part of an overall development strategy. However, the local regulations and legislations that have a specific impact on the IEs (planning, environmental protection, land ownership) need to be transparent and consistent in order to support the development.

Contributions of IEs to economic and industrial development

IEs serve:

- To accelerate industrialization of the country
- To increase national and local employment
- To achieve a more balanced regional distribution of employment, production and consequent balanced regional growth
- To attract private investment both national and international
- To promote the development of small domestic-owned industries
- To bring industries and industrial employment to rural areas
- To induce structural changes in production and employment; especially diversification
- To encourage more effective use of resources through the development of large-scale industrial complexes, including diversified industries of all sizes, centered on major projects such as ports, airports, railroad and highway junctions, power plants, oil refineries, steel mills and chemical plants
- To improve product quality and increase productivity
- To train labour and increase its productivity

- To achieve economies in investment in public infrastructure
- To reduce the cost of capital investment to the industrialist
- To eliminate delays for the industrialist in obtaining a suitable site utilities and buildings

Contributions of IEs to urban and regional development

As part of urban and regional planning IEs serve:

- To promote decentralization by preventing or checking excessive concentration in or growth of single urban area especially large metropolitan areas.
- To increase the economic productive and employment base of urban communities.
- To regulate the inflow of industry and to guide its orderly location on the most suitable land within the metropolitan area.
- To strengthen the economic base of small and medium-sized towns
- To provide a healthier and more attractive urban environment by separating non-industrial and industrial areas
- To minimise distance to work and to reduce load on the transport system
- To maximise efficient land usage and reduce the cost of land and land development
- To integrate urban marginal population into the productive industrial system
- To provide sites to relocate industries displaced by urban renewal projects
- To achieve economies in the provision of urban services and utilities

3.1.5 Types of IE

An IE may be classified according to the sponsorship, location, or function it performs. The sub-divisions of the category are not mutually exclusive and estate may be intended to fulfill more than one function. The broad basis for classification includes:

- Location
- Industrial activity
- Motivation
- Sponsorship or ownership
- Promotional aspects

Various types of IEs are illustrated in Figure 3-2 and are discussed in **Annexure I**. This classification may also help the proponent in selecting the IE type during the pre-project surveys.

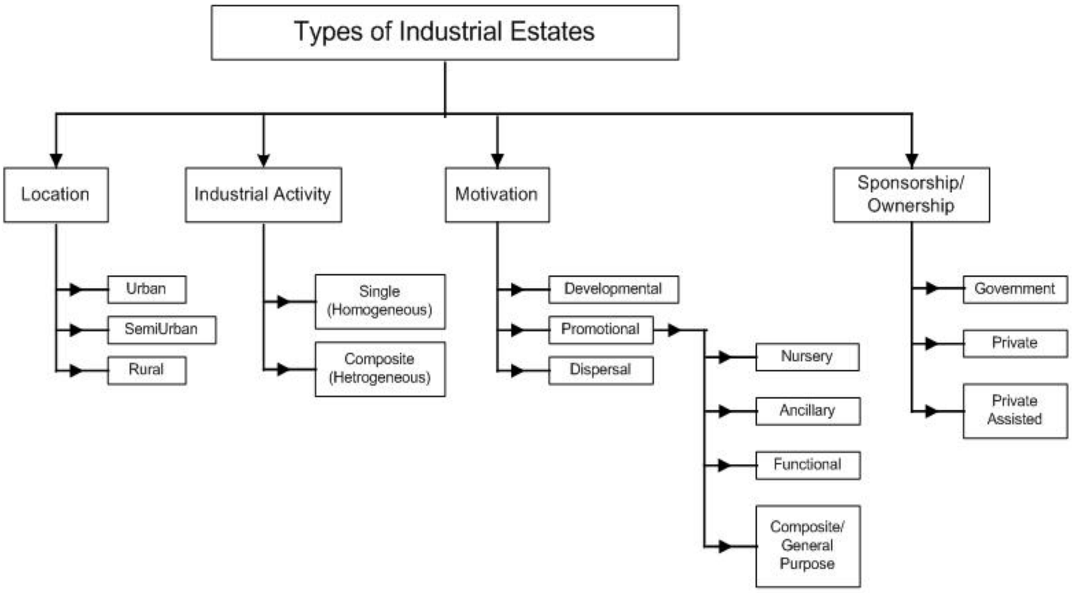


Figure 3-2: Various Types of IE

3.1.6 Various forms of IE

IE are referred in various forms in India, and include the following:

- Industrial areas
- Industrial zones
- Growth centers
- Export processing zones (EPZs)
- Special economic zones (SEZs)
- Science & Technology Parks (Biotechnology and Leather Parks)
- Petroleum, chemical & petrochemical investment regions

Each form of IE is discussed with reference to its functions and intended purposes in **Annexure II**.

India's first EPZ was established in Kandla in 1965. As EPZs did not succeed as expected, it was envisaged to convert the existing EPZs to SEZs. Various forms of EPZ explaining the parameters such as physical characteristics, economic objectives, duty free goods allowed, typical activities, incentives offered, *etc* are provided in **Annexure II**. The difference between the Export Oriented Units and SEZs are explained in **Annexure III**.

SEZs are governed exclusively by SEZ Acts and Notifications (SEZ Act 2005 and SEZ Rules 2006).

Petroleum, Chemical and Petrochemical Investment Regions, a type of Homogeneous IE, are the recently developed context of IEs, mainly concentrating on petroleum-based industries.

3.1.7 Characteristics / Components of IEs

Types of IE accommodation

The accommodation, if any, provided by the IE sponsors depend to a great extent on what they hope to achieve. There are five variations:

- Custom-built factories are provided throughout, usually for a selected range of industries based on locally arising materials
- Standard and custom-built factories are erected, the latter to attract some special industries
- Standard factories of various sizes are provided throughout. This is the usual pattern adopted for IEs intended to stimulate small-scale industry
- The IE provides fully developed plots and a number of standard factories. IEs intended to accommodate large and small-scale establishments are of this type
- Only fully developed plots are provided. The lessee of a plot builds his own premises in accordance with the IE building regulations. This has the great advantage of minimising the sponsors' investment and allowing the development to be most accurately phased to meet the demand for accommodation.

Common production facilities

Common production facilities may be considered as falling into two categories:

- Separate units to provide special services to estate tenants
- Equipment provided for use by estate tenants

The reasons for providing these facilities are:

- To improve the quantity, or reduce the cost, of the production of a group of entrepreneurs by making available the equipment that would be too expensive for the resources, and be underutilized by, anyone of them
- To conserve the capital of the small-scale industrialist

The first category might include a foundry, tool-and-dye, electroplating, machine or carpentry shop, or a quality-control laboratory. They should be available if the facilities they can provide are required in economic quantities and are not available from commercial undertakings in or near the IE. Often, the number of IE tenants is not sufficient for the service to be economical, and therefore they usually undertake work for outside customers as well. Common facilities may also be used to train or to upgrade the skill of workers. In such a case a loss on the operations may be acceptable, but it should not be charged to the IE administration.

As with other services, common facilities should not be provided in absence of accurate information on the tenants' needs.

The second category consists of machines and machine tools to enable the entrepreneur to improve the quality and quantity of output, or to eliminate operations previously carried out by hand. They should not be tools or machines that are a basic prerequisite to the industrial activity in question. The tools may be fixed or portable. For example, every joinery shop, except perhaps one at handicraft level, has an overhand planner, but very few of the small-scale units have the equipment to sharpen the cutters. Blunt tools result in lower production and unsatisfactory work, but a cutter grinder is expensive, and only in a large establishment could it be used to full capacity. Arrangements sometimes are made for tenants to hire portable tools - electric drills, compressors, pneumatic tools, lifting gear and the like - from the IE administration. Small-scale entrepreneurs find this facility particularly valuable.

Common service facilities

Common service facilities and the amenities found in an IE are listed below. Each is discussed in **Annexure IV**.

- Fire protection
- Security
- Collection and disposal of waste
- Medical care
- Common temporary storage for hazardous waste
- Bank, post office, *etc*
- Weighbridge
- Exhibition halls
- Repair workshops
- Green belt/cover
- Stormwater, *etc*.

Some are essential in all IEs while others may be desirable. Few others in the list are necessary only in special circumstances. Sometimes training, technical, managerial and advisory services are included under this category.

Amenities

- A communal canteen is a common feature in an IE. The premises are provided by the IE administration and the catering by a contractor. There is no need to provide shops on an IE; very few, if any, IEs have them.
- A crèche is necessary if a large number of women with small children are employed. A children's playground should not be built within an IE. The place for it is in the housing area, if any, near the IE.
- A bus terminal in the usual sense of the term is not necessary. All that may be required is a paved area for four or five buses in a position that does not obstruct the IE traffic. Whether even that is necessary depends on the public transport arrangements. If a service passes the entrance to the IE, the matter can be left to the transport Authority.
- A meeting hall may be desirable, but it is hardly a necessity for very small estates.
- A few IEs have technical libraries. Probably their most important function is to make available the trade journals. Even if a formal library is not envisaged, space should be reserved in the administration building for the filing, display and perusal of technical periodicals.
- The most important amenity that can be provided by an estate administration is the workers' housing. Unless an IE is within six or seven km of an urban or dormitory area, it may be necessary to build accommodation for the labour. If a housing scheme for IE workers is envisaged, it is not sufficient to provide just the dwellings. Stores,

schools, recreational and religious facilities are also required. It is important that the accommodation is made available within the affordable price range for the workers, and that if the premises are not let in for rent, there should be hire-purchase arrangements. Above all, the housing must be reserved for IE workers.

3.2 IE Site Identification, Planning, Development and Management

The economic development in developing countries is essentially through IE, where many of these SMEs are gathered together. The regional agglomeration of SMEs in IE facilitates in providing a good opportunity for Eco-Industrial Networks. The objective of integrated approach towards development of ecologically sustainable IE should be to minimise the risks during the following critical stages of establishment and management:

- Site identification
- Planning
- Development and
- Management

Each stage-specific activity is illustrated in Figure 3-3.

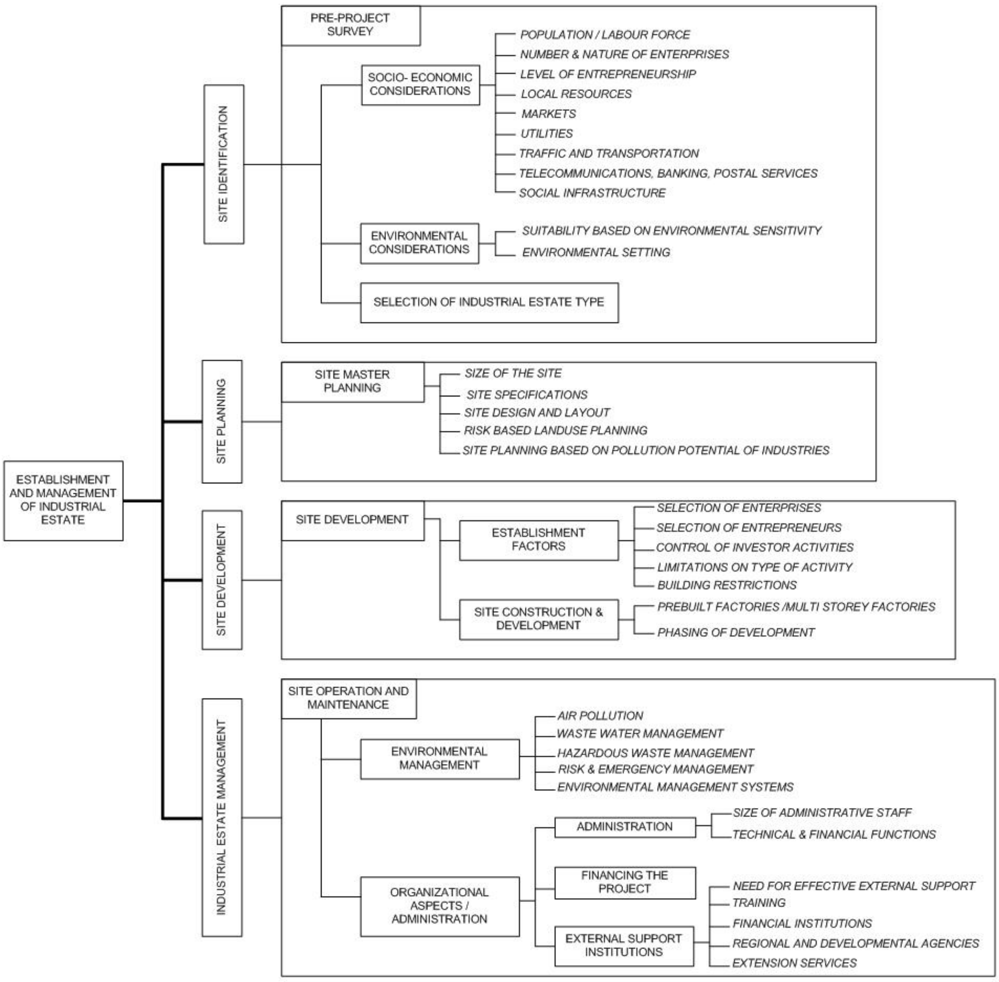


Figure 3-3: Stages in IE Establishment and Management

The various tools and techniques that can be used for the IE Planning are illustrated in Figure 3-4.

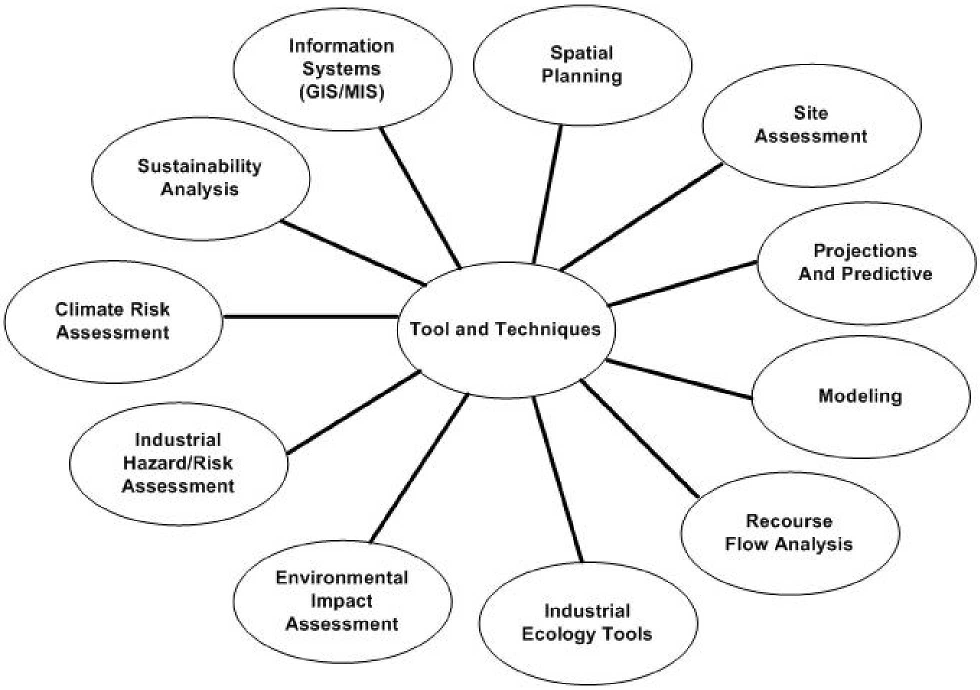


Figure 3-4: Tools and Techniques for IE Planning

3.2.1 Steps involved in identification of site

The overall objective of IE planning is to identify sites for IEs and plan industrial development in compatibility with the surrounding landuses in a sustainable manner. The various steps involved in the identification of a suitable site for IE include:

- Identification of a search area where suitable sites for developing IEs for polluting industries might be found
- Detailing environmental sensitivity of the search area and its surroundings;
- Avoiding areas which are attached with the sensitivity (please refer **Annexure V**)
- Assessing the siting potential of the search areas by identifying suitable sties for IEs (so called "candidate sites")
- Identification of types of industries that can be allowed in these IEs after assessing the pollution risks from those industries and the environmental impact risks by predicting the amount and spatial extent of adverse impacts
- Recommending necessary effluent treatment, waste disposal facilities and other commonly needed abatement infrastructure used by all industries of the IE
- Providing appropriate buffer zones around the IEs
- Recommending landuse controls around the IEs for controlling and minimising adverse environmental impacts; and
- Identifying the social impacts of developing an IE at an identified site and recommend methods of mitigation or compensation, if needed

3.2.1.1 Site analysis

Identification of suitable site for IE is based on various considerations. Approach for assessment of site suitability of identified candidate sites is shown in Figure 3-5 below.

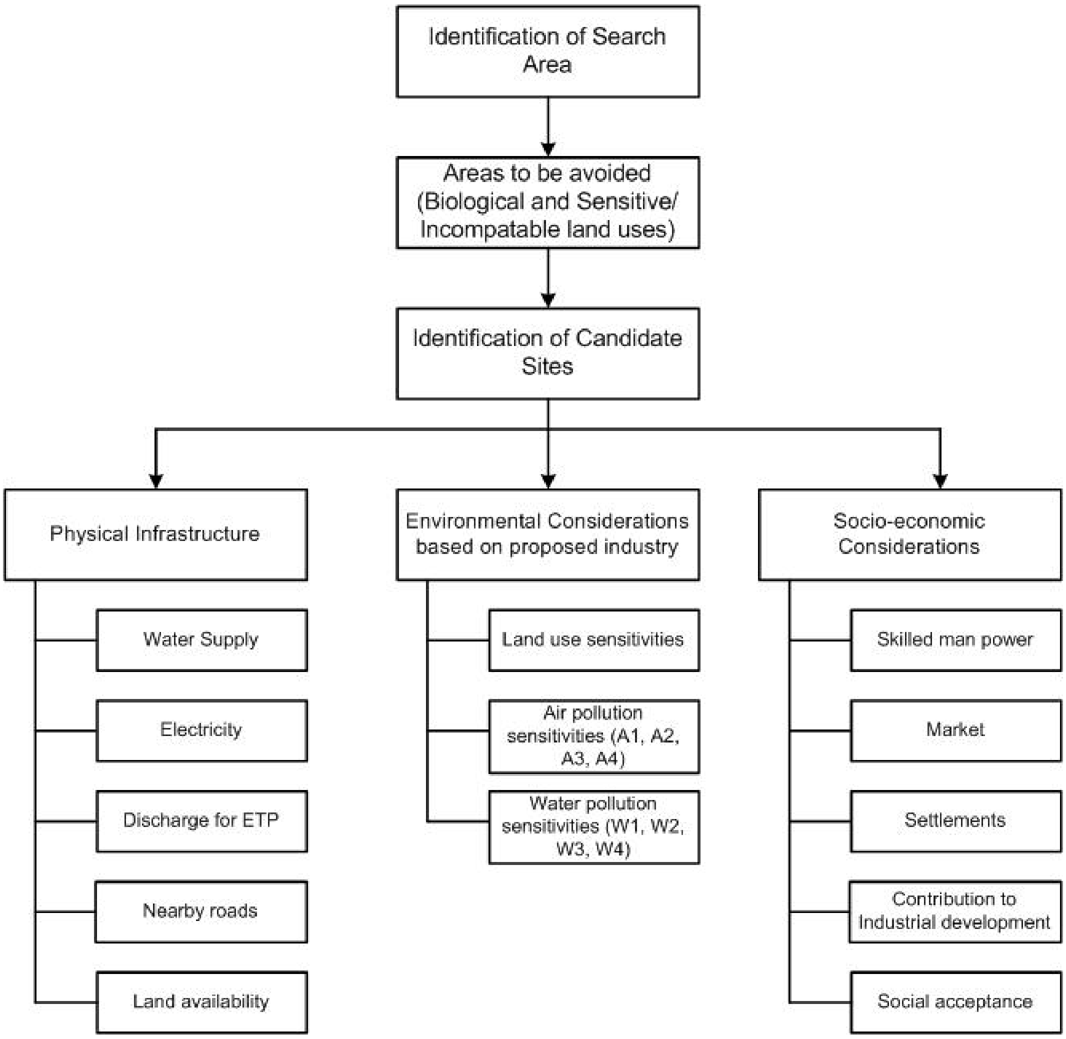


Figure 3-5: Site Suitability Approach for Candidate Sites

The guidance for identification of suitable sites and industries are given in **Annexure V**.

3.2.2 Site planning and development

Site planning within the IE demands a holistic approach for its sustainability, which includes the effective components of spatial planning, infrastructure planning, risk based planning and environmental management tools, resource utilization and management, and social infrastructure planning, *etc*. The master site plan for the IEs shall include the following important aspects.

- Long-term vision with focus on international competitiveness
- Focus on integrated infrastructure with emphasis on environmental management utilities
- Optimal utilization of available land
- Conservation of important natural features

- Optimal use of natural resources
- Explore synergies of co-existence
- Use of renewable energy sources
- Energy conservation measures
- Traffic management including public transport
- Disaster management
- Inclusion of social infrastructure like housing and allied requirements
- Integration of operation and management aspects

3.2.2.1 Site Master Planning

The development costs and the construction of an IE are heavily influenced by:

- size of the site
- shape of the site
- its load-bearing capacity
- location of the site in relation to physical services

Another very important consideration is the potential demand for space over time, together with details of the type of demand, the type of industry which may be expected, the plot sizes likely to be demanded, the standard of design and layout, factory density, and an estimate of the required support facilities. Are investors likely to seek pre-built factory buildings or plots on which they can build their own? Should the estate cater for different types of industry? Demand for water, sewerage, electricity and telecommunications varies considerably with activities, and some estimate of the need for these services is required for the physical planning process.

Proper phasing of development in line with demand is a very important consideration in an IE programme. Changing economic conditions may require that the IE be expanded beyond the site originally reserved for development. Holding extra land in reserve is one solution, but will involve additional expenditure unless the land can be used for agricultural purposes.

A. Size of the site

Large sites can create congestion and transportation problems, and may be an obstacle to decentralized development, if this is a policy priority. Smaller sites can be disproportionally expensive to develop, although there are some very successful public and private sector IEs specifically due to the presence of comparatively high value-added activities requiring limited amounts of space.

B. Site specifications

The ideal site for an IE for light and medium industry should have:

- A gentle slope for drainage
- Good ground bearing conditions for foundations
- Good access by main road to the city, port, and airport
- An adequate water supply
- Reliable electricity supply and telecommunications facilities
- Adequate storm water drainage network

- Facilities for treating industrial effluent and a means of disposing of the effluent after treatment. A satisfactory method of disposing of solid waste is also needed.

C. Site design and layout

Industrial sites should be designed and laid out to suit the requirements of industry. Industries in an IE differ among regions, and each industry has a particular design and layout requirements. The type of industry likely to be attracted to a certain IE is therefore an important factor in determining design and layout.

As a general rule, about one-third of the site is devoted to public areas including roads, administration buildings and green areas. The remaining two-thirds are available for industrial buildings. Normally about half the site is built over, thus one-third of the estate when fully developed is covered with commercial or industrial buildings.

The physical concept of planning within the IEs consists of the processing areas and the non-processing areas with proper linkages between them. The processing area will be well demarcated from the non-processing areas by definite constructed boundary wall with barbed wire fencing. The processing area shall be managed with restricted entry and exit options with proper security management.

The non-processing areas include residential areas, business complexes, hospitals, hotels, educational institutions, recreation and entertainment areas, *etc*.

The processing areas shall include the common facilities supporting the industrial processes like waste management plants, temporary storage units, *etc*.

Within the processing areas, grouping of industries based on their pollution potential (reference CPCB classification) will enable fair understanding to the order of magnitude of impacts. The ecological aspects such as protection of recharge zones, greening, use of non-conventional energy, *etc*. will determine the suitable location for siting within the IE. Similarly, size of blocks/plots, entries/exits, are designed considering disaster management requirements, traffic and transportation aspects, utility networks, common facilities, *etc*.

If the IE is designed for terraced buildings rather than industrial plots, a higher percentage may be covered over with buildings.

If the potential investors are what might be termed as 'prestige investors' , such as transnational electronics or medical equipment manufacturers, a low-density layout with very high standards of landscaping and appearance may be necessary. For small manufacturers who are very cost conscious, a higher-density building design, possibly using terraced factories or even simple sheds, would be more suitable.

Roadways

Roadways must be designed in outline at the preliminary stage, as their widths will determine the site layout and, together with their carrying capacity, the costs. Obviously, the roads should be adequate for the estimated traffic flow and provide against congestion between the main road and any point in the estate where goods or personnel will be loaded and unloaded. At the same time they should not occupy more area, say higher than 15% of the total area. Road design should allow for the installation and easy maintenance of the utilities. Roads should not be congested by vehicle loading, unloading or parking. Such activities should be either completely separated from the roadway or in separate docks with limited access to the traffic carrying roads.

During the first phase of development some roadways may be paved only in part. It is necessary' however, to allow sufficient width from the beginning, with utilities so sited that they will not be covered by road widening. These considerations generally indicate a rectangular road pattern if the shape of the site and natural drainage permits. Dead ends restrict movement and are undesirable where communications between factories and access to central services are important, but they may be necessary to open up isolated sites and have the advantage of eliminating through traffic and reducing road and utility costs.

Common services and utilities

The extent to which common services, should be supplied by the developer will depend on the purpose of the IE and the availability and quality of services from commercial firms, municipal authorities and the government.

In an ideal situation, the IE is planned in relation to the development of a wider area. If a proportionate share of the cost of utilities is carried by those responsible for that development, then utilities can be made available very economically in the IE. An estate cannot be commercially viable if it must bear large off-site infrastructure costs; or if it should provide free or subsidized infrastructural services to neighbours in need. In many cases the most practical solution for estate developers is to locate the estate close to existing utilities. If water and sewerage mains, electric power cables, gas and steam supply pipes are provided, these should run alongside roads, preferably under grass or hard, unmade ground for easy maintenance.

Water

The water requirement varies with the combination of industries and their processes. A storage tank with adequate capacity, say for meeting two days' water supply requirement may be needed to cater for interruptions and breakdowns in water supply. Water is normally piped to each plot or site. Investors may be advised or obliged to provide on-site storage for a minimum of one day's supply to ensure continuity in case of supply interruptions. The water storage system does not have to be located on the estate.

Where economically feasible, a ring system of mains should be used to reduce the danger of supply interruptions; enable sections of mains to be shut off for maintenance; and prevent pressure drops when users at different positions on the line are drawing water at the same time.

Power

It costs more to bury power cables than to run them on overhead poles, but this may be justified by the estate's improved appearance, safety and security. Power supply companies often guarantee an uninterrupted supply, or at least high priority for estate users. This is an important attraction for investors.

Normally the individual client/investor will deal directly with the company supplying the electricity. Occasionally, the estate developer may generate his own electricity, or take on the responsibility for supplying electricity to individual investors.

Sewage and dry waste disposal

Pump houses and treatment plants should be planned to minimise pipe runs while avoiding nuisance and odours, and have a capacity equivalent to the water supply for the area. Usually the system will be designed to accept normal domestic sewerage. Trade effluents which do not conform to acceptable standards must be treated by the factory before entering the system or shall be rated to the common treated facility.

Therefore, provision for adequate place to accommodate these facilities need to be considered. MSW must be stored safely and collected regularly. It is usually deposited in authorized MSW landfills, after required processing. This is often unavoidable, but may lead to air pollution, formation of greenhouse gases and groundwater pollution. Alternatives (greater production efficiency, recycling of waste, composting of organic waste - also a source of biogas) should be encouraged.

While these represent essential steps for controlling pollution, an integrated approach to the estate's environmental sustainability is recommended.

D. Risk based landuse planning

Landuse choices for new industrial activities should take into account the different levels of risk associated with various categories of industrial uses. Where municipalities use conventional planning and zoning techniques to identify landuses permitted or prohibited by zone, it may be useful to separate higher risk industries from both other industries and other landuses. The creation of industrial parks for these uses may contribute to adequate site planning and more effective emergency planning.

Care must be taken; however, to avoid creating potentially more hazardous situations as a result of the domino effect of "knock-on" events involving multiple high-risk industries within the same area. The use of adequate buffer zones within such industrial parks is particularly important and the use of site specific risk assessments is desirable.

To assist planning authorities in improving their industrial landuse classification within plans the following typology of industry is suggested, based on the chemicals produced.

- Type 1: industries presenting no major risks;
- Type 2: industries presenting some risk (*e.g.* producers or users of benzene, ammonia, vinyl chloride);
- Type 3: industries presenting moderate risk (*e.g.* producers or users of hydrogen chloride, liquefied petroleum gas, or gasoline);
- Type 4: industries presenting high risk (*e.g.* producers or users of chlorine or ethylene oxide).

For planning purposes, this typology based on risk should be included in the definition of industry classes. This classification must be based not only on safety considerations, but also on concerns with environmental impacts and nuisances (noise, glare, odour, traffic and visual impact).

Table 3-1: Risk Levels and Landuse Development

RISK LEVEL	LAND USE
> 10 –4	no other land use
10 –4 to 10 –5	manufacturing, ware house, open space
10-5 to 10 -6	Commercial, offices, low density residential
< 10 –6	all other uses

Note:

Source: Risk based landuse planning guidelines, Major Industrial Accidents Council of Canada

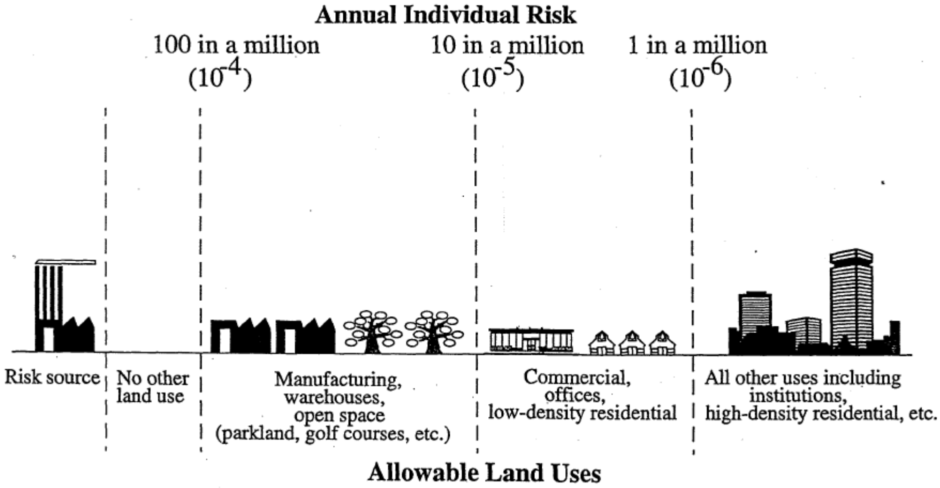


Figure 3-6: Land Uses for Different Risk Levels

3.2.2.2 Site development

Phasing of development

The cost of developing land (drainage, roads and utilities) is high. Therefore, development is normally carried out in stages related to the rate of growth. A successful industry operating in a pleasant environment and supplied with all the necessary utilities and services of an IE is good publicity. Therefore, the first phase must be finished quickly and be reasonably complete in itself. The first phase should be restricted to an area which can be completely developed and occupied within two or three years. This means a realistic (or conservative) appraisal of the likely initial demand for space. Many IE developers, particularly public sector developers, have overestimated the demand for space during the first phase. As a result, they were left with expensive unused capacity for many years, leading to financial difficulties, lack of money for maintenance, and a gradual, steady deterioration in the general infrastructure. In some cases, transformers and wastewater treatment plants had such excess capacity that they were unusable. If demand exceeds expectations, the second phase of the development can always be accelerated

Site establishment factors

Establishment of IE is determined by various factors based on entrepreneurship, technology involved, facilities that are to be provided, *etc*. the major factors that are considered in the establishment of IE are

- Selection of enterprises
- Selection of entrepreneurs
- Control of investor activities
- Limitation on investor activities
- Building restrictions
- Parking
- Storage
- Safety
- Pollution

Each of the above factors is discussed in **Annexure VI** of this guidance manual.

3.2.3 IE management

3.2.3.1 Operation and maintenance

Basics of environmental management

Ecologically sensitive estate planning, construction and management will be based on EIAs of the estate project as such and of individual enterprises and will

- Maintain or restore parts of the original natural area where possible (this will also contribute to the site's attractiveness) and preserve natural drainage systems
- Use environmentally sensitive construction methods and all local viable methods to design energy-efficient sites (passive solar heating, tree shade, *etc*)
- Arrange buildings as compactly as possible from a technical and economic point of view to save on infrastructure and transport:
- Develop a transport management system for factory staff and goods.
- Establish a comprehensive system for wastewater treatment, solid waste management and prevention of air pollution.
- Use water resources as efficiently as possible (recycle wastewater where possible).
- Encourage environmentally sustainable production methods.

Air quality management

- Determination of ventilation coefficient, as a measure of assimilative potential
- Listing of all air polluting industries
- Studying the industries for the pollutant control system including its efficiency & reliability
- Establishment of pollution load from each point source

- Inventory of vehicles (line sources) and establishing pollution load contribution by considering emission factors
- Inventory of grid-wise aerial sources, through the consumption figures of kerosene, LPG, use of firewood, *etc*.
- Determination of areas for locating monitoring stations, where maximum ground level concentrations are likely to occur.
- Determination of relative share of the industries at sensitive locations for arriving at the degree of control efficiency/control technologies
- Constant persuasion for improvement

Wastewater management

In an IE, wastewater will be generated from various industries. The main advantage of industries to be located within the IE is the common treatment facility. The wastewater generated from various industries can be managed by a CETP within the IE. The CETP becomes one of the basic amenities that are offered to the industries by an IE. The feasible approaches in the wastewater management through a CETP are listed below:

- Preliminary treatment at individual level to meet influent limits of a common treatment facility
- Common/combined treatment facility for further treatment
- Re-cycling of treated waters for beneficial uses or disposal through marine outfall.

Advantages of common treatment facility

- Homogenization of wastewaters
- Relatively better hydraulic stability
- Advantage through scale of operation.
- Professional control over treatment can be affordable
- Offers great relief to small units, which are of main concern in terms of treatment
- Eliminates multiple discharges in the area, provides opportunity for better management of wastewater, *i.e.,* proper treatment, disposal

Please refer TGM for CETP for further details.

Municipal solid waste and sludge

The activities associated with the management of solid wastes from the start of waste generation to final disposal can be grouped into the six functional elements:

- Waste generation
- Waste handling and sorting, storage, and processing at the source
- Waste collection
- Sorting, processing and transformation
- Transfer and transport
- Disposal

Waste generation encompasses activities in which materials are identified as no longer being of value (in their present form) and are either thrown away or gathered together for disposal. Reduction of waste at source, although not controlled by solid waste managers, is now included in system evaluations as a method of limiting the quantity of waste generated.

Waste handling and sorting involves the activities associated with management of wastes until they are placed in storage containers for collection. Handling also encompasses the movement of loaded containers to the point of collection. Sorting of waste components is an important step in the handling and storage of solid waste at the source. For example, the best place to separate waste materials for reuse and recycling is at the source of generation. On-site storage is of primary importance because of public health concerns and aesthetic consideration. Unsightly makeshift containers and even open ground storage, both of which are undesirable. The cost of providing storage for solid wastes at the source is normally borne by the management of industrial properties.

The functional element of collection includes not only the gathering of solid wastes and recyclable materials, but also the transport of these materials, after collection, to the location where the collection vehicle is emptied. This location may be materials processing facility, a transfer station, or a landfill disposal site.

The sorting, processing and transformation of solid waste materials includes the recovery of sorted materials, processing of solid waste and transformation of solid waste that occurs primarily in locations away from the source of waste generation. Sorting of commingled (mixed) wastes usually occurs at a materials recovery facility, transfer stations, combustion facilities, and disposal sites. Sorting often includes the separation of bulky items, separation of waste components by size using screens, manual separation of waste components, and separation of ferrous and non-ferrous metals.

Waste processing is undertaken to recover conversion products and energy. The organic fraction of Municipal Solid Waste (MSW) can be transformed by a variety of biological and thermal processes like aerobic composting and incineration.

Waste transformation is undertaken to reduce the volume, weight, size or toxicity of waste without resource recovery. Transformation may be done by a variety of mechanical (*e.g.* shredding), thermal (*e.g.* incineration without energy recovery) or chemical (*e.g.* encapsulation) techniques.

The functional element of transfer and transport involves two steps: (i) the transfer of wastes from the smaller collection vehicle to the larger transport equipment and (ii) the subsequent transport of the wastes, usually over long distances, to a processing or disposal site. The transfer usually takes place at a transfer station.

All the residual materials from material recovery facilities (MRFs), residue from the combustion of solid waste, rejects of composting, or other substances from various solid waste processing facilities are disposed by landfilling.

Wherever possible, generation of sludge should be minimised. Sludge must be treated, and if toxic metals are present, the sludge must be stabilized.

For various types of solid waste management techniques and other related details, please refer TGM for common municipal solid waste management.

Hazardous waste management

In case of IEs comprising of industries that generate hazardous waste, management of the same becomes mandatory. The principle steps that are to be followed in the effective management of hazardous waste are:

- Segregation of waste into hazardous / non-hazardous
- Exploring recovery, re-use, renovation and re-cycle
- Categorization of waste in to:
  - Incinerable waste
  - Non-incinerable waste
- Incinerable waste to hazardous waste incineration facility, in accordance to the guidelines, disposal of slag into TSDF based on TCLP.
- Non-incinerable waste – pre-treatment, secured landfill site, collection of leachate and its treatment, regular monitoring to check integrity of the liners.

For various techniques on hazardous waste management please refer TGM for treatment, storage and disposal facilities (TSDFs).

Good environmental practices

- Encourage the use of vapor recovery systems to reduce VOC emissions
- Encourage the use of sulphur recovery systems where considered feasible
- Encourage the use of low NOx burners
- Encourage the recovery and recycle of oily wastes
- Encourage the regeneration and reuse of spent catalysts and solvents
- Encourage the recycling of cooling water and the reuse of wastewaters
- Institute segregation of stormwater from process wastewater
  - Encourage the use of non-chrome additives to cooling water
  - Institute spill prevention and control measures
  - Include properly designed storage facilities for hazardous chemicals and wastes, including provision for containment of contaminated water in case of fire

H. Emergency management

The four core elements of emergency management are:

- Prevention/mitigation - landuse planning, dangerous goods corridors, buffer zones and process safety management for industry
- Preparedness - emergency planning, emergency equipment, training, exercises, public awareness and education
- Response - liaison, advice, assistance and resources such as personal/ equipment/materials, emergency information and coordination of emergency response

- Recovery - returning to normal, which is often longer than response phase, recovery plans and programmes, return of evacuees/migrants, infrastructure restoration, funding assistance, critical incident stress management

3.2.3.2 Environmental management systems for IEs

EMS provides an action framework that brings together the main elements of a practical environmental plan. The framework should define explicit environmental policy, performance objectives and targets, and mechanisms for their enforcement and implementation. In addition, the EMS framework should clearly define the roles and responsibilities of various stakeholders as individual companies and regulatory agencies within and outside the IE.

Environmental performance goals broadly target resource efficiency (energy, water and material use), reduction in emission load (atmospheric release, liquid waste and solid waste) and sound management of surrounding environment and natural resources (habitat and wildlife, neighbouring facilities and units). Some of the specific management elements, which contribute to improving environmental performance, are

- Well-defined operating standards and realistic targets set internally
- Regular review of environmental performance and monitoring. *e.g.*, audits
- Programmes on training and awareness on environmental risks
- Effective incident reporting and investigation
- Effective contingency planning for accidents, spills and fibres
- Reporting systems within the estate, and with the public

In order to avoid the conflict of responsibilities of IE managers as developers, promoters, regulators and providers of essential services, it is essential to establish 'Environment Management Cell' (EMC) in each IE. The role of such EMC would be to conduct environmental monitoring, track performance targets, monitor and check the growth of industries within the estate, correlating it with the carrying capacity limits, conduct R&D for developing clean technologies and information dissemination to different stakeholders. Such activities of EMC could be undertaken in technical guidance from PCBs

The end objective of EMS implementation in IE is to boost industrial growth without putting additional burden on the environment. The complexities of sustainable industrial development require new types of partnerships within industry, between industry and the public sector, and with its wider group of stakeholders.

Monitoring and reporting

Frequent sampling should be recommended to plants during start-up and upset conditions. Once a record of consistent performance has been established, sampling for the parameters listed in this document can be eased.

IEs should encourage units to analyze monitoring data, review it at regular intervals, and compare it with the operating standards, so that any necessary corrective actions can be taken. Records of monitoring results should be kept in an acceptable format. The results should be reported to the responsible authorities and relevant parties, as required. IEs should maintain a record of accidental releases of pollutants by the environment and should take appropriate corrective action to be better prepared for future occurrences. Where feasible, IEs should educate the industrial units on ways to mitigate environmental problems

Sustainable management of industrial areas

The efficient management of IEs starts with identifying the facts in terms of problems and impacts, analyzing the cause, development and assessment of measures that can be implemented and evaluation of integration of these measures. Based on a clear collective approach, it aims at the development of solutions which are beneficial at all levels, for the enterprise as much as for the general optimization of infrastructure and services in the industrial zone. The cycle of change allows the progressive and systematic implementation of sustainable development in industrial areas with economic, environmental, organizational, and social benefits (including risks) for industrial areas which usually integrate commerce and services (Figure 3-7).

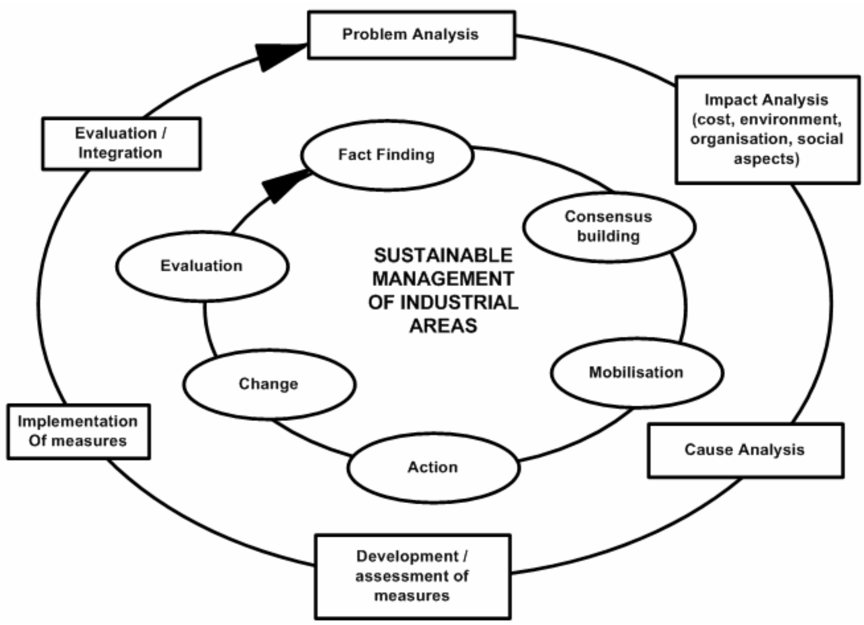


Figure 3-7: Sustainable Management of Industrial Areas: Cycle of Change

Environmental Protection, Economic Development and Social Progress are the three main dimensions that are considered to have a Sustainable Development within IEs. Each dimension has specific key issues that are to be addressed and these are identified by various performance indicators. The challenges that are to be addressed and the contributions to achieve a Sustainable development are illustrated in the following Figure 3-8.

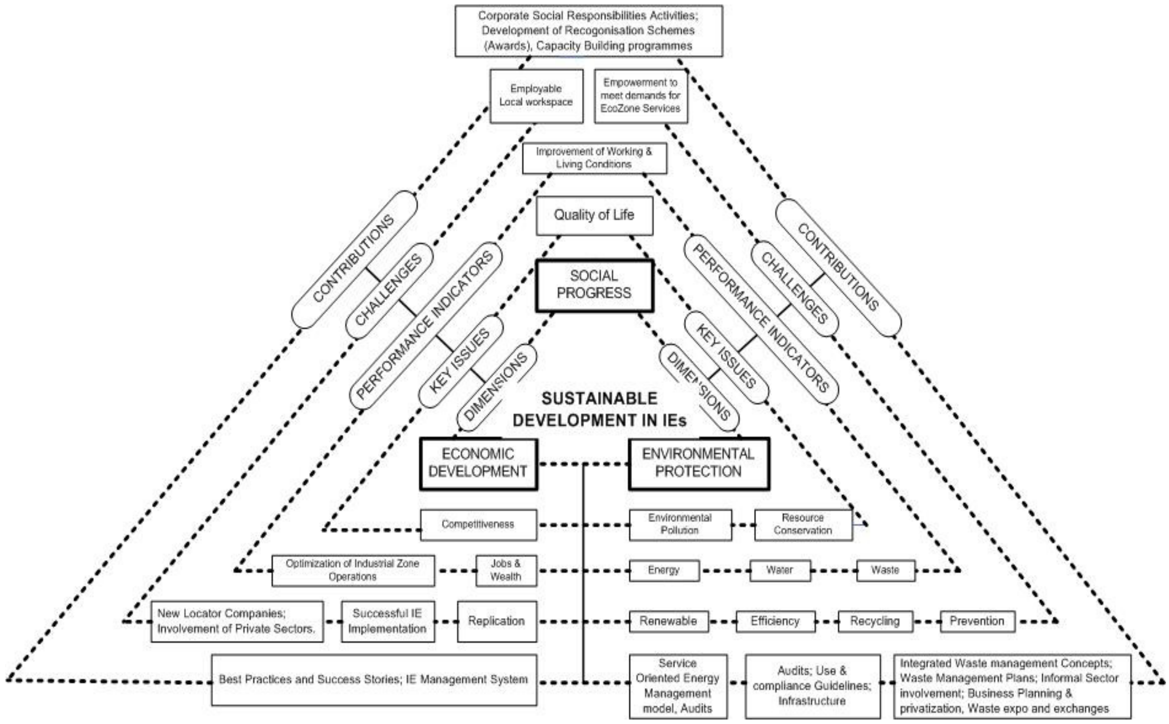


Figure 3-8: Sustainable Development within IEs

3.2.3.3 Organisational considerations and administration

Good management is vital for the success of an estate. The agency responsible for the estate management should not limit itself to maintenance of the facilities and supervision of activities, but play a dynamic role, promoting the services offered by the estate among local entrepreneurs. Depending on the development objectives, an estate's services may also be marketed elsewhere in the country, and possibly abroad. If an estate is run by a public-sector agency, it is essential that staff with private sector experience is employed for this purpose.

The estate developer and/or the environmental agency should monitor the adherence of each plant to environmental regulations on a regular basis. This means that the developer or its appointed environmental officer would have the right to enter premises at all reasonable times to take samples and do all that is necessary to ensure that environmental standards are complied with.

When a country launches a programme of estate development, it is advisable to set up a body responsible for the programme. The main tasks of the IE Authority would be to evaluate the demand for and supply of IEs and to encourage private developers to undertake the construction and management of IEs.

Administration

The size and duties of the administration will depend on the services to be provided. The administration may have three divisions - managerial, technical and financial. An overview of the responsibilities of the divisions is given in Table 3-2.

Table 3-2: Responsibilities of IE Administration

DIVISION	RESPONSIBILITIES
Managerial Division	▪ To implement the admission of the sponsors ▪ To enforce the restrictive covenants in lease agreements ▪ To maintain the buildings and services on the estate ▪ To arrange the payment of taxes and all charges that may be levied on the estate and the wages of estate employees ▪ To collect rents and other dues from tenants ▪ To be responsible for the general good order of the estate
Technical Division	▪ This division of the administration is responsible for the common facilities, technical and training services that are provided
	▪ Operation of the central workshop and other common facilities ▪ Operation of plant hire scheme ▪ Preparation of feasibility studies and project reports for tenant enterprises ▪ Provision of marketing information ▪ Organization of training schemes ▪ Organization of exhibitions
Financial Division	▪ The functions of the division are
	▪ Either to provide direct loans to estate tenants or to guarantee loans extended to tenants by commercial banks ▪ To arrange bulk purchasing of materials ▪ To allocate scarce materials to estate enterprises

On all IEs, irrespective of size, there must be arrangements for carrying out the responsibilities of the managerial division.

Size of IE administrative staff

The cost of administering an estate must be borne by the tenants, by the sponsors or jointly. Normally it should fall on the tenants; otherwise they receive, in effect, a continuing subsidy. It is essential, therefore, that the cost of administration be kept as low as possible, consistent with the maintenance of the services needed. The largest single component of the cost usually consists of salaries.

It is sometimes argued that the administration should be carried out by an association of entrepreneurs occupying premises on the estate. So far as is known, the only instances of occupier administration occur in cooperative IEs (private and government-assisted). It is however, desirable for an association/IE local Authority of tenants and/or owners to cooperate in the administration.

Technical and financial functions

An estate administration does not always carry out all functions that are technical and financial. Certainly in the absence of any other organization, the operation of central workshops, common service facilities and plant-hire schemes would come under its aegis, if they are provided at all. All the duties listed can be carried out more conveniently by a separate organisation - an extension service, small industries institute or the like - catering to the whole small-scale industrial sector. Common technical services are probably best managed by a private-sector entity.

It is not the duty of an estate administration to interfere in the running of individual enterprises on an estate. The manager of a small estate may be called upon to advice tenant entrepreneurs on almost any aspect of their business. The manager should be in a position to do so. He should not be expected to provide all advice on the basis of his own experience, but he should be able to put a client in touch with the person or organisation that can supply it.

Dues other than rent

Apart from rent, enterprises pay dues for water, electricity, medical services and, sometimes, conservancy. A perennial question is whether the estate should buy electricity in bulk for distribution to the tenants or whether the supply company should provide the service directly. There can be a considerable saving to the tenants if the estate undertakes the distribution. However, the estate may be faced with the cost of providing the necessary appliances, along with reading the meters, preparing the bills and collecting the amounts due. The system can be of great help to small consumers. The matter should be decided on an actuarial basis allowing for the extra costs involved to be borne by the estate administration.

Financing the project

To implement an IE programme, or even to construct a single estate, involves a large investment. The funds raised, or allocated, for the establishment of an IE have to meet the costs of physically creating the estate and of providing and maintaining the various services; the latter, at least, until such time as they become self-financing. There are thus capital and recurring expenditures.

Capital, whether supplied by the government or raised by the sponsors of a private organisation, is used to acquire and improve the site and to install the utilities - roads, water, electric power and drainage. In exceptional circumstances it may go so far as to cover the cost of buildings and services. However, funds are borrowed on the security of the improved land for the items mentioned in the preceding sentence.

Working capital is used to meet all the charges incurred in the running of the estate - salaries, street lighting, taxes, conservancy, maintenance and operation of services. In general, all of these will be recouped, with the possible exception of services of a promotional character, by the inclusion of a component in the rent of the structure to cover them, but they may not be recovered in full in a partially occupied estate. If it is necessary to increase the working capital, funds are usually borrowed from a commercial bank.

The different types of IEs from the point of view of financial sponsorship - government, government-assisted and private IEs are explained in **Annexure I**, under various types of IEs.

IE authority – property issues

An estate may provide advance standard and custom-built work-places or only serviced plots. Some IEs make all three available. There is a trend away from the erection of work-places in advance of demand; such construction was at one time considered to be the main function of an IE. Current opinion favours the provision of serviced plots and long-term loans to enable industrialists to build their own premises. This arrangement has much to recommend it in the case of the medium-scale and upper range of the small-scale sectors. It reduces the sponsors' original investment in the estate because the loan funds are likely to come from another source. But the arrangement may not be appropriate for nursery and rural IEs, for the first estate in a semi-urban region, or any estate that is required to have a demonstration effect. A good arrangement for a first estate is a combination of advance standard work-places and serviced plots on which work-sheds may be erected by the industrialists or the estate administration, if the need for them is seen.

Accommodation can be leased or sold. From the point of view of the sponsors of the estate, the main advantage of selling is that it allows them to recover their investment more rapidly. This means; however, that they will not benefit from increases in property values by progressively increasing rents. To the entrepreneur a leased work-place releases capital that otherwise would be immobilized. The advantage to him of an owned work-place is its value as collateral for any loan he may wish to raise. Probably the best method is to provide work-places on lease or for sale. An option to acquire the premises, by hire-purchase or other arrangement, can be written into the lease.

In many cases, irrespective of the ownership of the premises, the plot is leased, and the title to the land on which the estate is built remains with the government or the local Authority.

External support institutions - need for effective external support

An IE is only one element in an industrial promotion programme. Its enterprises need qualified managers, a trained labour force and sources of technical advice and finance. An estate can be the means of delivering them, but only if it is supported by the appropriate institutions. These will normally cater for other enterprises in the area as well.

Where market forces do not (or cannot) provide a "natural selection" of such services on the basis of effective demand, there is the danger of a wide gap between the need for and the supply of services. Lack of developmental efficiency is one reason for the increasing emphasis (also among donor agencies) on involving the private sector in the provision of support services. Another reason is that staff of public-sector support agencies, unless recruited from the private sector, will not really understand the problems of enterprises or have the expertise to solve them.

Support agencies must be close to their clients, also in a geographic sense. In the case of public sector agencies, this implies delegation to lower administrative levels. Local capacities must be strengthened accordingly. To use limited human and financial resources effectively, support should focus on areas where a sufficient number of (potential) clients are found, and on the most promising activities. It is now generally agreed that services should at least be partly funded by charging fees. This will reduce demands on government budgets and will increase cost-consciousness among clients.

Financial institutions

No matter what type of institution is formed or selected to finance small-scale industry it is essential that it be suitably staffed to evaluate technically and commercially the projects put before it, or that it be able to draw on the services of some other organisation for this purpose. The experience with financial schemes, which particularly target the small-scale sector has been mixed. Inadequate customer orientation (complex procedures, unhelpful staff) is an often-quoted problem. Revolving schemes suffer from low repayment rates. With regard to the latter, loan schemes relying on "peer pressure" have preformed better.

While special financial facilities and programmes can and do contribute to industrial development, they can only help a minority of enterprises. The crucial question therefore is how conditions can be created which will stimulate the development of private banking, and how competition among banks can be increased to lower the cost of credit

Training

Most countries have a vocational training system. It may take the form of a trade school for those who have left school, or a special school within the normal educational system. The success of either of the above methods depends on how well the school is equipped and how near it reproduces working conditions in industry. Few of the developing countries have a formal apprenticeship system for on-the-job learning. A combination of vocational training with a formal apprenticeship is-usually best. One of the problems in providing training courses for persons in employment is that few employers are prepared to continue paying the trainees' wages; hence the need for stipends.

Little information is available on the training of supervisors. That there is a need to improve the standards of supervision in industry is widely recognised. There are; however, two aspects to this problem: upgrading of technical skills and maintenance of good personal relationships. The latter generally comes under the heading of management techniques. While the most highly skilled worker does not necessarily make the best foreman, it is true that one of indifferent skill never can possess the necessary Authority to be a satisfactory supervisor.

Extension services

An extension service is essentially a multidisciplinary organisation created to solve the technical, managerial and financial problems of small-scale enterprises through advice, diagnostic services and direct support. The extent and content of an extension service depends on the predominant type(s) of industry, the levels of technology and entrepreneurship of the small-scale industrial sector, and the number and density of enterprises.

The necessity for links between purely technical counseling and managerial advice is evident. What may not be so obvious is the linkage of extension services and sources of finance. It is pointless to make a recommendation to an entrepreneur unless, at the same time, he can be provided with information on how to obtain the funds to follow it up. Nor can the availability of finance be effective if the borrower lacks the knowledge or the ability to make the best use of the proceeds of the loan.

The provision of services to clusters of related small enterprises in a particular area may be cheaper and more effective. It is also likely to intensify linkages among them, accelerating their development. Once firms have understood the advantages of finding common solutions to common problems, clusters are assisted in identifying and analyzing their specific problems, determining common development objectives and generating a joint project to attain them. Experts then help to upgrade the capabilities of the clustered enterprises. The clusters are also assisted in building links with institutions such as banks and research centres, and lobbying for the improvement of policies and regulations affecting small enterprises with the relevant authorities.

3.3 Eco-industrial Parks

'An EIP is a community of manufacturing and service businesses seeking enhanced environmental and economic performance through collaboration in managing environmental and resource issues including energy, water, and materials. By working together, the community of businesses seeks a collective benefit that is greater than the sum of industrial benefits and company would realise if it optimized its individual performance only. The goal of an EIP is to improve economic performance of the participating companies while minimising their environmental impact.

The above definition and many other such concepts of industrial zones, business park, Industrial district, IE focus mainly on the performance optimization and environmental management of the industries within the defined boundaries only. The social benefits that should usually follow from EIP development include fostering a sense of community among businesses and surrounding neighborhoods (Klee and Williams, 1999).

The EIP approach offers a wide variety of measures and tools to improve the environmental performance of individual industries and IEs / parks. However each IE / park no matter whether an already existing one or a newly planned, requires an individual mix of measures and tools. The overlapping steps of Eco-industrial development are depicted in the following Figure 3-9.

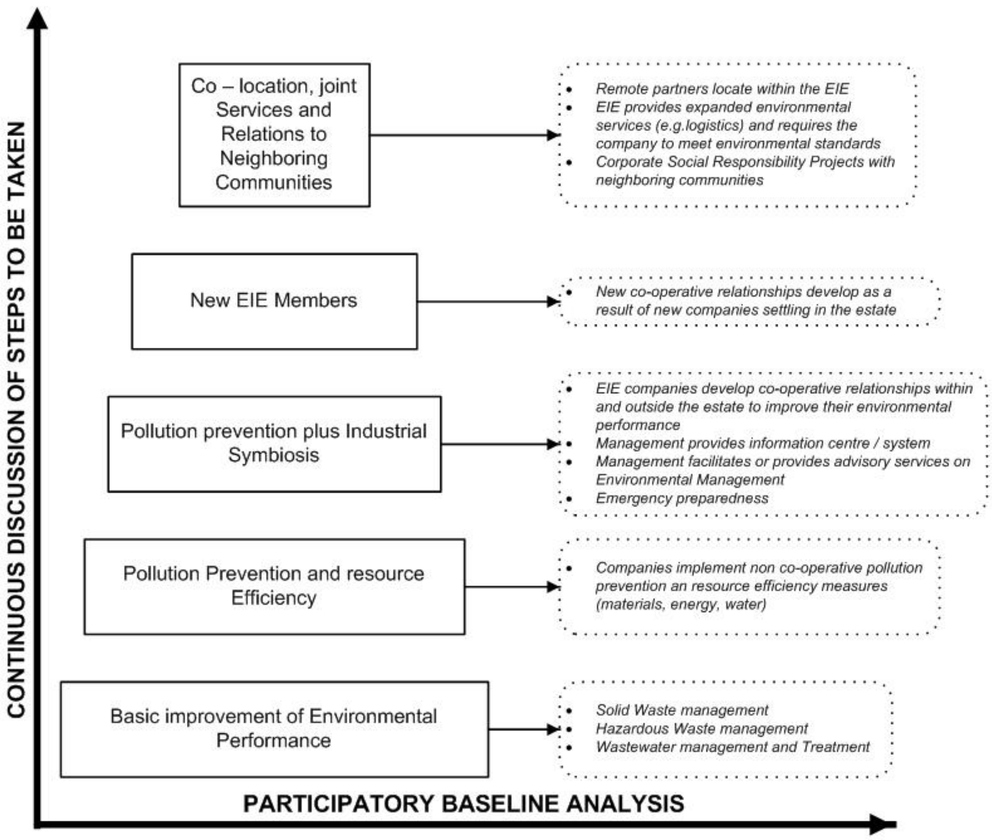


Figure 3-9: Eco- Industrial Development

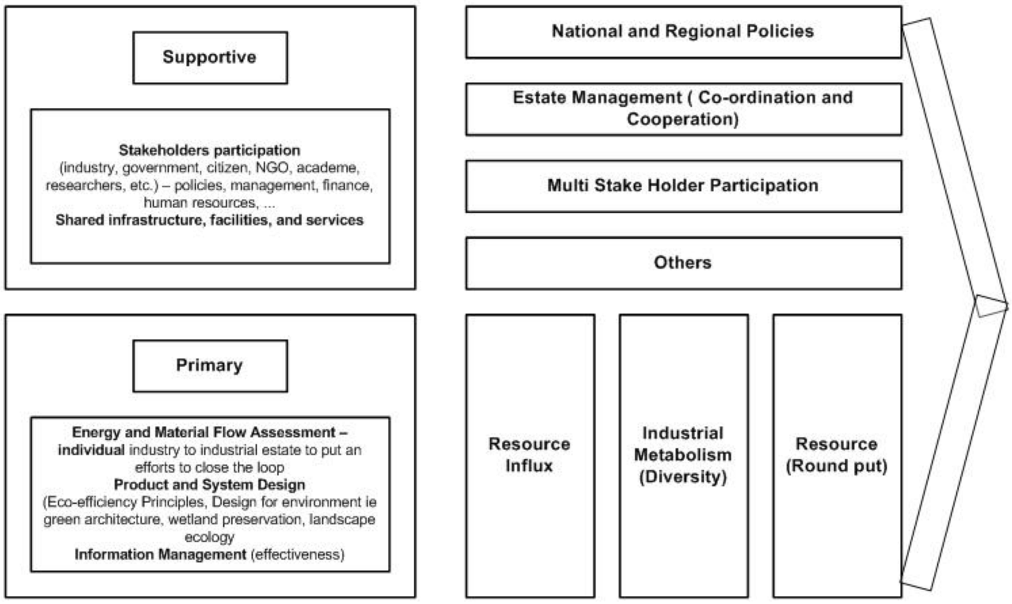


Figure 3-10: Eco Industrial Networks

3.3.1 Tools to explore for converting existing IEs into EIPs

To convert the existing IEs into EIPs the parameters mentioned in the Table 3-3 can be explored.

Table 3-3: Tools to Explore for Conversion to EIPs

Quality of Life	Marketing	Materials
▪ Integrating Work and Recreation ▪ Cooperative education Opportunities ▪ Volunteer and Community programs ▪ Involvement in Regional planning *etc.*	▪ Green Labeling ▪ Accessing Green Markets ▪ Joint Promotions (*e.g.* advertising, trade shows) ▪ Joint Ventures ▪ Recruiting Value Added Companies	▪ Common Buying ▪ Customer/Supplier Relations ▪ By-Product Connections ▪ Creating New Material Markets
Information / Communication Systems	**Transportation**	**Environment, Health and Safety**
▪ Internal Communications ▪ External Information Exchange ▪ Monitoring Systems ▪ Computer Compatibility ▪ Joint Management Information System for Park Management *etc.*	▪ Shared Commuting ▪ Shared Shipping ▪ Common Vehicle Maintenance ▪ Alternative Packaging ▪ Intra-Park Transportation ▪ Integrated Logistics	▪ Accident Prevention ▪ Emergency Response ▪ Waste Minimization ▪ Multi-media Planning ▪ Design for Environment ▪ Shared Environmental Information Systems, *etc.*
Production Process	**Human Resources**	**Energy**
▪ Pollution Prevention ▪ Scrap Reduction and Re-use ▪ Production Design ▪ Common Subcontractors	▪ Human Resources Recruiting Joint Benefit Packages ▪ Wellness Programs ▪ Common Needs (payroll,	▪ Green Buildings ▪ Energy Auditing ▪ Cogeneration ▪ Spin-off Energy Firms

▪ Common Equipment ▪ Technology Sharing Integration *etc.*	maintenance, security) ▪ Training ▪ Integrated Logistics *etc.*	▪ Alternative Fuels *etc.*

3.3.2 Stage-wise explorable programmes

The stage wise explorable programmes to convert the existing IEs to an Eco-IE are explained in the Table 3-4.

Table 3-4: Stage-wise Explorable Programmes

Internally neutral	Internally supportive	Externally neutral	Externally supportive
▪ Cleaner Production (CP) ▪ Environmental Management System (EMS) ▪ Life Cycle Assessment (LCA) ▪ Environmental Management Accounting (EMA) ▪ Environmental Performance Indicator (EPI) ▪ Corporate Social Responsibility (CSR)	▪ Greening the Supply Chain ▪ Green Procurement ▪ Eco-labeling ▪ Programmatic Cleaner Production (P-CP) ▪ Programmatic Environmental Impact Assessment (P-EIA) ▪ By Product Exchange (BPX) ▪ Packaging material take back ▪ Design for Environment (DfE) ▪ Reverse Manufacturing / End of life Disassembly	▪ Extended Producers Responsibilities (EPR) ▪ Material and Water Recycling ▪ Energy Cascading ▪ Collective Utility ▪ Sharing of transportation, warehousing logistics, training, recruitment, marketing, procurement ▪ Green architecture ▪ Landscape Ecology ▪ Centralized WWTF ▪ Emergency Response System ▪ Estate Env.Management	▪ Integrated Resource Recovery System ▪ Regional Resource Management ▪ Life Cycle Assessment (LCA) ▪ Material Flow Accounting (MFA) ▪ Intra- and Inter-estate Collaboration

3.4 Summary of Applicable National Regulations

3.4.1 General description of major statutes

A comprehensive list of all the laws, rules, regulations, decrees and other legal instruments relevant to IEs is given in **Annexure VII**. It includes all the statues related to different forms of IEs *viz*. EPZs, SEZs, STPs, petroleum, chemical and petrochemical regions.

3.4.2 General standards for discharge of environmental pollutants

List of general standards for discharge of environmental pollutants as per CPCB is given in **Annexure VIII.**

3.4.3 Industry-specific requirements

All the individual industries are required to comply with industry-specific minimal national standards. However, when a homogenous IE/complex proposes to take a single clearance for all the industries which come up in their IE/complex, the notification provides an opportunity for taking single clearance, in such case entire IE/complex will be treated as a single entity to comply with the standards prescribed by the regulatory authorities.

When the industries send their effluents to CETPs, then CETP effluent standards will apply.

If sector-specific standards are not notified, the general standards for all the relevant pollutants will be applicable. The general standards for the effluent discharge and emissions are given in the Table 3-5 and 3-6 respectively.

Table 3-5: General Environmental Standards for Effluent Discharge

S.No	Parameter	Inland Surface Water	Public Sewers	Land for Irrigation	Marine / Coastal Areas
		(A)	(B)	(C)	(D)
1	Colour & odour				
2	Suspended Solids mg/l, max.	100	600	200	For Process Wastewater For cooling water effluent 10 % above total suspended matter of influent
3	Particle size of suspended solids	Shall pass 850 micron IS Sieve	-	-	Floatable solids, solids max 3 mm Settleable solids, max 856 microns
4	pH value	5.5 – 9.0	5.5 – 9.0	5.5 – 9.0	5.5 – 9.0
5	Temperature	Shall not exceed above the receiving water temperature			Shall not exceed 5^{o}C above the receiving water temperature
6	Oil and Grease, mg/l max.	10	20	10	20
7	Total residual chlorine, mg/l max	1.0	-	-	1.0
8	Ammonical Nitrogen (as N), mg/l, max.	50	50	-	50
9	Total Kjeldhal Nitrogen (as N); mg/l, max.	100	-	-	100
10	Free ammonia (as NH_3);mg/l max	5.0	-	-	5.0
11	Biochemical Oxygen Demand (3 days at 27^{o}C); mg/l max.	30	350	100	100

S.No	Parameter	Inland Surface Water	Public Sewers	Land for Irrigation	Marine / Coastal Areas
		(A)	(B)	(C)	(D)
12	Chemical Oxygen Demand, mg/l, max	250	-	-	250
13	Arsenic (as As)	0.2	0.2	0.2	0.2
14	Mercury (as Hg); mg/l, max.	0.01	0.01	-	0.01
15	Lead (as Pb); mg/l, max	0.1	1.0	-	2.0
16	Cadmium (as Cd); mg/l.max	2.0	1.0	-	2.0
17	Hexavalent Chromium (as Cr+6);mg/l, max	0.1	2.0	-	1.0
18	Total Chromium (as Cr);mg/l, max	2.0	2.0	-	2.0
19	Copper (as Cu); mg/l, max	3.0	3.0	-	3.0
20	Zinc (as Zn); mg/l, max	5.0	15	-	15
21	Selenium (as Se)	0.05	0.05	-	0.05
22	Nickel (as Ni);mg/l, max	3.0	3.0	-	5.0
23	Cyanide (as Cn);mg/l, max	0.2	2.0	0.2	0.2
24	Fluoride (as F);mg/l, max	2.0	15	-	15
25	Dissolved phosphates (as P);mg/l, max	5.0	-	-	-
26	Sulphides (as S);mg/l, max	2.0	-	-	5.0
27	Phenolic Compounds (as C_6H_5OH);mg/l, max	1.0	5.0	-	5.0
28	Radioactive materials:				
	(a) Alpha emitters microcurie mg/l, max.	10-7	10-7	10-8	10-7
	(b) Beta emitters microcurie mg/l	10-6	10-6	10-7	10-6
29	Bio-assay test	90% survival of fish after 96 hrs	90% survival of fish after 96 hrs	90% survival of	90% survival of fish after 96 hrs in 100%

S.No	Parameter	Inland Surface Water	Public Sewers	Land for Irrigation	Marine / Coastal Areas
		(A)	(B)	(C)	(D)
		in 100% effluent	in 100% effluent	fish after 96 hrs in 100% effluent	effluent
30	Manganese mg/l	2	2	-	2
31	Iron (as Fe) mg/l	3	3	-	3
32	Vanadium (as V) mg/l	0.2	0.2	-	0.2
33	Nitrate Nitrogen	10 mg/l	-	-	20 mg/l
* These standards shall be applicable for industries, operations or processes other than those industries, operations or process for which standards have been specified in Schedule of the Environment protection Rules, 1989.					
Source: CPCB					

Table 3-6: General Emission Standards

S.NO	PARAMETER	CONCENTRATION NOT TO EXCEED (MG/NM^3)
1	Particulate matter	150
2	Total Fluoride	25
3	Asbestos	4 fibres/cc ad dust should not be more than 2mg/Nm3
4	Mercury	0.2
5	Chlorine	15
6	Hydrochloric acid vapour and mist	35
7	Sulphuric acid mist	50
8	Carbon monoxide	1%
9	Lead	10
Source: CPCB		

4.
OPERATIONAL ASPECTS OF EIA

Prior environmental clearance process has been revised in the Notification issued on 14th September, 2006, into following four major stages *i.e.,* screening, scoping, public consultation and appraisal. Each stage has certain procedures to be followed. This section deals with all the procedural and technical guidance, for conducting objective-oriented EIA studies, their review and decision-making. Besides, the Notification also classifies projects into Category A, which requires prior environmental clearance from MoEF and Category B from SEIAA/UTEIAA.

Consistency with other requirements

- Clearance from other regulatory bodies is not a prerequisite for obtaining the prior environmental clearance and all such clearances will be treated as parallel statutory requirements.
- Consent for Establishment (CFE) and prior environmental clearance are two different legal requirements a project proponent should acquire. Therefore, these two activities can be initiated and proceeded with simultaneously.
- If a project falls within the purview CRZ and EIA Notifications, then the project proponent is required to take separate clearances from the concerned Authorities.
- Rehabilitation and Resettlement (R&R) issues need not be dealt under the EIA Notification as other statutory bodies deal with these issues. However, socio-economic studies be considered while taking environmental decisions.

4.1 Coverage of Industrial Estates under the Purview of Notification

All new IEs including expansion and modernization require prior environmental clearance. Based on pollution potential, these projects are classified into Category A and Category B *i.e.*

- Category A:
  - If at least one industry in the proposed IE falls under the Category A, entire industrial area shall be treated as Category A, irrespective of the area.
  - IEs with area greater than 500 hectares (ha) and housing at least one Category B industry.
- Category B:
  - IEs housing at least one Category B industry and area < 500 ha.
  - IEs of area > 500 ha and not housing any industry belonging to Category A or B.

Besides there are general as well as specific conditions, when it applies, a Category B project will be treated as Category A project. These conditions are discussed in subsequent sections.

Note:

i. IE of area below 500 ha and not housing any industry of Category A or B does not require clearance.

ii. If the area is less than 500 ha. But contains building and construction projects > 20,000 m^2 and or development area more than 500 ha it will be treated as activity listed at serial no. 8(a) or 8(b) in the Schedule, as the case may be.

iii. An IE with known composition of industries applies for a prior environmental clearance, then single clearance for IE with those clearly listed industries with specified products, capacities can be considered.

iv. The individual industries and IEs may parallely can apply for Environmental Clearance.

v. For common effluent treatment plants and other services, parallel environmental clearance can be considered.

vi. If an industry comes up at a later stage after obtaining environmental clearance for IE and the details of which are not included in environmental clearance cleared for the IE, then such industry may apply for Environmental Clearance, in individual capacity, if falls under the purview of EIA Notification.

vii. If individual new industries do not fall under the purview of EIA Notification, but the total capacity/area cleared for IE is complete, in such case IE may approach for Environmental Clearance, as a modernization/expansion case.

viii. Any developmental activity, which was issued EIA clearance (existing industrial area), when undergoes expansion or modernization (change in process or technology) with increase in production capacity or any change in product mix beyond the list of products cleared in the issued clearance is required to submit new application for EIA clearance (either individual industry or IE).

ix. Any developmental activity, which is listed in Schedule of the EIA Notification and after expansion due to its total capacity, if falls under the purview of either Category B or Category A, then such developmental activities requires clearance from respective authorities (either individual industry or IE).

x. The choice of going IE or industrial industry is up to the project proponents.

The sequence of steps in the process of prior environmental clearance for Category A projects and the Category B projects are shown in Figure 4.1 and Figure 4.2 respectively. The timelines indicated against each stage are the maximum permissible time lines set in the Notification for said task. In case the said task is not cleared/objected by the concerned Authority, within the specified time, said task is deemed to be cleared, in accordance to the proposal submitted by the proponent. Each stage in the process of prior environmental clearance for the IEs are discussed in subsequent sections

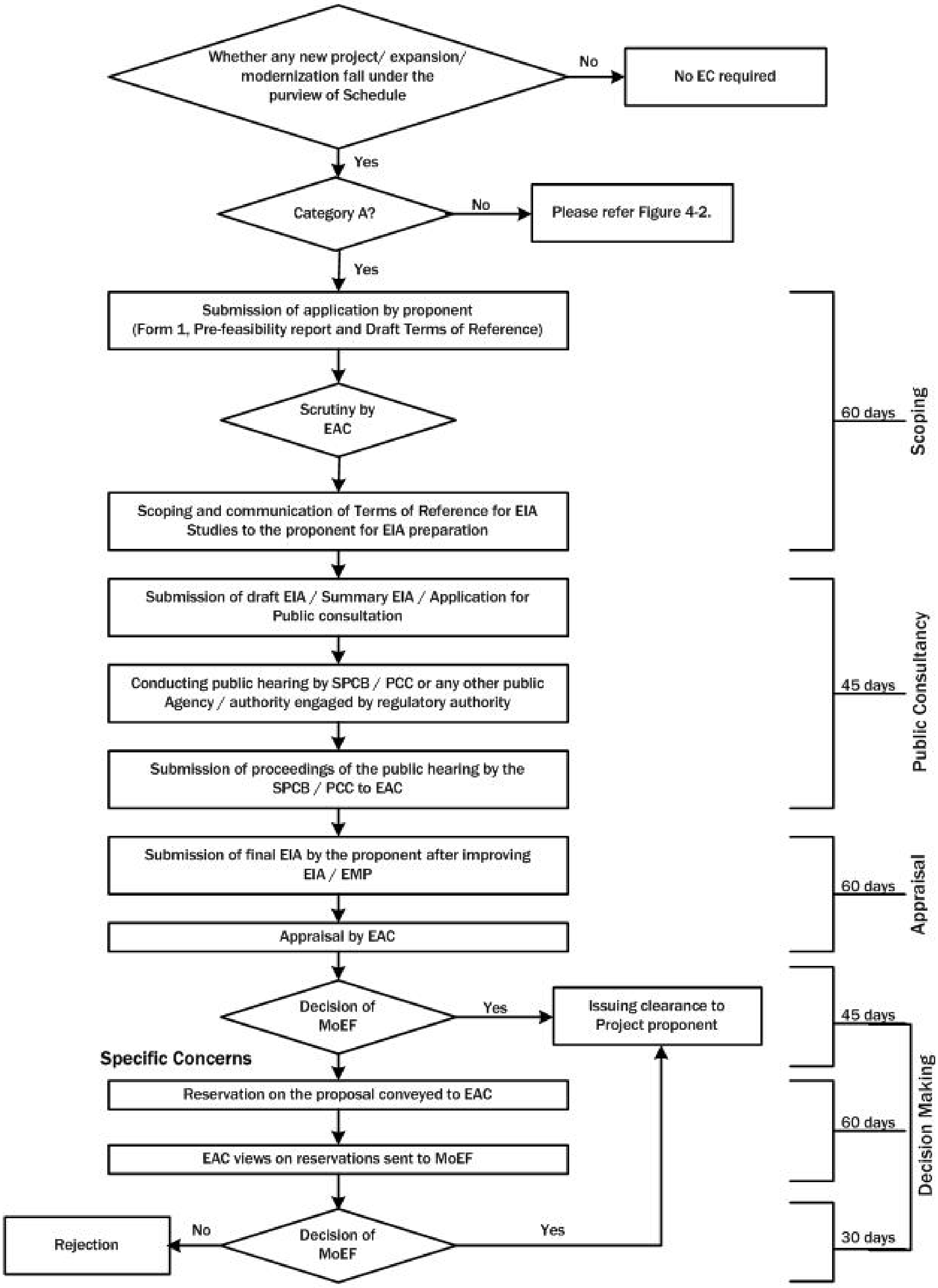


Figure 4-1: Prior Environmental Clearance Process for Activities Falling Under Category A

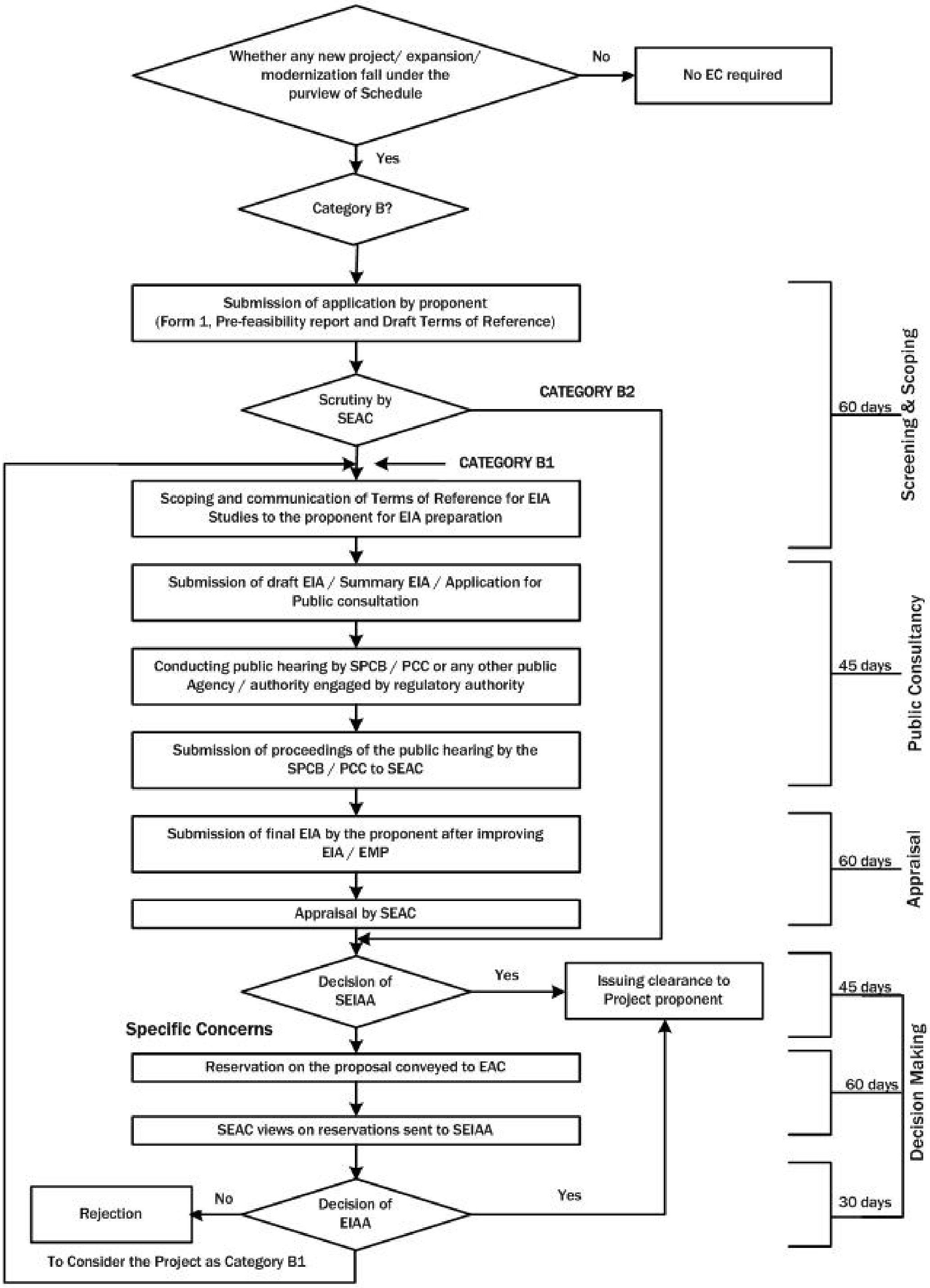


Figure 4-2: Prior Environmental Clearance Process for Activities Falling Under Category B

4.2 Screening

Screening of the project shall be performed at the initial stage of the project development so that proponents are aware of their obligations before deciding on the budget, project design and execution plan.

This stage is applicable only for Category 'B' developmental activity *i.e.*, if general conditions are applicable for a Category B project, then it will be treated as Category A project. Besides, screening also refers to the classification of Category B projects into either Category B1 or Category B2. Category B1 projects require to follow all stages applicable for a Category A project, but are processed at the SEIAAs/UTEIAAs. Category B2 projects, on the other hand, do not require either EIA or public consultation.

As per the Notification, classification of Category B projects falls under the purview of the SEAC. This manual provides certain guidelines to the stakeholders for classification of Category B1 and Category B2.

4.2.1 Applicable conditions for Category B projects

General conditions:

- Any Industrial Estate usually falling under Category B will be treated as Category A, if located in whole or in part within 10 km from the boundary of:
  - Protected areas notified under the Wild Life (Protection) Act, 1972
  - Critically polluted areas as notified by the CPCB from time to time
  - Eco-sensitive areas as notified under Section 3 of the E(P) Act, 1986, such as Mahabaleshwar, Panchgani, Matheran, Panchmarhi, Dahanu, Doon valley and
  - Inter-State boundaries and international boundaries
  - Provided that the requirement regarding distance of 10 km of the inter-state boundaries can be reduced or completely done away with, by an agreement between the respective States/UTs sharing the common boundary in case the activity does not fall within 10 km of the areas mentioned above
- The SEIAA shall base its decision on the recommendations of a State/UT level EAC for the purpose of Environmental Clearance
- In absence of a duly constituted SEIAA or SEAC, a Category B project shall be appraised at Central level *i.e.,* at the MoEF.
- The EAC at the State/UT level shall screen the projects or activities in Category B. SEAC shall meet at least once every month.
- If any Category B Industrial Estate, after proposed expansion of capacity/production or fuel change, falls under the purview of Category A in terms of production capacity, then clearance is required from the Central Government.

Specific Conditions

- If any Industrial Estate / Complex / Export Processing Zones / Special Economic Zones / Biotech parks / Leather Complex with homogeneous type of industries such leather / skin / hide / processing industry or those industrial estates with pre-defined set of activities (not necessarily homogeneous obtains prior environmental clearance, individual industries including proposed industrial housing within such estates/ complexes will not be required to take prior environmental clearance, so long as the terms and conditions for the industrial estate / complex are complied with (such estates/ complexes must have a clearly identified management with the legal responsibility of ensuring adherence to the terms and conditions of prior environmental clearance, who may be held responsible for violation of the same throughout the life of the complex / estate.)

4.2.2 Criteria for classification of Category B1 and B2 projects

The classification of Category B projects or activities into B1 or B2 (except the project or activities listed in item 8(b) in the schedule to the EIA Notification, 2006) will be determined based on whether or not the project or activity requires further environmental studies for preparation of an EIA for its appraisal prior to the grant of Environmental Clearance. The necessity of which will be decided, depending upon the nature and location specificity of the project, by SEAC after scrutiny of the applications seeking environmental clearance for Category B projects or activities.

The projects requiring an EIA report shall be included in Category B1 and remaining projects will fall under Category B2 and will not require an EIA report and public consultation.

4.2.3 Application for prior environmental clearance

- The project proponent, after identifying the site and carrying out a pre-feasibility study, is required to apply for the prior environmental clearance using Form 1 given in **Annexure IX**. The proponent has to submit the filled in Form 1 along with the pre-feasibility report and draft ToR for EIA studies to the concerned Authority *i.e.* MoEF, Government of India for Category A projects and the SEIAA in case of Category B projects. Please refer subsequent sections for the information on how to fill the Form 1, contents of pre-feasibility report and draft ToR for industrial estate.
- Prior environmental clearance is required before starting any construction work, or preparation of land on the identified site/project or activity by the project management, except for securing the land.
- If the application is made for a specific developmental activity, which has an inherent area development component as a part of its project proposal and the same project also attracts the construction and area development provisions under 8a and 8b of the Schedule, then the project will be seen as a developmental activity other than 8a and 8b of the Schedule.

4.2.4 Siting guidelines

These are the guidelines, stakeholders may consider while siting the developmental projects, to minimize the associated possible environmental impacts. In some situations, adhering to these guidelines is difficult and unwarranted. Therefore, these guidelines may be kept in the background, as far as possible, while taking the decisions.

Areas preferably be avoided

While siting industries, care should be taken to minimize the adverse impacts of the industries on immediate neighborhood as well as distant places. Some of the natural life sustaining systems and some specific landuses are sensitive to industrial impacts because of the nature and extent of fragility. With a view to protect such sites, the industries may maintain the following distances, as far as possible, from the specific areas listed:

- Ecologically and/or otherwise sensitive areas: Preferably 5 km; depending on the geo-climatic conditions the requisite distance may be decided appropriately by the agency.
- Coastal areas: Preferably ½ km away from high tide line (HTL).
- Flood plain of the riverine system: Preferably ½ km away from flood plain or modified flood plain affected by dam in the upstream or flood control systems.
- Transport/Communication System: Preferably ½ km away from highway and railway line.
- Major settlements (3,00,000 population): Distance from major settlements is difficult to maintain because of urban sprawl. At the time of siting of the industry, if the notified limit of any major settlement is found to be within 50 km from the project boundary, the spatial direction of growth of the settlement for at least a decade must be assessed. Subsequently, the industry may be sited at least 25 km from the projected growth boundary of the settlement.
- Critically polluted areas are identified by MoEF from time-to-time. Current list of critically polluted areas is given in **Annexure X**.

Note:

Ecological and/or otherwise sensitive areas include (i) Religious and Historic Places; (ii) Archaeological Monuments (e.g. identified zone around Taj Mahal); (iii) Scenic Areas; (iv) Hill Resorts; (v) Beach Resorts; (vi) Health Resorts; (vii) Coastal Areas rich in Corals, Mangroves, Breeding Grounds of Specific Species; (viii) Estuaries rich in Mangroves, Breeding grounds of Specific Species; (ix) Gulf Areas; (x) Biosphere Reserves; (xi) National Parks and Sanctuaries; (xii) Natural lakes, Swamps; (xiii) Seismic Zones; (xiv) Tribal Settlements; (xv) Areas of Scientific and Geological Interest; (xvi) Defence Installations, specially those of security importance and sensitive to pollution; (xvii) Border Areas (International) and (xviii) Air Ports.

Pre-requisite: State and Central Governments are required to identify such areas on a priority basis.

General siting factors

In any particular selected site, the following factors must also be recognized.

- No forest land shall be converted into non-forest activity for the sustenance of the industry (Ref: Forest Conversation Act, 1980).
- No prime agricultural land shall be converted into industrial site.
- Land acquired shall be sufficiently large to provide space for appropriate green cover including breen belt, around the battery limit of the industry.
- Layout of the industry that may come up in the area must conform to the landscape of the area, without affecting the scenic features of that place.
- Associated township of the industry may be created at a space having physiographic barrier between the industry and the township.

4.3 Scoping for EIA Studies

Scoping exercise is taken up soon after the project contours are defined. The primary purpose of scoping is to identify the concerns and issues which may affect the project decisions. Besides, scoping defines the requirements and boundaries of an EIA study.

Scoping refers to the process by which EAC, in case of Category 'A' projects or activities, and SEAC in case of Category 'B1' projects, including applications for expansion and/or modernization of existing projects, determines ToR for EIA studies addressing all relevant environmental concerns for preparation of an EIA Report for a particular project.

- Project proponent shall submit application to the concerned Authority. The application (Form 1 as given in **Annexure IX**) shall be attached with pre-feasibility report and proposed ToR for EIA Studies. The proposed sequence to arrive at the draft ToR is discussed below:
  - Pre-feasibility report provides a precise summarizes of project details and also the likely environmental concerns based on secondary information, which will be availed for filling Form 1.
  - From pre-feasibility report and Form 1, valued environmental components (VECs) may be identified for a given project (receiving environment/social components, which are likely to get affected due to the project operations/activities).
  - Once the project details from pre-feasibility report & Form 1; and VECs are identified, a matrix establishing interactions which can lead to effects/impacts could be developed (Qualitative analysis).
  - For each identified possible effect in the matrix, significance analysis could be conducted to identify the impacts, which need to be studied further (quantitative analysis) in subsequent EIA studies. All such points find a mention in the draft ToR to be proposed by the project proponent along with the application form. The draft ToR shall include applicable baseline parameters (refer annexure XIII) and impact prediction tools (refer annexure XV) proposed to be applied.
  - The information to be provided in pre-feasibility report, guidelines for filling Form 1 and guidelines for developing draft ToR is summarized in subsequent sections.
  - Authority consults the respective EAC/SEAC to reply to the proponent. The EAC/SEAC concerned, reviews the application form, pre-feasibility report and proposed draft ToR by the proponent and makes necessary additions/deletions to make it a comprehensive ToR that suits the statutory requirements for conducting the EIA studies.
- The concerned EAC/SEAC may formulate a sub-committee for a site visit if considered necessary. The sub-committee will act up on receiving a written approval from the chairperson of EAC/SEAC concerned. Project proponent will facilitate such site visits of the sub-committees.
- EAC/SEAC shall provide an opportunity to the project proponent for presentation and discussions on the proposed project and related issues as well as the proposed ToR for EIA studies. If the State Government desires to present its views on any specific project in the scoping stage, it can depute an officer for the same at the scoping stage to EAC, as an invitee but not as a member of EAC. However, non-appearance of the

project proponent before EAC/SEAC at any stage will not be a ground for rejection of the application for the prior environmental clearance.

- If a new or expansion project is in proposed problem area as identified by the CPCB, then the Ministry may invite representative of SEIAA to the EAC to present their views, if any at the stage of scoping.
- The final set of ToR for EIA Studies shall be conveyed to the proponent by the EAC/ SEAC within sixty days of the receipt of Form 1 and pre-feasibility report. If the finalized ToR for EIA studies is not conveyed to the proponent within sixty days of the receipt of Form 1, the ToR suggested by the proponent shall be deemed as final and will be approved for EIA studies.
- Final ToR for EIA Studies shall be displayed on website of the MoEF/SEIAA.
- Applications for prior environmental clearance may be rejected by the concerned Authority based on the recommendations by the concerned EAC or SEAC at the scoping stage itself. In case of such rejection, the decision, together with reasons for the same shall be communicated to the proponent in writing within sixty days of the receipt of the application.
- The final EIA report and other relevant documents submitted by the applicant shall be scrutinized by the concerned Authority strictly w.r.t the approved ToR for EIA studies.

4.3.1 Pre-feasibility report

The pre-feasibility report should include, but not limited to highlight the proposed project information, keeping in view the environmental sensitivities of the selected site, raw material, technology options and its availability. Information required in pre-feasibility report varies from case to case even in the same sector depending upon the local environmental setting within which the plant is located/ proposed. However, the environmental information to be furnished in the pre-feasibility report may include as under:

- Project description, including in particular:
  - a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases,
  - a description of the main characteristics of the production processes, for instance, nature and quantity of materials used,
  - an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, *etc.*) resulting from the operation of the proposed project.
- An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account, the environmental effects.
- A description of environment as aspects likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.
- A description of the likely significant effects of the proposed project on the environment resulting from:
  - existence of project
  - use of natural resources – specific consumptions

- emission of pollutants, creation of nuisances and elimination of waste, and description by the developer of the forecasting methods used to assess the effects on environment.

- A description of measures envisaged to prevent, reduce and where possible offset any significant adverse effects on environment
- A non-technical summary of the information provided under the above headings.
- An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the project proponent in compiling the required information.

Besides, depending on the scope defined in the pre-feasibility report some pre-feasibility reports are based on various studies and data collection and addresses in detail the concern as technical & economical analysis and detailed feasibility level design of equipment, power optimization, transmission, economic, financial, social and environmental investigations, cost estimates with detailed bill of quantities (BOQ). The components identified here focuses on the requirements of Scoping for EIA study in order to define the ToR for EIA studies. Points which may be covered in pre-feasibility report are listed in **Annexure XI**.

4.3.2 Guidance for providing information in Form 1

The information given in specifically designed pre-feasibility report for this developmental activity may also be availed for filling Form 1.

Form 1 is designed to help users identify the likely significant environmental effects of proposed projects sight at the scoping stage. There are two stages for providing information under two columns:

- First - identifying the relevant project activities from the list given in column 2 of Form 1. Start with the checklist of questions set out below and complete Column 3 by answering:
  - Yes - if the activity is likely to occur during implementation of the project;
  - No - if it is not expected to occur;
  - May be - if it is uncertain at this stage whether it will occur or not.

- Second - For each activity for which the answer in Column 3 is “Yes” the next step is to refer to the fourth column which quantifies the volume of activity which could be judged as significant impact on the local environmental characteristics, and identify the areas that could be affected by that activity during construction /operation / decommissioning of the project. Form 1 requires information within 15 km around the project, whereas actual study area for EIA will be as prescribed by respective EAC/SEAC. Project proponent information about the surrounding VECs in order to complete this Form 1.

4.3.3 Identification of appropriate valued environmental components

VECs are components of natural resources and human world that are considered valuable and are likely to be affected by the project activities. Value may be attributed for economic, social, environmental, aesthetic or ethical reasons. VECs represent the investigative focal point for further EIA process. The indirect and/or cumulative effects can be concerned with indirect, additive or even synergistic effects due to other projects or activities or even induced developments on the same environmental components as would be considered direct effects. But such impacts tend to involve larger scale VECs such as within entire region, river basins or watersheds; and, broad social and economic VECs such as quality of life and the provincial economy. Once VECs are identified, then appropriate indicators are selected for impact assessments on respective VECs.

4.3.4 Methods for identification of impacts

There are various factors which influence the approach adopted for the assessment of direct, indirect, cumulative impacts, *etc*., for a particular project. The method should be practical and suitable for the project given the data, time and financial resources available. However, the method adopted should be able to provide a meaningful conclusion from which it would be possible to develop, where necessary, mitigation measures and monitoring. Key points to consider when choosing the method(s) include:

- Nature of the impact(s)
- Availability and quality of data
- Availability of resources (time, finance and staff)

The method chosen should not be complex, but should aim at presenting the results in a way that can be easily understood by the developer, decision maker and the public. A comparative analysis of major impact identification methods is given in Table 4-1.

Table 4-1: Advantages and Disadvantages of Impact Identification Methods

	Description	Advantages	Disadvantages
Checklists	▪ Annotate the environmental features that need to be addressed when identifying the impacts of activities in the project	▪ Simple to understand and use ▪ Good for site selection and priority setting ▪ Simple ranking and weighting	▪ Do not distinguish between direct and indirect impacts ▪ Do not link action and impact ▪ The process of incorporating values can be controversial
Matrices	▪ Identify the interaction between project activities (along one axis) and environmental characteristics (along other axis) using a grid like table ▪ Entries are made in the cells which highlights impact severity in the form of symbols or numbers or descriptive comments	▪ Link action to impact ▪ Good method for displaying EIA results	▪ Difficult to distinguish direct and indirect impacts ▪ Significant potential for double-counting of impacts
Networks	▪ Illustrate cause effect relationship of project activities and environmental	▪ Links action to impact ▪ Useful in simplified form for	▪ Can become very complex if used beyond simplified version

	Description	Advantages	Disadvantages
	characteristics ▪ Useful in identifying secondary impacts ▪ Useful for establishing impact hypothesis and other structured science based approaches to EIA	checking for second order impacts ▪ Handles direct and indirect impacts	
Overlays	▪ Maps the impacts spatially and displays them pictorially ▪ Useful for comparing site and planning alternatives for routing linear developments ▪ Can address cumulative effects ▪ Information incentive	▪ Easy to understand ▪ Good to display method ▪ Good siting tool	▪ Addresses only direct impacts ▪ Does not address impact duration or probability
GIS	▪ Maps the impacts spatially and display them pictorially ▪ Useful for comparing site and planning alternatives for routing linear developments ▪ Can address cumulative effects ▪ Information incentive	▪ Easy to understand ▪ Good to display method ▪ Good siting tool ▪ Excellent for impact identification and analysis	▪ Do not address impact duration or probability ▪ Heavy reliance on knowledge and data ▪ Often complex and expensive
Expert System	▪ Assist diagnosis, problem solving and decision making ▪ collects inputs from user by answering systematically developed questions to identify impacts and determine their mitigability and significance ▪ Information intensive, high investment methods of analysis	▪ Excellent for impact identification and analysis ▪ Good for experimenting	▪ Heavy reliance on knowledge and data ▪ Often complex and expensive

The project team made an attempt to construct an impact matrix considering major project activities (generic operations) and stage-specific likely impacts which is given in Table 4-2.

While the impact matrix is project-specific, Table 4-2 may facilitate the stakeholders in identifying a set of components and phase-specific project activities for determination of likely impacts. Location-specific concerns may vary from case to case. Therefore, the components even without likely impacts are also retained in the matrix for the location-specific reference.

Table 4-2: Matrix of Impacts

			Phase I		Phase II																
			Pre- Construction		Infrastructure Development And Operation																
			In-case of individual Industries and common facilities, the matrix for significance of Impacts of the respective Guidance Manuals may please be referred in addition																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ENVIRONMENT	Components		Land Acquirement	Site Preparation / Leveling including development of plots, parking lots, site zoning	Burning of wastes, refuse and cleared vegetation	Construction of Boundary Wall / Separation between zones within Industrial Estates	Laying of Roads	Water Supply & Pipelines, Overhead tanks, *etc.*	Drainage Network	Laying of treated water disposal Pipe Lines	Power connection and laying of transmission lines	Laying of Telecom lines	Laying of Gas Distribution lines	Civil works such as earth moving and building of structures including temporary structures and common facilities	Heavy Equipment operations	Disposal of construction wastes	Influx of construction workers	Transportation of material and traffic movements	Greenbelt Development	Operation of Generator facilities	Storage of chemicals/ flammables
Physical	Soil	Erosion Prevention																	*		
		Soil Quality/ Contamination		*														*			*
	Resources	Fuels/ Electricity		*							*							*			
		Construction material- stone, aggregates				*	*				*			*							
		Land especially undeveloped or agricultural land		*															*		

			Phase I			Phase II															
			Pre- Construction			Infrastructure Development And Operation															
			In-case of individual Industries and common facilities, the matrix for significance of Impacts of the respective Guidance Manuals may please be referred in addition																		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
	Water	Interception or Alteration of River Beds																			
		Alteration of Hydraulic Regime				*								*							
		Alteration of surface run-off and interflow																			
		Alteration of aquifers																			
		Water quality							*							*		*			*
		Temperature																			
	Air	Air quality			*	*	*						*	*	*	*		*	*	*	*
		Noise		*		*	*							*	*	*		*	*	*	
		Climate											*						*		
Biological	Terrestrial Flora	Effect on grass & flowers		*			*		*							*		*	*		*
		Effect on trees & shrubs		*					*							*			*		*
		Effect on farmland		*															*		*
		Endangered species		*																	
	Aquatic Biota	Habitat removal																			*
		Contamination of habitats																			*
		Reduction of aquatic biota																			*
	Terrestrial Fauna	Fragmentation of terrestrial habitats		*												*					*

			Phase I			**Phase II**															
			Pre- Construction			**Infrastructure Development And Operation**															
			In-case of individual Industries and common facilities, the matrix for significance of Impacts of the respective Guidance Manuals may please be referred in addition																		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
		Disturbance of habitats by noise or vibration		*																	*
		Reduction of Biodiversity		*																	*
Social	Economy	Creation of new economic activities	*				*	*			*	*	*								
		Commercial value of properties	*				*	*		*	*		*								
		Conflict due to negotiation and/ compensation payments	*				*	*		*			*					*			
		Generation of temporary and permanent jobs	*			*	*	*			*		*	*		*	*		*		
		Effect on crops		*					*												
		Reduction of farmland productivity		*																	
		Income for the state and private sector	*					*			*	*	*								
		Electricity tariffs									*		*								
		Savings for consumers & private consumers				*					*	*	*	*							
		Savings in foreign currency for the state											*								
	Education	Training in new technologies																			*

			Phase I			Phase II															
			Pre- Construction			Infrastructure Development And Operation															
			In-case of individual Industries and common facilities, the matrix for significance of Impacts of the respective Guidance Manuals may please be referred in addition																		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
		Training in new skills to workers											*								*
	Public Order	Political Conflicts	*				*	*		*							*				
		Unrest, Demonstrations & Social conflicts	*				*	*	*	*	*		*			*	*	*			
	Infrastructure and Services	Conflicts with projects of urban, commercial or Industrial development	*				*	*		*			*		*	*	*				
	Security and Safety	Increase in Crime															*				
		Accidents caused by									*		*		*	*				*	*
	Health	Temporary								*				*	*	*				*	*
		Chronic																			*
		Acute							*												*
	Cultural	Land use	*	*		*	*	*		*				*					*		*
		Recreation		*	*	*								*							*
		Aesthetics and human interest		*	*	*	*			*	*		*	*		*		*	*		*
		Cultural status															*				

Note:

1. The above table represents a model for likely impacts, which will have to be arrived case-to-case basis considering VECs and significance analysis (Ref Section 2.9).

2. Project activities are shown as indicative. However, in Form 1 (application for EIA Clearance), for any question for which answer is 'Yes', then the corresponding activity shall reflect in project activities. Similarly 'parameters'/'factors' will also be changed within a component in order to reflect the target species of prime concern in the receiving local environment.

4.3.5 Testing the significance of impacts

The following set of conditions may be used as the checklist for testing the significance of the impacts and also to provide information in Column IV of Form 1.

- Will there be a large change in environmental conditions?
- Will new features be out-of-scale with the existing environment?
- Will the effect be unusual in the area or particularly complex?
- Will the effect extend over a large area?
- Will there be any potential for trans-frontier impact?
- Will many people be affected?
- Will many receptors of other types (fauna and flora, businesses, facilities) be affected?
- Will valuable or scarce features or resources be affected?
- Is there a risk that environmental standards will be breached?
- Is there a risk that protected sites, areas, features will be affected?
- Is there a high probability of the effect occurring?
- Will the effect continue for a long time?
- Will the effect be permanent rather than temporary?
- Will the impact be continuous rather than intermittent?
- If it is intermittent will it be frequent rather than rare?
- Will the impact be irreversible?
- Will it be difficult to avoid, or reduce or repair or compensate for the effect?

For each "Yes" answer in column 3, the nature of effects and reasons for it should be recorded in the column 4. The questions are designed so that a "Yes" answer in column 3, will generally point towards the need for analyzing for the significance and requirement for conducting impact assessment for the effect.

4.3.6 Terms of reference for EIA studies

For any common facilities such as CETPs, municipal solid waste management, common incinerators, TSDFs, coming-up as a part of the IEs, then respective developmental activity-specific guidance points may be considered. Besides, the ToR for EIA studies for IEs may include, but may not be limited to the following:

1. Executive summary of the project – giving a *prima facie* idea of the objectives of the proposal, use of resources, justification, *etc*. In addition, it should provide a compilation of EIA report including EMP and post-project monitoring plan in brief.

Project description

2. Details of the industries, for which the estate is being planned and their proposed capacities of installation, if available. In the absence of complete details, indicate the type of industries and capacity being considered.
3. Land requirement for the project including the peripheral greenbelt inside the boundary.
4. Justification for selecting the proposed size of the IEs.
5. Details on strategy being followed for development of IE.
6. Layout map of estate indicating processing zones, admin area, roads, plots, green belt, common utilities area, *etc*., shall be shown along with contour map. Landscape plan including open spaces may be described.
7. Classify the proposed industries based on their pollution potential to the extent possible *i.e*., A1 to A4 categories for air pollution and W1 to W4 categories for water pollution - CPCB Guidance may be referred for classification
8. Backward and forward linkages of the IEs (availability of input resources and markets for the products / by-products and anticipated benefits for the regional development).
9. Details of Infrastructure Development within the IE and in the region.
10. Details on known industrial activity-specific proposed processes, resource consumption and rejects assessment.
11. Details on estimated quantity of fuel required, fuel type, nature, source and transportation.
12. Details on estimated water balance taking into account conservation measures, reuse and recycling of treated effluents.
13. Individual and/or common facilities for waste collection, treatment, recycling and disposal (all effluent, emission and refuse including MSW, and hazardous wastes)
14. Commitment from the concerned authorities regarding availability of power, water and sewerage network.
15. Details of Solid Waste management including arrangements for hazardous waste management and e-waste.
16. Details on provisions made for safety in storage of materials, products and wastes.
17. Details on use of local building materials. The provisions of fly ash Notification should be kept in view.
18. Detailed plan of treated water disposal, reuse and utilization/management.
19. In case of site leveling involving quarrying, details thereof.
20. Any litigation pending against the project and /or any direction /order passed by any Court of Law related to the environmental pollution and impacts in the last two years, if so, details thereof.

Description of the environment

21. The project study area for EIA studies shall be up to a distance of 10 km from the boundary of the proposed IE.

22. Location of the project site and nearest habitats with distances from the project site to be demarcated on a toposheet (1: 50000 scale).
23. Landuse based on satellite imagery including location specific sensitivities such as national parks / wildlife sanctuary, villages, industries, etc. for the study area.
24. Demography details of all the villages falling within the study area.
25. Topography details of the project area.
26. Anticipated pollution loads from each of the known composition of industrial units. Cumulative wastewater quantity and pollution load, point source–specific details for air pollutants and their loads, total solid/hazardous waste generation *etc*.
27. Details of rainwater harvesting and how it will be used in the IE & outfall.
28. The baseline data to be collected from the study area w.r.t. different components of environment viz. air, noise, water, land, and biology and socio-economic (please refer Section 4.4.2 for guidance for assessment of baseline components and identify attributes of concern). Actual monitoring of baseline environmental components shall be strictly according to the parameters prescribed in the ToR after considering the proposed coverage of parameters by the proponent in draft ToR and shall commence after finalization of ToR by the competent Authority..
29. Identification of existing potential sources of pollution in the study area.
30. Present and projected population; present and proposed land use; planned development activities, issues relating to squatting and relocation, community structure, employment, distribution of income, goods and services; recreation; public health and safety; cultural peculiarities, aspirations and attitudes shall be explored in study.
31. Details regarding availability of social infrastructure and future projections, details of facilities such as sanitation, fuel, restroom *etc*. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.
32. Detailed study of the hydrological and geo-hydrological conditions of the project area including a contour plan indicating slopes and showing drainage pattern and outfall.
33. Information regarding surface hydrology and water regime and impact of the same, if any due to the project.
34. Examine soil characteristics, topography, rainfall pattern and soil erosion.
35. Details on surface water quality of nearby water sources and other surface drains.
36. Details of groundwater quality in and around the IE.
37. Examine water quality with reference to Persistent Organic Pollutants, if relevant.
38. Details on water quality for parameters such as pH, Temperature (^oC), Oil and grease*, Cyanide* (as CN), Ammoniacal nitrogen* (as N), Phenolic compounds* (as C_6H_5OH), Hexavalent Chromium*, Total chromium*, Copper*, Nickel* , Lead*, Arsenic*, Mercury*, Cadmium*, Selenium*, Fluoride*, Boron*, Radioactive Materials*, Alfa emitters*, Hc/ml*, Beta emitters*, Hc/ml*, *etc*. (* - As applicable). These parameters to be determined depend on the type of industries coming in industrial estates.
39. Details on existing ambient air quality and expected, stack and fugitive emissions for PM10, PM 2.5, SO_2*, NOx*, O_3, suspended particulates, VOC, Mercury, *etc*., and evaluation of the adequacy of the proposed pollution control devices to meet

standards for point sources and to meet AAQ standards. (* - As applicable and these parameters to be determined depends on the type of industries coming in industrial estates)

40. The air quality contours may be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any and wind roses.
41. Mathematical modeling for calculating the dispersion of air pollutants and ground level concentration along with emissions from boilers
42. Details on noise levels at sensitive/commercial receptors.
43. Site-specific meteorological data including mixing heights and secondary data for future predictions.
44. One season site-specific data excluding monsoon season.
45. Proposed baseline monitoring network for the consideration and approval of the Competent Authority.
46. Fuel analysis to be provided (sulphur, ash content and mercury). Details of auxiliary fuel, if any including its quantity, quality, storage, *etc*., should also be given.
47. Examine entry/exit of the project including the crossings from the highway and provision of service roads on the basis of traffic density studies and analysis.
48. Climatic conditions of the study area shall be monitored for hourly wind speed, wind direction, relative humidity, ambient dry and wet bulb temperatures and precipitation.
49. Ecological status (terrestrial and aquatic) of the study area such as habitat type and quality, species, diversity, rarity, fragmentation, ecological linkage, age, abundance, *etc*.
50. If ecologically sensitive attributes fall within the study area, proponent shall describe the sensitivity (distance, area and significance) and propose the additional points based on significance for review and acceptance by the EAC/ SEAC. Ecological sensitive attributes include:
    - National parks
    - Wild life sanctuaries Game reserve
    - Tiger reserve/elephant reserve/turtle nesting ground
    - Mangrove area
    - Wetlands
    - Reserved and Protected forests, *etc*.
    - Any other closed/protected area under the Wild Life (Protection) Act, 1972, any other area locally applicable
51. If any incompatible land use attributes fall within the study area, proponent shall describe the sensitivity (distance, area and significance) and propose the additional points based on significance for review and acceptance by the EAC/SEAC. Incompatible land use attributes include:
    - Public water supply areas from rivers/surface water bodies, from ground water
    - Scenic areas/tourism areas/hill resorts
    - Religious places, pilgrim centers that attract over 10 lakh pilgrims a year
    - Protected tribal settlements (notified tribal areas where industrial activity is not permitted)
    - Monuments of national significance, World Heritage Sites
    - Cyclone, Tsunami prone areas (based on last 25 years);
    - Airport areas

- Any other feature as specified by the State or local government and other features as locally applicable, including prime agricultural lands, pastures, migratory corridors, *etc*.

52. If the location falls in Valley, specific issues connected to the natural resources management shall be studied and presented.
53. If the location falls in CRZ area: A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the project and associate facilities w.r.t. CRZ, coastal features such as mangroves, if any.
    - Provide the CRZ map in 1:10000 scale in general cases and in 1:5000 scale for specific observations.
    - Proposed site for disposal of dredged material and environmental quality at the point of disposal/impact areas.
    - Fisheries study should be done w.r.t. Benthos and Marine organic material and coastal fisheries.

Anticipated environmental impacts and mitigation measures

54. Anticipated generic environmental impacts due to this project are indicated in Table 4-2, which may be evaluated for significance and based on corresponding likely impacts VECs may be identified. Baseline studies may be conducted for all the concerned VECs and likely impacts will have to be assessed for their magnitude in order to identify mitigation measures (please refer Chapter 4 of the manual for guidance).
55. Tools as given in Section 4.4.3 may be referred for the appropriate assessment of environmental impacts and same may be submitted in draft ToR for consideration and approval by EAC/SEAC.
56. While identifying the likely impacts, also include the following for analysis of significance and required mitigation measures:
    - impacts due to transportation of raw materials and end products on the surrounding environment
    - impacts on surface water, soil, groundwater, drainage due to project activities
    - impacts due to air pollution
    - impacts due to odour pollution
    - impacts due to noise
    - impacts due to fugitive emissions
    - impact on health of workers due to proposed project activities
57. Proposed odour control measures.
58. Examine in detail the proposed site with reference to possible impact of infrastructure covering water supply, pipelines, roads, storm water drainage, sewerage, power, temporary waste storage facilities, treated wastewater disposal (land/sewer/surface water bodies), common facilities, *etc*.
59. Environmental condition scenarios shall be developed based on industrial activities and pollution potentials.
60. Details of traffic density vis-à-vis impact on the ambient air.
61. Cumulative impact on regional supportive capacity shall be studied in terms of population density, water supply, sewerage, storm water drainage, power supply, educational facilities, medical facilities, public transport, traffic, housing for EWS, and community facilities, *etc*.

62. Details on positive and negative impacts, direct and indirect impacts, induced impacts.
63. Project activities and impacts shall be represented in matrix form with separate matrices for pre and post mitigation scenarios.
64. Traffic management plan including parking and loading/unloading areas may be described. Traffic survey should be carried out on week days and weekends and also analyze the anticipated traffic increase.
65. Odour mitigation plan may be described. Also make provision of green cover as a measure for mitigation of dust and noise and buffer between habitation and industry.
66. Rain water harvesting proposals should be made with due safeguards for groundwater quality. Maximize recycling of water and utilization of rain water.
67. Temporary plans for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile Sewage Treatment Plant (STP), safe drinking water, medical health care, crèche, *etc*.
68. Proposed measures for occupational safety and health of the workers.
69. Impact of the project on local infrastructure of the area such as road network and whether any additional infrastructure would need to be constructed and the agency responsible for the same with time frame.
70. Action plan for the greenbelt development – species, width of plantations, planning schedule *etc*. within the boundary around the IE in accordance to CPCB published guidelines.
71. In case of likely impact from the proposed project on the surrounding reserve forests, Plan for the conservation of wild fauna in consultation with the State Forest Department.
72. For identifying the mitigation measures, please refer Chapter III for source control and treatment. Besides typical mitigation measures which may also be considered are discussed in Table 4-5.

Analysis of alternative resources and technologies

73. Comparison of alternate sites considered and the reasons for selecting the proposed site. Conformity of the site with the prescribed guidelines in terms of CRZ, river, highways, railways, *etc*.
74. Evaluate alternative disposal modes of effluent and solid wastes, from the point of view of disposal points and associated impacts.
75. All kind of resources both renewable and non-renewable shall be taken into account.
76. Details on improved technologies.

Environmental monitoring program

77. Monitoring programme for pollution control at source.
78. Monitoring pollutants at receiving environment for the appropriate notified parameters – air quality, groundwater, surface water, *etc*. during operational phase of the project.
79. Specific programme to monitor safety and health protection of workers.

80. Appropriate monitoring network has to be designed and proposed, to assess the possible residual impacts on VECs.
81. Details of in-house monitoring capabilities and the recognized agencies if proposed for conducting monitoring.

Additional studies

82. Details on risk assessment and damage control during different phases of the project and proposed safeguard measures.
83. Details on socio-economic development activities such as commercial property values, generation of jobs, education, social conflicts, cultural status, accidents, *etc*.
84. Proposed plan to handle the socio-economic influence on the local community. The plan should include quantitative dimension as far as possible.
85. Details on compensation package for the people affected by the project, considering the socio-economic status of the area, homestead oustees, land oustees, and landless labourers.
86. Public hearing should be conducted as per the prescribed procedure. Points identified in the public hearing and commitment of the project proponent to the same. Detailed action plan addressing the issues raised, and the details of necessary allocation of funds.
87. The historical importance of the area shall also be examined in the study. While this analysis is being conducted, it is expected that an assessment of public perception of the proposed development be conducted.
88. Describe the application of industrial ecology concept for planning of IEs. Explore possibility of utilizing waste of one unit as raw material for the other units.
89. Specific chemical emergency response and proposed rescue system.
90. Details on corporate social responsibility proposal.

Environmental management plan

91. Administrative and technical organizational structure to ensure proposed post-project monitoring programme for approved mitigation measures.
92. EMP devised to mitigate the adverse impacts of the project should be provided along with item-wise cost of its implementation (capital and recurring costs).
93. Allocation of resources and responsibilities for plan implementation.
94. Details of the emergency preparedness plan and on-site and off-site disaster management plan.

Note:

Above points shall be adequately addressed in the EIA report at corresponding chapters, in addition to the contents given in the reporting structure (Table: 4-6).

4.4 Environmental Impact Assessment

The generic approach for accomplishing EIA studies is shown in Figure 4.3. Each stage is discussed in detail, in subsequent sections.

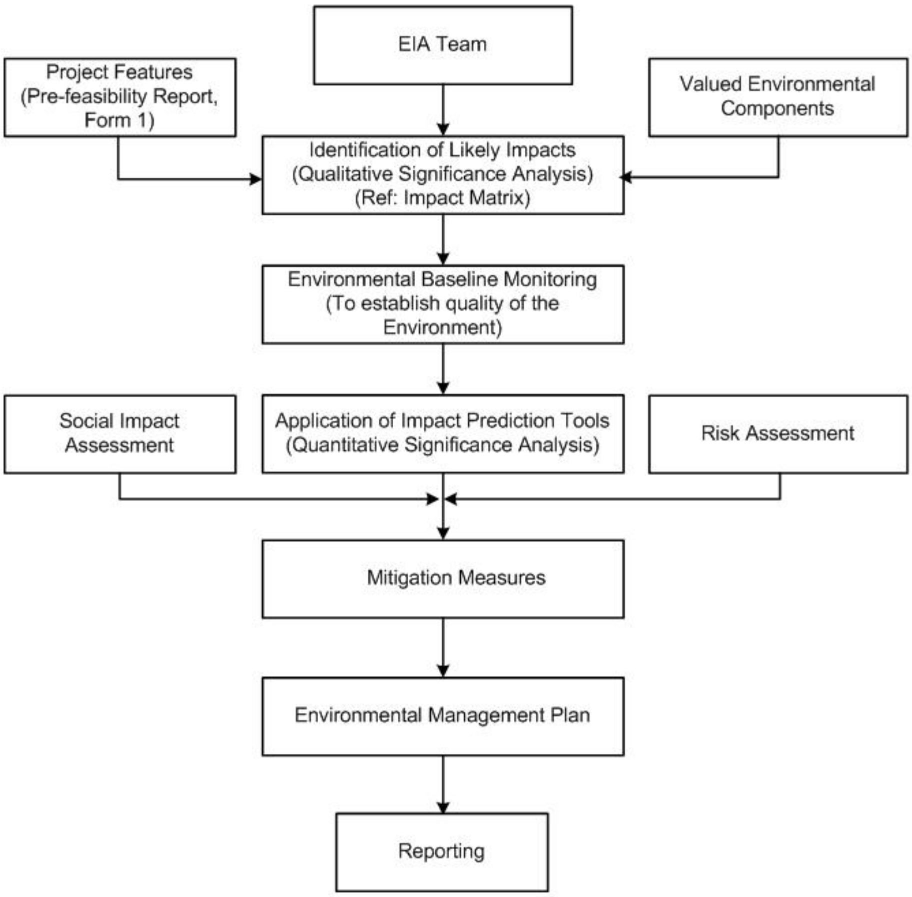


Figure 4-3: Approach for EIA Study

4.4.1 EIA team

The success of a multi-functional activity like an EIA primarily depends on constitution of a right team at the right time (preferable at the initial stages of an EIA) in order to assess the significant impacts (direct, indirect as well as cumulative impacts).

The professional Team identified for a specific EIA study should comprise of qualified and experienced professionals from various disciplines in order to address the critical aspects identified for the specific project. Based on the nature and the environmental setting, following professionals may be identified for EIA studies:

- Environmental management specialist/Environmental regulator
- Environmental planner
- Air & Noise quality expert
- Occupational Health expert
- Geology / Geo – hydrology specialist
- Ecologist
- Transportation specialist
- Safety & Health specialist
- Social scientist
- Organic Chemistry specialist
- Agronomy specialist
- Irrigation & flood control expert

- Mineral Exploration & beneficiation expert
- Chemical Engineer
- Marine Engineer
- Metallurgical Engineer
- Civil Engineer, *etc.*

4.4.2 Baseline quality of the environment

EIA Notification 2006 specifies that an EIA Report should contain a description of the existing environment that would be or might be affected directly or indirectly by the proposed project. Environmental Baseline Monitoring (EBM) is a very important stage of EIA. On one hand EBM plays a very vital role in EIA and on the other hand, it provides feedback about the actual environmental impacts of a project. EBM, during the operational phase, helps in judging the success of mitigation measures in protecting the environment. Mitigation measures, in turn are used to ensure compliance with environmental standards, and to facilitate the needed project design or operational changes.

Description of the existing environment should include natural, cultural, socio-economic systems and their interrelationships. The intention is not to describe all baseline conditions, but to focus the collection and description of baseline data on those VECs that are important and are likely to be affected by the proposed industrial activity.

4.4.2.1 Objective of EBM in the EIA context

The term 'baseline' refers to conditions existing before development. EBM studies are carried out to:

- identify environmental conditions which might influence project design decisions (*e.g.*, site layout, structural or operational characteristics);
- identify sensitive issues or areas requiring mitigation or compensation;
- provide input data to analytical models used for predicting effects;
- provide baseline data against which the results of future monitoring programs can be compared.

At this stage of EIA process, EBM is primarily discussed in the context of first purpose wherein feedback from EBM programs may be used to:

- determine available assimilative capacity of different environmental components within the designated impact zone and whether more or less stringent mitigation measures are needed; and
- improve the predictive capability of EIAs.

There are many institutional, scientific, quality control, and fiscal issues that must be addressed in implementation of an environmental monitoring program. Careful consideration of these issues in the design and planning stages will help avoid many of the pitfalls associated with environmental monitoring programs. Such major issues are as under:

4.4.2.2 Environmental monitoring network design

Monitoring refers to the collection of data through a series of repetitive measurements of environmental parameters (or, more generally, to a process of systematic observation). The environmental quality monitoring programme design will depend on the monitoring objectives specified for the selected area of interest. Types of monitoring and network design considerations are discussed in **Annexure XII**.

4.4.2.3 Baseline data generation

List of important physical environmental components and indicators of EBM are given in Table 4-3.

Table 4-3: List of Important Physical Environment Components and Indicators of EBM

Environmental Component	Environmental Indicators
Climatic variables	▪ Rainfall patterns – mean, mode, seasonality ▪ Temperature patterns ▪ Extreme events ▪ Climate change projections ▪ Prevailing wind - direction, speed, anomalies ▪ Relative humidity ▪ Stability conditions and mixing height, *etc.*
Topography	▪ Slope form ▪ Landform and terrain analysis ▪ Specific landform types, *etc.*
Drainage	▪ Surface hydrology ▪ Natural drainage pattern and network ▪ Rainfall runoff relationships ▪ Hydrogeology ▪ Groundwater characteristics – springs, *etc.*
Soil	▪ Type and characteristics ▪ Porosity and permeability ▪ Sub-soil permeability ▪ Run-off rate ▪ Infiltration capacity ▪ Effective depth (inches/centimeters) ▪ Inherent fertility ▪ Suitability for method of sewage disposal, *etc.*
Geology	▪ Underlying rock type, texture ▪ Surgical material ▪ Geologic structures (faults, shear zones, *etc.*) ▪ Geologic resources (minerals, *etc.*)
Water quality	▪ Raw water availability ▪ Water quality ▪ Surface water (rivers, lakes, ponds, gullies) – quality, water depths, flooding areas, *etc.* ▪ Ground water – water table, local aquifer storage capacity, specific yield, specific retention, water level depths and fluctuations, *etc.* ▪ Coastal ▪ Floodplains

Environmental Component	Environmental Indicators
	▪ Wastewater discharges ▪ Waste discharges, *etc.*
Air quality	▪ Ambient ▪ Respirable ▪ Airshed importance ▪ Odour levels, *etc.*
Coastal dynamics and morphology	▪ Wave patterns ▪ Currents ▪ Shoreline morphology – near shore, foreshore ▪ Sediment – characteristics and transport, *etc.*
Biological	▪ Species composition of flora and fauna ▪ Flora – type, density, exploitation, *etc.* ▪ Fauna – distribution, abundance, rarity, migratory, species diversity, habitat requirements, habitat resilience, economic significance, commercial value, *etc.* ▪ Fisheries – migratory species, species with commercial/ recreational value, *etc.*
Landuse	▪ Landuse pattern, *etc.*

Guidance for assessment of baseline components and attributes describing sampling network, sampling frequency, method of measurement is given in **Annexure XIII**.

Infrastructure requirements for EBM

In addition to devising a monitoring network design and monitoring plan/program, it is also necessary to ensure adequate resources in terms of staffing,, equipment, training, budget, *etc*., for its implementation. Besides assigning institutional responsibility, reporting requirements, QA/QC plans and its enforcement capability are essential. A monitoring program that does not have an infrastructural support and QA/QC component will have little chance of success.

Defining data statistics/analyses requirements

The data analyses to be conducted are dictated by the objectives of environmental monitoring program. The statistical methods used to analyze data should be described in detail prior to data collection. This is important because repetitive observations are recorded in time and space. Besides, the statistical methods could also be chosen so that uncertainty or error estimates in the data can be quantified. For *e.g.*, statistical methods useful in an environmental monitoring program include: 1) frequency distribution analysis; 2) analysis of variance; 3) analysis of covariance; 4) cluster analysis; 5) multiple regression analysis; 6) time series analysis; 7) the application of statistical models.

Use of secondary data

The EBM program for EIA can, at best address temporal and/or spatial variations limited to a certain extent because of cost implications and time limitations. Therefore analysis of all available information or data is essential to establish the regional profiles. So all the relevant secondary data available for different environmental components should be collated and analyzed.

To facilitate stakeholders, IL&FS Ecosmart Ltd., has made an attempt to compile the list of information required for EIA studies and sources of secondary data, which are given in **Annexure XIVA** and **Annexure XIVB**.

4.4.3 Impact prediction tools

The scientific and technical credibility of an EIA relies on the ability of EIA practitioners to estimate the nature, extent, and magnitude of change in environmental components that may result from project activities. Information about predicted changes is needed for assigning impact significance, prescribing mitigation measures, and designing & developing EMPs, and post-project monitoring programs. The more accurate the predictions are, the more confident the EIA practitioner will be in prescribing specific measures to eliminate or minimize the adverse impacts of development project.

Choice of models/methods for impact predictions in respect of air, noise, water, land, biological environment and socio-economic aspects are precisely tabulated in **Annexure XV**.

4.4.4 Significance of the impacts

Evaluating the significance of environmental effects is perhaps the most critical component of impact analysis.. The interpretation of significance bears directly on the subsequent EIA process and also during environmental clearance on project approvals and condition setting. At an early stage, it also enters into screening and scoping decisions on what level of assessment is required and which impacts and issues will be addressed.

Impact significance is also a key to choosing among alternatives. In total, the attribution of significance continues throughout the EIA process, from scoping to EIS review, in a gradually narrowing "cone of resolution" in which, one stage sets up the next. But at this stage it is the most important as better understanding and quantification of impact significance is required.

One common approach is based on determination of the significance of predicted changes in the baseline environmental characteristics and compares these w.r.t regulatory standards, objective criteria and similar 'thresholds' as eco-sensitivity, cultural /religious values. Often, these are outlined in guidance. A better test proposed by the CEAA (1995) is to determine if 'residual' environmental effects are adverse, significant, and likely (given under). But at this stage, the practice of formally evaluating significance of residual impacts, *i.e.*, after predicting the nature and magnitude of impacts based on before-versus-after-project comparisons, and identifying measures to mitigate these effects is not being followed in a systematic way.

i. Step 1: Are the environmental effects adverse?

Criteria for determining if effects are "adverse" include:

- effects on biota health
- effects on rare or endangered species
- reductions in species diversity
- habitat loss
- transformation of natural landscapes

- effects on human health
- effects on current use of lands and resources for traditional purposes by aboriginal persons; and
- foreclosure of future resource use or production

ii. Step 2: Are the adverse environmental effects significant?

Criteria for determining 'significance' are to judge that the impacts:

- are extensive over space or time
- are intensive in concentration or proportion to assimilative capacity
- exceed environmental standards or thresholds
- do not comply with environmental policies, landuse plans, sustainability strategy
- adversely and seriously affect ecologically sensitive areas
- adversely and seriously affect heritage resources, other landuses, community lifestyle and/or indigenous peoples traditions and values

iii. Step 3: Are the significant adverse environmental effects likely?

Criteria for determining 'likelihood' include:

- probability of occurrence, and
- scientific uncertainty

4.5 Social Impact Assessment

Social Impact Assessment (SIA) is an instrument used to analyze social issues and solicit stakeholder views for the design of projects. SIA helps in making the project responsive to social development concerns, including options that enhance benefits for poor and vulnerable people while mitigating risk and adverse impacts. It analyzes distributional impacts of intended project benefits on different stakeholder groups, and identifies differences in assets and capabilities to access the project benefits.

The scope and depth of SIA should be determined by the complexity and importance of issues studied, taking into account the skills and resources available. SIA should include studies related to involuntary resettlement, compulsory land acquisition, impact of imported workforces, job losses among local people, damage to sites of cultural, historic or scientific interest, impact on minority or vulnerable groups, child or bonded labour, use of armed security guards. However, SIA may primarily include the following:

Description of the socio-economic, cultural and institutional profile

Conduct a rapid review of available sources of information to describe the socio-economic, cultural and institutional interface in which the project operates.

Socio-economic and cultural profile: Describe the most significant social, economic and cultural features that differentiate social groups in the project area. Describe their different interests in the project, and their levels of influence. Explain any specific effects, the project may have on the poor and underprivileged. Identify any known conflicts among groups that may affect project implementation.

Institutional profile: Describe the institutional environment; consider both the presence and function of public, private and civil society institutions relevant to the operation. Are there important constraints within existing institutions *e.g.* disconnect between institutional responsibilities and the interests and behaviors of personnel within those institutions? Or are there opportunities to utilize the potential of existing institutions, *e.g.* private or civil society institutions, to strengthen implementation capacity.

Legislative and regulatory considerations

To review laws and regulations governing the project's implementation and access of poor and excluded groups to goods, services and opportunities provided by the project. In addition, review the enabling environment for public participation and development planning. SIA should build on strong aspects of legal and regulatory systems to facilitate program implementation and identify weak aspects while recommending alternative arrangements.

Key social issues

SIA provides baseline information for designing social development strategy. The analysis should determine the key social and Institutional issues which affect the project objectives; identify the key stakeholder groups in this context and determine how relationships between stakeholder groups will affect or be affected by the project; and identify expected social development outcomes and actions proposed to achieve those outcomes.

Data collection and methodology

Describe the design and methodology for social analysis. In this regard:

- Build on existing data;
- Clarify the units of analysis for social assessment: intra-household, household level, as well as communities/settlements and other relevant social aggregations on which data is available or will be collected for analysis;
- Choose appropriate data collection and analytical tools and methods, employing mixed methods wherever possible; mixed methods include a mix of quantitative and qualitative methods.

Strategy to achieve social development outcomes

Identify the likely social development outcomes of the project and propose a social development strategy, including recommendations for institutional arrangements to achieve them, based on the findings of the social assessment. The social development strategy could include measures that:

- strengthen social inclusion by ensuring inclusion of both poor and excluded groups and intended beneficiaries in the benefit stream; offer access to opportunities created by the project
- empower stakeholders through their participation in design and implementation of the project, their access to information, and their increased voice and accountability (*i.e.* a participation framework); and
- that enhance security by minimizing and managing likely social risks and increasing the resilience of intended beneficiaries and affected persons to socio-economic shocks

Implications for analysis of alternatives

Review proposed approaches for the project, and compare them in terms of their relative impacts and social development outcomes. Consider what implications the findings of social assessment might have on those approaches. Should some new components be added to the approach, or other components be reconsidered or modified?

If SIA and consultation processes indicate that alternative approaches may to have better development outcomes, such alternatives should be described and considered, along with the likely budgetary and administrative effects these changes might have.

Recommendations for project design and implementation arrangements

Provide guidance to project management and other stakeholders on how to integrate social development issues into project design and implementation arrangements. As much as possible, suggest specific action plans or implementation mechanisms to address relevant social issues and potential impacts. These can be developed as integrated or separate action plans, for example, as Resettlement Action Plans, Indigenous Peoples Development Plans, Community Development Plans, *etc*.

Developing a monitoring plan

Through SIA process, a framework for monitoring and evaluation should be developed. To the extent possible, this should be done in consultation with key stakeholders, especially beneficiaries and affected people.

The framework shall identify expected social development indicators, establish benchmarks, and design systems and mechanisms for measuring progress and results related to social development objectives. The framework shall identify organizational responsibilities in terms of monitoring, supervision, and evaluation procedures. Wherever possible, participatory monitoring mechanisms shall be incorporated. The framework should establish:

- a set of monitoring indicators to track the progress achieved. The benchmarks and indicators should be limited in number, and should combine both quantitative and qualitative types of data. The indicators should include outputs to be achieved by the social development strategy; indicators to monitor the process of stakeholder participation, implementation and institutional reform;
- indicators to monitor social risk and social development outcomes; and indicators to monitor impacts of the project's social development strategy. It is important to suggest mechanisms through which lessons learnt from monitoring and stakeholder feedback can result in changes to improve operation of the project. Indicators should be of such nature that results and impacts can be disaggregated by gender and other relevant social groups;
- Define transparent evaluation procedures. Depending on context, these may include a combination of methods, such as participant observation, key informant interviews, focus group discussions, census and socio-economic surveys, gender analysis, Participatory Rural Appraisal (PRA), Participatory Poverty Assessment (PPA) methodologies, and other tools. Such procedures should be tailored to the special conditions of the project and to the different groups living in the project area; Estimate resource and budget requirements for monitoring and evaluation activities,

and a description of other inputs (such as institutional strengthening and capacity building) needs to be carried out.

4.6 Risk Assessment and Disaster Management Plan

4.6.1 Risk assessment

Industrial accidents results in great personal and financial loss. Managing these accidental risks in today's environment is the concern of every industry including IEs, because either real or perceived incidents can quickly jeopardize the financial viability of a business. Many facilities involve various manufacturing processes that have the potential for accidents which may be catastrophic to the plant, work force, environment, or public.

The main objective of risk assessment study is to propose a comprehensive but simple approach to carry out risk analysis and conducting feasibility studies for industries, planning and management of industrial prototype hazard analysis study in Indian context.

Risk analysis and risk assessment should provide details on Quantitative Risk Assessment (QRA) techniques used world-over to determine risk posed to people who work inside or live near hazardous facilities, and to aid in preparing effective emergency response plans by delineating a Disaster Management Plan (DMP) to handle on-site and off-site emergencies. Hence, QRA is an invaluable method for making informed risk-based process safety and environmental impact planning decisions, as well as being fundamental to any decision while siting a facility. QRA whether, site-specific or risk-specific for any plant is complex and needs extensive study that involves process understanding, hazard identification, consequence modeling, probability data, vulnerability models/data, local weather and terrain conditions and local population data. QRA may be carried out to serve the following objectives:

- Identification of safety areas
- Identification of hazard sources
- Generation of accidental release scenarios for escape of hazardous materials from the facility
- Identification of vulnerable units with recourse to hazard indices
- Estimation of damage distances for the accidental release scenarios with recourse to Maximum Credible Accident (MCA) analysis
- Hazard and Operability studies (HAZOP) in order to identify potential failure cases of significant consequences
- Estimation of probability of occurrences of hazardous event through fault tree analysis and computation of reliability of various control paths
- Assessment of risk on the basis of above evaluation against the risk acceptability criteria relevant to the situation
- Suggest risk mitigation measures based on engineering judgement, reliability and risk analysis approaches
- Delineation / upgradation of DMP
- Safety Reports: with external safety report/ occupational safety report

The risk assessment report may cover the following in terms of the extent of damage with resource to MCA analysis and delineation of risk mitigations measures with an approach to DMP.

- Hazard identification – identification of hazardous activities, hazardous materials, past accident records, *etc*.
- Hazard quantification – consequence analysis to assess the impacts
- Risk Presentation
- Risk Mitigation Measures
- DMPs

Figure 4-4: Risk Assessment – Conceptual Framework

Methods of risk prediction should cover all the design intentions and operating parameters to quantify risk in terms of probability of occurrence of hazardous events and magnitude of its consequence. Table 4-4 shows the predictive models for risk assessment.

Table 4-4: Choice of Models for Impact Predictions: Risk Assessment

Name	Application	Remarks
EFFECT WHAZAN	Consequence Analysis for Visualization of accidental chemical release scenarios & its consequence Consequence Analysis for Visualization of accidental chemical release scenarios & its consequence	Heat load, press wave & toxic release exposure neutral gas dispersion
EGADIS	Consequence Analysis for Visualization of accidental chemical release scenarios & its consequence	Dense gas dispersion
HAZOP and Fault Tree Assessment	For estimating top event probability	Failure frequency data is required
Pathways reliability and protective system hazard analysis	For estimating reliability of equipments and protective systems	Markov models
Vulnerability Exposure models	Estimation of population exposure	Uses probit equation for population exposure
F-X and F-N curves	Individual / Societal risks	Graphical Representation

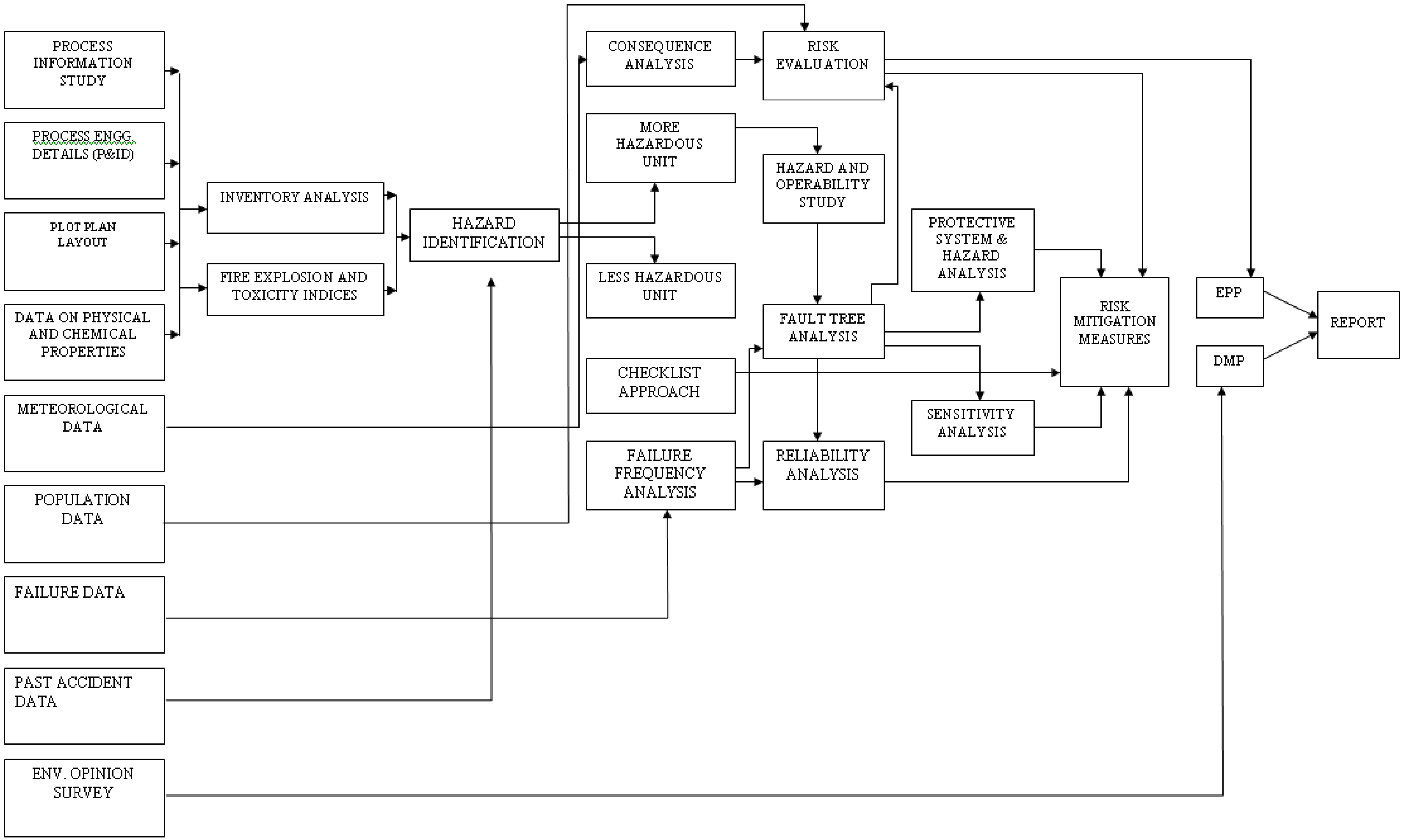


Figure 4-5: Comprehensive Risk Assessment - At a Glance

A. Storage and handling of hazardous materials

Both the hazardous and non-hazardous material generated within the IEs shall be temporarily accommodated in necessary units placed within the IE in line with the safety, health and environmental standards.

The size of these temporary units would depend on the quantity and type of waste Hazardous materials like asbestos, PCB, oils, fuels, *etc*. with appropriate storage capacities are placed in the Estate following Hazardous Waste Management and Handling Rules. In case of Radioactive wastes, the wastes shall be handled based on Rules for Management of Radioactive Waste under AERB. Also, if gas cylinders must be stored in the Estate, the Gas cylinders Rules under Explosives Act shall be followed. Later, these materials must be disposed off at a centralized disposal facility with utmost care following safety norms. Each Unit in the IEs should be facilitated with fire hydrant system to handle fire hazards.

B. Hazard identification

Hazard is the characteristic of any system or process which has the potential for accident. Identification of hazards, in the presence of any hazardous waste generating industries within the IEs is of primary significance in the analysis, quantification and cost effective control of accidents involving chemicals and process.

Hence, all the components of a system need to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/sequence of events, which can be termed as an accident.

The typical methods for hazard identification employed are:

- Identification of major hazardous units based on Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 of Government of India (as amended in 2000); and
- Identification of hazardous units and segments of plants and storage units based on relative ranking technique, *viz.* Fire-Explosion and Toxicity Index (FE&TI).

Hazardous substances may be classified into three main classes namely Flammable substances, unstable substances and Toxic substances. Flammable substances require interaction with air for their hazard to be realized. Under certain circumstances the vapours arising from flammable substances when mixed with air may be explosive, especially in confined spaces. However, if present in sufficient quantity such clouds may explode in open air also. Unstable substances are liquids or solids, which may decompose with such violence so as to give rise to blast waves. Besides, toxic substances are dangerous and cause substantial damage to life when released into the atmosphere. The ratings for a large number of chemicals based on flammability, reactivity and toxicity have been given in NFPA Codes 49 and 345 M.

C. Hazard assessment and evaluation

A preliminary hazard analysis shall be carried out to identify the major hazards associated with storages in the facility. This is followed by consequence analysis to quantify these hazards. Finally the vulnerable zones are plotted for which risk reducing measures are deduced and implemented.

Frequent causes of accidents

- Fire and explosion: explosives, flammable materials
- Being struck by falling objects
- Caught in or compressed
- Snapping of cables, ropes, chains, slings
- Handling heavy objects
- Electricity (electrocution)
- Poor illumination
- Falls from height inside industrial units or on the ground
- Struck by moving objects
- Slipping on wet surfaces
- Sharp objects
- Oxygen deficiency in confined spaces
- Lack of PPEs, housekeeping practices, safety signs,
- Hackles, hooks, chains
- Cranes, winches, hoisting and hauling equipment;

Hazardous substances and wastes

- Heavy and toxic metals (lead, mercury, cadmium, copper, zinc, *etc*.)
- Organometallic substances (tributyltin, *etc*.)
- Lack of hazard communication (storage, labelling, material safety data sheets)
- Batteries, fire-fighting liquids
- PCBs and PVC (combustion products)
- Welding fumes
- Volatile organic compounds (solvents)
- Inhalation in confined and enclosed spaces
- Physical hazards
- Noise
- Extreme temperatures
- Vibration
- Radiation (UV, radioactive materials)

Physical hazards

- Noise
- Extreme temperatures
- Vibration
- Radiation (UV, radioactive materials)

Mechanical Hazards

- Trucks and transport vehicles
- Scaffolding, fixed and portable ladders
- Impact by tools, sharp-edged tools
- Power-driven hand tools, saws, grinders and abrasive cutting wheels
- Failure of machinery and equipment
- Poor maintenance of machinery and equipment
- Lack of safety guards in machines
- Structural failure

Biological hazards

- Toxic marine organisms (In case if the IEs are in Coastal Regions)
- Risk of communicable diseases transmitted by pests, vermin, rodents, insects and other animals that may infest in the IEs.
- Animal bites
- Vectors of infectious diseases (TB, malaria, dengue fever, hepatitis, respiratory infections, others)

Ergonomic and psychosocial hazards

- Repetitive strain injuries, awkward postures, repetitive and monotonous work, excessive workload
- Long working hours, shift work, night work, temporary employment
- Mental stress, human relations (aggressive behaviour, alcohol and drug abuse, violence)
- Poverty, low wages, minimum age, lack of education and social environment

General concerns

- Lack of safety and health training
- Poor work organization
- Inadequate housing and sanitation
- Inadequate accident prevention and inspection
- Inadequate emergency, first-aid and rescue facilities
- Lack of medical facilities and social protection

4.6.2 Disaster management plan

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and a personnel training is to be provided through rehearsals/drills.

To tackle the consequences of a major emergency inside the plant or immediate vicinity of the plant, a Disaster Management Plan has to be formulated and this planned emergency document is called "Disaster Management Plan".

The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;

- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any dead;
- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area;
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the Emergency.

In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Disaster Management Plan should include Emergency Preparedness Plan, Emergency Response Team, Emergency Communication, Emergency Responsibilities, Emergency Facilities, and Emergency Actions

Emergency preparedness plan

Incidents, accidents and contingency preparedness should be accounted during ship recycling process. This shall be a part of EMS. Emergency Preparedness Plan (EPP) should be prepared following the national environmental Emergency plan and OSHA guidelines. According to these guidelines, an environmental emergency plan would essentially provide the following information:

- Assignment of the duties and responsibilities among the authorities, participating agencies, the response team and coordinators and/or those responsible for the pollution incident;
- Relationship with other emergency plans;
- A reporting system that ensures rapid notification in the event of a pollution incident;
- The establishment of a focal point for co-ordination and directions connected to the implementation of the plan;
- Response operations; should always cover these four phases:
  - Discovery and alarm
  - Evaluation, notification and plan invocation
  - Containment and countermeasures
  - Cleanup and disposal
- Identification of expertise and response resources available for assistance for the implementation of the plan;
- Directions on the necessary emergency provisions applicable to the handling, treatment or disposal of certain pollutants;
- Link to the local community for assistance, if necessary;
- Support measures, such as procedures for providing public information, carrying out surveillance, issuing post incident reports, review and updating of the plan, and periodic exercising of the plan.

Emergency response

Various industrial activities within the IE are always subjected to accidents and incidents of many a kind. Therefore, a survey of potential incidents and accidents is to be carried out. Based on this, a plan for response to incidents, injuries and emergencies should be prepared. Response to emergencies should ensure that:

- The exposure of workers should be limited as much as possible during the operation
- Contaminated areas should be cleaned and if necessary disinfected
- Limited impact on the environment at the extent possible.

Written procedures for different types of emergencies should be prepared and the entire workforce should be trained in emergency response. All relevant emergency response equipment should also be readily available.

With regard to dangerous spills, associated clean-up and fire-fighting operations should be carried out by specially allocated and trained personnel.

Response team

It is important to setup an Emergency Organization. A senior executive who has control over the affairs of the plant would be heading the Emergency Organization. He would be designated at Site Controller. Manager (Safety) would be designated as the Incident Controller. In the case of stores, utilities, open areas, which are not under the control of the Production Heads, Senior Executive responsible for maintenance of utilities would be designated as Incident Controller. All the Incident Controllers would be reporting to the Site Controller.

Each Incident Controller organizes a team responsible for controlling the incidence with the personnel under his control. Shift In-charge would be the reporting officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller.

Emergency Coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security In-charge, Personnel Department, Essential services personnel would be engaged. All these personnel would be designated as Key personnel.

In each shift, electrical supervisor, electrical fitters, pump house in-charge, and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of staff members in the office/facility would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

Response to injuries

Based on a survey of possible injuries, a procedure for response to injuries or exposure to hazardous substances should be established. All staff should have a minimum of training to such response and the procedure ought to include the following:

- Immediate first aid, such as eye splashing, cleansing of wounds and skin, and bandaging
- Immediate reporting to a responsible designated person

- If possible, retention of the item and details of its source for identification of possible hazards
- Rapid additional medical care from medical personnel
- Medical surveillance
- Recording of the incident
- Investigation, determination and implementation of remedial action

It is vital that incident reporting should be straightforward so that reporting is actually carried out.

Emergency communication

Whoever notices an emergency situation such as fire, growth of fire, leakage *etc*. would inform his immediate superior and Emergency Control Center. The person on duty in the Emergency Control Center, would appraise the Site Controller. Site Controller verifies the situation from the Incident Controller of that area or the Shift In-charge and takes a decision about an impending On Site Emergency. This would be communicated to all the Incident Controllers, Emergency Coordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

Emergency responsibilities

The responsibilities of the key personnel should be defined for the following:

- Site controller
- Incident controller
- Emergency coordinator - rescue, fire fighting
- Emergency coordinator-medical, mutual aid, rehabilitation, transport and communication
- Emergency coordinator - essential services
- Employers responsibility

Emergency facilities

- Emergency Control Center – with access to important personnel, telephone, fax, telex facility, safe contained breathing apparatus, hand tools, emergency shut down procedures, duties and contact details of key personnel and government agencies, emergency equipments, *etc*.
- Assembly Point – with minimum facilities for safety and rescue
- Emergency Power Supply – connected with diesel generator, flame proof emergency lamps, *etc*.
- Fire Fighting Facilities – first aid fire fighting equipments, fire alarms, *etc*.
- Location of wind Stock – located at appropriate location to indicate the direction of wind for emergency escape
- Emergency Medical Facilities – Str*etc*hers, gas masks, general first aid, emergency control room, breathing apparatus, other emergency medical equipment, ambulance

Emergency actions

- Emergency Warning
- Evacuation of Personnel

- All Clear Signal
- Public information and warning
- Coordination with local authorities
- Mutual aid
- Mock drills

4.7 Mitigation Measures

The purpose of mitigation is to identify measures that safeguard the environment and the community affected by the proposal. Mitigation is both a creative and practical phase of the EIA process. It seeks best ways and means of avoiding, minimizing and remedying impacts. Mitigation measures must be translated into action in right way and at the right time, if they are to be successful. This process is referred to as impact management and takes place during project implementation. A written plan should be prepared for this purpose, and should include a schedule of agreed actions. Opportunities for impact mitigation will occur throughout the project cycle.

4.7.1 Important considerations for mitigation methods

The responsibility of project proponents to 'internalize' the full environmental costs of development proposals is now widely accepted under "Polluter Pay" principle. In addition, many proponents have found that good design and impact management can result in significant savings applying the principles of cleaner production to improve their environmental performance.

- The predicted adverse environmental as well as social impacts for which mitigation measures are required should be identified and briefly summarized along with cross referencing them to significance, prediction components of the EIA report or other documentation.
- Each mitigation measure should be briefly described w.r.t the impact of significances to which it relates and the conditions under which it is required (for example, continuously or in the event of contingencies). These should also be cross-referenced to the project design and operating procedures which elaborate on the technical aspects of implementing the various measures.
- Cost and responsibilities for mitigation and monitoring should be clearly defined, including arrangements for coordination between various Authorities responsible for mitigation.
- The proponent can use the EMP to develop environmental performance standards and requirements for the project site as well as supply chain. An EMP can be implemented through EMS for the operational phase of the project.

Prior to selecting mitigation plans it is appropriate to study the mitigation alternatives for cost-effectiveness, technical and socio-political feasibility. Such mitigation measures could include:

- avoiding sensitive areas such as eco-sensitive area, *e.g.,* fish spawning areas, dense mangrove areas or areas known to contain rare or endangered species
- adjusting work schedules to minimize disturbance
- engineered structures such as berms and noise attenuation barriers
- pollution control devices, such as scrubbers and electrostatic precipitators

- changes in fuel feed, manufacturing, process, technology use, or waste management practices, *etc.*

4.7.2 Hierarchy of elements of mitigation plan

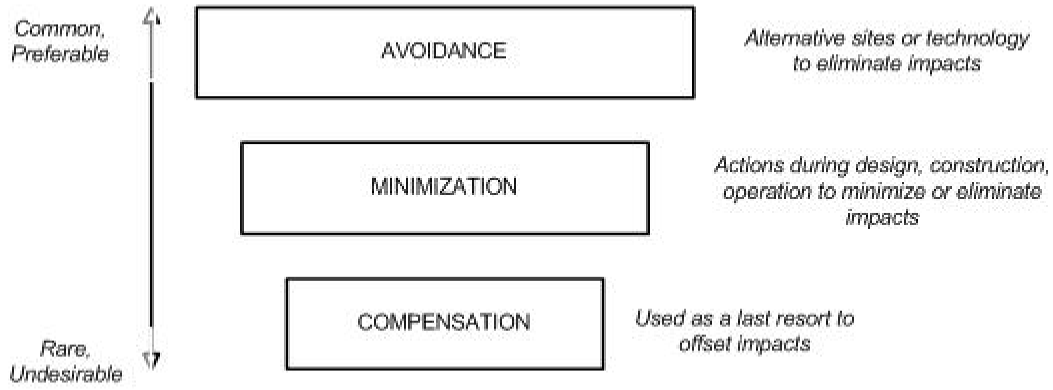


Figure 4-6: Elements of Mitigation

A good EIA practice requires technical understanding of relevant issues and measures that work in such given circumstances. The priority of selection of mitigation measures should be in the order:

Step One: Impact avoidance

This step is most effective when applied at an early stage of project planning. It can be achieved by:

- not undertaking certain projects or elements that could result in adverse impacts
- avoiding areas that are environmentally sensitive; and
- putting in place the preventative measures to stop adverse impacts from occurring, for example, release of water from a reservoir to maintain a fisheries regime.

Step Two: Impact minimization

This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- scaling down or relocating the proposal
- redesigning elements of the project
- taking supplementary measures to manage the impacts

Step Three: Impact compensation

This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- rehabilitation of the affected site or environment, for example, by habitat enhancement and restocking fish
- restoration of the affected site or environment to its previous state or better, as typically required for mine sites, forestry roads and seismic lines

- replacement of the same resource values at another location. For example, by wetland engineering to provide an equivalent area to that lost to drainage or infill.

Important compensation elements

Resettlement Plans: Special considerations apply to mitigation of proposals that displace or disrupt people. Certain types of projects, such as reservoirs and irrigation schemes and public works, are known to cause involuntary resettlement. This is a contentious issue because it involves far more than re-housing people; in addition, income sources and access to common property resources are likely to be lost. Almost certainly, a resettlement plan will be required to ensure that no one is worse off than before, which may not be possible for indigenous people whose culture and lifestyle is tied to a locality. This plan must include the means for those displaced to reconstruct their economies and communities and should include an EIA of the receiving areas. Particular attention should be given to indigenous, minority and vulnerable groups who are at higher risk from resettlement.

In-kind compensation

When significant or net residual loss or damage to the environment is likely, in kind compensation is appropriate. As noted earlier, environmental rehabilitation, restoration or replacement have become standard practices for many proponents. Now, increasing emphasis is given to a broader range of compensation measures to offset impacts and assure the sustainability of development proposals. These include impact compensation 'trading', such as offsetting CO_2 emissions by planting forests to sequester carbon.

4.7.3 Typical mitigation measures

Choice of location for the developmental activity plays an important role in preventing the adverse impacts on the surrounding environment. Detailed guidelines on siting of industries are provided in Section 4.2. However, if the developmental activity still produces any adverse impacts, mitigation measures should be taken.

Previous subsections of the Section 4.7 could be precisely summarized into following:

- Impacts from a developmental project could have many dimensions. As most of the direct impacts are caused by releases from developmental projects, often impact control at source is the best opportunity to either eliminate or mitigate the impacts, in case these are cost-effective. In other words, the best way to mitigate impacts is to prevent them from occurring. Choice of raw materials/technologies/processes which produce least impact would be one of the options to achieve it.
- After exploring cost-effective feasible alternatives to control impacts at source, various interventions to minimize the adverse impacts may be considered. These interventions, primarily aim at reducing the residual impacts on VECs of the receiving environment to acceptable concentrations.
- Degree of control at source and external interventions differs from situation-to - situation and is largely governed by techno-economic feasibility. While the regulatory bodies stress for further source control (due to high reliability), the project proponents bargain for other interventions which may be relatively cost-effective than further control at source (in any case project authority is required to meet the industry-specific standards by adopting the best practicable technologies. However,

if the location demands further control at source, then the proponents are required to adopt further advanced control technologies, *i.e.* towards best available control technologies). After having discussions with the project proponent, EAC/SEAC reaches to an agreed level of source control+other interventions (together called as mitigation measures in the given context) that achieve the targeted protection levels for the VECs in the receiving environment. These levels will become the principle clearance conditions.

- Chapter 3 of this TGM offers elaborate information on cleaner technologies, waste minimization opportunities, and control technologies for various kinds of polluting parameters that emanate from this developmental activity (put sector name). This information may be used to draw appropriate control measures applicable at source.

The choice of interventions for mitigation of impacts may also be numerous and depend on various factors. Mitigation measures based on location-specific suitability and some other factors are discussed in sub-sections 4.7.1 and 4.7.2. A few typical measures which may also be explored for mitigation of impacts are listed in Table 4-5.

Table 4-5: Typical Mitigation Measures

Impacts	Typical Mitigation Measures
Soil	▪ Windscreens, maintenance, and installation of ground cover ▪ Installation of drainage ditches ▪ Runoff and retention ponds ▪ Minimize disturbances and scarification of the surface ▪ Usage of appropriate monitoring and control facilities for construction equipments deployed ▪ Methods to reuse earth material generated during excavation
Resources – fuel/construction material, etc.	▪ Availing the resources which could be replenished by natural systems, etc.
Deforestation	▪ Plant or create similar areas ▪ Initiate a tree planning program in other areas ▪ Donate land to conservationalist groups
Water pollution (Ground water/ Surface water)	▪ Conjunctive use of ground/surface water, to prevent flooding/water logging/depletion of water resources. Included are land use pattern, land filling, lagoon/reservoir/garland canal construction, and rainwater harvesting and pumping rate. ▪ Stormwater drainage system to collect surface runoff ▪ Minimise flow variation from the mean flow ▪ Storing of oil wastes in lagoons should be minimised in order to avoid possible contamination of the ground water system. ▪ All effluents containing acid/alkali/organic/toxic wastes should be properly treated. ▪ Monitoring of ground waters ▪ Use of biodegradable or otherwise readily treatable additives ▪ Neutralization and sedimentation of wastewaters, where applicable ▪ Dewatering of sludges and appropriate disposal of solids ▪ In case of oil waste, oil separation before treatment and discharge into the environment ▪ By controlling discharge of sanitary sewage and industrial waste into the environment ▪ By avoiding the activities that increases erosion or that contributes

	nutrients to water (thus stimulating alga growth) ▪ For wastes containing high TDS, treatment methods include removal of liquid and disposal of residue by controlled landfilling to avoid any possible leaching of the fills ▪ All surface runoffs around mines or quarries should be collected treated and disposed. ▪ Treated wastewater (such as sewage, industrial wastes, or stored surface runoffs) can be used as cooling water makeup. ▪ Wastewater carrying radioactive elements should be treated separately by means of de-watering procedures, and solids or brine should be disposed of with special care. ▪ Develop spill prevention plans in case of chemical discharges and spills ▪ Develop traps and containment system and chemically treat discharges on site
Air Pollution	▪ Periodic checking of vehicles and construction machinery to ensure compliance to emission standards ▪ Attenuation of pollution/protection of receptor through green belts/green cover ▪ Dilution of odourant (dilution can change the nature as well as strength of an odour), odour counteraction or neutralise (certain pairs of odours in appropriate concentrations may neutralise each other), odour masking or blanketing (certain weaker malodours may be suppressed by a considerably stronger good odour). ▪ Regular monitoring of air polluting concentrations
Dust pollution	▪ Adopt sprinkling of water ▪ Wetting of roadways to reduce traffic dust and reentrained particles ▪ Control vehicle speed on sight ▪ Ensure priodical wahsing of cosntruction equipment and transport vehicles to prevent accumulated dust ▪ Ensure that vehicles should be covered during transportation ▪ Installation of windscreens to breakup the wind flow ▪ Burning of refuse on days when meteorological conditions provide for good mixing and dispersion ▪ Providing dust collection equipment at all possible points ▪ Maintaining dust levels within permissible limits ▪ Provision for masks when dust level exceeds
Noise pollution	▪ Use of suitable muffler systems/enclosures/sound-proof glass panelling on heavy equipment/pumps/blowers ▪ Pumps and blowers may be mounted on rubber pads or any other noise absorbing materials ▪ Limiting certain activities ▪ Proper scheduling of high noise generating activities to minimise noise impacts ▪ Usage of well maintained construction equipment meeting the regulatory standards ▪ Placement of equipments emitting high noise in an orientation that directs the noise away from sensitive receptors ▪ Periodic maintenance of equipments/repalcing whenever necessary/lubrication of rotating parts, *etc.* ▪ By using damping, absorption, dissipation, and deflection methods ▪ By using common techniques such as constructing sound enclosures, applying mufflers, mounting noise sources on isolators, and/or using materials with damping properties

	▪ Performance specifications for noise represent a way to insure the procured item is controlled ▪ Use of ear protective devices. ▪ In case of steady noise levels above 85-dB (A), initiation of hearing conservation measures ▪ Implementation of greenbelt for noise attentuation may be taken up
Biological	▪ Installation of systems to discourage nesting or perching of birds in dangerous environments ▪ Increased employee awareness to sensitive areas
Social	▪ Health and safety measures for workers ▪ Development of traffic plan that minimizes road use by workers ▪ Upgrade of roads and intersections ▪ Provide sufficient counselling and time to the affected population for relocation ▪ Discuss and finalize alternate arrangements and associated infrastructure in places of religious importance ▪ Exploration of alternative approach routes in consultation with local community and other stakeholders ▪ Provision of alternate jobs in unskilled and skilled categories
Marine	▪ Water quality monitoring program ▪ Limit construction activities to day time to provide recuperation time at night and reduce turbidity ▪ Prevention of spillage of diesel, oil, lubes, *etc*. ▪ Usage of appropriate system to barges/workboats for collection of liquid/solid waste generated onboard ▪ Avoid discharge of construction/dredging waste (lose silt) into sea. It may be disposed at the identified disposal point. ▪ Ensure usage of suitable/proper equipment for dredging in order to minimize the turbidity and suspensions at the dredging site. ▪ Checking with the complainace conditions before discharging wastes into the sea water ▪ Have a post-dregding monitoring programme in place ▪ Take up periodic maintenance dredging including inspectionof sub-sea conditions, etc.
Occupational health and safety	▪ Provision of worker camps with proper santiation and medical facilities, as well as making the worker camps self- sufficient with resources like water supply, power supply, etc ▪ Arrangement of periodic health check-ups for early detection and control of communicatble diseases. ▪ Arrangement to dispose off the wastes at approved disposal sites. ▪ Provide preventive measures for potentital fire hazards with requisite fire detection, fire-fighting facilities and adequate water storage
Construction	▪ Have a Transport Management Plan in place in order to prevent/minimize the disturbance on surrounding habitats ▪ Initiate traffic density studies
Solid/Hazardous waste	▪ Proper handling of excavated soil ▪ Proper plan to collect and dispose off the solid waste generated onsite. ▪ Identify an authorized waste handler for segregation of construction and hazardous waste and its removal on a regular basis to minimise odour, pest and litter impacts ▪ Prohibit buring of refuse onsite.

4.8 Environmental Management Plan

A typical EMP shall be composed of the following:

1. summary of potential impacts of the proposal
2. description of recommended mitigation measures
3. description of monitoring programme to ensure compliance with relevant standards and residual impacts
4. allocation of resources and responsibilities for plan implementation
5. implementation schedule and reporting procedures
6. contingency plan when impacts are greater than expected

Summary of impacts: The predicted adverse environmental and social impacts for which mitigation measures are identified in earlier sections to be briefly summarized with cross referencing to the corresponding sections in EIA report.

Description of mitigation measures: Each mitigation measure should be briefly described w.r.t the impact to which it relates and the conditions under which it is required. These should be accompanied by/referenced to, project design and operating procedures, which elaborate on the technical aspects of implementing various measures.

Description of monitoring programme to ensure compliance with relevant standards and residual impacts: Environmental monitoring refers to compliance monitoring and residual impact monitoring. Compliance monitoring refers to meeting the industry-specific statutory compliance requirements (Ref. Applicable National regulations as detailed in Chapter 3).

Residual impact monitoring refers to monitoring of identified sensitive locations with adequate number of samples and frequency. The monitoring programme should clearly indicate the linkages between impacts identified in the EIA report, measurement indicators, detection limits (where appropriate), and definition of thresholds that signal the need for corrective actions.

Allocation of resources and responsibilities for plan implementation: These should be specified for both the initial investment and recurring expenses for implementing all measures contained in the EMP, integrated into the total project costs, and factored into loan negotiation.

The EMP should contain commitments that are binding on the proponent in different phases of project implementation *i.e.,* pre-construction or site clearance, construction, operation, decommissioning.

Responsibilities for mitigation and monitoring should be clearly defined, including arrangements for coordination between various actors responsible for mitigation. Details should be provided w.r.t deployment of staff (detailed organogram), monitoring network design, parameters to be monitored, analysis methods, associated equipments *etc*.

Implementation schedule and reporting procedures: The timing, frequency and duration of mitigation measure should be specified in an implementation schedule, showing links with overall project implementation. Procedures to provide information on progress and results of mitigation and monitoring measures should also be clearly specified.

Contingency Plan when the impacts are greater than expected: There shall be a contingency plan for attending the situations where the residual impacts are higher than expected. It is an imperative requirement for all project Authorities to plan additional programmes to deal with the situation, after duly intimating the concerned local regulatory bodies.

4.9 Reporting

Structure of the EIA report (Appendix III of the EIA Notification), applicable for IEs is given in the Table 4.6. Each task prescribed in ToR shall be incorporated appropriately in the contents in addition to the contents described in the following table.

Table 4-6: Structure of EIA Report

S.NO	EIA STRUCTURE	CONTENTS
1.	Introduction	▪ Purpose of the report ▪ Identification of project & project proponent ▪ Brief description of nature, size, location of the project and its importance to the country, region ▪ Scope of the study – details of regulatory scoping carried out (As per ToR)
2.	Project Description	Condensed description of those aspects of the project (based on project feasibility study), likely to cause environmental effects. Details should be provided to give clear picture of the following: ▪ Type of project ▪ Need for the project ▪ Location (maps showing general location, specific location, project boundary & project site layout) ▪ Size or magnitude of operation (incl. Associated activities required by / for the project) ▪ Proposed schedule for approval and implementation ▪ Technology and process description ▪ Project description including drawings showing project layout, components of project *etc*. Schematic representations of the feasibility drawings which give information important for EIA ▪ Description of mitigation measures incorporated into the project to meet environmental standards, environmental operating conditions, or other EIA requirements (as required by the scope) ▪ Assessment of new & untested technology for the risk of technological failure
3.	Description of the Environment	▪ Study area, period, components & methodology ▪ Establishment of baseline for VECs, as identified in the scope ▪ Base maps of all environmental components
4.	Anticipated Environmental Impacts & Mitigation Measures	▪ Details of investigated environmental impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project

S.NO	EIA STRUCTURE	CONTENTS
		▪ Measures for minimizing and / or offsetting adverse impacts identified ▪ Irreversible and irretrievable commitments of environmental components ▪ Assessment of significance of impacts (Criteria for determining significance, assigning significance) ▪ Mitigation measures
5.	Analysis of Alternatives (Technology & Site)	In case the scoping exercise results in need for alternatives: ▪ Description of each alternative ▪ Summary of adverse impacts of each alternative ▪ Mitigation measures proposed for each alternative and selection of alternative
6.	Environmental Monitoring Program	▪ Technical aspects of monitoring the effectiveness of mitigation measures (incl. measurement methodologies, frequency, location, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules)
7.	Additional Studies	▪ Public consultation ▪ Risk assessment ▪ Social impact assessment, R&R Action Plans
8.	Project Benefits	▪ Improvements in physical infrastructure ▪ Improvements in social infrastructure ▪ Employment potential –skilled; semi-skilled and unskilled ▪ Other tangible benefits
9.	Environmental Cost Benefit Analysis	▪ If recommended at the Scoping stage
10.	EMP	▪ Description of administrative aspects that ensures proper implementation of mitigative measures and their effectiveness monitored, after approval of the EIA
11.	Summary & Conclusion (This will constitute the summary of the EIA Report)	▪ Overall justification for implementation of the project ▪ Explanation of how, adverse effects have been mitigated
12.	Disclosure of Consultants engaged	▪ Names of the Consultants engaged with their brief resume and nature of Consultancy rendered

4.10 Public Consultation

Public consultation refers to the process by which the concerns of local affected people and others who have plausible stake in the environmental impacts of the project or activity are ascertained.

- Public consultation is not a decision taking process, but is a process to collect views of the people having plausible stake. If the SPCB/Public agency conducting public hearing is not convinced with the plausible stake, then such expressed views need not be considered.
- Public consultation involves two components, one is public hearing, and other one is inviting written responses/objections through Internet/by post, *etc*., by placing the summary of EIA report on the web site.
- All Category A and Category B1 projects require public hearing except the following:

- Once environmental clearance is granted to an industrial estate/SEZ/EPZ *etc*., for a given composition (type and capacity) of industries, then individual units will not require public hearing
- Expansion of roads and highways, which do not involve any further acquisition of land.
- Maintenance dredging provided the dredged material shall be disposed within port limits
- All building/ construction projects/ area development projects/townships
- All Category B2 projects
- All projects concerning national defense and security or involving other strategic considerations as determined by the Central Government

- Public hearing shall be carried out at the site or in its close proximity, district-wise, for ascertaining concerns of local affected people.
- Project proponent shall make a request through a simple letter to the Member–Secretary of the SPCB or UTPCC to arrange public hearing.
- Project proponent shall enclose with the letter of request, at least 10 hard copies and 10 soft copies of the draft EIA report including the summary EIA report in English and in the official language of the State/local language prepared as per the approved scope of work, to the concerned Authority.
- Simultaneously, project proponent shall arrange to send, one hard copy and one soft copy, of the above draft EIA report along with the summary EIA report to the following Authorities within whose jurisdiction the project will be located:
  - District magistrate(s) /District Collector/Deputy Commissioner (s)
  - Zilla parishad and municipal corporation or panchayats union
  - District industries office
  - Urban local bodies (ULBs)/PRIs concerned/development authorities
  - Concerned regional office of the MoEF/SPCB
- Above mentioned Authorities except regional office of MoEF shall arrange to widely publicize the draft EIA report within their respective jurisdictions requesting the interested persons to send their comments to the concerned regulatory Authorities. They shall also make draft EIA report for inspection electronically or otherwise to the public during normal office hours till the public hearing is over.
- Concerned regulatory Authority (MoEF/SEIAA/UTEIA) shall display the summary of EIA report on its website and also make full draft EIA report available for reference at a notified place during normal office hours at their head office.
- SPCB or UTPCC concerned shall also make similar arrangements for giving publicity about the project within the State/UT and make available the summary of draft EIA report for inspection in select offices, public libraries or any other suitable location, *etc*. They shall also additionally make available a copy of the draft EIA report to the above five authorities/offices as mentioned above.
- The Member–Secretary of the concerned SPCB or UTPCC shall finalize the date, time and exact venue for the conduct of public hearing within seven days of the date of the receipt of the draft EIA report from the project proponent and advertise the same in one major National Daily and one Regional vernacular Daily/official State language.
- A minimum notice period of 30 (thirty) days shall be provided to the public for furnishing their responses.

- No postponement of the date, time, venue of the public hearing shall be undertaken, unless some untoward emergency situation occurs. Only in case of emergencies, and up on recommendation of the concerned District Magistrate/District Collector/Deputy Commissioner (s) the postponement shall be notified to the public through the same National and Regional vernacular dailies and also prominently displayed at all the identified offices by the concerned SPCB or UTPCC
- In the above exceptional circumstances fresh date, time and venue for the public consultation shall be decided by the Member–Secretary of the concerned SPCB or UTPCC only in consultation with the District Magistrate/District Collector/Deputy Commissioner (s) and notified afresh as per the procedure.
- The District Magistrate/District Collector/Deputy Commissioner (s) or his or her representative not below the rank of an Additional District Magistrate assisted by a representative of SPCB or UTPCC, shall supervise and preside over the entire public hearing process.
- The SPCB or UTPCC shall arrange to video film the entire proceedings. A copy of the videotape or a CD shall be enclosed with the public hearing proceedings while forwarding it to the Regulatory Authority concerned.
- The attendance of all those who are present at the venue shall be noted and annexed with the final proceedings.
- There shall be *no quorum* required for attendance for starting the proceedings.
- Persons present at the venue shall be granted the opportunity to seek information or clarifications on the project from the proponent. The summary of the public hearing proceedings accurately reflecting all the views and concerns expressed shall be recorded by the representative of the SPCB or UTPCC and read over to the audience at the end of the proceedings explaining the contents in the local/vernacular language and the agreed minutes shall be signed by the District Magistrate/District Collector/Deputy Commissioner (s) or his or her representative on the same day and forwarded to the SPCB/UTPCC concerned.
- A statement of the issues raised by the public and the comments of the proponent shall also be prepared in the local language or the official State language, as the case may be and in English and annexed to the proceedings.
- The proceedings of the public hearing shall be conspicuously displayed at the office of the Panchayats within whose jurisdiction the project is located, office of the concerned Zilla Parishad, District Magistrate/District Collector/Deputy Commissioner (s), and the SPCB or UTPCC. The SPCB or UTPCC shall also display the proceedings on its website for general information. Comments, if any, on the proceedings, may be sent directly to the concerned regulatory authorities and the Applicant concerned.
- The public hearing shall be completed within a period of 45 (forty five) days from date of receipt of the request letter from the Applicant. Therefore the SPCB or UTPCC concerned shall send public hearing proceedings to the concerned regulatory Authority within eight (8) days of the completion of public hearing. Simultaneously, a copy will also be provided to the project proponent. The proponent may also directly forward a copy of the approved public hearing proceedings to the regulatory Authority concerned along with the final EIA report or supplementary report to the draft EIA report prepared after the public hearing and public consultations incorporating the concerns expressed in the public hearing along with action plan and financial allocation, item-wise, to address those concerns.

- Up on receipt of the same, the Authority will place executive summary of the report on website to invite responses from other concerned persons having a plausible stake in the environmental aspects of the project or activity.
- If SPCB/UTPCC is unable to conduct public hearing in the prescribed time, the Central Government incase of Category A projects and State Government or UT administration in case of Category B projects at the request of SEIAA may engage any other agency or authority for conducting the public hearing process within a further period of 45 days. The respective governments shall pay appropriate fee to the public agency for conducting public hearing.
- A public agency means a non-profit making institution/ body such as technical/academic institutions, government bodies not subordinate to the concerned Authority.
- If SPCB/Public Agency authorized for conducting public hearing informs the Authority, stating that it is not possible to conduct the public hearing in a manner, which will enable the views of the concerned local persons to be freely expressed, then Authority may consider such report to take a decision that in such particular case, public consultation may not have the component of public hearing.
- Often restricting the public hearing to the specific district may not serve the entire purpose, therefore, NGOs who are local and registered under the Societies Act in the adjacent districts may also be allowed to participate in public hearing, if they so desire.
- Confidential information including non-disclosable or legally privileged information involving intellectual property right, source specified in the application shall not be placed on the website.
- The Authority shall make available, on a written request from any concerned person the draft EIA report for inspection at a notified place during normal office hours till the date of the public hearing.
- While mandatory requirements will have to be adhered to, utmost attention shall be given to the issues raised in the public hearing for determining the modifications needed in the project proposal and the EMP to address such issues.
- Final EIA report after making needed amendments, as aforesaid, shall be submitted by the applicant to the concerned Authority for prior environmental clearance. Alternatively, a supplementary report to draft EIA and EMP addressing all concerns expressed during the public consultation may be submitted.

4.11 Appraisal

Appraisal means the detailed scrutiny by the EAC or SEAC of the application and the other documents like the final EIA report, outcome of the public consultation including public hearing proceedings submitted by the applicant for grant of environmental clearance.

- The appraisal shall be made by EAC to the Central Government or SEAC to SEIAA.
- Project proponent either personally or through consultant can make a presentation to EAC/SEAC for the purpose of appraising the features of the project proposal and also to clarify the issues raised by the members of the EAC/SEAC.
- On completion of these proceedings, concerned EAC/SEAC shall make categorical recommendations to the respective Authority, either for grant of prior environmental

clearance on stipulated terms & conditions, if any, or rejection of the application with reasons.

- In case EAC/SEAC needs to visit the site or obtain further information before being able to make categorical recommendations, EAC/SEAC may inform the project proponent accordingly. In such an event, it should be ensured that the process of environmental clearance is not unduly delayed to go beyond the prescribed timeframe.
- Up on the scrutiny of the final report, if EAC/SEAC opines that ToR for EIA studies finalized at the scoping stage are covered by the proponent, then the project proponent may be asked to provide such information. If such information is declined by the project proponent or is unlikely to be provided early enough so as to complete the environmental appraisal within prescribed time of 60 days, the EAC/SEAC may recommend for rejection of the proposal with the same reason.
- Appraisal shall be strictly in terms of ToR for EIA studies finalized at the scoping stage and the concerns expressed during public consultation.
- This process of appraisal shall be completed within 60 days from the receipt of the updated EIA and EMP reports, after completing public consultation.
- The EIA report will be typically examined for following:
  - Project site description supported by topographic maps & photographs – detailed description of topography, land use and activities at the proposed project site and its surroundings (buffer zone) supported by photographic evidence.
  - Clarity in description of drainage pattern, location of eco-sensitive areas, vegetation characteristics, wildlife status - highlighting significant environmental attributes such as feeding, breeding and nesting grounds of wildlife species, migratory corridor, wetland, erosion and neighboring issues.
  - Description of the project site – how well the interfaces between the project related activities and the environment have been identified for the entire project cycle *i.e.* construction, operation and decommissioning at the end of the project life.
  - How complete and authentic are the baseline data pertaining to flora and fauna and socio economic aspects?
  - Citing of proper references, with regard to the source(s) of baseline data as well as the name of the investigators/ investigating agency responsible for collecting the primary data.
  - How consistent are the various values of environmental parameters with respect to each other?
  - Is a reasonable assessment of the environmental and social impact made for the identified environmental issues including project affected people?
  - To what extent the proposed environmental plan will mitigate the environmental impact and at what estimated cost, shown separately for construction, operation and closure stages and also separately in terms of capital and recurring expenses along with details of agencies that will be responsible for the implementation of environmental plan/ conservation plan.
  - How well the concerns expressed/highlighted during public hearing have been addressed and incorporated in the EMP giving item wise financial provisions and commitments (in quantified terms)?

– How far the proposed environmental monitoring plan will effectively evaluate the performance of EMP? Are details for environmental monitoring plan provided in the same manner as the EMP?

– Identification of hazard and quantification of risk assessment and whether appropriate mitigation plan has been included in the EMP?

– Does the proposal include a well formulated time bound green belt development plan for mitigating environmental problems such as fugitive emissions of dust, gaseous pollutants, noise, odour *etc*.?

– Does EIA make a serious attempt to guide the project proponent for minimizing the requirement of natural resources including land, water energy and other non renewable resources?

– How well has the EIA statement been organized and presented so that the issues, their impact and environmental management strategies emerge clearly from it and how well organized was the power point presentation made before the expert committee?

– Is the information presented in EIA adequately and appropriately supported by maps, imageries and photographs highlighting site features and environmental attributes?

4.12 Decision Making

The Chairperson reads the sense of the Committee and finalizes the draft minutes of the meeting, which are circulated by the Secretary to all the expert members invited to the meeting. Based on the response from the members, the minutes are finalized and signed by the Chairperson. This process for finalization of the minutes should be so organized that the time prescribed for various stages is not exceeded.

Approval / Rejection / Reconsideration

- The Authority shall consider the recommendations of concerned appraisal Committee and convey its decision within 45 days of the receipt of recommendations.
- If the Authority disagrees with the recommendations of the Appraisal Committee, then reasons shall be communicated to concerned Appraisal Committee and applicant within 45 days from the receipt of the recommendations. The Appraisal Committee concerned shall consider the observations of the Authority and furnish its views on the observations within further period of 60 days. The Authority shall take a decision within the next 30 days based on the views of appraisal Committee.
- If the decision of the Authority is not conveyed within the time, then the proponent may proceed as if the environmental clearance sought has been granted or denied by the regulatory Authority in terms of the final recommendation of the concerned appraisal Committee. For this purpose, the decision of the Appraisal Committee will be a public document, once the period specified above for taking the decision by the Authority is over.
- In case of Category B projects, application shall be received by the Member–Secretary of the SEIAA and clearance shall also be issued by the same SEIAA.
- Deliberate concealment and/or submission of false or misleading information or data which is material to screening or scoping or appraisal or decision on the application

shall make the application liable for rejection, and cancellation of prior environmental clearance granted on that basis. Rejection of an application or cancellation of a prior environmental clearance already granted, on such ground, shall be decided by the regulatory authority, after giving a personal hearing to the applicant, and following the principles of natural justice.

If approved

- MoEF or concerned SEIAA will issue the environmental clearance for the project.
- The project proponent should make sure that the award of environmental clearance is properly publicized in at least two local newspapers of the district or state where the proposed project is located. For instance, the executive summary of the environmental clearance may be published in the newspaper along with the information about the location (website/office where it is displayed for public) where the detailed environmental clearance is made available. The MoEF and SEIAA/UTEIAA, as the case may be, shall also place the environmental clearance in the public domain on Government Portal. Further copies of the environmental clearance shall be endorsed to the Heads of local bodies, Panchayats and Municipal bodies in addition to the relevant offices of the Government.
- The Environmental clearance will be valid from the start date to actual commencement of the production of the developmental activity.
- Usual validity period will be 5 years from the date of issuing environmental clearance, unless specified by EAC/SEAC.
- A prior environmental clearance issued to a project proponent can be transferred to another legal person entitled to undertake the project, upon application by the transferor to the concerned Authority or submission of no-objection of the transferor by the transferee to the concerned Authority for the concurrence. In this case, EAC/SEAC concurrence is not required, but approval from the concerned authority is required to avail the same project configurations, validity period transferred to the new legally entitled person to undertake the project.

4.13 Post-clearance Monitoring Protocol

The MoEF, Government of India will monitor and take appropriate action under the EP Act, 1986.

- In respect of Category A projects, it shall be mandatory for the project proponent to make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by advertising it at least in two local newspapers of the district or State where the project is located and in addition, this shall also be displayed in the project proponent's website permanently.
- In respect of Category B projects, irrespective of its clearance by MoEF/SEIAA, the project proponent shall prominently advertise in the newspapers indicating that the project has been accorded environment clearance and the details of MoEF website where it is displayed.
- The MoEF and the SEIAAs/UTEIAAs, as the case may be, shall also place the environmental clearance in the public domain on Government Portal.
- Copies of environmental clearance shall be submitted by the project proponents to the Heads of the local bodies, Panchayats and Municipal bodies in addition to the

relevant offices of the Government who in turn have to display the same for 30 days from the date of receipt.

The project proponent must submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to the regulatory Authority concerned, on 1st June and 1st December of each calendar year.

All such compliance reports submitted by the project management shall be public documents. Copies of the same shall be given to any person on application to the concerned regulatory Authority. Such latest compliance report shall also be displayed on the website of the concerned regulatory Authority.

The SPCB shall incorporate EIA clearance conditions into consent conditions in respect of Category A and Category B projects and in parallel shall monitor and enforce the same.

5. STAKEHOLDERS' ROLES AND RESPONSIBILITIES

Prior environmental clearance process involves many stakeholders *i.e.*, Central Government, State Government, SEIAA, EAC at the National Level, SEAC, Public Agency, SPCB, the project proponent, and the public.

- Roles and responsibilities of the organizations involved in different stages of prior environmental clearance are listed in Table 5-1.
- Organization-specific functions are listed in Table 5-2.

In this Chapter, constitution, composition, functions, *etc*., of the Authorities and the Committees are discussed in detail.

Table 5-1: Roles and Responsibilities of Stakeholders Involved in Prior Environmental Clearance

STAGE	MoEF/ SEIAA	EAC/ SEAC	PROJECT PROPONENT	EIA CONSULTANT	SPCB/ PUBLIC AGENCY	PUBLIC AND INTEREST GROUP
Screening	Receives application and takes advice of EAC/ SEAC	Advises the MoEF/ SEIAA	Submits application (Form 1) and provides necessary information	Advises and assists the proponent by providing technical information		
Scoping	Approves the ToR, communicates the same to the project proponent and places the same in the website	Reviews the ToR, visits the proposed site, if required, and recommends the ToR to the MoEF/ SEIAA	Submits the draft ToR to SEIAA and facilitates the visit of the EAC/SEAC members to the project site	Prepares ToR		
EIA Report & Public Hearing	Reviews and forwards copies of the EIA report to SPCB /public agency for conducting public hearing		Submits detailed EIA report as per the finalized ToR Facilitates the public hearing by arranging presentation on the project, EIA and EMP – takes note of objections and	Prepares the EIA report Presents and appraises the likely impacts and pollution control measures proposed in the public hearing	Reviews EIA report and conducts public hearing in the manner prescribed Submits proceedings and views of	Participates in public hearings and offers comments and observations. Comments can be sent directly to SEIAA

STAGE	MoEF/ SEIAA	EAC/ SEAC	PROJECT PROPONENT	EIA CONSULTANT	SPCB/ PUBLIC AGENCY	PUBLIC AND INTEREST GROUP
	Places the summary of EIA report in the website Conveys objections to the project proponent for update, if any		updates the EMP accordingly		SPCB, to the Authority and the project proponent as well	through Internet in response to the summary placed in the website
Appraisal and Clearance	Receives updated EIA Takes advice of EAC/ SEAC, approves EIA and attaches the terms and conditions	Critically examines the reports, presentation of the proponent and appraises MoEF/ SEIAA (recommendations are forwarded to MoEF/ SEIAA)	Submits updated EIA, EMP reports to MoEF/SEIAA. Presents the overall EIA and EMP including public concerns to EAC/SEAC	Provides technical advise to the project proponent and if necessary presents the proposed measures for mitigation of likely impacts (terms and conditions of clearance)		
Post-clearance Monitoring			Implements environmental protection measures prescribed and submits periodic monitoring results	Conducts periodic monitoring	Incorporates the clearance conditions into appropriate consent conditions and ensures implementation	

Table 5-2: Organization-specific Functions

ORGANIZATION	FUNCTIONS
Central Government	▪ Constitutes the EAC ▪ Considering recommendations of the State Government, constitutes the SEIAA & SEAC ▪ Receives application from the project proponent in case of Category A projects or Category B projects attracting general condition ▪ Communicates the ToR finalized by the EAC to the project proponent. ▪ Receives EIA report from the project proponent and soft copy of summary of the

ORGANIZATION	FUNCTIONS
	report for placing in the website ▪ Summary of EIA report will be placed in website. Forwards the received responses to the project proponent ▪ Engages other public agency for conducting public hearings in cases where the SPCB does not respond within time ▪ Receives updated EIA report from project proponent incorporating the considerations from the proceedings of public hearing and responses received through other media ▪ Forwards updated EIA report to the EAC for appraisal ▪ Either accepts the recommendations of EAC or asks for reconsideration of specific issues for review by the EAC. ▪ Takes the final decision – acceptance/ rejection – of the project proposal and communicates the same to the project proponent
State Government	▪ Identifies experts as per the composition specified in the Notification and subsequent guidelines to recommend to the the Central Government. ▪ Extends funding support to fulfill the functions of SEIAA/SEAC ▪ Engages other public agency for conducting public hearings in cases where the SPCB does not respond within time ▪ State Governments will suitably pay the public agency for conducting such activity
EAC	▪ Reviews Form 1 and its attachments ▪ Visits site(s), if necessary ▪ Finalizes ToR and recommends to the Central Government, which in turn communicates the finalized ToR to the project proponent, if not exempted by the Notification ▪ Reviews EIA report, proceedings and appraises their views to the Central government ▪ If the Central Government has any specific views, then the EAC reviews again for appraisal
SEIAA	▪ Receives application from the project proponent ▪ Considers SEAC's views for finalization of ToR ▪ Communicates the finalized ToR to the project proponent ▪ Receives EIA report from project proponent ▪ Uploads the summary of EIA report in the website in cases of Category B projects ▪ Forwards the responses received to the project proponent ▪ Receives updated EIA report from project proponent incorporating the considerations from the proceedings of public hearing and responses received through other media ▪ Forwards updated EIA report to SEAC for appraisal ▪ Either accepts the recommendations of SEAC or asks for reconsideration of specific issues for review by SEAC. ▪ Takes the final decision and communicates the same to the project proponent
SEAC	▪ Reviews Form 1 ▪ If necessary visits, site(s) for finalizing the ToR ▪ Reviews updated EIA - EMP report and ▪ Appraises the SEIAA
SPCB	▪ Receives request from project proponent and conducts public hearing in the manner prescribed. ▪ Conveys proceedings to concerned Authority and project proponent
Public Agency	▪ Receives request from the respective Governments to conduct public hearing ▪ Conducts public hearing in the manner prescribed. ▪ Conveys proceedings to the concerned Authority/EAC /Project proponent

5.1 SEIAA

- SEIAA is constituted by the MoEF to take final decision regarding the acceptance/rejection of prior environmental clearance to the project proposal for all Category 'B' projects.
- The state government may decide whether to house them at the Department of Environment or at any other Board for effective operational support.
- State Governments can decide whether the positions are permanent or part-time. The Central Government (MoEF) continues to follow the model of paying fee (TA/DA, accommodation, sitting fee) to the Chairperson and the members of EAC. As such, the State Government is to fund SEIAA & SEAC and decide the appropriate institutional support for them.

A. Constitution

- SEIAA is constituted by the Central Government comprising of three members including a Chairperson and Member–Secretary to be nominated by the State Government or UT Administration concerned.
- The Central Government will notify as and when the nominations (in order) are received from the State Governments, within 30 days from the date of receipt.
- The Chairperson and the non-official member shall have a fixed term of three years, from the date of Notification by the Central Government constituting the Authority.

The form used by the State Governments to submit nominations for Notification by the Central Government is provided in **Annexure XVI**.

B. Composition

- Chairperson shall be an expert in the EIA process
- Member–Secretary shall be a serving officer of the concerned State Government/ UT Administration familiar with the environmental laws.
- Member–Secretary may be of a level equivalent to the Director, Dept. of Environment or above – a full time member.
- All the members including the Chairperson shall be the experts as per the criteria set in the Notification.
- The Government servants can only serve as the Member–Secretary to SEIAA and the Secretary to SEAC. All other members including Chairperson of the SEIAA and SEAC shall not be comprised of serving Government Officers; industry representatives; and activists.
- Serving faculty (academicians) is eligible for the membership in the Authority and/or the Committees, if they fulfill the criteria given in Appendix VI to the Notification.
- This is to clarify that the serving Government officers shall not be nominated as professional/expert member of SEIAA/SEAC/EAC.
- Professionals/Experts in the SEIAA and SEAC shall be different.

Summary regarding the eligibility criteria for Chairperson and Members of the SEIAA is given in Table 5-3.

C. Decision-making process

- The decision of the Authority shall be arrived through consensus.
- If there is no consensus, the Authority may either ask SEAC for reconsideration or may reject the approval.
- All decisions of the SEIAA shall be taken in a meeting and shall ordinarily be unanimous. In case a decision is taken by majority, details of views, for and against the decision, shall be clearly recorded in the minutes of meeting and a copy thereof shall sent to MoEF.

Table 5-3: SEIAA: Eligibility Criteria for Chairperson/ Members/ Secretary

S. No.	Attribute	Requirement			
			Members	Member–Secretary	Chairperson
1	Professional qualification as per the Notification		Compulsory	Compulsory	Compulsory
2	Experience (Fulfilling any one of a, b, c)	a	Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI	Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI	Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI
		b	Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in Appendix VI	Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI	Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI
		c	Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management	Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management	-------------
3	Test of independence (conflict of interest) and minimum grade of the Secretary of the Authority		Shall not be a serving government officer Shall not be a person engaged in industry and their associations Shall not be a person associated with environmental activism	Only serving officer from the State Government (DoE) familiar with environmental laws not below the level of Director	Shall not be a serving government officer Shall not be a person engaged in industry and their associations Shall not be a person associated with environmental

S. No.	Attribute	Requirement			
			Members	Member–Secretary	Chairperson
					activism
4	Age		Below 67 years at the time of Notification of the Authority	As per State Government Service Rules	Below 72 Years at the time of the Notification of the Authority
5	Other memberships in Central/State Expert Appraisal Committee		Shall not be a member in any SEIAA/EAC/SEAC	Shall not be a member in any SEIAA/EAC/SEAC	Shall not be a member in any SEIAA/EAC/SEAC
6	Tenure of earlier appointment (continuous)		Only one term before this in continuity is permitted	Not applicable	Only one term before this in continuity is permitted
7	Eminent environmental expertise with understanding on environmental aspects and impacts		Desirable	Desirable	Compulsory
8	Expertise in the environmental clearance process		Desirable	Desirable	Compulsory

Note:

1. A member after continuous membership in two terms (6 years) shall not be considered for further continuation. His/her nomination may be considered after a gap of one term (three years), if other criteria meet.

2. Chairperson/Member once notified may not be removed prior to the tenure of three years without cause and proper enquiry.

5.2 EAC and SEAC

EAC and SEAC are independent Committees to review each developmental activity and offer its recommendations for consideration of the Central Government and SEIAA respectively.

A. Constitution

- EAC and SEAC shall be constituted by the Central Government comprising a maximum of 15 members including a Chairperson and Secretary. In case of SEAC, the State Government or UT Administration is required to nominate the professionals/experts for consideration and Notification by the Central Government.
- The Central Government will notify as and when the nominations (in order) are received from the State Governments, within 30 days from the date of receipt.
- The Chairperson and the non-official member shall have a fixed term of three years, from the date of Notification by the Central Government.

- The Chairperson shall be an eminent environmental expert with understanding on environmental aspects and environmental impacts. The Secretary of the SEAC shall be a State Government officer, not below the level of a Director/Chief Engineer.
- The members of the SEAC need not be from the same State/UT.
- In case the State Governments/ Union Territories so desire, the MoEF can form regional EAC to serve the concerned States/Union Territories.
- State Governments may decide to their convenience to house SEAC at the Department of Environment or at SPCB or at any other department, to extend support to the SEAC activities.

B. Composition

- Composition of EAC/SEAC as per the Notification is given in **Annexure XVII**.
- Secretary to EAC/SEAC may invite a maximum of two professionals/experts with the prior approval of the Chairperson, if desired, for taking the advisory inputs for appraisal. In such case, the invited experts will not take part in the decision making process.
- The Secretary of each EAC/SEAC preferably is an officer of the level equivalent to or above the level of Director, MoEF, GoI.

C. Decision making

The EAC and SEAC shall function on the principle of collective responsibility. The Chairperson shall endeavour to reach a consensus in each case, and if consensus cannot be reached, the view of the majority shall prevail.

D. Operational issues

- Secretary may deal with all correspondence, formulate agenda and prepare agenda notes. Chairperson and other members may act only for the meetings.
- Chairperson of EAC/SEAC shall be one among the expert members having considerable professional experience with proven credentials.
- EAC/SEAC shall meet at least once every month or more frequently, if so needed, to review project proposals and to offer recommendations for the consideration of the Authority.
- EAC/SEAC members may inspect the site at various stages *i.e.*, during screening, scoping and appraisal, as per the need felt and decided by the Chairperson of the Committee.
- The respective Governments through the Secretary of the Committee may pay/reimburse the participation expenses, honorarium *etc.*, to the Chairperson and members.

i. Tenure of EAC/SEIAA/SEAC

The tenure of Authority/Committee(s) shall be for a fixed period of three years. At the end of the three years period, the Authority and the committees need to be re-constituted. However, staggered appointment dates may be adopted to maintain continuity of members at a given point of time.

ii. Qualifying criteria for nomination of a member to EAC/SEIAA/SEAC

While recommending nominations and while notifying the members of the Authority and Expert Committees, it shall be ensured that all the members meet the following three criteria:

- Professional qualification
- Relevant experience/Experience interfacing with environmental management
- Absence of conflict of interest

These are elaborated subsequently.

a) Professional qualification

The person should have at least (i) 5 years of formal University training in the concerned discipline leading to a MA/MSc Degree, or (ii) in case of Engineering/Technology/ Architecture disciplines, 4 years formal training in a professional training course together with prescribed practical training in the field leading to a B.Tech/B.E./B.Arch. Degree, or (iii) Other professional degree (*e.g.* Law) involving a total of 5 years of formal University training and prescribed practical training, or (iv) Prescribed apprenticeship/articleship and pass examinations conducted by the concerned professional association (*e.g.* MBA/IAS/IFS). In selecting the individual professionals, experience gained by them in their respective fields will be taken note of.

b) Relevant experience

- Experience shall be related to professional qualification acquired by the person and be related to one or more of the expertise mentioned for expert members. Such experience should be a minimum of 15 years.
- When the experience mentioned in the foregoing sub-paragraph interfaces with environmental issues, problems and their management, the requirement for the length of the experience can be reduced to a minimum of 10 years.

c) Absence of conflict of interest

For the deliberations of the EAC/SEAC to be independent and unbiased, all possibilities of potential conflict of interests have to be eliminated. Therefore, serving government officers; persons engaged in industry and their associations; persons associated with the formulation of development projects requiring environmental clearance, and persons associated with environmental activism shall not be considered for membership of SEIAA/ SEAC/ EAC.

iii. Age

Below 70 years for the members and below 72 years for the Chairperson of the SEIAA/SEAC/EAC. The applicability of the age is at the time of the Notification of the SEIAA/SEAC/EAC by the Central Government.

Summary regarding the eligibility criteria for Chairperson and Members of the EAC/SEAC is given in Table 5-4.

Table 5-4: EAC/SEAC: Eligibility Criteria for Chairperson / Members / Secretary

S. No.	Attribute		Requirement		
			Expert members	**Secretary**	**Chairperson**
1	Professional qualification as per the Notification		Compulsory	Compulsory	Compulsory
2	Experience (Fulfilling any one of a, b, c)	a	Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI	Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI	Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI
		b	Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI	Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI	Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in Appendix VI
		c	Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management	Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management	-------------
3	Test of independence (conflict of interest) and minimum grade of the Secretary of the Committees		Shall not be a serving government officer Shall not be a person engaged in industry and their associations Shall not be a person associated with environmental activism	In case of EAC, not less than a Director from the MoEF, Government of India Incase of SEAC, not below the level of Director/Chief Engineer from the State Government (DoE)	Shall not be a serving government officer Shall not be a person engaged in industry and their associations Shall not be a person associated with environmental activism
4	Age		Below 67 years at the time of Notification of the Committee	As per state Government Service Rules	Below 72 Years at the time of the Notification of the Committee
5	Membership in Central /State Expert Appraisal committee		Only one other than this nomination is permitted	Shall not be a member in other SEIAA/EAC/SEAC	Shall not be a member in any other SEIAA/EAC/SEAC
6	Tenure of earlier appointment (continuous)		Only one term before this in continuity is permitted	Not applicable	Only one term before this in continuity is permitted

S. No.	Attribute	Requirement		
		Expert members	**Secretary**	**Chairperson**
7	Eminent environmental expertise with understanding on environmental aspects and impacts	Desirable	Not applicable	Compulsory

Note:

1. A member after continuous membership in two terms (six years) shall not be considered for further continuation. His/her nomination may be reconsidered after a gap of one term (three years), if other criteria meet.

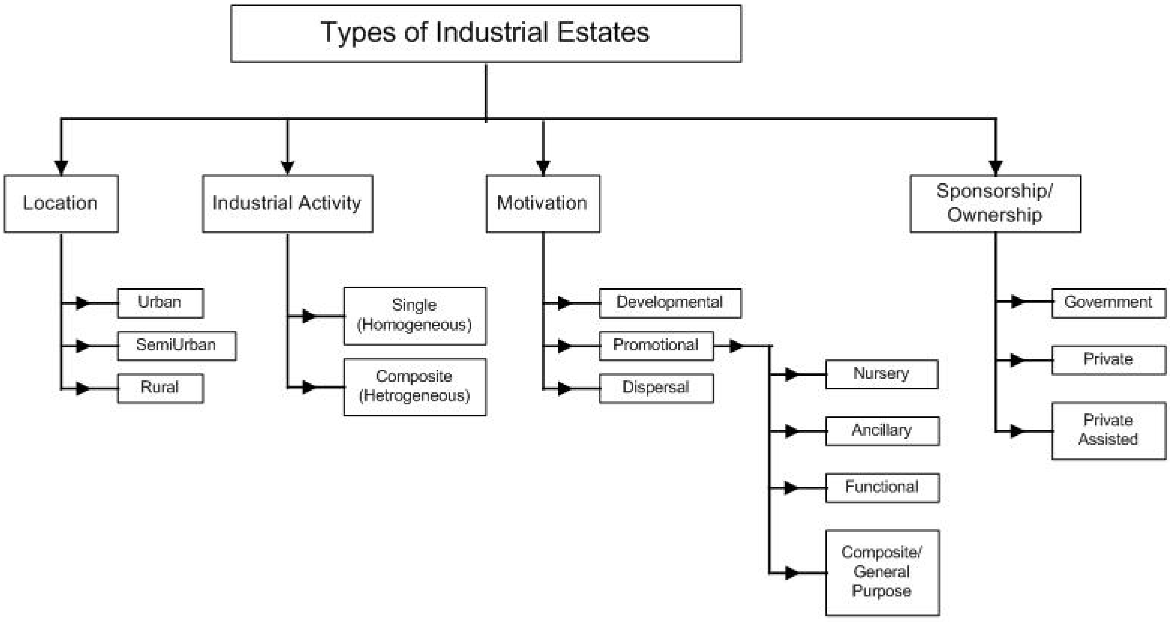
2. Chairperson/Member once notified may not be removed prior to the tenure of 3 years with out cause and proper enquiry. A member after continuous membership in two terms (6 years) shall not be considered for further continuation. The same profile may be considered for nomination after a gap of three years, i.e., one term, if other criteria are meeting.

E. Other conditions

- An expert member of one State/UT, can have at the most another State/UT Committee membership, but in no case more than two Committees at a given point of time.
- An expert member of a Committee shall not have membership continuously in the same committee for more than two terms, *i.e.* six years. They can be nominated after a gap of three years, *i.e.*, one term. When a member of Committee has been associated with any development project, which comes for environmental clearance, he/she may not participate in the deliberations and the decisions in respect to that particular project.
- At least four members shall be present in each meeting to fulfill the quorum
- If a member does not consecutively attend six meetings, without prior intimation to the Committee his/her membership may be terminated by the Notifying Authority. Prior information for absence due to academic pursuits, career development and national/state-endorsed programmes may be considered as genuine grounds for retention of membership.

ANNEXURE I
Types of Industrial Estates

Types of Industrial Estates



A. Location

IEs are often classified as urban, semi-urban or rural. In the present context, an urban IE is defined as the located in, or within easy commuting distance of, the metropolitan area or a city of, say, 500,000 inhabitants. Semi-urban and rural refer more to the region in which the estate is situated than to its actual site. A semi-urban estate is the one located in the principal town of a mixed urban and rural area. The population of the centre should not be less than 50,000. A rural estate is not the one built in the open country, as the name might imply, but in the central town, the population of which should be at least 25,000, of a predominantly rural region.

The lower limits of population given above should be treated with caution. For an IE to be viable, the city or town in which it is established must be able to provide the utilities and services required by the tenant enterprises. These usually are not to be found in small towns and villages.

B. Industrial Activity

The classification of an IE by the function it performs, or is expected to perform, tends to be confusing since normally there is more than one function. To some extent this may be resolved by separating function into activity and motivation.

An estate may be described as:

- Composite: containing establishments engaged in a variety of unrelated industries
- Ancillary: containing enterprises, usually small, in various fields, but all serving one large establishment and frequently supervised by the parent enterprise

- Single trade: often called as functional, accommodating either establishments engaged in the same trade (e.g., woodwork, repair of motor vehicles) or producing the same class of articles.

C. Motivation

Motivation is related to objectives. From this perspective, an IE may be classified as developmental, promotional, or dispersal. In most cases these descriptions refer to the composite IEs.

- **Developmental** – A developmental IE is the one intended to advance, improve, or increase the level of industrial activity in the area in which it is located. This will usually be a semi-rural or rural area. If, to achieve this goal, it is necessary to stimulate entrepreneurial talent among selected artisans, a variant - a nursery estate - is established.
- **Promotional –** In a sense, all IEs are promotional, but the term has come to mean the introduction of new industries into, and the improvement of existing industries in, economically backward regions. Rural IEs fall into this category.
- **Dispersal –** These IEs are intended to accommodate enterprises that on account of lack of space for expansion, or for environmental reasons, are required to move from urban areas.

Promotional Aspects

Nursery Estate

A nursery estate would be indicated if artisan activity were the only feature of the industrial scene. It could provide the physical facilities to transform artisans into small-scale industrialists. Support in the forms of common production facilities and advice, technical and managerial, would be essential.

A nursery estate (artisan work-sheds) usually consists of one or more sheds, built on developed land, so constructed that each may be subdivided to meet the varied need for floor space, and to accommodate limited expansion of individual enterprises. It is customary to provide electric power connections to each module, and for water supply and sanitary arrangements to be communal. Common production facilities may be provided. They appear to be useful only where most of the artisans are engaged in the same trade.

Normally, an entrepreneur is permitted to occupy only a specified number of modules, frequently not more than three. If his business expands to the extent that more space is required he is expected to find other accommodation. This rule works only if alternative accommodation is available. Very few tenants leave on this account. Those requiring of extra space sometimes hire it outside while still retaining their estate premises.

Functional Estate

A functional estate may be considered if there are a sufficient number of establishments engaged in the manufacture of the same or allied products. It would be a probable choice for a (semi-rural or rural) area either where local materials are worked extensively or where special skills have developed. The making of pottery, furniture, clocks and sports equipment is often found on IEs of this kind. The estate may contain either standard or custom-built work-places. The size of the former may be determined by the number of workers per unit in the existing establishments.

Common production facilities, bulk purchasing and quality control arrangements can be more effective on this type of estate than on any other. Experience shows that these services should preferably be managed by the entrepreneurs as a group.

Ancillary Estate

An ancillary estate might be a feasible proposition in the vicinity of a large establishment, provided a considerable proportion of its intermediate inputs could be produced by small-scale enterprises. Such an estate can be established only if the management of the large firm is prepared to give full support. There are a number of examples of such IEs in India. There is a danger that the industrial development of the area may become too dependent on the success of the parent company; if it fails, so do all the small establishments associated with it.

The needs of the parent establishment which an ancillary estate is intended to serve will determine its composition and size. Because an estate of this kind will bring work to the area that hitherto had gone elsewhere, it may be expedient to waive the lower limit of size. Indeed, the estate will be able to take advantage of the infrastructure created by the parent enterprise.

Composite or General Purpose IE

Most frequently the circumstances will call for setting up a composite estate to accommodate a variety of industries. Such an IE may be designed to cater to the needs of small establishments or for mixed sizes of light industry. The requirements of heavy industry cannot economically be provided by an IE. There are financial and technical advantages to IEs accommodating a mixture of small and medium-sized or large enterprises. This type of IE is by far the most common. It can be designed to accommodate virtually all sizes and types of enterprise, with the exception of those engaged in heavy industry.

D. Sponsorship / Ownership

The sponsor is the agency initiating the estate and providing all or part of the necessary funds. There are three types of sponsorship:

- **Governmental:** central, state or municipal
- **Private:** cooperative society, limited company or an association of industrialists
- **Government-assisted:** co-operative society, limited company or an association of industrialists with assistance from the government through the grant of a long-term loan

Government sponsorship and ownership predominated heavily in the past. Donor agency funding has also played an important role in the establishment of IEs in developing countries. In recent years, privately financed IEs have become very common, and much of the donor assistance has shifted to advice and the funding of various support services, which should preferably be run by industrial associations.

In spite of the growing role of private sector, a large IE programme cannot be carried solely by a private enterprise. Land ownership issues, planning and environmental considerations will make it essential to involve the government authorities. Many of the private-assisted IEs are the result of official pressure on industrialists to relocate their work places to less congested or environmentally less vulnerable sites. A coherent strategy for IE development may be desirable. To ensure that such overall development objectives are attained, it may be necessary to set up a parastatal IE development authority even though the actual attainment of the objectives is left to the private sector. In a country or region with a low development level, it may be necessary for the government to 'prime-the-pump' by financing at least the first set of IEs and setting up basic support services. Where IEs are privatized, new owners should sign an obligation to maintain environmental standards, sewage systems, etc.

Government IEs

For government IEs, the executing agency may be either a government department, a parastatal government corporation or a municipality.

When a government department is the executing agency, all funds for the establishment of an estate comes from government sources or through the government if foreign aid is involved. In a developing country this may be the only means of starting an IE programme. Until the beneficial effects of an estate are demonstrated, there may be no other way to raise the required capital. The disadvantage of a department as an executing agency lies in the lack of persons with suitable commercial or managerial experience for executing the programme and managing the IEs, and in the fact that, until the estate is able to meet its recurring costs, annual deficits must be met by the government. A parastatal differs from a government department in that frequently there are non-government representatives on the board of directors, and it has borrowing powers. In countries with a federal constitution the central government usually makes long-term loans to state or provincial governments to construct IEs.

While municipalities frequently function as executing agencies in developed market economies, they are still comparatively rare in economies in transition and developing countries. In most cases, local government lacked sufficient decision-making powers to initiate such projects and the skills to execute them, at least until recently. Finally, the municipality by itself will in many cases not have access to adequate sources of finance.

Government-Assisted IEs

The principal difference between a government-assisted and private estate is that the former is eligible for government grants and foreign investment. Both may be in receipt of loans from the government, but, normally, loans to assisted IEs are at concessionary rates and for longer terms. Often, government-assisted IEs are the result of pressure on local entrepreneurs by the municipality to move from the urban centre, as in Turkey (see Box 1). The industrialists or the municipality, sometimes jointly, form a body to implement the project. This executing agency is usually organized as a co-operative society if it is composed entirely of entrepreneurs and is a de facto co-operative. A government loan is then approved for the sole purpose of erecting work-places and buildings to house common facilities. The loan may not be used to purchase equipment.

Private IEs

Although private IEs have become common, information on the financing modes of these IE is hard to find. Private sponsorship is likely to ensure that an estate is efficient and profitable. However, the necessity to provide a return to the private shareholders may defeat one of the broader, long-term objectives of development policy in many countries:

that of stimulating small-scale enterprise by providing work-places at sub economic rents, often in locations outside economic core regions. Co-operative IEs can be a solution to this dilemma.

A variant on the private estate is the estate created by the erection of workshops by a privately owned firm on surplus land within the compound of the factory. These work-places are let to small-scale entrepreneurs who will often be ancillaries to the estate owner

ANNEXURE II
Forms of Industrial Estates

Industrial areas

An industrial area is a parcel of improved land developed and subdivided into plots for the accommodation of industrial establishments and offered for sale or for lease. Its size may allow advantage to be taken of economies of scale in providing the infrastructure, which may be passed on to the occupants. An attraction for a prospective occupier is the time saved in finding a site and in preparing the land. The industrial area is essentially a piece of real estate promotion. An industrial area may approximate an IE, but the essential differences are that in the former there is no unified and continuous management and that, beyond land and utilities, it provides no additional incentive to industry.

Industrial zones

An industrial zone is merely an area of raw land set aside for industry. In general, it is created by a municipal by-law and is part of an urban renewal or development programme. Any promotional effect it may have is dependent on its location in relation to transport and distribution facilities, and the price of land within the zone.

Growth centers

In order to promote industrialization of backward areas, the central Government, in June 1988, announced the scheme for establishment 70 Growth Centres throughout the country. Each growth centre would be bestowed with the best of infrastructural facilities to facilitate and promote industrial growth. The facilities for growth centers are:

- Proximity to railway station, national or state highways, or port
- Water, electricity, telecommunication, education and health facilities, sufficient land

Financing pattern of each growth centre is as follows:

- Central Government : Rs. 10 Crores
- State Governments : Rs. 5 Crores
- Financial Institutions/Banks : Rs. 5 Crores
- Market Borrowing : Rs. 10 Crores

About 65 Growth Centres have been identified so far, out of which about 28 Growth centres are in various state of completion. One of the important criteria for identification of a growth centre is that its sphere of influence should cover an area of about 400 to 800 hectares.

Export processing zones (EPZs)

IEs may serve as a step towards more advanced industrial infrastructure such as EPZs. EPZs can play a useful role in countries which intend to develop an export-oriented manufacturing sector, but do not have adequate countrywide conditions for foreign investment and imports of raw materials and equipment. Physically, an EPZ need not be restricted to an estate location. An EPZ should not remain an enclave; to be a real catalyst of export-oriented manufacturing, it must develop linkages to domestic industries.

The International Labour Organization (ILO) has defined EPZs as the "Industrial zones with special incentives set up to attract foreign investors, in which imported materials undergo some degree of processing before being re-exported".

With developments in information technology (IT), "imported material" would also include "electronic data" and electronic labour (Call Centres). EPZs have evolved from initial assembly and simple processing activities to include hi-tech and science parks, finance zones, logistic centres and even tourist resorts. Their physical form now includes not only enclave-type zones but also single-industry zones; single-commodity zones; and single-factory (such as the Export Oriented Units in India) or single-company zones.

India's first EPZ was established in Kandla in 1965 while seven others were later established in Mumbai, Chennai, Surat, Falta, Kochi, Noida and Vishakapatnam (Vizag). India's experience with EPZs has not been a huge success for the following reasons:

- there were zone scale and location issues
- the operations were cumbersome
- there were insular policies, focused on import minimization (vs. trade enhancement through export promotion)

It was envisaged that some of the existing EPZs would be converted into SEZs and accordingly the Government converted the EPZs located at Surat, kandla, Kochi, Vizag and Noida into SEZs.

The different forms of EPZs are listed in the following table.

Table: Different Forms of EPZs

	Trade	Manufacturing			Services		
	Free port	**Special Economic Zone (SEZ)**	**Industrial free zone / EPZ**	**Enterprise Zone**	**Information Processing Zone**	**Financial Services Zone**	**Commercial free zone**
Physical characteristics	entire city or jurisdiction	entire province region or municipality	enclave or industrial park	part of city or entire city	part of city or "zone within zone"	entire city or "zone within zone"	warehouse area, often adjacent to port or airport
Economic objectives	development of trading centre and diversified economic base	deregulation; private sector investment in restricted area	development of export industry	development of SMEs in depressed areas	development of information processing centre	development of off-shore banking, insurance, securities hub	facilitation of trade and imports
Duty free goods allowed	all goods for use in trade, industry, consumption	selective basis	capital equipment and production inputs	no	capital equipment	varies	all goods for storage and re-export of import
Typical activities	trade, service, industry, banking, etc.	all types of industry and services	light industry and manufacturing	all	data processing, software development, computer graphics	financial services	warehousing, packaging, distribution, trans-shipment
Incentives **- taxation** **- customs' duties** **- labour laws** **- other**	Simple business start-up; minimal tax and regulatory restraints. Waivers with regard to termination of employment and overtime. Free	Reduced business taxes; liberalized labour codes; reduced foreign exchange controls. no specific advantages;	Profits tax abatement and regulatory relief; exemption from foreign exchange controls. Free repatriation of profits. Trade union freedom restricted despite the fact that EPZs are required to respect	Zoning relief; simplified business registration; local tax abatement; reduction of licensing requirements.	Demonopolization and deregulation of telecoms; access to market-priced INTELSAT services. A specific authority manages labour relations. Trade union freedom	Tax relief; strict confidentiality; deregulation of currency exchange and capital movements. free repatriation of profits	Exemption from import quotas. reinvested profits wholly tax-free

	Trade	Manufacturing			Services		
	Free port	**Special Economic Zone (SEZ)**	**Industrial free zone / EPZ**	**Enterprise Zone**	**Information Processing Zone**	**Financial Services Zone**	**Commercial free zone**
	repatriation of capital, profits and dividends preferential interest rates.	trade unions are discouraged within the SEZ	national employment regulations.15 years exemptions on all taxes(maximum)	Trade unions are prohibited. Government mandated liberal on hiring and firing of workers	restricted		
Domestic sales	unrestricted within Freeport outside Freeport, upon payment of full duty	highly restricted	limited to small portion of production			limited to small portion of production	unlimited, upon payment of full duty
Other features	additional incentives and streamlined procedures	developed by socialist countries	may be extended to single- factory sites				
Typical examples	Hong Kong, Singapore, Bahamas Freeport, Batam, Labuan, Macao	China (southern provinces, including Hainan and Shenzhen)	Ireland, Taiwan (China), Malaysia, Dominican Republic, Mauritius, Kenya, Hungary	Indonesia, Senegal	India-Bangalore, Caribbean	Bahrain, Dubai, Caribbean, Turkey, Cayman	Jebel ali, Colon, Miami (USA FTZ) Mauritius, Iran

Source: International Labour Organization

Special economic zones (SEZ)

SEZs are specially demarcated geographical regions that have more liberal economic laws as compared to the centralized laws of the country. The SEZ concept itself gives the SEZ definition. The very purpose of a SEZ is to develop the area covered under the special economic zone by following special economic policies.

The basic motive behind developing an SEZ in India is to attract mass foreign investments to India. India Real Estate Investments have attracted huge foreign funds and thus the SEZs in India have increased by and large.

The SEZ benefits are:

- SEZ's offer economic progress to the area, the local inhabitants and the country as a whole
- Exemption from payment of stamp duty and registration fees on the lease/license of plots to the SEZ developer
- External commercial borrowings of up to 500 million USD a year without any restriction of maturity to the SEZ developers

Presently around fourteen major SEZs are functional in India. Santa Cruz, Mumbai, Maharashtra; Cochin, Kerala, Kandla And Surat in Gujarat; Chennai, Tamil Nadu; Vishakhapatnam, Andhra Pradesh; Falta And Salt Lake in West Bengal; Noida, Greater Noida in Uttar Pradesh; Indore, Madhya Pradesh; Jaipur, Rajasthan,etc.

India was one of the first in Asia to recognize the effectiveness of the EPZ model in promoting exports, with Asia's first EPZ set up in Kandla in 1965. With a view to overcome the shortcomings experienced on account of the multiplicity of controls and clearances, absence of world-class infrastructure, and an unstable fiscal regime and with a view to attract larger foreign investments in India, the SEZs Policy was announced in April 2000.

This policy intended to make SEZs an engine for economic growth supported by quality infrastructure complemented by an attractive fiscal package, both at the Centre and the State level, with the minimum possible regulations. SEZs in India functioned from 1.11.2000 to 09.02.2006 under the provisions of the Foreign Trade Policy and fiscal incentives were made effective through the provisions of relevant statutes.

The Special Economic Zones Act, 2005, was passed by the Parliament in May, 2005 which received Presidential assent on the 23rd of June, 2005. After extensive consultations, the SEZ Act, 2005, supported by the SEZ Rules, came into effect on 10th February, 2006, providing for drastic simplification of procedures and for single window clearance on matters relating to central as well as state governments. The main objectives of the SEZ Act are:

- generation of additional economic activity
- promotion of exports of goods and services
- promotion of investment from domestic and foreign sources
- creation of employment opportunities
- development of infrastructure facilities

Science and technology parks (such as biotechnology parks and leather complexes)

S&T parks basically provide the same kind of infrastructure as IEs, but are intended for technologically advanced industries and emphasize the high-level support services that such activities need – technical consultancy through networking with local R&D institutions; advisory services on finance and venture capital; marketing; and search for joint venture partners

Petroleum, chemical & petrochemical investment regions

To promote investment in this sector and make the country a hub for both domestic and international markets, the government has decided to attract major investment, both domestic and foreign, by providing a transparent and investment-friendly policy and facility regime under which integrated Petroleum, Chemicals & Petrochemical Investment Regions (PCPIRs) may be set up. The PCPIRs would reap the benefits of co-siting, networking and greater efficiency through the use of common infrastructure and support services. They would have high-class infrastructure, and provide a competitive environment conducive for setting up businesses. They would thus result in a boost to manufacturing, augmentation of exports and generation of employment.

A PCPIR would be a specifically delineated investment region with an area of around 250 km2 planned for the establishment of manufacturing facilities for domestic and export led production in petroleum, chemicals and petrochemicals, along with the associated services and infrastructure.

A PCPIR would be a combination of production units, public utilities, logistics, environmental protection mechanisms, residential areas and administrative services. It would have a processing area, where the manufacturing facilities, along with associated logistics and other services, and required infrastructure will be located, and a non-processing area, to include residential, commercial and other social and institutional infrastructure. The minimum processing area for the PCPIR will be about 40% of the total designated area, i.e., around 100 km2. The processing area may or may not be contiguous.

The PCPIR may include one or more SEZs, Industrial Parks, Free Trade & Warehousing Zones, EOUs, or Growth Centres, duly notified under the relevant Central or State legislation or policy. All the benefits available under the relevant legislation or policy will continue to remain available to the said Zones or Parks, as the case may be, forming part of the PCPIR. The PCPIR could cover existing settlements/industries & IEs/ services and would therefore benefit from and be complementary to the region. The concerned state government may not acquire the entire area comprising the PCPIR, but it will notify the same under the relevant Act for proper planning and zoning to ensure coordinated development.

ANNEXURE III
Difference between Expert Oriented Units and Special Economic Zones

Difference between Export Oriented Units and Special Economic Zones

	EXPORT ORIENTED UNITS (EOU)	SEZ
Establishment	EOU unit can be set-up any place declared as "warehousing station" under Customs Act. There are 300 such places all over India	SEZ Economic Zone unit has to be located within the specified zones developed
Import Procedures	The unit can import capital goods, raw material, consumables, packing material, spares, etc without payment of customs duty. Similarly these can be procured indigenously without payment of excise duty. Second hand capital goods can also be imported.	The unit can import capital goods, raw material, consumables, packing material, spares, etc without payment of customs duty. Similarly these can be procured indigenously without payment of excise duty. Second hand capital goods can also be imported.
Net Foreign Exchange Earnings (NEF)	They have to achieve positive NFE (Net foreign Exchange Earnings)	They have to achieve positive NFE (Net foreign Exchange Earnings)
Minimum Investment	Minimum Investment in plant and machinery building is Rs. 100 lakhs for EOU. This should be before commencement of commercial production	There is no such limit to Special Economic Zone
Procedure	A bond in prescribed form has to be executed –B-17 in case of EOU	A bond in prescribed form has to be executed – a form prescribed in Special Economic Zone Rules, 2003 in case of SEZ.
Green Channel	There is no physical supervision of customs / /excise authorities over production and clearances, but prescribed records are required to be maintained.	There is no physical supervision of customs / /excise authorities over production and clearances, but prescribed records are required to be maintained.
Custom Clearance	Fast Track Clearance Scheme (FTCS) for clearances of imported consignments of EOU	In case of Special Economic Zone units , custom clearance for export and import is obtained within the zone itself.
Export of final production	Generally all final production should be exported except rejects up to prescribed limit	Generally all final production should be exported except rejects up to prescribed limit
Central Sales Tax (CST)	Central Sales tax (CST) paid on purchases is refundable (but not local tax)	In case of Special Economic Zone supplier does not have to pay CST
Supplies made by Indian Suppliers	Supplies made to EOU by Indian Suppliers are 'deemed exports' and supplier is entitled to benefits of 'deemed export'.	Supplies to Special Economic Zone are 'Exports' and all export benefits are available
Infrastructure	General infrastructure available to EOU unit are not as better as available to SEZ units	Better infrastructural facilities are available to Special Economic Zone
Schemes like EOU / SEZ are suitable when : ▪ the undertaking is predominantly export oriented ▪ Requirement of imported capital goods and imported raw material is high.		
Source: Confederation of Indian Industry		

ANNEXURE IV
Common Service Facilities for IE

Fire Protection

Fire protection is essential. It is usual for fire hydrants to be fitted at strategic points in the water reticulation and for fire hoses to be available. The tenants are expected to provide first-aid fire appliances for their own premises (a customary requirement under all fire insurance schemes).

Security

Security may be provided either by the IE administration, in which case it consists of fencing the area and employing watchmen, or by the establishment of a policy post on the estate. It is not uncommon, especially in IEs for medium- and large-scale establishments, for the tenants to be required to fence their plots and to provide their own security guards.

Collection and disposal of waste

Collection and disposal of IE waste must be undertaken either by the local authority or the estate administration. If the IE is within the collection area of the local authority, it should be handled by the authority. However, there were a few notified instances where the local authority, while levying rates on estate premises, had declined to provide the service. In such cases, an agreement should be reached on this matter before the IE is built. If the duty devolves on the estate administration, the tenants are charged for the service. Sometimes an incinerator is provided for the use of tenants.

Medical Care

The provision of medical care - first-aid post, clinic or dispensary - by the IE administration depends on the current labour legislation. In some countries each workplace is required to have first-aid materials, appliances and trained personnel on the premises on a scale that would vary with the number of persons employed. Where this is not a legal obligation, it is not uncommon for the IE administration to provide the service - often a clinic with a resident dresser and a visiting doctor. For a very small IE, probably all that is needed is a small stock of first-aid materials and an IE worker with some training in first-aid.

Common temporary storage for Hazardous Waste

A common storage facility for storing the hazardous wastes generated from the industries within IEs may be required. These storage facilities can temporarily store the hazardous wastes before they are transported to the disposal sites.

Bank, Post Office

A bank and a post-office are for the convenience of the IE tenants. They are desirable but not essential. Many IEs have neither. It is not necessary for the IE administration to provide one or the other. If business develops to the extent that either a commercial bank or the postal authority sees the need to open a branch office in the IE, it will do so. It would be advisable none-the-less to reserve space for such an office.

Weigh Bridge

A weigh bridge may be necessary, but only in special circumstances, e.g., where there are several large firms on the IE with bulky material inputs and outputs. It is unlikely to be needed on an IE for small-scale enterprises.

Exhibition Halls

Showroom or exhibition halls are luxuries. One or the other could be justified on an IE producing articles for the tourist trade, assuming that the location of the IE attracts tourists.

Repair Workshop

A central repair workshop to deal with machinery and vehicles owned by the IE tenants is necessary. It should be provided by the IE administration only if there is no commercial firm capable of undertaking the work, and then only if there is sufficient volume to justify the equipping and staffing of a workshop.

In countries where the allocation of certain materials is controlled, the IE administration may be called upon to endorse applications for materials submitted by tenant enterprises. It is a necessary service and one that does not involve the administration in any expense.

ANNEXURE V
Criteria for Industrial Estate Planning

Criteria Industrial Estate Planning

Identification of areas to be avoided for siting of industrial estates

A.1 Biological diversity of an area

1	National parks
2	Wild life sanctuaries
3	Game reserve
4	Tiger reserve/elephant reserve/turtle nesting ground, breeding grounds
5	Core zone of biosphere reserve
6	Habitat for migratory birds
7	Mangrove area
8	Areas with threatened (rare, vulnerable, endangered) flora/fauna , protected corals
9	Wetlands
10	Botanical gardens, Zoological gardens, Gene Banks
11	Reserved forests, Protected forests
12	Any other closed/protected area under the Wild Life (Protection) Act, 1972
13	Any other area as locally applicable

A.4 Sensitive/incompatible land uses

1	Public water supply areas from rivers/surface water bodies - Upto 2 km from watersheds u/s of public water supply abstraction points in the rivers/surface water bodies
2	Public water supply areas from ground water- 1 km around public water supply abstraction points from ground water
3	Ground water recharge areas - 1/2 km ground water recharge areas
4	Scenic areas/tourism areas/hill resorts - 1 km from the periphery of the core areas of scenic areas/tourism areas/hill resorts with tourists/visitors more than 10 lakhs a year
5	Religious places, pilgrim centers - 1 km around core areas of religious places that attract over 10 lakhs pilgrims a year
6	Protected tribal settlements - notified tribal areas where industrial activity is not permitted
7	Coastal Regulatory Zone (CRZ)
8	Monuments of national significance - 1 km from monuments of national significance
9	Monuments of state significance – ½ km from monuments of state significance
10	Monuments of national significance – 100 m from monuments of local significance
11	World Heritage Sites - 2 km from World Heritage sites
12	Flood prone areas (based on flood in 1in 25 years)

13	Agricultural research stations
14	Air port areas
15	Any other feature as specified by the State or local government and other features as locally applicable (including prime agricultural lands, pastures, migratory corridors etc.)

Identification of candidate sites based on socio-economic factors from the areas other than those areas to be avoided

- Land availability - extent of land to suit to the industrialization demand, preferably wastelands
- Land ownership - government or private land lease in acquisition.
- Electricity- nearness or distance of various pre- final sites from nearest existing sub-station / power plant.
- Nearness to the major settlement - distance of nearest major settlement from all the pre-final candidate sites.
- Water availability- distance from source of water supply for domestic and industrial purposes
- Distance from existing industrial areas
- Distance from sensitive zone
- Drainage- distance of major rivers or drains from the pre-final sites
- Nearness to transportation network for economic handling of both raw materials and finished goods
- Environmental sensitivity of the area to suit to the needed industrial development.
- Transportation facility: distance from existing railway line and highway.

Candidate site Matrix for Site Suitability

Parameters		Site - I	Site - II	Site - III	Site …….
ENVIRONMENTAL PARAMETERS					
Distance to sensitive zones	Weightage				
	Justification				
Suitability to air Polluting Industries	Weightage				
	Justification				
Suitability to Water Polluting Industries	Weightage				
	Justification				
PHYSICAL INFRASTRUCTURE PARAMETERS					
Availability of water and nearness to water supply source	Weightage				
	Justification				
Availability of	Weightage				

Parameters		Site - I	Site - II	Site - III	Site …….
effluent disposal places	Justification				
Nearness to Road	Weightage				
	Justification				
Nearness to Railway Line	Justification				
	Weightage				
Availability of Land and Land Costs	Weightage				
	Justification				
SOCIO-ECONOMIC PARAMETERS					
Skilled Manpower Availability	Weightage				
	Justification				
Nearness to Sales Market	Weightage				
	Justification				
Nearness to Major Settlement	Weightage				
	Justification				
Contribution to balanced industrial development	Weightage				
	Justification				
Social acceptance to the proposed estate development	Weightage				
	Justification				

The categorization of physical, environmental and social parameters have to be done rationally, such as in the case of physic infrastructure given below.

Physical Infrastructure Parameters

Parameters	Good	Moderate	Poor
Water supply (Nearness to source)	Upto 5 km	5-10 kms	10-15 kms
Availability of electricity	Uninterrupted power supply	Power supply with intermittent cuts	Frequent power cuts
Discharge from the ETP (nearness to the disposal point)	Disposal point within 5 kms	Disposal point within 15 kms	Disposal point more than 15 kms
Nearness to road	Up to 1 km	1-5 km	More than 5 km
Nearness to railway line	Up to 1 km	1-2 km	More than 2 km
Availability of land	Government ownership	Institutional ownership	Private ownership

Weightage out of 5: 5 for excellent, 4 for very good, 3 for good, (-ve)3 for poor, (-ve) 5 for very poor.

Description of potential site(s)

Parameters	Industrial Estate 1	Industrial Estate2
Location		
Area		
Habitable villages		
Land use		
Land availability		
Nearness to the road		
Nearness to the railway line		
Water supply (Nearness to the source)		
Discharge from the ETP (Nearness to the disposal point)		

Assessment of sensitivity of land use and air/water pollution of the potential site(s) and suitability to industries

A. Landuse sensitivity assessment

		0.5 km	0.5-2 km	2-5 km	5-7 km	7-15 km	>15 km
A Biological diversity							
	National parks						
	Wild life sanctuaries						
	Game reserve						
	Tiger reserve/elephant reserve/turtle nesting ground, breeding grounds						
	Core zone of biosphere reserve						
	Habitat for migratory birds						
	Mangrove area						
	Areas with threatened (rare, vulnerable, endangered) flora/fauna, protected corals						
	Wetlands						
	Botanical gardens, Zoological gardens, Gene Banks						

	Reserved forests, Protected forests						
	Any other closed/protected area under the Wild Life (Protection) Act, 1972						
	Any other area as locally applicable						
B. Incompatible Land uses							
	Public water supply areas from rivers/surface water bodies - Upto 2 km from watersheds u/s of public water supply abstraction points in the rivers/surface water bodies						
	Public water supply areas from ground water						
	Ground water recharge areas						
	Scenic areas/tourism areas/hill resorts (over 10 lakhs tourists/visitors a year)						
	Religious places, pilgrim centers (over 10 lakhs pilgrims/visitors a year						
	Protected tribal settlements - notified tribal areas where industrial activity is not permitted						
	Coastal Regulatory Zone (CRZ)						
	Monuments of national significance						
	Monuments of state significance						
	Monuments of local significance						
	World Heritage Sites						
	Flood prone areas (based on flood in 1in 25 years)						
	Agricultural research stations						
	Air port areas						
	Any other feature as specified by the State or local government and other features as locally						

	applicable (including prime agricultural lands, pastures, migratory corridors etc.)						
C. Land Use:							
	Double Cropped						
	Single Cropped						
	Plantations						
	Command Areas						
	Fallow Lands						
	Forests:						
	Reserved Forest						
	Protected Forest						
	Scrub/Degraded Forest						
	Other Forest						
	Waste Lands:						
	gullied and/or ravenous land upland with or without scrub water logged and marshy land/salt pan land affected by salinity/alkalinity-coastal/inland shifting cultivation area under utilized/degraded notified forest land degraded pastures/grazing land degraded land under plantation crops sands-desertic/coastal mining/industrial wasteland barren rocky/stony waste/sheet rock area steep sloping area snow covered and/or glacial area						
D. Population							
	Rural						
	Urban						
E. Environmental Quality							

	Areas with 'critical'/'high' air pollution						
	Critically polluted areas or 'low' quality areas - areas with surface water quality exceeding the applicable 'criteria'						
	Areas with ground water quality exceeding the applicable 'criteria'						
	Hilly stretches that act as barriers for dispersion of emissions, areas with frequent inversion conditions						
F. Others							
	Municipality/ Metro City						
	NH						
	Railways						

Note:

1. Use 'X' to indicate not existing and '✓' to indicate that a feature exists.

2. From the above table, the conclusions on the land use sensitivity are to be drawn. For example, if a sensitive land use falls at a distance of 6 km, for this site industries with pollution potential of 5-7 km then additional pollution control measures byondjust meeting MINAS may be required.

Site Suitability

Distance to sensitive land use **Impact potential of industry**	**< 0.5 km**	**0.5 to 2 km**	**2 to 5 km**	**5 to 7 km**	**7 to 15 km**	**> 15 km**
Upto 0.5 km	B	G	G	G	G	G
0.5 to 2 km	R	B	G	G	G	G
2 to 5 km	R	R	B	G	G	G
5 to 7 km	R	R	R	B	G	G
>7 km	R	R	R	R	B	G

R	Requires additional pollution control measures towards best available technologies
B	Requires additional pollution control measures beyond the technologies considered for meeting minimal national standards

G	Suitable

B. Air pollution sensitivity assessment

a) Air Pollution Potential of Industries

Industry Category	Impact Potential*
A1	> 7 km
A2	5 to 7 km
A3	2 to 5 km
A4	< 2 km

* impact potential considered without pollution control equipment in operation

b) Air Quality in the Area

Distance from IE Site	Upto 0.5 km	0.5 to 2 km	2 to 5 km	5 to 7 km	7 to 15 km or more
Air Quality*					

* Low, Moderate, high, Critical

Concentration	Industrial	SO_2	SPM	Residential	SO_2 &NO_2	SPM
Low	L	0-40	0-180	L	0-30	0-70
Moderate	M	40-80	180-360	M	30-60	70-140
High	H	80-120	360-540	H	60-90	140-210
Critical	C	> 120	> 540	C	>90	>210

Site Suitability

Distance to 'critical'/'high' quality Impact potential of industry	< 0.5 km	0.5 to 2 km	2 to 5 km	5 to 7 km	7 to 15 km	> 15 km
A4 (>2 km)	R	B	G	G	G	G
A3 (2 to 5 km)	R	R	B	G	G	G
A2 (5 to 7 km)	R	R	R	B	G	G
A1 (>7 km)	R	R	R	R	B	G

R	Requires additional pollution control measures towards best available technologies
B	Requires additional pollution control measures

	beyond the technologies considered for meeting minimal national standards
G	Suitable

c) Land Use Sensitivity: Site Suitability

Distance to sensitive land use **Impact potential of industry**	**< 0.5 km**	**0.5 to 2 km**	**2 to 5 km**	**5 to 7 km**	**7 to 15 km**	**> 15 km**
A4 (>2 km)	R	B	G	G	G	G
A3 (2 to 5 km)	R	R	B	G	G	G
A2 (5 to 7 km)	R	R	R	B	G	G
A1 (>7 km)	R	R	R	R	B	G

R	Requires additional pollution control measures towards best available technologies
B	Requires additional pollution control measures beyond the technologies considered for meeting minimal national standards
G	Suitable

d) Dispersion Sensitivity

Distance from IE Site	**Upto 0.5 km**	**0.5 to 2 km**	**2 to 5 km**	**5 to 7 km**	**7 to 15 km or more**
Dispersion Sensitivity*					

* Low, Moderate, high, Critical

Site Suitability

Distance to critical/high dispersion area Impact potential of industry	**< 0.5 km**	**0.5 to 2 km**	**2 to 5 km**	**5 to 7 km**	**7 to 15 km**	**> 15 km**
A4 (>2 km)	R	B	G	G	G	G
A3 (2 to 5 km)	R	R	B	G	G	G
A2 (5 to 7 km)	R	R	R	B	G	G
A1 (>7 km)	R	R	R	R	B	G

R	Requires additional pollution control measures

	towards best available technologies
B	Requires additional pollution control measures beyond the technologies considered for meeting minimal national standards
G	Suitable

e) Confirmatory Tests through Air Quality Modelling

The Kilder Dispersion Model system (POI-KILD and ARE-KILD) of the NILU programs specially prepared for planning use for the Central Pollution Control Board in India should preferably be used to confirm the site suitability by placing the data from existing industries of the suitable type at the proposed site and assessing its behavior.

f) Suitability to Air Polluting Industries

Summary statement showing the site suitability for air polluting industries form various aspects as above (air quality, dispersion, land use, modeling) should be summarized as below:

S.No.	**Parameter**	**Suitability**	
		Site 1	**Site 2**
1	Land use sensitivity assessment		
2	Dispersion sensitivity		
2	Air Quality		
4	Air quality modelling		

C. Water pollution sensitivity assessment

- Water pollution potential of industries
- Wastewater disposal options (place of disposal) available
- imilative capacity of the receiving water body (taking into consideration source strength (pollution potential of industries), dilution factor (flow), use, existing quality etc.)
- Location of wastewater disposal point in the river or receiving water body
- Flow available in the rivers/streams (hydrology of the receiving water bodies);
- Uses in the downstream (ecological sensitivity and functions of the receiving water bodies);
- Existing water quality (ref. Chapter 2)
- Assimilative capacity

a) Water Pollution Potential of Industries

Industry Category	Description	Impact Potential*
W1	Industry with ≥25 kld discharge of effluents (irrespective of organic load) that are not easily bio-degradable (BOD/COD ≤ 0.4) or toxic or having TDS generation more than 10,000 mg/l Industry with 100-500 kld discharge of non-toxic effluents with organic load of >100 kg/d with BOD/COD ratio = 0.4-0.7) Industry with > 500 kld of discharge of non-toxic effluents (irrespective of organic load) that are less bio-degradable (BOD/COD=0.4-0.7)	Very High
W2	Industry with 100-500 kld discharge of non-toxic effluents with organic load of < 100 kg/day with BOD/COD ≤ 0.7 Industry with >500 kld discharge of non-toxic effluents (irrespective of organic load) that are less biodegradable (BOD/COD ratio of >0.7) Industry with ≥25 kld discharge of effluents (irrespective of organic load) having TDS generation >5,000 mg/l but ≤ 10,000 mg/l	High
W3	Industry with 25-500 kld of non-toxic effluents that are easily biodegradable or less biodegradable (BOD/COD ratio of > 0.7) Industry with ≥25 kld discharge of effluents (irrespective of organic load) having TDS generation ≤ 5,000 mg/l	Medium to High
W4	Industry with <25 kld discharge of effluents that are easily biodegradable (BOD/COD ratio of > 0.7) and non-toxic	Low

* impact potential considered without pollution control equipment in operation

Table: Indicative Classification of Industries based on their Air/Water Pollution Potential

S. No.	Industries	Air Pollution Potential	Water Pollution Potential
1	Thermal Power Plants – Coal or coke based ≥ 200/210 MW	A1	W2
2	Thermal Power Plants – Coal or coke based < 200/210 MW	A3	W2
3	Thermal Power Plants – gas based	A3	W4
4	Thermal Power Plants – LDO based	A3	W4
5	Oil Refinery, Petroleum Refining	A1	W1
6	Petrochemicals	A1	W1
7	Integrated Iron and Steel	A1	W1
8	Fertilizer	A1	W1
9	Copper Smelter	A1	W4
10	Zinc Smelter	A1	W4
11	Aluminum Smelter	A1	W4
12	Lead Smelting	A1	W4
13	Cement – large	A2	W4
14	Cement – medium	A2	W4
15	Cement – small/tiny	A4	W4
16	Pesticides – Technical grades	A2	W1
17	Pharmaceuticals – bulk drug	A2	W1
18	Nitric Acid	A1	W2
19	Sulphuric Acid	A1	W2
20	Phosphoric acid	A2	W2
21	Caustic Soda a) Mercury cell b) Membrane cell	 A3 A3	 W1 W3
22	Dye and Dye Intermediates	A2	W1
23	Sugar	A3	W2
24	Organic Chemicals	A2	W2
25	Re-Heating (Reverberatory) Furnace, Capacity: large	A3	W4
26	Foundries, Cupola, Arc Furnace, Induction Furnaces – large	A3	W4
27	Paint (excluding formulation)	A2	W2
28	Inorganic Chemicals	A2	W2
29	Man-Made Fibres (Synthetic; Semi Synthetic)	A1	W2
30	Boilers More than 15 t/hr	A3	W4

S. No.	Industries	Air Pollution Potential	Water Pollution Potential
31	Composite Woolen Mills - Chromium and Sulphide	A4	W2
32	Glass - Soda lime and Borosilicate and Other special glasses (other than Lead) Furnace capacity - Product draw capacity more than 60 tpd	A3	W4
33	Glass - Lead Glass: Furnaces of all Capacity	A3	W4
34	Wood and wood products a) Ply wood manufacturing b)Fibre board manufacturing c)Furniture	A4	W4
35	Leather Tannery a) Chrome Tanneries / Combined Chrome and Vegetable Tanneries b) Vegetable Tanneries	 A4 A4	 W1 W1
36	Pulp and Paper a) Agro Based b) Waste Paper Based c) Paper Board without cooking operation	 A2 A2 A2	 W1 W2 W3
37	Composite Woollen Mills - Common	A4	W2
38	Fermentation (Maltries and Breweries)	A3	W2
39	Asbestos manufacturing – medium/large (Including all process involving the use of Asbestos)	 A1	 W3
40	Boilers Less than 2 t/hr 2 to 5 t/hr	 A4 A4	W4 W4
41	Slaughter House, Meat and Sea Food Industry - Slaughter House - all capacities	A3	W2
42	Food and Fruit Processing a) Soft Drinks b) Fruit Based Synthetic (More than 0.4 tpd) c) Bottle and Tetrapack Synthetic (Less than 0.4 tpd)	 A4 A4 A4	 W3 W3 W3
43	Food and Fruit Processing - Fruit and Vegetables	A4	W4

S. No.	Industries	Air Pollution Potential	Water Pollution Potential
44	Food and Fruit Processing – Bakery	A4	W4
45	Food and Fruit Processing a) Bread and Bread and Biscuit Continuous Process (More than 20tpd) Non Continuous Process (Less than 20tpd) b) Biscuit Production all capacities	 A4 A4	 W4 W4
46	Food and Fruit Processing - Confectioneries > 4 tpd Below 4 tpd	 A4 A4	 W4 W4
47	Distillery (Alchohol distillery)	A2	W1
48	Pesticides – formulation	A2	W3
49	Pharmaceuticals – formulation	A4	W3
50	Cotton Textile Industries	A4	W2
51	Electroplating	A4	W1
52	Stone Crushing	A3	W4
53	Coke Oven	A1	W1
54	Synthetic Rubber	A3	W2
55	Calcium Carbide	A3	W4
56	Carbon Black	A2	W4
57	Natural Rubber	A4	W4
58	Re-Heating (Reverberatory) Furnace, Capacity: small/medium	A4	W4
59	Foundries, Cupola, Arc Furnace, Induction Furnaces – small/medium	A4	W4
60	Lime Kiln	A3	W4
61	Jute Processing	A4	W4
62	Dairy	A4	W3
63	Ceramic Industry	A3	W4
64	Starch and Glucose	A4	W2
65	a) Pottery and Earthen Ware b) SSI and Using Furnace oil	A4 A4	W4 W4
66	Soap (Detergent Formulation)	A4	W4
67	Bone mills and allied industries	A4	W2

Indicative List of Industries of A4W4 Category

1. Agarbatti and similar products
2. Agricultural equipment manufacturing units
3. Air conditioner's parts
4. Aluminium doors / windows / fittings / furniture
5. Assembly and repair of cycles
6. Assembly and repair of electrical gadgets
7. Assembly and repair of sewing machines
8. Assembly and repair of electronic goods
9. Assembly of coolers
10. Atta chakki, spices (except chillies)
11. Auto parts (lathe work)
12. Automobile servicing and repairing stations
13. Ball pen refill
14. Barbed wire making
15. Basket making
16. Batic works
17. Belts and buckles
18. Bio-gas
19. Biscuit, cakes, and cookies making
20. Black smithy
21. Bianco cake
22. Block making and Photo enlarging
23. Book binding
24. Bread and bakeries
25. Brooms & Brushes
26. Bulbs (battery)
27. Button making, fixing of buttons and hooks
28. Candles
29. Cane and bamboo products
30. Canvas bags and hold-all making
31. Canned fruits & vegetables
32. Cardboard boxes
33. Carpentry
34. Cement jellies, cement tanks, manhole covers and wall rings etc.
35. Chewing gum and supari
36. Clay and modeling
37. Clarified Fruit Juices from Pulpy fruits
38. Coir and jute products
39. Cold storage < 10 t capacity
40. Confectionery and bubble gum
41. Copper and Brass artwares
42. Cordages, rope and twine making
43. Cotton ginning
44. Cotton and Woolen hosiery (dry processing)
45. Cotton / silk printing (by hand)
46. Crayons
47. Cycle chain
48. Cycle locks

49. Dal Dehusking Unit (Cottage Scale)
50. Dari and carpet weaving
51. Data processing
52. Detergent (without Bhatti - cottage type of industries, only mixing process)
53. Dehydrated Fruits
54. Desiccated Coconut
55. Diamond cutting and polishing work
56. Elastic products
57. Electric fittings (switch, ;lug, pin, etc.)
58. Electric motor parts
59. Electric press assembling
60. Electroplating for jewelry and engraving
61. Embroidery
62. Engineering works
63. Fishing net making
64. Fish Pickles
65. Fish Products : Thermal Processed
66. Flavours (blending operation)
67. Flour mills (excluding roller mills)
68. Fountain pens, ball pens and felt pens
69. Framing of pictures and mirrors
70. Fruit processing and preservation - pickles, fruit crushers etc.
71. Fruit and Vegetable Preserves and Candies
72. Fruit Jam, Jellies and Marmalades
73. Fruit Squashes and Syrups
74. Fruit Toffees
75. Garment making (no bleaching or dyeing)
76. Gold and Silver Threads
77. Groundnut decorticating
78. Handloom weaving
79. Hangers
80. Hats, caps, turban including embroidery
81. Hosiery products (without dyeing and bleaching)
82. Honey-Based Beverages
83. Ice boxes and body of the coolers
84. Ice creams, ice candy
85. Instant Pickles
86. Iron grills and door making
87. Jam, jellies and fruits preserves
88. Jewellery items
89. Key rings
90. Khadi and handloom
91. Knife making
92. Kulfi and confectionery
93. Kumkum, kajal, tika, etc
94. Lace products
95. Lactic Beverage : Cereal Based
96. Laundry and dry cleaning
97. Leather and Rexene made ups
98. Leather footwear (does not include any kind of tanning)

99. Manjan and hair oil
100. Manufacture of mineral water
101. Manufacture of tooth paste, tooth powder, shampoo, nail polish, hair oil by mixing process
102. Manufacture of biddies
103. Manufacture of made-up textiles goods such as curtains, mosquito nets, mattress bedding material, pillow covers and bags etc.
104. Manufacture of metal building components such as grills, gates, doors and window frame, water tanks, wire net etc. (use of coal is not permitted)
105. Manufacture of milk products such as butter, ghee etc..
106. Manufacture of mirrors and photo frames
107. Manufacture of musical instruments
108. Manufacture of paper and card board products (pulp and paper mfg. excluded)
109. Manufacturing of ice-cream
110. Manufacturing of ink for fountain pens (formulation only)
111. Manufacturing of office and household furniture and appliances-steel and wood
112. Manufacturing of optical frames
113. Manufacturing of scientific and mathematical instruments (Engg. works & Assly.
114. Manufacturing of surgical gauges and bandages
115. Manufacturing of writing instruments (pens, pencils, etc.)
116. Mushrooms : Production and Preservation
117. Marble stone items
118. Mattress and pillows without blowing process
119. Metal lathe cutting
120. Mini Rice Mill
121. Motor winding works
122. Musical instruments (including repairs)
123. Nails, screws, rolling shutters (from finished material)
124. Name plate making
125. Oil ginning and expelling (no hydrogenation and no refining)
126. Packing boxes for shirts etc.
127. Pan masala
128. Papad making
129. Paper bags
130. Paper stationery items and book binding
131. Parboiled Paddy (Dry Heat Method)
132. Peanut Chikki
133. Pencil and pen manufacturing units
134. Photographs, printings (including sign board painting)
135. Photosetting
136. Photostat and cyclostyling
137. Pickles and Chutneys
138. Garland of flowers
139. Processing of condiments spices, groundnuts and dal etc
140. Pulse mills
141. Rakhee making
142. Ready-made garments and apparel making (dry processing)
143. Repairs of watches and clocks
144. Rice Flakes
145. Rubber stamps
146. Saree fall making

147. Saw mills
148. Scissors making
149. Screen printing
150. Screw and nails
151. Shoe laces
152. Silver foil making
153. Small electronic components
154. Soap making (only mixing process)
155. Soft drink making (not excluding 500 bottles per day)
156. Spectacles and optical frames
157. Spices (Masala) Powder
158. Sports goods
159. Stamp pads
160. Stationery articles (except manufacturing of paper and inks)
161. Steel furniture
162. Stone engraving
163. Stone, marble, granite cutting, polishing and finishing
164. Stove pipe, alpine and safety pins, aluminum buttons, (by hand process)
165. Surgical bandages rolling and cutting
166. Surgical instruments and equipment
167. Table lamps and shades
168. Tailoring
169. Textile weaving
170. Thread balls, and cotton fillings
171. Tin boxes and makings
172. Toys and dolls
173. Turmeric, salt and spices grinding units
174. Typewriter parts, manufacturing and assembling
175. Tyre retreating
176. Umbrella assembly
177. Velvet embroidered shoes/shawls
178. Vermicelli and Macaroni
179. Village oil ghani
180. Village pottery industry (without bhatti)
181. Water meters repairing
182. Water tanks
183. Welding works
184. Wet grinding
185. Wood carving and decorative woodwares
186. Wooden furniture works
187. Wool balling and lachhee making
188. Wool knitting (with machine)
189. Xerox and photocopying; and
190. Zari making

ANNEXURE VI
Site Establishment Factors for IE Development

Selection of Enterprises

For an IE built to relocate industry there is no need for an admission policy; all establishments involved in the move must be housed. If new enterprises are to be introduced into any IE, it becomes a matter of selecting from among the applicants those most suitable in the light of national industrial objectives. This involves the assignment of priorities. How far an admission policy is applied is open to question. On some IEs it is obvious that the objective has been to fill the vacant plots as quickly as possible. However, the factors normally to be considered in connection with the applicant enterprise are:

- Its degree of complementarity with existing or prospective establishments in the estate
- Its level of technology
- The employment it will provide
- The use it will make of local materials

The relative priority assigned to each of these will depend on the principal goal of the IE. An applicant enterprise that can provide services needed by establishments on the IE should be given a high priority. Its presence could obviate the necessity for the IE administration to supply such services. A high level of technology is to be encouraged provided it does not run counter to the goal of increasing employment. Preference should be given to entrepreneurs who are prepared to modernize their equipment. In a few instances this has been made a condition for admission.

If an establishment uses electricity or water at a rate per worker much greater than that allowed for in the design of the estate, the expansion of other establishments may be restricted. If a firm needs a great deal of space per worker, the employment potential of the estate is reduced. Industries in which there is a high risk of fire or explosion could cause damage to other properties on an IE. Industries handling toxic materials can affect the quality of output of food processing industries. Nuisance can be caused by the excessive emission of dust (e.g., stone crushing), smoke (e.g., brickworks) or offensive odours (e.g. tanneries). On a large IE it may be possible to accept such industries by assigning them to special zones, but that is not possible on a smaller estate.

Selection of Entrepreneurs

The many objectives of an IE can be summed up in the words "industrial expansion". To attain this, it is essential that the firms on the estate increase productivity and profitability. This will largely depend on the entrepreneurial acumen of their managers. IEs may, and do, shelter firms that neither contribute to the development objective of the enterprise nor to returns on sponsors’ investment. Therefore, the entrepreneurial ability of the applicants must be ascertained. A good screening procedure will help to identify the right type of entrepreneur. To prevent speculation with freehold plots, entrepreneurs should only be accepted if their investment projects have been approved by the authorities and if they can submit proof that adequate financial resources have been secured. Speculators will be screened out in this way.

If the reason for the application is the transfer of an existing enterprise, then information on the credit-worthiness of the applicant may be obtainable from his bank, and on his business reputation by discreet inquiries in the trade. It is more difficult if an applicant is proposing to engage in a new line of business. An effort should be made to ascertain what experience, if any, he has in that field. Lack of experience need not necessarily disqualify him if he is in a position to employ the necessary expertise. His ability as a manager may be gauged by the success of his current undertaking.

Control of Investor Activities

Orderly development of an estate requires some controls on investor activities. Their main purpose is to ensure that investors behave as good neighbours, construct buildings which are in conformity with an overall plan for the estate, and use and maintain them in a proper way. The controls should also bind the developer to certain standards and policies. Investors (especially those which might be classed as high quality, like electronics or medical equipment manufacturers) will normally seek assurances that no unsuitable development will take place in or near the estate, e.g. activities involving odours, smoke or dust. Controls can take the form of conditions attached to a licence or lease agreement, or as a set of by-laws or protective covenants, and may include the following:

Limitation on Types of Activity

In many developing countries and economies in transition, environmental factors were often neglected when factories were established in the past. While everything should be done to reduce their environmental impact, it may not always be possible, for economic and social reasons, to curtail activities. The establishment of new polluting factories, however, should be discouraged. The short-term gain brought by accepting these plants is unlikely to outweigh the long-term cost to society and the environment. Industries requiring special safety precautions such as refineries and explosives manufacturing should be assigned to separate areas, or IEs located well away from residential areas.

Building Restrictions

Building plans should be subject to approval by the estate developer, in addition to any approvals from planning authorities or other agencies involved in building control. Normally, the developer will have a set of guidelines indicating the height and design restrictions, the building line (x metres back from the centre of the road or the edge of the plot), and the built-over or building/open space ratio in each plot. In many IEs the ratio is 50, i.e. the building area can occupy half the plot area. In some higher quality IEs the building/open space ratio may be as low as 30:70. If the estate is close to an airport there may be also restrictions on lighting and advertising signs. Plots and buildings must be completed/occupied within an agreed period. Without authorization no changes in the purpose of a building, subletting or alterations to buildings may take place.

Parking

All well-planned IEs have parking restrictions. Each investor may be obliged to provide enough parking space for cars and trucks on the site to avoid parking on roadways. Truck parking in front of buildings may be prohibited.

Storage

The developer will often set down standards or guidelines for the storage of chemicals and/or hazardous goods. The developer may reserve the right to improve the storage of such goods.

Safety

Each building should conform to fire regulations and industrial safety standards.

Pollution

Domestic sewage can usually be discharged into the sewer system. Industrial liquid effluent is normally treated at the plant prior to discharge. The estate developer or environmental authority should approve the proposals for treatment of industrial waste and the equipment to measure the volume of the discharge. They may find it necessary to limit the volume of the discharge from time to time and to vary the discharge standards to comply with new environmental regulations.

Substances which would damage the sewerage system would be prohibited; These include: any liquids at a temperature exceeding 45^{o}C; substances such as adhesives or paint which form viscous or solid coatings on the system; petroleum or other inflammable spirits; radio-active substances; effluents with high levels of acidity or alkalinity (*i.e.* with a pH value below 6 or above 9); and substances which produce fumes or odours. No effluent or harmful material should be allowed to enter storm water drains.

Solid waste must be stored safely (if possible in closed containers) until it is removed. Air pollution must be kept below the standards set by the estate by using effective combustion processes and/or installing scrubbers or filters.

ANNEXURE VII
A Compilation of Legal Instruments

Table: A Compilation of Legal Instruments

Sl. No.	Legal Instrument (Type, Reference, Year)	Responsible Ministries or Bodies	Chemical Use Categories/Pollutants	Objective of Legislation	Relevant Articles/Provisions
1	Air (Prevention and Control of Pollution) Act, 1981 amended 1987	Central Pollution Control Board and State Pollution Control Boards	Air pollutants from chemical industries	The prevention, control and abatement of air pollution	Section 2: Definitions Section 21: Consent from State Boards Section 22: Not to allow emissions exceeding prescribed limits Section 24: Power of Entry and Inspection Section 25: Power to Obtain Information Section 26: Power to Take Samples Section 37-43: Penalties and Procedures
2	Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983	Central Pollution Control Board and State Pollution Control Boards	Air pollutants from chemical industries	The prevention, control and abatement of air pollution	Rule 2: Definitions Rule 9: Consent Applications
3	Water (Prevention and Control of Pollution) Act, 1974 amended 1988	Central Pollution Control Board and State Pollution Control Boards	Water Pollutants from water polluting industries	The prevention and control of water pollution and also maintaining or restoring the wholesomeness of water	Section 2: Definitions Section 20: Power to Obtain Information Section 21: Power to Take Samples Section 23: Power of Entry and Inspection Section 24: Prohibition on Disposal Section 25: Restriction on New Outlet and New Discharge Section 26: Provision regarding existing discharge of sewage or trade effluent Section 27: Refusal or withdrawal of consent by state boards Section 41-49: Penalties and Procedures
4	Water (Prevention and Control of Pollution) Rules, 1975	Central Pollution Control Board and State Pollution Control Boards	Water Pollutants from water polluting industries	The prevention and control of water pollution and also maintaining or restoring	Rule 2: Definitions Rule 30: Power to take samples Rule 32: Consent Applications

				the wholesomeness of water	
5	The Environment (Protection) Act, 1986, amended 1991	Ministry of Environment and Forests, Central Pollution Control Board and State Pollution Control Boards	All types of environmental pollutants	Protection and Improvement of the Environment	Section 2: Definitions Section 7: Not to allow emission or discharge of environmental pollutants in excess of prescribed standards Section 8: Handing of Hazardous Substances Section 10: Power of Entry and Inspection Section 11: Power to take samples Section 15-19: Penalties and Procedures
6	Environmental (Protection) Rules, 1986 (Amendments in 1999, 2001, 2002, 2002, 2002, 2003, 2004)	Ministry of Environment and Forests, Central Pollution Control Board and State Pollution Control Boards	All types of Environmental Pollutants	Protection and Improvement of the Environment	Rule 2: Definitions Rule 3: Standards for emission or discharge of environmental pollutants Rule 5: Prohibition and restriction on the location of industries and the carrying on process and operations in different areas Rule 13: Prohibition and restriction on the handling of hazardous substances in different areas Rule 14: Submission of environmental statement
7	Hazardous Waste (Management and Handling) Rules, 1989 amended 2000 and 2003	MoEF, CPCB, SPCB, DGFT, Port Authority and Customs Authority	Hazardous Wastes generated from industries using hazardous chemicals	Management & Handling of hazardous wastes in line with the Basel convention	Rule 2: Application Rule 3: Definitions Rule 4: Responsibility of the occupier and operator of a facility for handling of wastes Rule 4A: Duties of the occupier and operator of a facility Rule 4B: Duties of the authority Rule 5: Grant of authorization for handling hazardous wastes Rule 6: Power to suspend or cancel authorization Rule 7: Packaging, labeling and transport of hazardous wastes Rule 8: Disposal sites Rule 9: Record and returns

					Rule 10: Accident reporting and follow up Rule 11: Import and export of hazardous waste for dumping and disposal Rule 12: Import and export of hazardous waste for recycling and reuse Rule 13: Import of hazardous wastes Rule 14: Export of hazardous waste Rule 15: Illegal traffic Rule 16: Liability of the occupier, transporter and operator of a facility Rule 19: Procedure for registration and renewal of registration of recyclers and re-refiners Rule 20: Responsibility of waste generator
8	Manufacture Storage and Import of Hazardous Chemicals Rules, 1989 amended 2000	Ministry of Environment & Forests, Chief Controller of Imports and Exports, CPCB, SPCB, Chief Inspector of Factories, Chief Inspector of Dock Safety, Chief Inspector of Mines, AERB, Chief Controller of Explosives, District Collector or District Emergency Authority, CEES under DRDO	Hazardous Chemicals - Toxic, Explosive, Flammable, Reactive	Regulate the manufacture, storage and import of Hazardous Chemicals	Rule 2: Definitions Rule 4: responsibility of the Occupier Rule 5: Notification of Major Accidents Rule 7-8: Approval and notification of site and updating Rule 10-11: Safety Reports and Safety Audit reports and updating Rule 13: Preparation of Onsite Emergency Plan Rule 14: Preparation of Offsite Emergency Plan Rule 15: Information to persons likely to get affected Rule 16: Proprietary Information Rule 17: Material Safety Data Sheets Rule 18: Import of Hazardous Chemicals
9	Chemical Accidents (Emergency Planning,	CCG, SCG, DCG, LCG and MAH Units	Hazardous Chemicals - Toxic, Explosive, Flammable, Reactive	Emergency Planning Preparedness and Response to chemical accidents	Rule 2: Definitions Rule 5: Functions of CCG Rule 7: Functions of SCG Rule 9: Functions of DCG

	Preparedness and Response) Rules, 1996				Rule 10: Functions of LCG
10	EIA Notification, 2006	MoEF, SPCB	For all the identified developmental activities in the notification	Requirement of environmental clearance before establishment of or modernization / expansion of certain type of industries/ projects.	Requirements and procedure for seeking environmental clearance of projects
11	Batteries (Management and Handling) Rules, 2001.	SPCB, CPCB and MoEF	Lead Acid Batteries	To control the hazardous waste generation (lead waste) from used lead acid batteries	Rule 2: Application Rule 3: Definitions Rule 4: Responsibilities of manufacturer, importer, assembler and re-conditioner Rule 5: Registration of Importers Rule 7: Responsibilities of dealer Rule 8: Responsibilities of recycler Rule 9: Procedure for registration / renewal of registration of recyclers Rule 10: Responsibilities of consumer or bulk consumer Rule 11: Responsibilities of auctioneer Rule 14: Computerization of Records and Returns
12	Public Liability Insurance Act, 1991 amended 1992	Ministry of Environment & Forests, District Collector	Hazardous Substances	To provide immediate relief to persons affected by accident involving hazardous substances	Section 2: Definitions Section 3: Liability to give relief in certain cases on principle of no fault Section 4: Duty of owner to take out insurance policy Section 7A: Establishment of Environmental Relief Fund Section 14-18: Penalties and Offences
13	Public Liability Insurance Rules, 1991 amended 1993	Ministry of Environment & Forests, District Collector	Hazardous Substances	To provide immediate relief to persons affected by accident involving hazardous substances and also for Establishing an Environmental Relief fund	Rule 2: Definitions Rule 6: Establishment of administration of fund Rule 10: Extent of liability Rule 11: Contribution of the owner to environmental relief fund

14	Factories Act, 1948	Ministry of Labour, DGFASLI and Directorate of Industrial Safety and Health/Factories Inspectorate	Chemicals as specified in the Table	Control of workplace environment, and providing for good health and safety of workers	Section 2: Interpretation Section 6: Approval, licensing and registration of factories Section 7A: General duties of the occupier Section 7B: General duties of manufacturers etc., as regards articles and substances for use in factories Section 12: Disposal of wastes and effluents Section 14: Dust and fume Section 36: Precautions against dangerous fumes, gases, etc. Section 37: Explosion or inflammable dust, gas, etc. Chapter IVA: Provisions relating to Hazardous processes Section 87: Dangerous operations Section 87A: Power to prohibit employment on account of serious hazard Section 88: Notice of certain accident Section 88A: Notice of certain dangerous occurrences Chapter X: Penalties and procedures
15	The Petroleum Act, 1934	Ministry of Petroleum and Natural Gas	Petroleum (Class A, B and C - as defined in the rules)	Regulate the import, transport, storage, production, refining and blending of petroleum	Section 2: Definitions Section 3: Import, transport and storage of petroleum Section 5: Production, refining and blending of petroleum Section 6: Receptacles of dangerous petroleum to show a warning Section 23-28 Penalties and Procedure
16	The Petroleum Rules, 2002	Ministry of Petroleum and Natural Gas, Ministry of Shipping (for notification of authorized ports for import), Ministry of Environment & Forests or SPCB (for clearance of establishment of loading/unloading	Petroleum (Class A, B and C - as defined in the rules)	Regulate the import, transport, storage, production, refining and blending of petroleum	Rule 2: Definition Chapter I part II: General Provision Chapter II: Importation of Petroleum Chapter III: Transport of Petroleum Chapter VII: Licenses

		facilities at ports) Chief Controller of Explosives, district authority, Commissioner of Customs, Port Conservator, State Maritime Board (Import)			
17	The Explosives Act, 1884	Ministry of Commerce and Industry (Department of Explosives)	Explosive substances as defined under the Act	To regulate the manufacture, possession, use, sale, transport, export and import of explosives with a view to prevent accidents	Section 4: Definition Section 6: Power for Central government to prohibit the manufacture, possession or importation of especially dangerous explosives Section 6B: Grant of Licenses
18	The Explosive Rules, 1983	Ministry of Commerce and Industry and Chief Controller of Explosives, port conservator, customs collector, railway administration	Explosive substances as defined under the Act	To regulate the manufacture, possession, use, sale, transport, export and import of explosives with a view to prevent accidents	Rule 2: Definition Chapter II: General Provisions Chapter III: Import and Export Chapter IV: Transport Chapter V: Manufacture of explosives Chapter VI: Possession sale and use Chapter VII: Licenses
19	The Gas Cylinder Rules, 2004	Ministry of Commerce and Industry and Chief Controller of Explosives, port conservator, customs collector, DGCA, DC, DM, Police (sub inspector to commissioner)	Gases (Toxic, non toxic and non flammable, non toxic and flammable, Dissolved Acetylene Gas, Non toxic and flammable liquefiable gas other than LPG, LPG	Regulate the import, storage, handling and transportation of gas cylinders with a view to prevent accidents	Rule 2: Definition Chapter II: General Provisions Chapter III: Importation of Cylinder Chapter IV: Transport of Cylinder Chapter VII: Filling and Possession

20	The Static and Mobile Pressure Vessels (Unfired) Rules, 1981	Ministry of Commerce and Industry and Chief Controller of Explosives, port conservator, customs collector, DGCA, DC, DM, Police (sub inspector to commissioner)	Gases (Toxic, non toxic and non flammable, non toxic and flammable, Dissolved Acetylene Gas, Non toxic and flammable liquefiable gas other than LPG, LPG	Regulate the import, manufacture, design, installation, transportation, handling, use and testing of mobile and static pressure vessels (unfired) with a view to prevent accidents	Rule 2: Definition Chapter III: Storage Chapter IV: Transport Chapter V: Licenses
21	The Motor Vehicle Act, 1988	Ministry of Shipping, Road Transport and Highways	Hazardous and Dangerous Goods	To consolidate and amend the law relating to motor vehicles	Section 2: Definition Chapter II: Licensing of drivers of motor vehicle Chapter VII: Construction equipment and maintenance of motor vehicles
22	The Central Motor Vehicle Rules, 1989	Ministry of Shipping, Road Transport and Highways	Hazardous and Dangerous Goods	To consolidate and amend the law relating to motor vehicles including to regulate the transportation of dangerous goods with a view to prevent loss of life or damage to the environment	Rule 2: Definition Rule 9: Educational qualification for driver's of goods carriages carrying dangerous or hazardous goods Rule 129: Transportation of goods of dangerous or hazardous nature to human life Rule 129A: Spark arrestors Rule 130: Manner of display of class labels Rule 131: Responsibility of the consignor for safe transport of dangerous or hazardous goods Rule 132: Responsibility of the transporter or owner of goods carriage Rule 133: Responsibility of the driver Rule 134: Emergency Information Panel Rule 135: Driver to be instructed Rule 136: Driver to report to the police station about accident Rule 137: Class labels
23	The Mines Act 1952	Ministry of Coal and Mines	Use of toxic and inflammable gases, dust or mixtures	Safety of the mine workers	Section 2: Definitions Chapter IV: Mining operations and management of mines Chapter V: Provisions as to health and safety

					Chapter IX: Penalties and procedure
24	The Custom Act, 1962	CBEC, Ministry of Finance	Hazardous Goods	To prevent entry of illegal hazardous goods or banned goods including hazardous or banned chemicals	Section 2: definitions Section 11: Power to Prohibit Importation or Exportation of Goods
25	The Merchant Shipping Act, 1958 amended in 2002 and 2003	Ministry of Shipping, Road Transport and Highways	All packaged cargo including Dangerous and hazardous goods as defined in the rules	For safe handling and transportation of cargo including dangerous goods to prevent accident	Section 3: Definitions Section 331: Carriage of Dangerous Goods
26	Merchant Shipping (carriage of Cargo) Rules 1995	Ministry of Shipping, Road Transport and Highways	All packaged cargo including Dangerous and hazardous goods as defined in the rules	For safe handling and transportation of cargo including dangerous goods to prevent accident	
27	The Indian Port Act, 1908	Ministry of Shipping, Road Transport and Highways	All Chemicals - handling and storage	For control of activities on ports including safety of shipping and conservation of ports	Section 2: Definitions Chapter IV: Rules for the safety of shipping and the conservation of ports Chapter VII: Provisions with respect to penalties
28	The Dock Workers, (Safety, Health and Welfare) Act, 1986	Ministry of Labour, DGFASLI and Directorate of Dock Safety	All Chemicals termed as dangerous goods	Safety of Dock workers including handling of dangerous goods	

ANNEXURE VIII
General Standards for Discharge of Environmental Pollutants

Table: Water Quality Standards

S. No.	Parameter	Standards			
		Inland Surface Water	Public Sewer	Land for Irrigation	Marine Coastal Areas
1.	2.	3.			
		(a)	(b)	(c)	(d)
1.	Colour and odour	See Note-1	—	See Note-1	See Note-1
2.	Suspended Solids, mg/l, Max	100	600	200	(a) For process waste water-100 (b) For cooling water effluent-10 per cent above total suspended matter of influent cooling water.
3.	Particle size of suspended solids	Shall pass 850 micron IS Sieve	—	—	(a) Floatable solids, Max 3 mm (b) Settleable solids Max 850 microns.
4.	Dissolved solids (inorganic), mg/a, mac	2100	2100	2100	—
5.	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6.	Temperature ^{o}C, Max	Shall not exceed 40 in any section of the stream within 15 meters down stream from the effluent outlet	45 at the point of discharge	—	45 at the point of discharge
7.	Oil and grease, mg/l, max	10	20	10	20
8.	Total residual chlorine, mg/l, Max.	1.0	—	—	1.0
9.	Ammonical nitrogen (as N), mg/l, Max.	50	50	—	50
10.	Total Kjeldahl nitrogen (as N), mg/l, Max.	100	—	—	100
11.	Free Ammonia (as NH3), mg/l, Max.	5.0	—	—	5.0
12.	Biochemical Oxygen Demand (5 days at 20^{o}C) Max.	30	350	100	100
13.	Chemical Oxygen Demand, mg/l, Max.	250	—	—	250
14.	Arsenic (as As), mg/l, Max.	0.2	0.2	0.2	0.2
15.	Mercury (as Hg), mg/l, Max.	0.01	0.01	—	0.01
16.	Lead (as Pb), mg/l, Max.	0.1	1.0	—	1.0
17.	Cadmium (as Cd), mg/l, Max.	2.0	1.0	—	2.0

18.	Hexavalent chromium (as Cr+6) mg/l, Max.	0.1	2.0	—	1.0
19.	Total chromium as (Cr), mg/l, Max.	2.0	2.0	—	2.0
20.	Copper (as Cu), mg/l, Max.	3.0	3.0	—	3.0
21.	Zinc (as Zn), mg/l, Max.	5.0	15	—	15
22.	Selenium (as Se), mg/l, Max.	0.05	0.05	—	0.05
23.	Nickel (as Ni), mg/l, Max.	3.0	3.0	—	5.0
24.	Boron (as B), mg/l, Max.	2.0	2.0	2.0	—
25.	Percent Sodium, Max.	—	60	60	—
26.	Residual sodium carbonate, mg/l, Max.	—	—	5.0	—
27.	Cyanide (as CN), mg/l, Max.	0.2	2.0	0.2	0.2
28.	Chloride (as Cl), mg/l, Max.	1000	1000	600	(a)
29.	Fluoride (as F), mg/l, Max.	2.0	15	—	15
30.	Dissolved Phosphates (as P), mg/l, Max.	5.0	—	—	—
31.	Sulphate (as SO4), mg/l, Max.	1000	1000	1000	—
32.	Sulphide (as S), mg/l, Max.	2.0	—	—	5.0
33.	Pesticides	Absent	Absent	Absent	Absent
34.	Phenolic compounds (as C6H5OH), mg/l, Max.	1.0	5.0	—	5.0
35.	Radioactive materials (a) Alpha emitters MC/ml, Max. (b) Beta emitters uc/ml, Max.	 10^{-7} 10^{-6}	 10^{-7} 10^{-6}	 10^{-8} 10^{-7}	 10^{-7} 10^{-6}

Note :-

1. All efforts should be made to remove colour and unpleasant odour as far as practicable.
2. The standards mentioned in this notification shall apply to all the effluents discharged such as industrial mining and mineral processing activities municipal sewage etc.

Table: Noise Standards

Ambient air quality standards in respect of noise

<table>
<tr><td rowspan="2">Area Code</td><td rowspan="2">Category of Area</td><td colspan="2">Limits in dB (A) Leq</td></tr>
<tr><td>Day Time</td><td>Night Time</td></tr>
<tr><td>(A)</td><td>Industrial area</td><td>75</td><td>70</td></tr>
<tr><td>(B)</td><td>Commercial area</td><td>65</td><td>55</td></tr>
<tr><td>(C)</td><td>Residential area</td><td>55</td><td>45</td></tr>
<tr><td>(D)</td><td>Silence zone</td><td>50</td><td>40</td></tr>
<tr><td colspan="4">Note :
1. Day time is reckoned in between 6.00 AM and 9.00 PM
2. Night time is reckoned in between 9.00 PM and 6.00 AM
3. Silence zone is defined as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The Silence zones are to be declared by the Competent Authority.
4. Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.
5. Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.</td></tr>
</table>

Standards/Guidelines for Control of Noise Pollution from Stationary Diesel Generator (DG) Sets

(A) Noise Standards for DG Sets (15-500 KVA)

The total sound power level, Lw, of a DG set should be less than, 94+10 log10 (KVA), dB (A), at the manufacturing stage, where, KVA is the nominal power rating of a DG set.

This level should fall by 5 dB (A) every five years, till 2007, i.e. in 2002 and then in 2007.

(B) Mandatory acoustic enclosure/acoustic treatment of room for stationary DG sets (5 KVA and above)

Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically.

The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5m from the acoustic enclosure/room, and then averaged.

The DG set should also be provide with proper exhaust muffler with Insertion Loss of minimum 25 dB(A).

(C) Guidelines for the manufacturers/users of DG sets (5 KVA and above)

1. The manufacturer should offer to the user a standard acoustic enclosure of 25 dB(A) Insertion Loss and also a suitable exhaust muffler with Insertion Loss of 25 dB(A).

2. The user should make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper siting and control measures.
3. The manufacturer should furnish noise power levels of the unlicensed DG sets as per standards prescribed under (A)
4. The total sound power level of a DG set, at the user's end, shall be within 2 dB(A) of the total sound power level of the DG set, at the manufacturing stage, as prescribed under (A).
5. Installation of a DG set must be strictly in compliance with the recommendation of the DG set manufacturer.
6. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

Order of the Lt. Governor of Delhi in respect of D.G. Sets (5th December, 2001)

In exercise of the powers conferred by section 5 of the Environment (Protection) Act, 1986, (29 of 1986), read with the Government of India, Ministry of Home Affairs notification S.O. 667 (E) bearing No. F.No. U-11030/J/91-VTL dated 10th September, 1992, the Lt. Governor of Government of National Capital of Delhi hereby directs to all owners/users of generators sets in the National Capital Territory of Delhi as follows :-

1. that generator sets above the capacity of 5 KVA shall not be operated in residential areas between the hours of 10.00 PM to 6.00 AM;
2. that the generator sets above the capacity of 5 KVA in all areas residential/commercial/industrial shall operate only with the mandatory acoustic enclosures and other standards prescribed in the Environment (Protection) Rules, 1986;
3. that mobile generator sets used in social gatherings and public functions shall be permitted only if they have installed mandatory acoustic enclosures and adhere to the prescribed standards for noise and emission as laid down in the Environment (Protection) Rules, 1986.

The contravention of the above directions shall make the offender liable for prosecution under section 15 of the said Act which stipulates punishment of imprisonment for a term which may extend to five years with fine which may extend to one lakh rupees, or with both, and in case the failure of contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention and if still the failure or contravention continues beyond a period of one year after the date of contravention, the offender continues beyond a period of one year after the date of contravention, the offender shall be punishable with imprisonment for a term which may extend to seven years.

Order Dated: 21st June, 2002

In exercise of the powers conferred by section 5 of the Environment (Protection) Act, 1986 (29 of 1986) read with the Govt. of India, Ministry of Home Affairs notification S.O. 667(E) bearing No. U-11030/J/91-VTL dated the 10th September, 1992, the Lt. Governor Govt. of the National Capital Territory of Delhi hereby makes the following amendment/modification in his order dated the 5th December, 2001 regarding the operation of generator sets, namely:-

Amendments/modifications

In the above said order, for clause(1), the following shall be substituted, namely:-

“(1) that the generator sets above 5KVA shall not be operated in residentoal areas between the hours from 10.00 p.m. to 6.00 a.m. except generator sets of Group Housing Societies and Multi-storey residential apartments”.

DIESEL GENERATOR SETS: STACK HEIGHT

The minimum height of stack to be provided with each generator set can be worked out using the following formula:

H = h + 0.2 x OKVA

H = Total height of stack in metre

h = Height of the building in metres where the generator set is installed

KVA = Total generator capacity of the set in KVA

Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorized as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100- 150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula

Source: Evolved By CPCB

[Emission Regulations Part IV: COINDS/26/1986-87]

ANNEXURE IX
Form 1 (Application Form for Obtaining EIA Clearance)

FORM 1

(I) BASIC INFORMATION

S. No.	Item	Details
1.	Name of the project/s	
2.	S.No. in the schedule	
3.	Proposed capacity/area/length/tonnage to be handled/command area/lease area/number of wells to be drilled	
4.	New/Expansion/Modernization	
5.	Existing Capacity/Area etc.	
6.	Category of Project i.e., ‘A’ or ‘B’	
7.	Does it attract the general condition? If yes, please specify.	
8.	Does it attract the specific condition? If yes, Please specify.	
9.	Location	
	Plot/Survey/Khasra No.	
	Village	
	Tehsil	
	District	
	State	
10.	Name of the applicant	
11.	Registered Address	
12.	Address for correspondence:	
	Name	
	Designation (Owner/Partner/CEO)	
	Address	
	Pin Code	
	E-mail	
	Telephone No.	
	Fax No.	
13.	Details of alternative Sites examined, if any location of these sites should be shown on a toposheet.	Village-District-State 1. 2. 3.

S. No.	Item	Details
14.	Interlined Projects	
15.	Whether separate application of interlined project has been submitted	
16.	If yes, date of submission	
17.	If no, reason	
18.	Whether the proposal involves approval/clearance under: The Forest (Conservation) Act, 1980 The Wildlife (Protection) Act, 1972 The C.R.Z. Notification, 1991	
19.	Forest land involved (hectares)	
20.	Whether there is any litigation pending against the project and/or land in which the project is propose to be set up Name of the Court Case No. Orders/directions of the Court, if any and its relevance with the proposed project.	

(II) ACTIVITY

1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)		
1.2	Clearance of existing land, vegetation and buildings?		
1.3	Creation of new land uses?		
1.4	Pre-construction investigations e.g. bore houses, soil testing?		
1.5	Construction works?		

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.6	Demolition works?		
1.7	Temporary sites used for construction works or housing of construction workers?		
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations		
1.9	Underground works including mining or tunneling?		
1.10	Reclamation works?		
1.11	Dredging?		
1.12	Offshore structures?		
1.13	Production and manufacturing processes?		
1.14	Facilities for storage of goods or materials?		
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?		
1.16	Facilities for long term housing of operational workers?		
1.17	New road, rail or sea traffic during construction or operation?		
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?		
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?		
1.20	New or diverted transmission lines or pipelines?		
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?		
1.22	Stream crossings?		
1.23	Abstraction or transfers of water form ground or surface waters?		
1.24	Changes in water bodies or the land surface affecting drainage or run-off?		
1.25	Transport of personnel or materials for construction, operation or decommissioning?		

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.26	Long-term dismantling or decommissioning or restoration works?		
1.27	Ongoing activity during decommissioning which could have an impact on the environment?		
1.28	Influx of people to an area in either temporarily or permanently?		
1.29	Introduction of alien species?		
1.30	Loss of native species or genetic diversity?		
1.31	Any other actions?		

2. Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):

S.No.	Information/checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)		
2.2	Water (expected source & competing users) unit: KLD		
2.3	Minerals (MT)		
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)		
2.5	Forests and timber (source – MT)		
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)		
2.7	Any other natural resources (use appropriate standard units)		

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)		
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)		
3.3	Affect the welfare of people e.g. by changing living conditions?		
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,		
3.5	Any other causes		

4. Production of solid wastes during construction or operation or decommissioning (MT/month)

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes		
4.2	Municipal waste (domestic and or commercial wastes)		
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)		
4.4	Other industrial process wastes		
4.5	Surplus product		
4.6	Sewage sludge or other sludge from effluent treatment		
4.7	Construction or demolition wastes		
4.8	Redundant machinery or equipment		

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
4.9	Contaminated soils or other materials		
4.10	Agricultural wastes		
4.11	Other solid wastes		

5. Release of pollutants or any hazardous, toxic or noxious substances to air (kg/hr)

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources		
5.2	Emissions from production processes		
5.3	Emissions from materials handling including storage or transport		
5.4	Emissions from construction activities including plant and equipment		
5.5	Dust or odours from handling of materials including construction materials, sewage and waste		
5.6	Emissions from incineration of waste		
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)		
5.8	Emissions from any other sources		

6. Generation of Noise and Vibration, and Emissions of Light and Heat:

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers		
6.2	From industrial or similar processes		
6.3	From construction or demolition		
6.4	From blasting or piling		
6.5	From construction or operational traffic		
6.6	From lighting or cooling systems		
6.7	From any other sources		

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials		
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)		
7.3	By deposition of pollutants emitted to air into the land or into water		
7.4	From any other sources		
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?		

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances		
8.2	From any other causes		
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?		

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.: ▪ Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.) ▪ housing development ▪ extractive industries ▪ supply industries ▪ other		
9.2	Lead to after-use of the site, which could have an impact on the environment		
9.3	Set a precedent for later developments		
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects		

(III) ENVIRONMENTAL SENSITIVITY

S.No.	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value		
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests		
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration		
4	Inland, coastal, marine or underground waters		
5	State, National boundaries		
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas		
7	Defence installations		
8	Densely populated or built-up area		
9	Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)*		
10	Areas containing important, high quality or scarce resources *(ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*		
11	Areas already subjected to pollution or environmental damage. *(those where existing legal environmental standards are exceeded)*		
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (*earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions*)		

(IV) PROPOSED TERMS OF REFERENCE FOR EIA STUDIES

"I hereby given undertaking that the data and information given in the application and enclosure are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance give, if any to the project will be revoked at our risk and cost.

Date:______________
Place:______________

Signature of the applicant
With Name and Full Address
(Project Proponent / Authorized Signatory)

NOTE:

1. The projects involving clearance under Coastal Regulation Zone Notification, 1991 shall submit with the application a C.R.Z. map duly demarcated by one of the authorized, agencies, showing the project activities, w.r.t. C.R.Z. and the recommendations of the State Coastal Zone Management Authority. Simultaneous action shall also be taken to obtain the requisite clearance under the provisions of the C.R.Z. Notification, 1991 for the activities to be located in the CRZ.
2. The projects to be located within 10km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden thereon."

ANNEXURE X
Critically Polluted Industrial Areas and Clusters/Potential Impact Zone

Table 1: Details of Critically Polluted Industrial Areas and Clusters / Potential Impact Zone (Ref: Office Memorandum No. J-11013/5/2010-IA.II(I) Dated 13.1.2010)

S. No.	Critically Polluted Industrial Area and CEPI	Industrial Clusters/ Potential Impact Zones
1.	Ankeshwar (Gujarat) CEPI-88.50(Ac_Wc_Lc)	▪ GIDC Ankeshwar and GIDC, Panoli
2	Vapi (Gujarat) CEPI-88.09(Ac_Wc_Lc)	▪ GIDC Vapi
3	Ghaziabad (Uttar Pradesh) CEPI-87.37(Ac_Wc_Lc)	Sub-cluster A ▪ Mohan nagar industrial area ▪ Rajinder nagar industrial area ▪ Sahibabad industrial area Sub-cluster B ▪ Pandav nagar industrial area ▪ Kavi nagar industrial area ▪ Bulandshahar road industrial area ▪ Amrit nagar ▪ Aryanagar industrial area Sub-cluster C ▪ Merrut road industrial are Sub-cluster D ▪ Loni industrial area ▪ Loni Road industrial area ▪ Roop nagar industrial area Sub-cluster E ▪ Hapur Road industrial area ▪ Dasna ▪ Philkura Sub-cluster F (Other scattered industrial areas) ▪ South side of GT road ▪ Kavi Nagar ▪ Tronica city ▪ Anand Nagar ▪ Jindal Nagar ▪ Prakash Nagar ▪ Rural industrial estate
4	Chandrapur (Maharashtra) CEPI-83.88 (Ac_Wc_Lc)	▪ Chandrapur (MIDC Chandrapur, Tadali, Ghuggus, Ballapur)
5	Kobra (Chhatisgarh) CEPI-83.00 (Ac_Ws_Lc)	▪ Industrial areas and their townships of NTPC, BALCO, CSEB (East) & CSEB (West) ▪ Korba town
6	Bhiwadi (Rajasthan) CEPI-82.91 (Ac_Wc_Ls)	▪ RIICO industrial areas Phase I to IV ▪ Bhiwadi town ▪ Other surrounding industrial areas: Chopanki, Rampura Mundana, Khuskhera Phase I to III
7	Angul Talcer(Orissa) CEPI-82.09 (Ac_Wc_Lc)	▪ MCL Coal mining area, Augul – Talcer region ▪ Industrial area (60 km x 45 km) Following blocks of Augul district: ▪ Kohina block ▪ Talcher block

		▪ Angul block ▪ Chhendipada block ▪ Banarpal block ▪ Odapada block of Dhenkamal district
8	Vellore (North Arcot) (Tamil Nadu) CEPI-81.79 (Ac_Wc_Lc)	▪ Ranipet, SIPCOT industrial complex
9	Singrauli (Uttar Pradesh) CEPI-81.73 (Ac_Wc_Ls)	Sonebhadra (UP) ▪ Dala-Tola ▪ Obra ▪ Renukoot ▪ Anpara ▪ Renusagar ▪ Kakri ▪ Dudhichuwa ▪ Bina ▪ Khadia ▪ Shakti nagar ▪ Rihand nagar ▪ Bijpur Sigrauli (Madhya Pradesh) Vindhyachal nagar and Jaynat, Nigahi, Dudhichua, Amlohri & Jhingurdah townships
10	Ludhiana (Punjab) CEPI-81.66 (Ac_Wc_Ls)	Ludhiana municipal limits covering industrial clusters: ▪ Focal point along with NH-I- Total eight phase ▪ Industrial area-B- from sherpur chowk to Gill road & Gill road to Miller Kotla road (left side of road) ▪ Mixed industrial area – right side of Gill road ▪ Industrial area –C (near Juglana village) ▪ Industrial area A & extension: area between old GT road and Ludhiana bypass road ▪ Industrial estate: near Dholwal chowk ▪ Mixes industrial area (MIA) Miller gunj ▪ MIA – bypass road ▪ Bahdur industrial area ▪ Tejpur industrial complex
11	Nazafgarh drain basin, Delhi CEPI-79.54 (As_Wc_Lc)	▪ Industrial areas: Anand Parvat, Naraina, Okhla and Wazirpur
12	Noida (Uttar Pradesh) CEPI-78.90 (Ac_Wc_Lc)	Territorial Jurisdiction of: ▪ Noida Phase-1 ▪ Noida Phase-2 ▪ Noida Phase-3 ▪ Surajpur industrial area ▪ Greater Noida industrial area ▪ Village- Chhaparaula
13	Dhanbad (Jharkhand) CEPI-78.63 (Ac_Ws_Lc)	Four blocks of Dhanbad district: ▪ Sadar (Dhanbad Municipality) ▪ Jharia (Jharia Municipality, Sindri industrial area) ▪ Govindpur (Govindpur industrial estate) ▪ Nirsa
14	Dombivalli (Maharashtra) CEPI-78.41 (Ac_Wc_Ls)	▪ MIDC Phase- I, Phase- II

15	Kanpur (Uttar Pradesh) CEPI-78.09 (Ac_Wc_Ls)	Industrial areas: ▪ Dada nagar ▪ Panki ▪ Fazalganj ▪ Vijay nagar ▪ Jajmau
16	Cuddalore (Tamil Nadu) CEPI-77.45 (As_Wc_Lc)	▪ SIPCOT industrial complex, Phase I & II
17	Aurangabad (Maharashtra) CEPI-77.44 (Ac_Wc_Ls)	▪ MIDC Chikhalthana, MIDC Waluj, MIDC Shendra, and Paithan road industrial area
18	Faridabad (Haryana) CEPI-77.07 (Ac_Ws_Lc)	▪ Sector 27-A, B, C, D ▪ DLF phase- 1, sector 31,32 ▪ DLF phase- 2, sector 35 ▪ Sector 4, 6, 24, 27, 31, 59 ▪ Industrial area Hatin ▪ Industrial model township
19	Agra (Uttar Pradesh) CEPI-76.48 (As_Wc_Ls)	▪ Nunihai industrial estate, Rambag nagar, UPSIDC industrial area, and Runukata industrial area
20	Manali (Tamil Nadu) CEPI-76.32 (Ac_Ws_Ls)	▪ Manali industrial area
21	Haldia (West Bengal) CEPI-75.43 (As_Wc_Ls)	▪ 5 km wide strip (17.4 x 5.0 km) of industrial area on the southern side of the confluence point of Rivers Hugli and Rupnarayan, covering ▪ Haldia municipal area & Sutahata block – I and II
22	Ahmedabad (Gujarat) CEPI-75.28 (Ac_Ws_Ls)	▪ GIDC Odhav ▪ GIDC Naroda
23	Jodhpur (Rajasthan) CEPI-75.19 (As_Wc_Ls)	▪ Industrial areas including Basni areas (phase-I & II), industrial estate, light & heavy industrial areas, industrial areas behind new power house, Mandore, Bornada, Sangariya and village Tanwada & Salawas. ▪ Jodhpur city
24	Greater Cochin (Kerala) CEPI-75.08 (As_Wc_Ls)	▪ Eloor-Edayar industrial belt, ▪ Ambala Mogal industrial areas
25	Mandi Gobind Garh (Punjab) CEPI-75.08 (Ac_Ws_Lc)	▪ Mandi Govindgarh municipal limit and khanna area
26	Howrah (West Bengal) CEPI-74.84 (As_Ws_Lc)	▪ Liluah-Bamangachhi region, Howrah ▪ Jalan industrial complex-1, Howrah
27	Vatva (Gujarat) CEPI-74.77 (Ac_Wc_Ls)	▪ GIDC Vatva, Narol industrial area (Villages Piplaj, Shahwadi, Narol)
28	Ib Valley (Orissa) CEPI-74.00 (Ac_Ws_Ls)	▪ Ib Valley of Jharsuguda (Industrial and mining area)
29	Varansi-Mirzapur (Uttar Pradesh) CEPI-73.79 (As_Wc_Ls)	▪ Industrial estate, Mirzapur ▪ Chunar ▪ Industrial estate, Chandpur, Varansi ▪ UPSIC, industrial estate, Phoolpur ▪ Industrial area, Ramnagar, Chandauli
30	Navi Mumbai (Maharashtra) CEPI-73.77 (Ac_Ws_Ls)	▪ TTC industrial area, MIDC, Navi Mumbai (including Bocks-D, C, EL, A, R, General, Kalva)

31	Pali (Rajasthan) CEPI-73.73 (As_Wc_Ls)	▪ Existing industrial areas: Mandia road, Puniyata road, Sumerpur ▪ Pali town
32	Mangalore (Karnataka) CEPI-73.68 (Ac_Ws_Ls)	▪ Baikampady industrial area
33	Jharsuguda (Orissa) CEPI-73.34 (Ac_Ws_Ls)	▪ Ib valley of Jharsuguda (Industrial and mining area)
34	Coimbatore (Tamil Nadu) CEPI-72.38 (Ac_Ws_Ln)	▪ SIDCO, Kurichi industrial Clusters
35	Bhadravati (Karnataka) CEPI-72.33 (Ac_Ws_Ln)	▪ KSSIDC Industrial area, Mysore paper mill & VISL township complex
36	Tarapur (Maharashtra) CEPI-72.01 (Ac_Ws_Ls)	▪ MIDC Tarapur
37	Panipat (Haryana) CEPI-71.91 (As_Ws_Ls)	▪ Panipat municipal limit and its industrial clusters
38	Indore (Madhya Pradesh) CEPI-71.26 (As_Ws_Ls)	Following 09 industrial area: ▪ Sanwer road ▪ Shivaji nagar ▪ Pologround ▪ Laxmibai nagar ▪ Scheme no.71 ▪ Navlakha ▪ Pipliya ▪ Palda ▪ Rau Indore city Other surrounding industrial areas: Manglia, Rajoda, Asrawad, Tejpur Gadwadi
39	Bhavnagar (Gujarat) CEPI-70.99 (As_Ws_Ls)	▪ GIDI Chitra, Bhavnagar
40	Vishakhapatnam (Andhra Pradesh) CEPI-70.82 (As_Ws_Ls)	▪ Bowl area (the area between Yarada hill range in the south to Simhachalam hill range in the north and sea on the east and the present NH-5 in the west direction)
41	Junagarh (Gujarat) CEPI-70.82 (As_Ws_Ls)	Industrial areas: ▪ Sabalpur ▪ Jay Bhavani ▪ Jay Bhuvneshwari ▪ GIDC Junagarh (I&II)
42	Asansole (West Bengal) CEPI-70.20 (As_Ws_Ls)	▪ Bumpur area surrounding IISCO
43	Patancheru - Bollaram (Andhra Pradesh) CEPI-70.07 (As_Ws_Ls)	Industrial area: ▪ Patancheru ▪ Bollaram

Note:

Names of identified industrial clusters/potential impact zones are approximate location based on rapid survey and assessment and may alter partially subject to the detailed field study and monitoring. Detailed mapping will be made available showing spatial boundaries of the identified industrial clusters including zone of influence/ buffer zone, after in depth field study.

ANNEXURE XI
Pre-Feasibility Report: Points for Possible Coverage

Table 1: Points for Possible Coverage in Pre-feasibility Report

S. No.	Contents	Points of Coverage in Pre-feasibility Report
I.	**Executive summary**	▪ Details on prima facie idea of the project.
II.	**Project Details**	
	Need/Justification of the Project	▪ Current demand scenario of the products from Industrial Estates ▪ Importance of the proposed IE for Quality of Life ▪ Alternatives to meet the demand ▪ Post project scenario on residual demand
	Capacity of Industrial Estate	▪ Production capacity of the industry ▪ Sustainability of raw material supply and quality ▪ Optimization of plant capacity
	Process technology	▪ Analysis of all available/advanced technologies, etc. ▪ Analysis of various possible configurations for each technology or a combination of these technologies from available manufactures ▪ Broad specifications for the proposed industry (s) including but not limited to: - Plant outputs and process flow diagrams for each alternative - Electrical equipment, I&C equipment, DCS equipment with redundancy - Balance of plant equipment - General plant layout
	Resources/raw materials	▪ Details on raw material, by products/co-products ▪ Water - Water requirement for process, utilities, domestic, gardening etc. - Source of construction water and potable water - Source of circulating/consumptive water - Quality of raw water, treated water - Water budget calculations and effluent generation - Approved water allocation quota (drinking, irrigation and industrial use) and surplus availability - Feasible ways of bringing water to site indicating constraints if any. - Lean season water availability and allocation source in case main source not perennial. ▪ Manpower ▪ Infrastructure ▪ Electrical power ▪ Construction material like sand, brick, stone chips, borrow earth etc.
	Rejects (Pollution potential)	▪ Air emissions ▪ Water pollution ▪ Solid / hazardous waste ▪ Noise ▪ Odour
	Technical profile	▪ Construction details - Estimated duration - Number of construction workers including migrating workers - Construction equipment - Vehicular traffic

		- Source, mode of transportation and storage of construction material ▪ Traffic that would arise during different phases of the project and transportation mechanism to handle such traffic ▪ Size of IE ▪ Technical parameters of the IE and components ▪ Types of industries ▪ Capacities and specific pollutants of concern ▪ Identification of sites, master planning, development and management aspects
	Project schedule	▪ Outline project implementation and procurement arrangement including contract packaging ▪ Project implementation schedule showing various activities
	Future prospects	▪ Ascertain the costs and benefits of the proposed project for project life ▪ Technical and logistic constraints/ requirements of project sustainability
III.	**Selection of site based on least possible impacts**	
i.	**Choice of site selection**	
	Major techno-economic feasibility considerations	▪ Land availability & its development ▪ Product demand around the selected site ▪ Access to site for transportation of equipments/construction machinery, material, *etc*. ▪ Raw material availability and its transportation ▪ Water availability and consumptive use ▪ Product transportation ▪ Infrastructure availability at selected site ▪ Inter-state issue, if any
	Incompatible landuse and ecologically sensitive attributes with respect to identified suitable sites	▪ If any incompatible land-use attributes fall within the study area, the following details has to be provided: - Public water supply areas from rivers/surface water bodies, from groundwater - Scenic areas/tourism areas/hill resorts - Religious places, pilgrim centers that attract over 10 lakh pilgrims a year - Protected tribal settlements (notified tribal areas where industrial activity is not permitted); CRZ - Monuments of national significance, World Heritage Sites - Cyclone, Tsunami prone areas (based on last 25 years); - Airport areas - Any other feature as specified by the State or local government and other features as locally applicable, including prime agricultural lands, pastures, migratory corridors, etc. ▪ If ecologically sensitive attributes fall within the study area, please give details. Ecologically sensitive attributes include - National parks - Wild life sanctuaries Game reserve - Tiger reserve/elephant reserve/turtle nesting ground - Breeding grounds - Core zone of biosphere reserve - Habitat for migratory birds - Mangrove area - Tropical forests - Important lakes - Endangered species of flora and fauna, *etc*.
	Social aspects	▪ Importance of the product for Quality-of-Life ▪ Employments and infrastructure addition

		▪ Status of land availability, current and post project land use variation
ii.	**Details of selected site**	
	Land details	▪ Land requirement and availability ▪ Land ownership details such as Government, private, tribal, non-tribal, etc. ▪ Total area of the project/site ▪ Prevailing land cost details
	Location	▪ Geographical details - Longitude & latitude, village, taluka, district, state ▪ Approach to site – roads, railways and airports ▪ Distance from nearest residential and industrial areas ▪ Distance from nearest water bodies such as river, canal, dam, etc ▪ Distance from ecologically sensitive areas ▪ In case of flood prone areas, HFL of the site ▪ In case of seismic areas, seismic zone, active faults, occurrence on earthquakes, etc. ▪ Proximity from infrastructural facilities
	Physical characteristics	▪ Demography ▪ Meteorological data ▪ Landuse pattern such as agricultural, barren, forest, *etc.* and details thereof ▪ Topography of the area ▪ Drainage patterns ▪ Soil condition and soil investigation results ▪ Ground profile and levels
IV.	**Anticipated impacts based on project operations on receiving environment**	▪ Population ▪ Flora and fauna ▪ Water ▪ Soil ▪ Air ▪ Climate ▪ Landscape, *etc.*
V.	**Proposed broad mitigation measures which could effectively be internalized as project components to have environmental and social acceptance of the proposed site**	▪ Preventive measures ▪ Source control measures ▪ Mitigation measures at the receiving environment, *etc.*
VI.	**An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.**	

The above listing is not exhaustive. Thus the proponent may provide additional necessary information, felt appropriate, to include in the pre-feasibility study report in support of selecting the site for the proposed developmental activities. The Concerned EAC/SEAC during scrutiny, may specifically ask for any additional information/data required to substantiate the requirement to prescribe the ToR for EIA studies. However, it is to make clear that all the required further information by EAC/SEAC may be mentioned in one single letter, within the prescribed time.

ANNEXURE XII
Types of Monitoring and Network Design Considerations

TYPES OF MONITORING AND NETWORK DESIGN CONSIDERATIONS

A. Types of Monitoring

Monitoring refers to the collection of data using a series of repetitive measurements of environmental parameters (or, more generally, to a process of systematic observation). The environmental quality monitoring programme design will be dependent upon the monitoring objectives specified for the selected area of interest. The main types of EIA monitoring activities are:

- Baseline monitoring is the measurement of environmental parameters during the pre-project period for the purpose of determining the range of variation of the system and establishing reference points against which changes can be measured. This leads to the assessment of the possible (additional available) assimilative capacity of the environmental components in pre-project period w.r.t. the standard or target level.
- Effects monitoring is the measurement of environmental parameters during project construction and implementation to detect changes which are attributable to the project to provide the necessary information to:
  - verify the accuracy of EIA predictions; and
  - determine the effectiveness of measures to mitigate adverse effects of projects on the environment.
  - Feedback from environmental effect monitoring programs may be used to improve the predictive capability of EIAs and also determine whether more or less stringent mitigation measures are needed
- Compliance monitoring is the periodic sampling or continuous measurement of environmental parameters to ensure that regulatory requirements and standards are being met.

Compliance and effects monitoring occurs during the project construction, operation, and abandonment stages. The resources and institutional set-up should be available for the monitoring at these stages. All large-scale construction projects will require some construction stage monitoring. To control the environmental hazards of construction as specified in the EIA, a monitoring program should be established to ensure that each mitigation measure is effectively implemented. There are numerous potential areas for monitoring during operations.

The scope of monitoring topics discussed in this chapter is limited to Baseline and Effects monitoring. In addition, this chapter will also discuss the Compliance monitoring during the construction phase. Post-project monitoring requirements are discussed in the EMP.

Before any field monitoring tasks are undertaken there are many institutional, scientific, and fiscal issues that must be addressed in the implementation of an environmental monitoring program. Careful consideration of these issues in the design and planning stages will help avoid many of the pitfalls associated with environmental monitoring programs. Although these issues are important but the discussions here are confined to the monitoring network design component.

B. Network Design

Analysis of Significant Environmental Issues

At the outset of planning for an environmental monitoring network, the EIA manager may not know exactly what should be monitored, when monitoring should begin, where it should monitor, which techniques should be employed, and who should take responsibility for its conduct. Because there are usually a number of objective decisions associated with network design to be made, it is important to start with an analysis of environmental issues. The scoping phase of an EIA is designed to identify and focus on the major issues. Scoping should provide a valuable source of information on the concerns that need to be addressed by the monitoring network design. These are project specific as well as specific to the environmental setting of the location where the project is proposed to be located

Hence, the network designs are associated with questions like:

- What are the expected outputs of the monitoring activity?
- Which problems do we need to address to? *etc*.

Defining the output will influence the design of the network and optimize the resources used for monitoring. It will also ensure that the network is specially designed to optimize the information on the problems at hand

What to Monitor?

The question of what to monitor is associated with the identification of VECs.

VECs are generally defined as environmental attributes or components of the environment that are valued by society as identified during the scoping stage of the project. They are determined on the basis of perceived public concerns. For example, changes to water quality and quantity could have implications on fish by affecting habitat, food supply, oxygen, and contaminant uptake. Similarly, employment and business, and economies are both VECs that serve as pathways.

The choice of VECs is also related to the perceived significant impact of the project implementation on important environmental components. In general, the significance or importance of environmental components is judged based on:

- legal protection provided (for example, rare and endangered species)
- political or public concerns (for example, resource use conflicts and sustainable development)
- scientific judgment (for example, ecological importance); or
- commercial or economic importance

However, in addition to their economic, social, political or ecological significance, the chosen VEC should also have unambiguous operational ease, be accessible to prediction and measurement; and be susceptible to hazard. Once the VECs are defined, the VECs may be directly measured (for example, extent of habitat for an endangered species). In cases where it is impossible or impractical to directly measure the VECs, the chosen measurement endpoints or environmental indicators must correspond to, or be predictive of assessment endpoints.

The chosen environmental indicators must be: 1) measurable; 2) appropriate to the scale of disturbance/ contamination; 3) appropriate to the impact mechanism; 4) appropriate and proportional to temporal dynamics; 5) diagnostic; and 6) standardized; as well as have: 1) a low natural variability; 2) a broad applicability; and 3) an existing data series.

Where, How and How Many Times to Monitor?

These are the other components of Monitoring Network Design. These questions are best answered based on local field conditions, capacity and resources available, prevailing legal and regulatory priorities, *etc*. For this, screening or reconnaissance surveys of the study area are also necessary. This may also include some simple inexpensive measurements and assimilative/dispersion modeling. The data will give some information on the prevailing special and temporal variations, and the general background air pollution in the area. The number of monitoring stations and the indicators to be measured at each station in the final permanent network may then be decided upon based on the results of the screening study as well as on the knowledge of the sources of the proposed development and prevailing local environmental/meteorological conditions. The best possible definition of the air pollution problem, together with the analysis of the resources: personnel, budget and equipment available, represent the basis for the decision on the following questions:

- What spatial density (number) of sampling stations is required? How many samples are needed and during what period (sampling (averaging) time and frequency)?
- Where should the stations be located?
- What kind of equipment should be used?
- What additional background information is needed?
  - meteorology
  - topography
  - population density
  - emission sources and emission rates
  - effects and impacts
- How will the data be made available/communicated?

C. Site Selection

When considering the location of individual samplers, it is essential that the data collected are representative for the location and type of area without the undue influence from the immediate surroundings. In any measurement point in the study area the total ambient concentration is the representative of:

- natural background concentration
- regional background
- impact of existing large regional sources such as Industrial emissions

To obtain the information about the importance of these different contributions it is therefore necessary to locate monitoring stations so that they are representative for different impacts. In addition to the ambient pollution data, one would often need other data governing the variations such as meteorological data for air pollution, to identify and quantify the sources contributing to the measurements.

ANNEXURE XIII
Guidance for Assessment of Baseline Components and Attributes

GUIDANCE FOR ASSESSMENT OF BASELINE COMPONENTS AND ATTRIBUTES*

<table>
<tr><th rowspan="2">Attributes</th><th colspan="2">Sampling</th><th rowspan="2">Measurement Method</th><th rowspan="2">Remarks</th></tr>
<tr><th>Network</th><th>Frequency</th></tr>
<tr><td colspan="5">A. Air</td></tr>
<tr><td>▪ Meteorological
▪ Wind speed
▪ Wind direction
▪ Dry bulb temperature
▪ Wet bulb temperature
▪ Relative humidity
▪ Rainfall
▪ Solar radiation
▪ Cloud cover</td><td>Minimum 1 site in the project impact area requirements

Other additional site(s) are require depending upon the model applied or site sensitivities</td><td>Min: 1 hrly observations from continuous records</td><td>Mechanical / automatic weather station

Rain gauge

As per IMD

As per IMD</td><td>IS 5182 Part 1-20 Sit-specific primary data is essential

Secondary data from IMD, New Delhi for the nearest IMD station</td></tr>
<tr><td>Pollutants

▪ SPM
▪ RPM
▪ SO_2
▪ NO_2
▪ CO
▪ H_2S*
▪ $NH*_3$
▪ HC*
▪ Fluoride*
▪ Pb*
▪ VOC-PAH*
▪ Mercury*
(parameters to be proposed by the proponent, in draft ToR, which will be reviewed and approved by EAC/SEAC)</td><td>10 to 15 locations in the project impact area</td><td>24 hrly twice a week

8 hrly twice a week

24 hrly twice a week</td><td>▪ Gravimetric (High – Volume)
▪ Gravimetric (High – Volume with Cyclone)
▪ EPA Modified West & Gaeke method
▪ Arsenite Modified Jacob & Hochheiser
▪ NDIR technique
▪ Methylene-blue
▪ Nessler's Method
▪ Infra Red analyzer
▪ Specific lon meter</td><td>Monitoring Network
▪ Minimum 2 locations in upwind side, more sites in downwind side / impact zone
▪ All the sensitive receptors need to be covered
Measurement Methods
As per CPCB standards for NAQM, 1994</td></tr>
</table>

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
B. Noise				
Hourly equivalent noise levels	Same as for Air Pollution along with others Identified in study area	At lest one day continuous in each season on a working and non-working day	Instrument : Sensitive Noise level meter (preferably recording type)	Min: IS: 4954- 1968 as adopted by CPCB
Hourly equivalent noise levels	Inplant (1.5 m from machinery or high emission processes)	Same as above for day and night	Instrument : Noise level metre	CPCB / OSHA
Hourly equivalent noise levels	Highways (within 500 metres from the road edge)	Same as above for day and night	Instrument : Noise level meter	CPCB / IS : 4954-1968
Peak particle velocity	150- 200m from blast site	Based on hourly observations	PPV meter	
C. Water				
Parameters for water quality ▪ Ph, temp, turbidity, magnesium hardness, total alkalinity, chloride, sulphate, nitrate, fluoride, sodium, potassium salinity ▪ Total nitrogen, total phosphorus, DO, BOD, COD, Phenol ▪ Heavy metals ▪ Total coliforms, faecal coliforms ▪ Phyto plankton ▪ Zooplankton ▪ Fish & other aquatic flora & fauna (parameters are given in ToR for EIA studies based on nature of project, raw material & process	Set of grab samples during pre and post- monsoon for ground and surface water for the whole study zone. For lab. Analysis the samples should be preserved for transport safe	Diurnal and season-wise	Samples for water quality should be collected and analyzed as per: IS: 2488 (Part 1-5) methods for sampling and testing of industrial effluents Standard methods for examination of water and waste water analysis published by American Public Health Association. International standard practices for benthos and aquatic flora & fauna	

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
technology, location-nature/activities within of air basin)				
For Surface Water Bodies				
▪ Total Carbon ▪ PH ▪ Dissolved Oxygen ▪ Biological Oxygen ▪ Demand ▪ Free NH_4 ▪ Boron ▪ Sodium Absorption ratio ▪ Electrical Conductivity	Monitoring locations should include up-stream, on site, down stream of proposed discharge point. Besides sampling should cover width of the river in case water quality modeling is proposed. Standard methodology for collection of surface water (BIS standards) At least one grab sample per location per season	Yield & impact on water sources to be measured during critical season River Stretch within project area be divided in grids (say 1 km length and 1/3 width) and samples should be from each grid at a time when the wastewater discharged by other sources of pollution is expected to be maximum	Samples for water quality should be collected and analyzed as per: IS: 2488 (Part 1-5) methods for sampling and testing of industrial effluents Standard methods for examination of water and wastewater analysis published by American Public Health Association.	Historical data should be collected from relevant offices such as central water commission, state and central ground water board, Irrigation dept.
Parameters for wastewater characterization				
▪ Temp, colour, odour, turbidity, TSS, TDS ▪ PH , alkalinity as CaCO3, p value, M value, tatal hardness as CaCO3, chloride as cl, sulphate as S04, Nitrate as NO3, Floride as F, Phosphate as P04, Chromium as Cr (Hexavalent, total) Ammonical Nitrogen as N, TKN, % sodium, BOD at 20 C, COD, DO, total residual chlorine as Cl2, oil and grease, sulphide, phenolic compound	Implant Source depending upon the different waste streams the parameters can be optimized Grab and composite sampling representing avg of different process operations as well as worst emission scenario should be represented	Different operational cycles as well as raw material variations should be reflected in the analysis	Samples for water quality should be collected and analyzed as per: IS: 2488 (Part 1-5) methods for sampling and testing of industrial effluents Standard methods for examination of water and wastewater analysis published by American Public Health Association.	All plant sources categorized as: ▪ Different Process waste streams as well as run-off conditions ▪ ETP wastewater Domestic/ sanitary wastewater

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
D. Land Environment				
▪ Soil ▪ Particle size distribution ▪ Texture ▪ pH ▪ Electrical conductivity ▪ Caution exchange capacity ▪ Alkali metals ▪ Sodium Absorption Ratio (SAR) ▪ Permeability ▪ Porosity	One surface sample from each landfill and/or hazardous waste site (if applicable) and prime villages, (soil samples be collected as per BIS specifications) in the study area	Season-wise	Collected and analyzed as per soil analysis reference book, M.I.Jackson and soil analysis reference book by C.A. Black	The purpose of impact assessment on soil (land environment) is to assess the significant impacts due to leaching of wastes or accidental releases and contaminating
Landuse / Landscape				
▪ Location code ▪ Total project area ▪ Topography ▪ Drainage (natural) ▪ Cultivated, forest plantations, water bodies, roads and settlements	At least 20 points along with plant boundary and general major land use categories in the study area. `	Drainage once in the study period and land use categories from secondary data (local maps) and satellite imageries	▪ Global positioning system ▪ Topo-sheets ▪ Satellite Imageries ▪ (1:25,000) ▪ Satellite Imageries ▪ (1:25,000)	Drainage within the plant area and surrounding is very important for storm water impacts. From land use maps sensitive receptors (forests, parks, mangroves etc.) can be identified
E. Solid Waste				
Quantity: ▪ Based on waste generated from per unit production ▪ Per capita contribution ▪ Collection, transport and disposal system ▪ Process Waste ▪ Quality (oily, chemical, biological)	For green field unites it is based on secondary data base of earlier plants.	Process wise or activity wise for respective raw material used. Domestic waste depends upon the season also	Guidelines IS 9569 : 1980 IS 10447 : 1983 IS 12625 : 1989 IS 12647 : 1989 IS 12662 (PTI) 1989	

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
Quality: ▪ General segregation into biological/organic/inert/hazardous ▪ Loss on heating ▪ pH ▪ Electrical Conductivity ▪ Calorific value, metals etc.	Grab and Composite samples	Process wise or activity wise for respective raw material used. Domestic waste depends upon the season also	Analysis IS 9334 : 1979 IS 9235 : 1979 IS 10158 : 1982	
Hazardous Waste				
▪ Permeability And porosity ▪ Moisture pH ▪ Electrical conductivity ▪ Loss on ignition ▪ Phosphorous ▪ Total nitrogen ▪ Caution exchange capacity ▪ Particle size distribution ▪ Heavy metal ▪ Ansonia ▪ Fluoride	Grab and Composite samples. Recyclable components have to analyzed for the recycling requirements	Process wise or activity wise for respective raw material used.	Analysis IS 9334 : 1979 IS 9235 : 1979 IS 10158 : 1982	Impacts of hazardous waste should be performed critically depending on the waste characteristics and place of discharge. For land disposal the guidelines should be followed and impacts of accidental releases should be assessed
F. Biological Environment Aquatic				
▪ Primary productivity ▪ Aquatic weeds ▪ Enumeration of ▪ phytoplankton, zooplankton and benthos ▪ Fisheries ▪ Diversity indices	Considering probable impact, sampling points and number of samples to be decided on established guidelines on ecological studies based on site eco-environment setting within 10/25 km radius from the	Season changes are very important	Standards techniques (APHA et. Al. 1995, Rau and Wooten 1980) to be followed for sampling and measurement	Seasonal sampling for aquatic biota One season for terrestrial biota, in addition to vegetation studies during monsoon season Preliminary assessment

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
▪ Trophic levels ▪ Rare and endangered species ▪ Sanctuaries / closed areas / Coastal regulation zone (CRZ) ▪ Terrestrial ▪ Vegetation – species, list, economic importance, forest produce, medicinal value ▪ Importance value index (IVI) of trees ▪ Wild animals	proposed site Samples to collect from upstream and downstream of discharge point, nearby tributaries at down stream, and also from dug wells close to activity site			Microscopic analysis of plankton and meiobenthos, studies of macrofauna, aquatic vegetation and application of indices, viz. Shannon, similarity, dominance IVI etc Point quarter plot-less method (random sampling) for terrestrial vegetation survey.
Avifauna ▪ Rare and endangered species ▪ Sanctuaries / National park / Biosphere reserve	For forest studies, chronic as well as short-term impacts should be analyzed warranting data on micro climate conditions			Secondary data to collect from Government offices, NGOs, published literature Plankton net Sediment dredge Depth sampler Microscope Field binocular
G. Socio Economic				
▪ Demographic structure ▪ Infrastructure resource base ▪ Economic resource base ▪ Health status: Morbidity pattern ▪ Cultural and aesthetic attributes	Socio-economic survey is based on proportionate, stratified and random sampling method	Different impacts occurs during construction and operational phases of the project	Primary data collection through R&R surveys (if require) or community survey are based on personal interviews and questionnaire	Secondary data from census records, statistical hard books, toposheets, health records and relevant official records available with Govt. agencies

* Project Specific concerned parameters needs to be identified by the project proponent and shall be incorporated in the draft ToR, to be submitted to the Authority for the consideration and approval by the EAC/SEAC.

ANNEXURE XIV
Sources of Secondary Data

Annexure XIIA: Potential Sources of Data For EIA

	Information	Source
	Air Environment	
1.	Meteorology- Temperature, Rainfall, Humidity, Inversion, Seasonal Wind rose pattern (16 point compass scale), cloud cover, wind speed, wind direction, stability, mixing depth	⑨ Indian Meteorology Department, Pune
2.	Ambient Air Quality- 24 hourly concentration of SPM, RPM, SO_2, NO_x, CO	⑨ Central Pollution Control Board (CPCB), ⑨ State Pollution Control Board (SPCB), ⑨ Municipal Corporations ⑨ Ministry of Environment and Forests (MoEF) ⑨ State Department of Environment (DoEN)
	Water Environment	
3.	Surface water- water sources, water flow (lean season), water quality, water usage, Downstream water users Command area development plan Catchment treatment plan	⑨ Central Water Commission (CWC), ⑨ Central Pollution Control Board (CPCB), ⑨ State Pollution Control Board (SPCB), Central Water and Power Research Institute (CWPRS), Pune ⑨ State Irrigation Department ⑨ Hydel Power generation organizations such as NHPC, State SEBs
4.	Ground Water- groundwater recharge rate/withdrawal rate, ground water potential groundwater levels (pre monsoon, post monsoon), ground water quality, changes observed in quality and quantity of ground water in last 15 years	⑨ Central Ground Water Board (CGWB) ⑨ Central Ground Water Authority (CGWA) ⑨ State Ground Water Board (SGWB) ⑨ National Water Development Authority (NWDA)
5.	Coastal waters- water quality, tide and current data, bathymetry	⑨ Department of Ocean Development, New Delhi ⑨ State Maritime Boards ⑨ Naval Hydrographer's Office, Dehradun ⑨ Port Authorities ⑨ National Institute of Oceanography (NIO), Goa
	Biological Environment	
6.	Description of Biological Environment- inventory of flora and fauna in 7 km radius, endemic species, endangered species, Aquatic Fauna, Forest land, forest type and density of vegetation, biosphere, national parks, wild life sanctuaries, tiger reserve, elephant reserve, turtle nesting ground, core zone of biosphere reserve, habitat of migratory birds, routes of migratory birds	⑨ District Gazetteers ⑨ National Remote Sensing Agency (NRSA), Hyderabad ⑨ Forest Survey of India, Dehradun ⑨ Wildlife Institute of India ⑨ World Wildlife Fund ⑨ Zoological Survey of India ⑨ Botanical Survey of India ⑨ Bombay Natural History Society, (BNHS), Mumbai ⑨ State Forest Departments ⑨ State Fisheries Department ⑨ Ministry of Environment and Forests ⑨ State Agriculture Departments ⑨ State Agriculture Universities
	Land Environment	
7.	Geographical Information-Latitude, Longitude, Elevation (above MSL)	⑨ Toposheets of Survey of India, Pune ⑨ National Remote Sensing Agency (NRSA), Hyderabad ⑨ Space Application Centre (SAC), Ahmedabad

	Information	Source
8.	Nature of Terrain, topography map indicating contours (1:2500 scale)	⑨ Survey of India Toposheets ⑨ National Remote Sensing Agency (NRSA), Hyderabad ⑨ State Remote Sensing Centre, ⑨ Space Application Centre (SAC), Ahmedabad
9.	Hydrogeology- Hydrogeological report (in case of ground water is used/area is drought prone/wastewater is likely to discharged on land) Geomorphological analysis (topography and drainage pattern) Geological analysis (Geological Formations/Disturbances- geological and structural maps, geomorphological contour maps, structural features, including lineaments, fractures, faults and joints) Hydrogeological analysis (disposition of permeable formations, surface-ground water links, hydraulic parameter determination etc) Analysis of the natural soil and water to assess pollutant absorption capacity	⑨ NRSA, Hyderbad ⑨ Survey of India Toposheets ⑨ Geological Survey of India ⑨ State Geology Departments ⑨ State Irrigation Department ⑨ Department of Wasteland Development, Ministry of Rural Areas ⑨ National Water Development Authority (NWDA)
10.	Nature of Soil, permeability, erodibility classification of the land	⑨ Agriculture Universities ⑨ State Agriculture Department ⑨ Indian Council for Agriculture Research ⑨ State Soil Conservation Departments ⑨ National Bureau of Soil Survey and Landuse Planning ⑨ Central Arid Zone Research Institute (CAZRI), Jodhpur
11.	Landuse in the project area and 10 km radius of the periphery of the project	⑨ Survey of India- Toposheets ⑨ All India Soil and Landuse Survey; Delhi ⑨ National Remote Sensing Agency (NRSA), Hyderabad ⑨ Town and County Planning Organisation ⑨ State Urban Planning Department ⑨ Regional Planning Authorities (existing and proposed plans) ⑨ Village Revenue Map- District Collectorate ⑨ Directorate of Economics and Statistics-State Government ⑨ Space Application Centre, Ahmedabad
12.	Coastal Regulation Zones- CRZMP, CRZ classification, Demarcation of HTL and LTL*	⑨ Urban Development Department ⑨ State Department of Environment ⑨ State Pollution Control Board ⑨ Space Application Centre* ⑨ Centre for Earth Sciences Studies, Thiruvanthapuram* ⑨ Institute of Remote Sensing, Anna University Chennai* ⑨ Naval Hydrographer's Office, Dehradun* ⑨ National Institute of Oceanography, Goa* ⑨ National Institute of Ocean Technology, Chennai ⑨ Centre for Earth Science Studies

* *Agencies authorized for approval of demarcation of HTL and LTL*

	Information	Source
	Social	
13.	Socioeconomic - population, number of houses and present occupation pattern within 7 km from the periphery of the project	⑨ Census Department ⑨ District Gazetteers- State Government ⑨ District Statistics- District Collectorate ⑨ International Institute of Population Sciences, Mumbai (limited data) ⑨ Central Statistical Organisation
14.	Monuments and heritage sites	District Gazetteer Archeological Survey of India, INTACH District Collectorate Central and State Tourism Department State Tribal and Social Welfare Department
	Natural Disasters	
15.	Seismic data (Mining Projects)- zone no, no of earthquakes and scale, impacts on life, property existing mines	⑨ Indian Meteorology Department, Pune ⑨ Geological Survey of India
16.	Landslide prone zone, geomorphological conditions, degree of susceptibility to mass movement, major landslide history (frequency of occurrence/decade), area affected, population affected	⑨ Space Application Centre
17.	Flood/cyclone/droughts- frequency of occurrence per decade, area affected, population affected	⑨ Natural Disaster Management Division in Department of Agriculture and Cooperation ⑨ Indian Meteorological Department
	Industrial	
18.	Industrial Estates/Clusters, Growth Centres	⑨ State Industrial Corporation ⑨ Industrial Associations ⑨ State Pollution Control Boards ⑨ Confederation Indian Industries (CII) ⑨ FICCI
19.	Physical and Chemical properties of raw material and chemicals (Industrial projects); fuel quality	⑨ Material and Safety Data Sheets ⑨ ENVIS database of Industrial Toxicological Research Centre, Lucknow ⑨ Indian Institute Petroleum
20.	Occupational Health and Industrial Hygiene- major occupational health and safety hazards, health and safety requirements, accident histories	⑨ Central Labour Institute, Mumbai ⑨ Directorate of Industrial Safety ⑨ ENVIS Database of Industrial Toxicological Research Centre, Lucknow ⑨ National Institute of Occupational Health, Ahmedabad
21.	Pollutant release inventories (Existing pollution sources in area within 10 km radius)	⑨ Project proponents which have received EC and have commenced operations
22.	Water requirement (process, cooling water, DM water, Dust suppression, drinking, green belt, fire service)	⑨ EIA Reports ⑨ National and International Benchmarks

Annexure XIIB: Summary of Available Data with Potential Data Sources for EIA

	Agency	Information Available
1.	Archaeological Survey of India Department of Culture Government of India Janpath, New Delhi - 110011 Asi@del3.vsnl.net.in	⑨ Inventory of monuments and sites of national importance- Listing and documentation of monuments according to world heritage, pre historic, proto historic and secular, religious places and forts
2.	Botanical Survey Of India P-8, Brabourne Road Calcutta 700001 Tel#033 2424922 Fax#033 2429330 Email: envis@cal2.vsnl.net.in. . RO - Coimbatore, Pune, Jodhpur, Dehradun, Allahabad, Gantok, Itanagar, Port Blair	⑨ Photodiversity documentation of flora at National, State and District level and flora of protected areas, hotspots, fragile ecosystems, sacred groves etc ⑨ Identification of threatened species including endemics, their mapping, population studies ⑨ Database related to medicinal plants, rare and threatened plant species ⑨ Red data book of Indian plants (Vol 1,2, and 3) ⑨ Manual for roadside and avenue plantation in India
3.	Bureau of Indian Standards Manak Bhawan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002 Tel#3230131, 3233375, 3239402 (10 lines) Fax : 91 11 3234062, 3239399, 3239382 Email- bis@vsnal.com	⑨ Bureau of Indian Standards Committees on Earthquake Engineering and Wind Engineering have a Seismic Zoning Map and the Wind Velocity Map including cyclonic winds for the country
4.	Central Water Commission (CWC) Sewa Bhawan, R.K.Puram New Delhi - 110066 cmanoff@niccwc.delhi.nic.in RO- Bangalore, Bhopal, Bhubaneshwar, Chandigarh, Coimbatore/Chennai, Delhi, Hyderabad, Lucknow, Nagpur, Patna, Shillong, Siliguri and Vadodara	⑨ Central Data Bank -Collection, collation and Publishing of Hydrological, Hydrometeorological, Sediment and Water Quality data-. ⑨ Basin wise Master Plans ⑨ Flood atlas for India ⑨ Flood Management and Development and Operation of Flood Forecasting System- CWC operate a network of forecasting stations Over 6000 forecasts are issued every year with about 95% of the forecasts within the permissible limit. ⑨ Water Year Books, Sediment Year Books and Water Quality Year Books. ⑨ Also actively involved in monitoring of 84 identified projects through National, State and Project level Environmental Committees for ensuring implementation of environmental safeguards
5.	Central Ground Water Board (HO) N.H.IV, New CGO Complex, Faridabad - 121001 RO - Guwahati, Chandigarh, Ahemadabad, Trivandrum, Calcutta, Bhopal, Lucknow, Banglore, Nagpur, Jammu, Bhubneshwar, Raipur, Jaipur, Chennai, Hyderabad, Patna	⑨ surveys, exploration, monitoring of ground water development

[16] *Based on web search and literature review*

6.	Central Pollution Control Board Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032 INDIA E-mail : cpcb@alpha.nic.in	⑨ National Air Quality Monitoring Programme ⑨ National River Water Quality Monitoring Programme- Global Environment Monitoring , MINARS ⑨ Zoning Atlas Programme ⑨ Information on 17 polluting category industries (inventory, category wise distribution, compliance, implementation of pollution control programmes
7.	Central Arid Zone Research Institute, Jodhpur Email : cazri@x400.nicgw.nic.in Regional Centre at Bhuj in Gujarat	⑨ AGRIS database on all aspects of agriculture from 1975 to date ⑨ Also have cell on Agriculture Research Information System; ⑨ Working on ENVIS project on desertification ⑨ Repository of information on the state of natural resources and desertification processes and their control ⑨ The spectrum of activities involves researches on basic resource inventories; monitoring of desertification, rehabilitation and management of degraded lands and other areas
8.	Central Inland Capture Fisheries Research Institute, Barrackpore-743101, Tel#033-5600177 Fax#033-5600388 Email : cicfri@x400.nicgw.nic.in	⑨ Data Base on Ecology and fisheries of major river systems of India. Biological features of commercially important riverine and estuarine fish species. Production functions and their interactions in floodplain wetlands. ⑨ Activities - Environmental Impact Assessment for Resource Management ; Fisheries Resource surveys
9.	Central Institute of Brackish Water Aquaculture 141, Marshalls Road, Egmore , Chennai - 600 008, Tel# 044-8554866, 8554891, Director (Per) 8554851 Fax#8554851,	⑨ Repository of information on brackish water fishery resources with systematic database of coastal fishery resources for ARIS ⑨ Agricultural Research Information System (ARIS) database covers State wise data on soil and water quality parameters, land use pattern, production and productivity trends, ⑨ Social, economic and environmental impacts of aquaculture farming, ⑨ Guidelines and effluent standards for aquaculture farming
10.	Central Marine Fisheries Research Institute (CMFRI), Cochin	⑨ Assessing and monitoring of exploited and un-exploited fish stocks in Indian EEZ ⑨ Monitoring the health of the coastal ecosystems, particularly the endangered ecosystems in relation to artisanal fishing, mechanised fishing and marine pollution ⑨ The institute has been collecting data on the catch and effort and biological characteristics for nearly half a century based on scientifically developed sampling scheme, covering all the maritime States of the country ⑨ The voluminous data available with the institute is managed by the National Marine Living Resources Data Centre (NMLRDC)
11.	Central Water and Power Research Station, Pune Tel#020-4391801-14; 4392511; 4392825 Fax #020-4392004,4390189	⑨ Numerical and Physical models for hydro-dynamic simulations
12.	Central Institute of Road Transport, Bhosari, Pune 411 026, India. Tel : +91 (20) 7125177, 7125292, 7125493, 7125494	⑨ Repository of data on all aspects of performance of STUs and a host of other related road transport parameters

13.	Department of Ocean Development	⑨ Assessment of environment parameters and marine living resources (primary and secondary) in Indian EEZ (Nodal Agency NIO Kochi) ⑨ Stock assessment, biology and resource mapping of deep sea shrimps, lobsters and fishes in Indian EEZ (Nodal agency-Fisheries Survey of India) ⑨ Investigations of toxical algal blooms and benthic productivity in Indian EEZ (Nodal agency- Cochin University of Science and technology) ⑨ Coastal Ocean Monitoring and Prediction System (COMAP) - monitoring and modelling of marine pollution along entire Indian coast and islands. Parameters monitored are temp, salinity, DO, pH, SS, BOD, inorganic phosphate, nitrate, nitrite, ammonia, total phosphorus, total nitrite, total organic carbon, petroleum hydrocarbons, pathogenic vibros, pathogenic E.coli, shigella, salmonella, heavy metals (Cd, Hg, Pb) and pesticide residues (DDT, BHC, Endosulfan). Monitoring is carried out along the ecologically sensitive zones and urban areas (NIO Mumbai- Apex coordinating agency). ⑨ Sea Level Measurement Programe (SELMAM)- sea level measurement at selected stations (Porbandar, Bombay, Goa, Cochin, Tuticorin, Madras, Machilipatnam, Visakhapatnam, Paradeep, Calcutta and Kavaratti (Lakshadweep Island)) along Indian coast and islands using modern tide gauges ⑨ Detailed coastal maps through Survey of India showing contour at 1/2 a metre interval in the scale of 1:25000. (Nellore- Machhalipatnam work already over) ⑨ Marine Data Centre (MDC) IMD for Ocean surface meteorology, GSI for marine geology, SOI for tide levels, Naval Hydrographic Office for bathymetry, NIO Goa for physical chemical and biological oceanography, NIO Mumbai for marine pollution, CMFRI for coastal fisheries, Institute of Ocean Management Madras for coastal geomorphology ⑨ DOD has setup Indian National Centre for Ocean Information Services (INCOIS) at Hyderabad for generation and dissemination of ocean data products (near real time data products such as sea surface temperature, potential fishing zones, upwelling zones, maps, eddies, chlorophyll, suspended sediment load etc). MDC will be integrated with INCOIS ⑨ Integrated Coastal and Marine Area Management (ICMAM) programme - GIS based information system for management of 11 critical habitats namely Pichavaram, Karwar, Gulf of Mannar, Gulf of Khambat, Gulf of Kutch, Malvan, Cochin, Coringa mangroves, Gahirmata, Sunderbans and Kadamat (Lakshadeep) ⑨ Wetland maps for Tamil Nadu and Kerala showing the locations of lagoons, backwaters, estuaries, mudflats etc (1:50000 scale) ⑨ Coral Reef Maps for Gulf of Kachch, Gulf of Mannar, Andaman and Nicobar and Lakshadeep Islands (1:50,000 scale) indicating the condition of corals, density etc
14.	Environment Protection Training and Research Institute Gachibowli, Hyderabad - 500 019, India Phone: +91-40-3001241, 3001242, 3000489 Fax: +91-40- 3000361 E-mail: info@eptri.com	⑨ Environment Information Centre- has appointed EPTRI as the Distributed Information Centre for the Eastern Ghats region of India. EIC Collaborates with the Stockholm Environment Institute Sweden Database on Economics of Industrial Pollution Prevention in India Database of Large and Medium Scale Industries of Andhra Pradesh Environmental Status of the Hyderabad Urban Agglomeration Study on 'water pollution-health linkages' for a few Districts of A.P

		- Environment Quality Mapping Macro level studies for six districts in the State of Andhra Pradesh Micro level studies for two study zones presenting the permissible pollutant load and scoping for new industrial categories Zonation of the IDA, Parwada which helped APIIC to promote the land for industrial development Disaster management plan for Visakhapatnam Industrial Bowl Area
15.	Forest Survey of India (FSI) Kaulagarh Road, P.O., IPE Dehradun - 248 195 Tel# 0135-756139, 755037, 754507 Fax # 91-135-759104 E-Mail : fsidir@nde.vsnl.net.in fsihq@nde.vsnl.net.in RO- Banglore, Calcutta, Nagpur and Shimla	- State of Forest Report (Biannual) - National Forest Vegetation Map (Biannual exercise) (on 1: 1 million scale) - Thematic mapping on 1:50,000 scale depicting the forest type, species composition, crown density of forest cover and other landuse National - Basic Forest Inventory System - Inventory survey of non forest area - Forest inventory report providing details of area estimates, topographic description, health of forest, ownership pattern, estimation of volume and other growth parameters such as height and diameter in different types of forest, estimation of growth, regeneration and mortality of important species, volume equation and wood consumption of the area studied
16.	Geological Survey of India 27 Jawaharlal Nehru Road, Calcutta 700 016, India Telephone +91-33-2496941 FAX 91-33-2496956 gsi_chq@vsnl.com	- Environmental hazards zonation mapping in mineral sector - Codification of base line information of geo-environmental appreciation of any terrain and related EIA and EMP studies - Lineament and geomorphological map of India on 1:20,000 scale. - Photo-interpreted geological and structural maps of terrains with limited field checks.
17.	Indian Council of Agriculture Research, Krishi Bhawan, New Delhi, Tel#011-338206 – ICAR complex, Goa- Agro metrology – Central Arid Zone Research Institute- Agro forestry – Central Soil salinity Research Institute, – Indian Institute of Soil Science – Central Soil and Water Conservation Research and Training Institute – National Bureau of Soil Survey and Landuse Planning	- A total of 80,000 profiles at 10 kms grid across the country were analyzed to characterize the soils of India. - Detailed soil maps of the Country (1:7 million), State (1:250,000) and districts map (1:50,000) depicting extent of degradation (1:4.4 millions) have been prepared. - Thematic maps depicting soil depth, texture drainage, calcareousness, salinity, pH, slope and erosion have been published - Agro-climate characterization of the country based on moisture, thermal and sunshine regimes - Agro-ecological zones (20) and sub-zones (60) for the country were delineated based on physiography, soils, climate, Length of Growing Period and Available Water Content, and mapped on 1:4.4 million scale. - Digitization of physiography and soil resource base on 1:50,000 scale for 14 States have been completed. - .Soil fertility maps of N,P,K,S and Zn have also been developed - Water quality guidelines for irrigation and naturally occurring saline/sodic water - Calibration and verification of ground water models for predicting water logging and salinity hazards in irrigation commands
18.	Indian Bureau of Mines Indira Bhawan, Civil Lines Nagpur Ph no - 0712-533 631, Fax- 0712-533 041	- National mineral inventory for 61 minerals and mineral maps - Studies on environmental protection and pollution control in regard to the mining and mineral beneficiation operations - Collection, processing and storage of data on mines, minerals and mineral-based industries, collection and maintenance of world mineral intelligence, foreign mineral legislation and other related matters

19.	Indian Meteorology Department Shivaji nagar, Pune 41100 RO- Mumbai, Chennai, Calcutta, New Delhi, Nagpur, Guwahati	- Meteorological data - Background air quality monitoring network under Global Atmospheric Watch Programme (operates 10 stations) - Seismicity map, seismic zoning map; seismic occurrences and cyclone hazard monitoring; list of major earthquakes - Climatological Atlas of India , Rainfall Atlas of India and Agroclimatic Atlas of India - Monthly bulletin of Climate Diagnostic Bulletin of India - Environmental Meteorological Unit of IMD at Delhi to provide specific services to MoEF
20.	INTACH Natural Heritage, 71 Lodi Estate, New Delhi-110 003 Tel. 91-11-4645482, 4632267/9, 4631818, 4692774, 4641304 Fax : 91-11-4611290 E-mail : nh@intach.net	- Listing and documentation of heritage sites identified by municipalities and local bodies (Listing excludes sites and buildings under the purview of the Archaeological Survey of India and the State Departments of Archaeology)
21.	Industrial Toxicology Research Centre Post Box No. 80, Mahatma Gandhi Marg, Lucknow-226001, Phone: +91-522-221856,213618,228227; Fax : +91-522 228227 Email: itrc@itrcindia.org	- Activities include health survey on occupational diseases in industrial workers, air and water quality monitoring studies, ecotoxicological impact assessment, toxicity of chemicals, human health risk assessment - Five databases on CD-ROM in the area of environmental toxicology viz: TOXLINE, CHEMBANK, POISINDEX, POLTOX and PESTBANK. The Toxicology Information Centre provides information on toxic chemicals including household chemicals - ENVIS centre and created a full-fledged computerized database (DABTOC) on toxicity profiles of about 450 chemicals
22.	Indian Institute of Forest Management Post Box No. 357, Nehru Nagar Bhopal - 462 003 Phone # 0755-575716, 573799, 765125, 767851 Fax # 0755-572878	- Consultancy and research on joint forest management (Ford Foundation, SIDA, GTZ, FAO etc)
23.	Indian Institute of Petroleum Mohkampur , Dehradun, India, 248005 0135- 660113 to 116 0135- 671986	- Fuel quality characterisation - Emission factors
24.	Ministry of Environment and Forest	- Survey of natural resources - National river conservation directorate - Environmental research programme for eastern and western ghats - National natural resource management system - Wetlands conservation programme- survey, demarcation, mapping landscape planning, hydrology for 20 identified wetlands National - wasteland identification programme
25.	Mumbai Metropolitan Regional Development Authority	- Mumbai Urban Transport Project - Mumbai Urban Development Project - Mumbai Urban Rehabilitation Project - Information on MMR; statistics on councils and corporations Regional - Information Centre- Basic data on population, employment, industries and other sectors are regularly collected and processed

26.	Municipal Corporation of Greater Mumbai	⑨ Air Quality Data for Mumbai Municipal Area ⑨ Water quality of lakes used for water supply to Mumbai
27.	Ministry of Urban Development Disaster Mitigation and Vulnerability Atlas of India Building Materials & Technology Promotion Council G-Wing,Nirman Bhavan, New Delhi-110011 Tel: 91-11-3019367 Fax: 91-11-3010145 E-Mail: bmtpc@del2.vsnl.net.in	⑨ Identification of hazard prone area ⑨ Vulnerability Atlas showing areas vulnerable to natural disasters ⑨ Land-use zoning and design guidelines for improving hazard resistant construction of buildings and housing ⑨ State wise hazard maps (on cyclone, floods and earthquakes)
28.	Natural Disaster Management Division in Department of Agriculture and Cooperation	⑨ Weekly situation reports on recent disasters, reports on droughts, floods, cyclones and earthquakes
29.	National Bureau Of Soil Survey & Land Use Planning P.O. Box No. 426, Shankar Nagar P.O., Nagpur-440010 Tel#91-712-534664,532438,534545 Fax#:91-712-522534 RO- Nagpur, New Delhi, Banglore, Calcutta, Jorhat, Udaipur	⑨ NBSS&LUP Library has been identified as sub centre of ARIC (ICAR) for input to AGRIS covering soil science literature generated in India ⑨ Research in weathering and soil formation, soil morphology, soil mineralogy, physicochemical characterisation, pedogenesis, and landscape-climate-soil relationship. ⑨ Soil Series of India- The soils are classified as per Soil Taxonomy. The described soil series now belong to 17 States of the country. ⑨ Landuse planning- watershed management, land evaluation criteria, crop efficiency zoning ⑨ Soil Information system is developed state-wise at 1:250,000 scale. Presently the soil maps of all the States are digitized, processed and designed for final output both digital and hardcopy. The thematic layers and interpreted layers of land evaluation (land capability, land irrigability and crop suitability), Agro-Ecological Zones and soil degradation themes are prepared. ⑨ Districts level information system is developed for about 15 districts at 1: 50, 000 scale. The soil information will be at soil series level in this system. Soil resource inventory of States, districts water-sheds (1:250,000; 1:50,000; 1:10,000/8000)
30.	National Institute of Ocean Technology, Velacherry-Tambaram main road Narayanapuram Chennai, Tamil Nadu Tel#91-44-2460063 / 2460064/ 2460066/ 2460067 Fax#91-44-2460645	⑨ Waste load allocation in selected estuaries (Tapi estuary and Ennore creek) is one the components under the Integrated Coastal and Marine Area Management (ICMAM) programme of the Department of Ocean Development ICMAM is conducted with an IDA based credit to the Government of India under the Environmental Capacity Building project of MoEF (waste assimilation capacity of Ennore creek is over) ⑨ Physical oceanographic component of Coastal & Ocean monitoring Predictive System (COMAPS) a long term monitoring program under the Department of Ocean Development ⑨ Identification of suitable locations for disposal of dredge spoil using mathematical models & environmental criteria ⑨ EIA Manual and EIA guidelines for port and harbour projects
31.	National Institute of Oceanography, Goa RO- Mumbai, Kochi	⑨ Coastal Ocean Monitoring and Predictions(COMAP)-Monitoring of coastal waters for physicochemical and biological parameters including petroleum hydrocarbons, trace metals, heavy metals, and biomass of primary (phytoplankton) and secondary (zooplankton, microbial and benthic organisms) ⑨ Marine Biodiversity of selected ecosystem along the West Coast of India

32.	National Botanical Research Institute, Post Box No 436 Rana Pratap Marg Lucknow- 226001, Tel: (+91) 522 271031-35 Fax: (+91) 522 282849, 282881 Lucknow	⑨ ⑨	Dust filtering potential of common avenue trees and roadside shrubs has been determined, besides studies have also been conducted on heavy-metals accumulation potential of aquatic plants supposedly useful as indicators of heavy metal pollution in water bodies and capable of reducing the toxic metals from water bodies. Assessment of bio-diversity of various regions of India
33.	National Geophysical Research Institute, Uppal Road, Hyderabad Telephone:0091-40-7171124, FAX:0091-40-7171564	⑨	Exploration, assessment and management of ground water resources including ground water modelling and pollution studies
34.	National Environmental Engineering Research Institute, Nagpur RO- Mumbai, Delhi, Chennai, Calcutta, Ahmedabad, Cochin, Hyderabad, Kanpur	⑨ ⑨	National Air Quality Monitoring (NAQM) for CPCB Database on cleaner technologies of industrial productions
35.	National Hydrology Institute, Roorkee RO- Belgaum (Hard Rock Regional Centre), Jammu (Western Himalayan Regional Centre), Guwahati (North Eastern Regional Centre), Kakinada (Deltaic Regional Centre), Patna (Ganga Plains North Regional Centre), and Sagar (Ganga Plains South)	⑨	Basin studies, hydrometeorological network improvement, hydrological year book, hydrological modelling, regional flood formulae, reservoir sedimentation studies, environmental hydrology, watershed development studies, tank studies, and drought studies.
36.	National Institute Of Urban Affairs, India Habitat Centre, New Delhi	⑨	Urban Statistics Handbook
37.	National Institute of Occupational Health Meghaninagar, Ahmedabad RO- Banglore, Calcutta	⑨ ⑨	epidemiological studies and surveillance of hazardous occupations including air pollution, noise pollution, agricultural hazards, industrial hazards in organised sectors as well as small scale industries, carcinogenesis, pesticide toxicology, etc WHO collaborative centre for occupational health for South East Asia region and the lead institute for the international programme on chemical safety under IPCS (WHO)
38.	NRSA Data Centre Department of Space, Balanagar, Hyderabad 500 037 Ph- 040-3078560 3078664 sales@nrsa.gov.in	⑨	Satellite data products (raw data, partially processed (radiometrically corrected but geometrically uncorrected), standard data (radiometrically and geometrically corrected), geocoded data(1:50,000 and 1:25000 scale), special data products like mosaiced, merged and extracted) available on photographic (B?W and FCC in form of film of 240 mm X 240mm or enlargements/paper prints in scale varying between 1:1M and 1:12500 and size varying between 240mm and 1000mm) and digital media (CD-ROMs, 8 mm tapes)
39.	Rajiv Gandhi National Drinking Water Mission	⑨	Database for groundwater using remote sensing technology (Regional Remote Sensing Service Centre involved in generation of ground water prospect maps at 1:50,000 scale for the State of Kerala, Karnataka, AP, MP and Rajasthan for RGNDWM)
40.	Space Application Centre Value Added Services Cell (VASC) Remote Sensing Application Area Ahmedabad 380 053 079-676 1188	⑨ ⑨ ⑨ ⑨	National Natural Resource Information System Landuse mapping for coastal regulation zone (construction setback line) upto 1:12500 scale Inventory of coastal wetlands, coral reefs, mangroves, seaweeds Monitoring and condition assessment of protected coastal areas

	Fax- 079-6762735	⑨ Wetland mapping and inventory ⑨ Mapping of potential hotspots and zoning of environmental hazards ⑨ General geological and geomorphological mapping in diverse terrain ⑨ Landslide risk zonation for Tehre area
41.	State Pollution Control Board	⑨ State Air Quality Monitoring Programme ⑨ Inventory of polluting industries ⑨ Identification and authorization of hazardous waste generating industries ⑨ Inventory of biomedical waste generating industries ⑨ Water quality monitoring of water bodies receiving wastewater discharges ⑨ Inventory of air polluting industries ⑨ Industrial air pollution monitoring ⑨ Air consent, water consent, authorization, environment monitoring reports
42.	State Ground Water Board	
43.	Survey of India	⑨ Topographical surveys on 1:250,000 scales, 1:50,000 and 1:25,000 scales ⑨ Digital Cartographical Data Base of topographical maps on scales 1:250,000 and 1:50,000 ⑨ Data generation and its processing for redefinition of Indian Geodetic Datum ⑨ Maintenance of National Tidal Data Centre and receiving/ processing of tidal data of various ports. ⑨ Coastal mapping along the Eastern coast line has been in progress to study the effect of submergence due to rise in sea-level and other natural phenomenon. Ground surveys have been completed for the proposed coastal region and maps are under printing. ⑨ District planning maps containing thematic information (135 maps) have been printed out of 249 maps covering half the districts of India. Districts planning maps for remaining half of the area are being processed by National Atlas and Thematic Mapping Organisation (NATMO)
44.	Town and Country Planning Organisation	⑨ Urban mapping - Thematic maps and graphic database on towns (under progress in association with NRSA and State town planning department)
45.	Wildlife Institute of India Post Bag No. 18, Chandrabani Dehradun - 248 001, Uttaranchal Tel#0135 640111 -15, Fax#0135 640117 email : wii@wii .	⑨ Provide information and advice on specific wildlife management problems. ⑨ National Wildlife Database
46.	Zoological Survey of India Prani Vigyan Bhawan 'M' Block, New Alipore Calcutta - 700 053 Phone # 91-33-4786893, 4783383 Fax # 91-33-786893 RO - Shillong, Pune, Dehradun, Jabalpur, Jodhpur, Chennai, Patna, Hyderabad, Canning, Behrampur, Kozikode, Itanagar, Digha, Port Bliar, Solan	⑨ Red Book for listing of endemic species ⑨ Survey of faunal resources

ANNEXURE XV
Impact Prediction Tools

Table 1: Choice of Models for Impact Prediction: Air Environment *

Model	Application	Remarks
ISCST 3	▪ Appropriate for point, area and line sources ▪ Application for flat or rolling terrain ▪ Transport distance up to 50 km valid ▪ Computes for 1 hr to annual averaging periods	▪ Can take up to 99 sources ▪ Computes concentration on 600 receptors in Cartesian on polar coordinate system ▪ Can take receptor elevation ▪ Requires source data, meteorological and receptor data as input.
AERMOD with AERMET	▪ Settling and dry deposition of particles; ▪ Building wake effects (excluding cavity region impacts); ▪ Point, area, line, and volume sources; ▪ Plume rise as a function of downwind distance; ▪ Multiple point, area, line, or volume sources; ▪ Limited terrain adjustment; ▪ Long-term and short-term averaging modes; ▪ Rural or urban modes; ▪ Variable receptor grid density; ▪ Actual hourly meteorology data	▪ Can take up to 99 sources ▪ Computes concentration on 600 receptors in Cartesian on polar coordinate system ▪ Can take receptor elevation ▪ Requires source data, meteorological and receptor data as input.
PTMAX	▪ Screening model applicable for a single point source ▪ Computes maximum concentration and distance of maximum concentration occurrence as a function of wind speed and stability class	▪ Require source characteristics ▪ No met data required ▪ Used mainly for ambient air monitoring network design
PTDIS	▪ Screening model applicable for a single point source ▪ Computes maximum pollutant concentration and its occurrences for the prevailing meteorological conditions	▪ Require source characteristics ▪ Average met data (wind speed, temperature, stability class *etc.*) required ▪ Used mainly to see likely impact of a single source
MPTER	▪ Appropriate for point, area and line sources applicable for flat or rolling terrain ▪ Transport distance up to 50 km valid ▪ Computes for 1 hr to annual averaging periods ▪ Terrain adjustment is possible	▪ Can take 250 sources ▪ Computes concentration at 180 receptors up to 10 km ▪ Requires source data, meteorological data and receptor coordinates
CTDM PLUS (Complex Terrain Dispersion Model)	▪ Point source steady state model, can estimate hrly average concentration in isolated hills/ array of hills	▪ Can take maximum 40 Stacks and computes concentration at maximum 400 receptors ▪ Does not simulate calm met conditions ▪ Hill slopes are assumed not to exceed 15 degrees ▪ Requires sources, met and terrain characteristics and receptor details

Model	Application	Remarks
UAM (Urban Airshed Model)	▪ 3-D grid type numerical simulation model ▪ Computes O_3 concentration short term episodic conditions lasting for 1 or 2 days resulting from NOx and VOCs ▪ Appropriate for single urban area having significant O_3 problems	▪
RAM (Rural Airshed Model)	▪ Steady state Gaussian plume model for computing concentration of relatively stable pollutants for 1 hr to 1 day averaging time ▪ Application for point and area sources in rural and urban setting	▪ Suitable for flat terrains ▪ Transport distance less than 50 km.
CRESTER	▪ Applicable for single point source either in rural or urban setting ▪ Computes highest and second highest concentration for 1hr, 3hr, 24hr and annual averaging times ▪ Tabulates 50 highest concentration for entire year for each averaging times	▪ Can take up to 19 Stacks simultaneously at a common site. ▪ Unsuitable for cool and high velocity emissions ▪ Do not account for tall buildings or topographic features ▪ Computes concentration at 180 receptor, circular wing at five downwind ring distance 36 radials ▪ Require sources, and met data
OCD (Offshore and coastal Dispersion Model)	▪ It determines the impact of offshore emissions from point sources on the air quality of coastal regions ▪ It incorporates overwater plume transport and dispersion as well as changes that occur as the plume crosses the shore line ▪ Most suitable for overwater sources shore onshore receptors are below the lowest shore height	▪ Requires source emission data ▪ Require hrly met data at offshore and onshore locations like water surface temperature; overwater air temperature; relative humidity *etc*.
FDM (Fugitive Dust Model)	▪ Suitable for emissions from fugitive dust sources ▪ Source may be point, area or line (up to 121 source) ▪ Require particle size classification max. up to 20 sizes ▪ Computes concentrations for 1 hr, 3hr, 8hr, 24hr or annual average periods	▪ Require dust source particle sizes ▪ Source coordinates for area sources, source height and geographic details ▪ Can compute concentration at max. 1200 receptors ▪ Require met data (wind direction, speed, Temperature, mixing height and stability class) ▪ Model do not include buoyant point sources, hence no plume rise algorithm
RTDM (Rough Terrain Diffusion Model)	▪ Estimates GLC is complex/rough (or flat) terrain in the vicinity of one or more co-located point sources ▪ Transport distance max. up to 15 km to up to 50 km ▪ Computes for 1 to 24 hr. or annual ave5rage concentrations	▪ Can take up to 35 co-located point sources ▪ Require source data and hourly met data ▪ Computes concentration at maximum 400 receptors ▪ Suitable only for non reactive gases ▪ Do not include gravitational

Model	Application	Remarks
		effects or depletion mechanism such as rain/ wash out, dry deposition
CDM(Climatologically Dispersion Model)	▪ It is a climatologically steady state GPM for determining long term (seasonal or annual) ▪ Arithmetic average pollutant concentration at any ground level receptor in an urban area	▪ Suitable for point and area sources in urban region, flat terrain ▪ Valid for transport distance less than 50 km ▪ Long term averages: One month to one year or longer
PLUVUE-II (Plume Visibility Model)	▪ Applicable to assess visibility impairment due to pollutants emitted from well defined point sources ▪ It is used to calculate visual range reduction and atmospheric discoloration caused by plumes ▪ It predicts transport, atmospheric diffusion, chemical, conversion, optical effects, and surface deposition of point source emissions.	▪ Require source characteristics, met data and receptor coordinates & elevation ▪ Require atmospheric aerosols (back ground & emitted) characteristics, like density, particle size ▪ Require background pollutant concentration of SO_4, NO_3, NOx, NO_2, O_3, SO_2 and deposition velocities of SO_2, NO_2 and aerosols
MESO-PUFF II (Meso scale Puff Model)	▪ It is a Gaussian, Variable trajectory, puff superposition model designed to account fro spatial and temporal variations in transport, diffusion, chemical transformation and removal mechanism encountered on regional scale. ▪ Plume is modeled as a series of discrete puffs and each puff is transported independently ▪ Appropriate for point and area sources in urban areas ▪ Regional scale model.	▪ Can model five pollutants simultaneously (SO2, SO4, NOx, HNO3 and NO3) ▪ Require source characteristics ▪ Can take 20 point sources or 5 area source ▪ For area source – location, effective height, initial puff size, emission is required ▪ Computes pollutant concentration at max. 180 discrete receptors and 1600 (40 x 40) grided receptors ▪ Require hourly surface data including cloud cover and twice a day upper air data (pressure, temp, height, wind speed, direction) ▪ Do not include gravitational effects or depletion mechanism such as rain/ wash out, dry deposition

Table 2: Choice of Models for Impact Modeling: Noise Environment *

Model	Application
FHWA (Federal Highway Administration)	Noise Impact due to vehicular movement on highways

Dhwani	For predictions of impact due to group of noise sources in the industrial complex (multiple sound sources)
Hemispherical sound wave propagation Air Port	Fore predictive impact due to single noise source For predictive impact of traffic on airport and rail road

Table 3: Choice of Models for Impact Modeling: Land Environment *

Model	Application	Remarks
Digital Analysis Techniques	Provides land use / land cover distribution	
Ranking analysis for soil suitability criteria	Provides suitability criteria for developmental conversation activities	Various parameters viz. depth, texture, slope, erosion status, geomorphology, flooding hazards, GW potential, land use *etc*., are used.

Table 4: Choice of Models for Impact Modeling: Water Environment *

Model	Application	Remarks
QUAL-II E	Wind effect is insignificant, vertical dispersive effects insignificant applicable to streams Data required Deoxygenation coefficients, re-aeration coefficients for carbonaceous, nitrogenous and benthic substances, dissolved oxygen deficit	Steady state or dynamic model
	The model is found excellent to generate water quality parameters Photosynthetic and respiration rate of suspended and attached algae	
	Parameters measured up to 15 component can be simulated in any combination, e.g. ammonia, nitrite, nitrate, phosphorous, carbonaceous BOD, benthic oxygen demand, DO, coliforms, conservative substances and temperature	
DOSAG-3, USEPA: (1-D) RECEIV – II, USEPA	Water quality simulation model for streams & canal A general Water quality model	Steady-state
Explore –I, USEPA	A river basin water quality model	Dynamic, Simple hydrodynamics
HSPE, USEPA	Hydrologic simulation model	Dynamic, Simple hydrodynamics
RECEIVE-II, USEPA	A general dynamic planning model for water quality management	
Stanford watershed model	This model simulates stream flows once historic precipitation data are supplied	

Model	Application	Remarks
	The major components of the hydrologic cycle are modeled including interception, surface detention, overland inflow, groundwater, evapo-transpiration and routing of channel flows, temperature, TDS, DO, carbonaceous BOD coliforms, algae, zooplanktons, nitrite, nitrate, ammonia, phosphate and conservative substances can be simulated	
Hydrocomp model	Long-term meteorological and wastewater characterization data is used to simulate stream flows and stream water quality	Time dependant (Dynamic)
Stormwater Management model (SWMM)	Runoff is modeled from overland flow, through surface channels, and through sewer network Both combined and separate sewers can be modeled. This model also enables to simulate water quality effects to stormwater or combined sewer discharges. This model simulates runoff resulting from individual rainfall events.	Time Dependent
Battelle Reservoir model	Water body is divided into segments along the direction of the flow and each segment is divided into number of horizontal layers. The model is found to generate excellent simulation of temperature and good prediction of water quality parameters. The model simulates temperature, DO, total and benthic BOD, phytoplankton, zooplankton, organic and inorganic nitrogen, phosphorous, coliform bacteria, toxic substances and hydrodynamic conditions.	Two Dimensional multi-segment model
TIDEP (Turbulent diffusion temperature model reservoirs)	Horizontal temperature homogeneity Coefficient of vertical turbulent diffusion constant for charge of area with depth negligible coefficient of thermal exchange constant Data required wind speed, air temperature, air humidity, net incoming radiation, surface water temperature, heat exchange coefficients and vertical turbulent diffusion coefficients.	Steady state model
BIOLAKE	Model estimates potential fish harvest from a take	Steady state model
Estuary models/ estuarial Dynamic model	It is simulates tides, currents, and discharge in shallow, vertically mixed estuaries excited by ocean tides, hydrologic influx, and wind action Tides, currents in estuary are simulated	Dynamic model
Dynamic Water Quality Model	It simulates the mass transport of either conservative or non-conservative quality constituents utilizing information derived from the hydrodynamic model Bay-Delta model is the programme generally used. Up to 10 independent quality parameters of either conservative or non-conservative type plus the BOD-DO coupled relationship can be handled	Dynamic model
HEC -2	To compute water surface profiles for stead7y, gradually: varying flow in both prismatic & non-	

Model	Application	Remarks
	prismatic channels	
SMS	Lake circulation, salt water intrusion, surface water profile simulation model	Surface water Modeling system Hydrodynamic model
RMA2	To compute flow velocities and water surface elevations	Hydrodynamic analysis model
RMA4	Solves advective-diffusion equations to model up to six non-interacting constituents	Constituent transport model
SED2D-WES	Model simulates transport of sediment	Sediment transport model
HIVEL2D	Model supports subcritical and supercritical flow analysis	A 2-dimensional hydrodynamic model
MIKE-II, DHI	Model supports, simulations of flows, water quality, and sediment transport in estuaries, rives, irrigation systems, channels & other water bodies	Professional Engineering software package

Table 5: Choice of Models for Impact Modeling: Biological Environment *

Name	Relevance	Applications	Remarks
Flora			
Sample plot methods	Density and relative density Density and relative dominance	Average number of individuals species per unit area Relative degree to which a species predominates a community by its sheer numbers, size bulk or biomass	The quadrant sampling technique is applicable in all types of plant communities and for the study of submerged, sessile (attached at the base) or sedentary plants
	Frequency and relative frequency importance value	Plant dispersion over an area or within a community	Commonly accepted plot size: 0.1 m^2- mosses, lichens & other mat-like plants
		Average of relative density, relative dominance and relative frequency	0.1 m^2- herbaceous vegetation including grasses
			10.20 m^2 – for shrubs and saplings up to 3m tall, and
			100 m^2 – for tree communities
Transects & line intercepts methods	Cover	Ratio of total amount of line intercepted by each species and total length of the line intercept given its cover	This methods allows for rapid assessment of vegetation transition zones, and requires minimum time or equipment of establish
	Relative dominance	It is the ratio of total individuals of a species and total individuals of all species	Two or more vegetation strata can be sampled simultaneously

Name	Relevance	Applications	Remarks
Plot-less sampling methods	Mean point plant Mean area per plant	Mean point – plant distance Mean area per plant	Vegetation measurements are determined from points rather than being determined in an area with boundaries
	Density and relative density		Method is used in grass-land and open shrub and tree communities
	Dominance and relative dominance		It allows more rapid and extensive sampling than the plot method
	Importance value		Point- quarter method is commonly used in woods and forests.
Fauna			
Species list methods	Animal species list	List of animal communities observed directly	Animal species lists present common and scientific names of the species involved so that the faunal resources of the area are catalogued
Direct Contact Methods	Animal species list	List of animals communities observed directly	This method involves collection, study and release of animals
Count indices methods (Roadside and aerial count methods)	Drive counts Temporal counts	Observation of animals by driving them past trained observers	Count indices provide estimates of animal populations and are obtained from signs, calls or trailside counts or roadside counts
	Call counts	Count of all animals passing a fixed point during some stated interval of time	These estimates, through they do not provide absolute population numbers, Provide an index of the various species in an area
			Such indices allow comparisons through the seasons or between sites or habitats
Removal methods	Population size	Number of species captured	Removal methods are used to obtain population estimates of small mammals, such as, rodents through baited snap traps
Market capture methods	Population size estimate (M)	Number of species originally marked (T) Number of marked animals recaptured (t) and total number of animals captured during census (n) $N = nT/t$	It involves capturing a portion of the population and at some later date sampling the ratio of marked to total animals caught in the population

Table 6: Choice of Models for Impact Predictions: Socio-economic Aspects *

Relevance		
Name	**Application**	**Remarks**
Extrapolative Methods	A prediction is made that is consistent with past and present socio-economic data, e.g. a prediction based on the linear extrapolation of current trends	
Intuitive Forecasting (Delphi techniques)	Delphi technique is used to determine environmental priorities and also to make intuitive predictions through the process of achieving group consensus	Conjecture Brainstorming Heuristic programming Delphi consensus
Trend extrapolation and correlation	Predictions may be obtained by extrapolating present trends Not an accurate method of making socio-economic forecasts, because a time series cannot be interpreted or extrapolated very far into the future with out some knowledge of the underlying physical, biological, and social factors	Trend breakthrough precursor events correlation and regression
Metaphors and analogies	The experience gained else where is used to predict the socio-economic impacts	Growth historical simulation commonsense forecasts
Scenarios	Scenarios are common-sense forecasts of data. Each scenario is logically constructed on model of a potential future for which the degrees of "confidence" as to progression and outcome remain undefined	Common-sense
Dynamic modeling (Input- Out model)	Model predicts net economic gain to the society after considering all inputs required for conversion of raw materials along with cost of finished product	
Normative Methods	Desired socio-economic goals are specified and an attempt is made to project the social environment backward in time to the present to examine whether existing or planned resources and environmental programmes are adequate to meet the goals	Morphological analysis technology scanning contextual mapping - functional array - graphic method Mission networks and functional arrays decision trees & relevance trees matrix methods scenarios

*** NOTE:** (i) If a project proponent prefer to use any model other than listed, can do so, with prior concurrence of concerned appraisal committee. (ii) Project-specific proposed prediction tools need to be identified by the project proponent and shall be incorporated in the draft ToR to be submitted to the Authority for the consideration and approval by the concerned EAC/SEAC.

ANNEXURE XVI

Form through which the State Governments/Administration of the Union Territories Submit Nominations for SEIAA and SEAC for the Consideration and Notification by the Central Government

Form for Nomination of a professional/expert as Chairperson / Member / Secretary of the SEIAA / EAC / SEAC						
1	Name (in block letters)					
2	Address for communication					
3	Age & Date of Birth (Shall be less than 67 years for the members and 72 years for the Chairman)					
4	Area of Expertise (As per Appendix VI)					
5	Professional Qualifications (As per Appendix VI)	Qualification(s)	University		Year of passing	Percentage of marks
6	Work experience (High light relevant experience as per Appendix VI)	Position	Years of association			Nature of work. If required, attach separate sheets
			From	to	Period in years	
7	Present position and nature of job	Serving Central / State Government Office?			Yes/No	
		Engaged in industry or their associations?			Yes/No	
		Associated with environmental activism?			Yes/No	
		If no is the answer for above three, please specify the present position and name of the organization				
8	Whether experienced in the process of prior environmental clearance?	Yes/No. If yes, please specify the experience in a separate sheet (Please restrict to 500 words)				
9	Whether any out-standing expertise has been acquired?	Yes/ No If yes, please provide details in a separate sheet (Please restrict to 500 words).				
10	Any other relevant information?	May like to attach separate sheets (Research projects, consultancy projects, publications, memberships in associations, trainings undergone, international exposure cum experience etc.)				

The Government of……………………is pleased to forward the Nomination of Dr./Sh. …………………...…. for the position of Chairperson / Member / Secretary of the SEIAA / SEAC / EAC to the Ministry of Environment & Forests, the Government of India for the Notification.

(Authorized Signature with Seal)

ANNEXURE XVII
Composition of EAC/SEAC

Composition of the EAC/SEAC

The Members of the EAC shall be Experts with the requisite expertise and experience in the following fields /disciplines. In the event that persons fulfilling the criteria of “Experts” are not available, Professionals in the same field with sufficient experience may be considered:

- Environment Quality Experts: Experts in measurement/monitoring, analysis and interpretation of data in relation to environmental quality
- Sectoral Experts in Project Management: Experts in Project Management or Management of Process/Operations/Facilities in the relevant sectors.
- Environmental Impact Assessment Process Experts: Experts in conducting and carrying out Environmental Impact Assessments (EIAs) and preparation of Environmental Management Plans (EMPs) and other Management plans and who have wide expertise and knowledge of predictive techniques and tools used in the EIA process
- Risk Assessment Experts
- Life Science Experts in floral and faunal management
- Forestry and Wildlife Experts
- Environmental Economics Expert with experience in project appraisal

ANNEXURE XVIII
Best Practices & Latest Technologies available and reference

Best Practices & Latest Technologies available and reference

General practices recommended for industries on industrial estates:

- Encourage the use of vapor recovery systems, where applicable, to control losses of volatile organic compounds (VOCs) from storage tanks and achieve 90–100% recovery.

- Encourage the use of low–nitrogen oxide (NOx) burners in combustion systems. Plants should be encouraged to use fuel with low sulfur content (or an emissions level of 2,000 milligrams per normal cubic meter, mg/Nm3) for sulfur oxides, SOx). A sulfur recovery system may be feasible for large facilities when the hydrogen sulfide concentration in the tail gases exceeds 230 mg/Nm3.

- Institute spill prevention and control measures. Liquid fuels and chemicals should be stored in areas where there are provisions for containment of spills.

- Encourage the segregation of stormwater from process water. Cooling water should generally be recycled. Sewage effluent should be segregated from wastewaters containing heavy metals.

Techniques for enhanced waste water management:

- The technique involves decreasing the amount of water used as an input for activites and find alternative sources of water resources, reuse and recycle water within the boundaries of the estate, and decrease the amount of wastewater and storm water leaving the estate.

- Input flows include: surface water, rainwater, groundwater
  These should be conserved and reused in the estate.
  The output flows include: evaporation loss and surplus flow from water users, wastewater, storm water.

- This surplus should be used to recharge groundwater, be reused or redistributed, or be safely discharged

Sources:
"Industrial Best Practices for Water Management", Dalhousie University,
http://ecoefficiency.management.dal.ca/Files/Industrial_Best_Practices_for_Water_Management_Guide.pdf

"Multilateral Investment Guarantee Agency Environmental Guidelines for Industrial Estates"
http://www.miga.org/documents/IndustrialEstates.pdf

"Industrial Estates" Pollution Prevention and Abatement Handbook, *World Bank Group*
http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_indusestates_WB/$FILE/industrialestates_PPAH.pdf

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