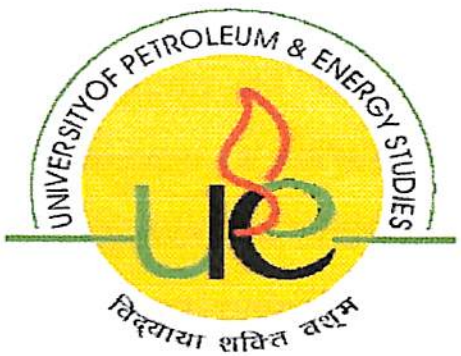
A
PROJECT REPORT
ON
RAPID ENVIRONMENTAL IMPACT ASSESMENT STUDY BASED ON EXPANSION OF REFINERY CAPACITY



PREPARED IN PARTIAL FULLFILMENT OF THE REQUIREMENT FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN APPLIED PETROLEUM ENGINEERING

SUBMITTED BY:-

ANKIT MIDDHA-R010103007
PILOT SURAJ NEGI-R010103026
B. Tech (APE) VII-SEM SEC-A
COLLEGE OF ENGINERING
UNIVERSITY OF PETROLEUM & ENERGY STUDIES
DEHRADUN-248007
(U.K.)

MAY-2007

SUBMITTED TO:-

DR. N.A.SIDDIQUI
ASST. PROFESSOR

Dr. B.P.PANDEY
DEAN, COE
UPES-DDN

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

CERTIFICATE

This is to certify that the project report on ***"RAPID ENVIRONMENTAL IMPACT ASSESMENT STUDY BASED ON EXPANSION OF REFINERY CAPACITY"*** *submitted to UPES, Dehradun by* ***Mr. ANKIT MIDDHA (R-010103007) & Mr. PILOT SURAJ NEGI (R-010103026)*** *in partial fulfillment of the requirements for the degree of Applied Petroleum Engineering & academic session (2003-2007) is a bonafide work carried out by him under my supervision & guidance. This work has not been submitted anywhere else for any other degree or diploma.*

PROJECT MENTOR

Dr. N.A. SIDDIQUI

Asst. Professor,UPES-DDN

Date: 3-5-07

Corporate Office :
Hydrocarbons Education & Research Society
3rd Floor, PHD House. 4/2, Siri Institutional Area
August Kranti Marg, New Delhi-11001 India
Ph + 91-11-41730151-53 Fax +91-11 1730154

Main Campus :
Energy Acres, PO Bidholi, Via Prem Nagar,
Dehradun-248 007 (Uttaranchal) India
Ph. : +91-135-2261090-91, 2694201/203/208
Fax : +91-135-2694204

Regional Centre (NCR) :
SCO 9-12, Sector-14, Gurgaon 122 007
(Haryana), India
Ph . + 91-124-4540300
Fax : +91 124 4540 330

E-mail : info@upes.ac.in URL:www.upes.ac.in

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INTRODUCTION

Oil industry in India is more than 100 years old handling variety of hydrocarbon material, natural gas, crude oil and petroleum products. With the technological advances and need for transportation of bulk energy carrier and natural gas. Over the years a variety of practices have been in vogue because of collaboration/association with different foreign companies and governments..

With this in view, the Ministry of Petroleum & Natural Gas in 1986 constituted a Safety Council assisted by the Oil Industry Safety Directorate (OISD) staffed from within the industry in formulating and implementing a series of self regulatory measures aimed at removing obsolescence, standardising and upgrading the existing standards to ensure safer pollution free operations.

Due to accelerated and enhanced operational activities of petroleum sector ,the several development projects have comes into existence from time to time and Environmental Impact Assessment is a well accepted activity . However industry has realised that EIA has critical issues which still need to be addressed minutely e.g. locations near coastal area ,offshore and high sea location etc including gearing of project personnel for EIA. With this view point , Oil Industry Safety Directorate (OISD), Ministry of Petroleum & Natural Gas has taken up formulation of Guidelines for Environmental Impact Assessment.

Environmental Impact Assessment (EIA) refers to the assessment of environmental impacts likely to arise from a major action i.e. legislation, a policy, a plan, a programme or a project, significantly affecting the environment. It usually addresses rational management and impact assessment of desired environmental components of proposed development / project.

The Environment Impact Assessment (EIA) is a decision making tool and is based on understanding of the implications including social, cultural and

aesthetic concerns which could be integrated with the cost benefit analysis of the project.

Environment impact assessment is statutory as per the 1994 EIA notification of Ministry of Environment and Forests and subsequent amendments thereof for following category projects in Petroleum Industry. In addition to the above Notification, the EIA Manual 2000, prepared by MOEF should also be referred.

development projects/new projects ,

expansion & modernization of existing projects,

petroleum refining ,

crude and product pipeline

exploration for oil and gas and their production, transportation & storage

The purpose of the environmental impact assessment is to identify and evaluate the potential impacts of the projects on the surrounding environmental system

These Guidelines are prepared to facilitate project authorities to do EIA preparatory work of concerned facilities of upstream (onland and offshore) and downstream sectors (refining) of petroleum industry including pipeline transportation to enable them in finalizing Scope of Work of EIA and evaluate the same before submission to the Impact Assessment Agency.

The objective of the Environmental Impact Assessment is to help in achieving sustainable development with minimum environmental degradation along with prevention of long term environmental effects by incorporating suitable mitigative measures. Environmental Impact Assessment process therefore, involves evaluation of Environmental implications and incorporation of necessary safeguards for these activities having bearing environmental quality. Evaluation of beneficial and adverse effects of developmental project on the Eco-system is attempted, both qualitatively as well as quantitatively.

Economic progress is the goal of all developing countries with the objective of improvement in quality of life of the people. This developmental effort has translated into rampant exploitation of the available resources and industrialization at the maximum possible pace by the use of technology. A side effect of such an effort has been the adverse impacts on the natural environment. The objective of development has been to improve the quality of improve, man's overpowering desire to enjoy maximum comfort and happiness has caused him to exploit the free goods and services of nature viz. water, air, land and purification capacity to the point where the capacity of environment to stabilize itself has been seriously impaired.

Any development requires not only monetary cost-benefit but also an impact assessment to look into the environmental impacts and plan for the mitigative measures.

By now everyone in the world has come to realize that the environment has to be taken seriously. The fact is that all living things we treasure and everything we enjoy whether it is in the town, in rural areas or in the open countryside depends on it. In recent decades, our environment has been seriously jeopardized by our desire for more progress and more prosperity. The only way of dealing with environmental repercussions and guaranteeing ecologically sustainable development is Environmental Impact Assessment (EIA).

DEFINITIONS RELATED TO ENVIRONMENTAL IMPACT ASSESSMENT

Environment Impact Assessment (EIA)

EIA is defined as an activity designed to identify and predict the impact of the proposed on environment and human health and to interpret and communicate information about the impacts.

Hazard Risk and Risk Analysis

A "hazard" is something with a potential to cause harm and "risk" is the likelihood of its occurrence. Risk analysis is the methodology by which risk is estimated, by combining the consequences and likelihood of the identified hazardous incidents. Risk assessment is the process by which the results of a risk analysis are used to make decisions, through comparison with risk acceptance criteria.

Disaster Management Plan (DMP)

Based on findings of risk analysis study a plan is drawn for onsite and off site of the plant facilities. This plan is drawn to safeguard the men and equipment in the event of any disaster. The DMP also includes an organ gram with responsibilities of the concerned person in the event of any crisis.

Baseline Studies

Studies conducted to document and monitor the environmental data of a particular location before starting any proposed development activity. The data generated by these studies are considered as baseline data for the proposed development project.

Environment Management Plan (EMP)

EMP is a Plan is drawn based on findings of EIA study consisting of environmental protection measures to be taken by the project authorities.

SCOPE

The purpose of Environmental Impact Assessment is to identify and evaluate the potential impacts (beneficial and adverse) of development projects on environmental components including social, cultural and aesthetic concerns. The exercise should be taken well in advance in planning stage of projects for selection of environmentally compatible sites, process technologies and such other environmental safeguards. The potential scope of a comprehensive EIA system is considerable and could include the appraisal of policies, plans, programmes and specific projects. The aim of the EIA is to assess the overall impact on the environment of development projects proposed by the public and private sectors (2).

The evolution of EIA procedures occurred in many countries. It varies in parts keeping in view the local conditions. However all EIA procedures have the following stages.

Identification of projects requiring EIA, sometimes known as screening.
Identification of the key issues to be addressed in an EIA, called scoping.
Impact assessment and evaluation.
Impact mitigation and monitoring.
Review of the completed EIS and;
Public participation.

The result of an EIA is assembled in a document known as an Environmental Impact Statement (EIS), which looks at all the positive and negative effects of a particular project on the Environment.

The guidelines should be applicable to all new/ development projects of oil drilling and gas extraction and processing facilities of onland and offshore areas of upstream petroleum sector, refining sector, LPG, LNG and other petroleum product facilities including marketing terminals of downstream sector including cross country pipeline (surface and sub-surface).

FACILITIES IN PETROLEUM SECTOR FOR WHICH EIA IS REQUIRED

FIXED TYPE (in onshore and offshore area)

Upstream Sector

Group gathering stations, gas collecting stations, gas processing facilities, central tank farms, and compressors stations in onland area.
Drilling and Processing Platform and other sub- surface sea pipelines etc. in offshore area.

Downstream Sector

Petroleum oil refineries and associated units, LPG plants, oil terminals, Marketing Terminals and other products facilities, transportation through pipelines (cross country pipelines) storage facilities etc.

MOBILE TYPE (in onshore and offshore area)

Drilling sites including cluster drilling site, Work over sites, Drill ship, jack up rig.

PREPARATION OF EIA

Depending upon the time available, there can be two stages of EIA preparation viz., rapid EIA and Comprehensive EIA.

METHODOLOGY:

Environmental Impact Assessment can be classified in to two main types viz

- Rapid Environmental Impact Assessment
- Comprehensive Environmental Impact Assessment

RAPID ENVIRONMENTAL IMPACT ASSESSMENT (REIA):

Rapid Environmental Impact Assessment can be defined as the study, which is done for quick assessment of likely adverse impacts. Rapid Environmental Impact Assessment studies will be conducted at the initiation of the new activity. In some cases this study may be required for the expansion of existing unit or change in the current manufacturing process (if the pollution load is to exceed the existing one). Rapid Environmental Impact Assessment study covers one season baseline data for various environmental components viz. Air, Noise, water, land, Biological and Socio-economic including parameters of human interest.

COMPREHENSIVE ENVIRONMENTAL IMPACT ASSESSMENT (CEIA):

Comprehensive Environmental Impact Assessment is basically a study which includes collection of data for various components for four seasons i.e. Monsoon, Post-monsoon, winter and summer. Comprehensive Environmental Impact Assessment report has to be submitted after the evaluation of Rapid

Environmental Impact Assessment report, if so asked by the Impact Assessment Agency.

The various methods used in the EIA are Adhoc Method, Overlays methods, Checklists, Matrix, network and Integrated Method- combination of Matrix, Network analysis model and a computer aided systematic approach (5).A typical EIA study including an industry includes.

- Field data collection for various Environmental parameters.
- Assessment of various liquid, solid and gaseous pollutants generated from the plant and existing pollution control devices.
- Assessment of various impacts from these pollutants on Environment.
- Consideration of various statuary guidelines and standards prescribed by Central Pollution Control Board and Ministry of Environment and Forests.
- Formulation of detailed Environment Management Plan (EMP) to mitigate / control the various impacts and bring them within the standards limits.

The difference between Comprehensive EIA and Rapid EIA is in the time-scale of the data supplied. Rapid EIA is for speedier appraisal process. While both types of EIA require analysis of data on environmental components including assessment of all significant environmental impacts and their mitigation. ,rapid EIA achieves this through the collection of 'one season' (other than monsoon) data only to reduce the time required. This is acceptable if it does not compromise on the quality of decision-making.

The comprehensive EIA is carried out based on the environmental data for one complete year consisting of all seasons .

The EIA study involves the following steps:

- Screening
- Scoping and consideration of alternatives
- Baseline data collection(One season for rapid EIA and all seasons of a year for comprehensive EIA)
- Impact identification and prediction
- Assessment of alternatives, mitigation measures and environmental Impact statement
- Environment Management Plan
- The project proponent should clearly define the scope of the work of the EIA.

COMPONENTS OF EIA

Following should be the basic component of EIA :

i. Project Details
ii. Process Information
iii. Physical Environment, General Topography and Baseline studies *(as per Annexure 1)
iv. Environmental Impact Identification Prediction .
v. Mitigation measures.
vi. Environment Management Plan
vii. Rehabilitation Plan
viii. Occupational Health & Safety * *
ix. Risk Analysis* *
x. Disaster Management Plan **

NOTES:

- The information required under this head needs should be collected from different sources such as census data of the region, nearest meteorological station, revenue authority of the region and forest authorities.
- The information should cover a distance as per requirements of MOEF.
- The Meteorological information should cover a period of more than one year and be presented in detail in the form of wind roses etc. This enable the calculation of ground level concentration of the pollutant in the environment.

Relevant account on these subjects is also required to be submitted to the impact assessment agency by the project proponent along with EIA. It is not necessary that these studies are carried out by the same agency which has carried out EIA..

PROJECT DETAILS: Project Details should be taken from the Feasibility Report

PROCESS INFORMATION

i) Details of the raw material, their daily consumption and their sources
ii) Details of the final products andByproducts (if any) at the full Capacity on daily basis.
iii) Details of process chemicals / materials
iv) Brief of manufacturing process
v) Details on waste generation or on storage and handling of hazardous substances.
vi) Source of energy and its consumption
vii) Material balance

EMISSIONS

Liquid – Physical / chemical characteristics, its quantity, proposed treatment , mode of disposal and point of discharge

Solid – Nature and quantity of solid production, method of treatment and its disposal.

Gases – Atmospheric emission, volume and composition particulate matter (SPM/RPM) , NOx, SO2, ammonia,CO, Hydrocarbons and other pollutants etc) both from fuel burning and as well as process. Air pollution control system and details of stack for atmospheric discharges.

Noise Levels.

NOTE:

The information on emission is required in terms of quantities produced per day, its physical and chemical characteristics, the treatment provided as well as the mode and point of its disposal.

The quantities of liquid/gas should be commensurate with the water requirement whereas those for solid waste should be in line with the process information given earlier.

Information on the quantity of the emission waste should include the concentration of different emission waste characteristics before treatment and after treatment.

The treatment should be such that the concentration of the various pollutants achieved after treatment should be within the limit stipulated by the Pollution Control Board.

The solid waste should be in form which are not leachable if they are to be used for land fill.

In case of gaseous emission arising from fuel burning, the quality and the constituents of the pollutants should be based on the fuel used.

The gaseous emission should be suitably treated such as use of filter scrubbers etc. before their discharge to atmosphere through stacks of suitable eight.

The fugitive emissions are of concern in some projects and they have to be controlled by use of local exhausts.

PHYSCIAL ENVIRONEMNT AND BASE LINE STUDIES

Following qualitative and quantitative assessment / measurement should be made.

- Collection of ambient air quality data and status.
- Collection of relevant meteorology data.
- Suface and ground water quality
- Soil Characteristics
- Collection of noise level at proposed location.
- Measurements and collection of surface current and hydrological characteristics.
- Characterization and quantification of hydrocarbon and other chemicals in water, sediments, fish and other biological materials.
- Assessment of micro flora with respect to activity and amount of hydrocarbon degrading bacteria.
- Collect data regarding species composition, abundance, diversity and bio mass of benthic flora and fauna.
- Demographic and socio-economics

Necessary data should be collected as per Annexure I.

IMPACT IDENTIFICATION AND PREDICTION

The Impact Identification and Prediction should be done as per following for construction, commissioning and operating phases of the Project.

- Identification, quantification and evaluation of impact due to gaseous emission through modeling of dispersion of gases.
- Assessment of the quality and quantity of effluent that will be routinely discharge into the recipient environment
- Characterization and quantification of the solid waste.
- Identification, quantification and evaluation of impact of marine environment due to on going and proposed offshore operations.
- Eco-toxicological studies incorporating toxicity, bio-accumulation and degradation tests.
- Mathematical models describing transport, dispersion , fate and effect of accidental and routine oil /chemical loading.
- Assessment of benefits of human interest due to proposed activity.

ENVORNMENT MANAGEMENT PLAN

This should be developed on following lines

- Evaluate adequacy of existing / proposed pollution control devices and suggest modifications to meet basic standards.
- Propose appropriate additional mitigatory measures to reduce adverse impact of activities on environment.
- Prepare post development environment quality monitoring programmes.
- Prepare environmental audit programme.

The objective of this plan to minimize the adverse impacts on the environment due to the plant as well as to restrict the concentration of various pollutants within the prescribed limits.Various control / mitigation measures have to be prescribed in this plan according to the different impacts, their nature and intensity along with green belt development plan. Green belt development being one of the important component of Environment Management Plan, it is made to meet the following objectives:

- Mitigation of fugitive gaseous emissions including the odor
- Sufficient capability to arrest accidental release.
- Noise pollution control
- Waste water reuse
- Ecological balance
- Prevent soil erosion
- Economic sustenance and
- Improvement in aesthetic environment

The scenario of planting and size is based on the optimum use of available land, quantity of irrigation water and treated wastewater. It has been considered that the plant trees would survive under existing environment (resistant species) and would be useful for pollution control. A 200 meter wide green belt should be laid down around the periphery of the plant. Keeping in view the soil and water quality available in and around the plant and the topography of the land, following additional aspects were considered for green belt development (7).

Vertical root development system

- Large leaf area index

- Fast growth potential
- Perennial nature
- Thick and shinning leaves
- Preferably local availability
- Low transportation rate
- The green belt is raised in tiers as stated below:
- Shrubs species having tolerance
- Plants having fast growth potential with conical canopy, and
- Plants with broad leaf area index having thick and shining surface.

In continuation to this general steps to handle emergency conditions are also recommended as Disaster Management Plan.

REHABILITATION PLAN

The project authorities should develop a comprehensive rehabilitation plan as per requirements of MOEF.

ENVIRONMENTAL IMPACT ASSESSMENT OF SPECIFIC PROJECTS

EIA for Projects located in Coastal Area / Marine Environment:

The EIA for setting up a project/developmental activity in the coastal marine environment is viewed primarily in terms of local, site specific, shoreline character and coastal variability, both in line and space, of the coastal marine environment. The rates and the magnitude at which coastal process operate and the normal variability in beach changes or shoreline energy levels are important variable in evaluating the impacts. These are supplemented by physical processes associated with rivers, winds as well as the biological processes that govern the development of mangroves, coral roofs, marshes etc. The following should be environmental considerations for the development projects which are expected to come in coastal areas.

- Mangrove, wetlands and other inter-tidal systems
- Seagrass systems
- Coral reef systems
- Sandy beach systems
- Lagoons and estuarine ecosystems
- River discharges
- Deltas
- Island ecosystems
- CRZ Regulations

The following factors should be considered for evaluation of the environmental impact of coastal / marine area development:

i.Physical Factors

- Shoreline character
- sediments, morphology
- beach cycles
- backshore character
- nearshore character

ii. Shoreline Processes

- winds, waves; tides; currents
- wave climate, storm frequency

iii.Chemical Factors

- Quantities, composition and potential bio accumulation or persistence of the pollutants to be discharged;
- Potential transport of the pollutants by biological, physical, or chemical processes:

iv.Biological Factors

Composition and vulnerability of potentially exposed biological communities, including

- unique species or communities
- Endangered or threatened species
- Species critical to the structure or function of the ecosystem

- Importance of the receiving water area to the surrounding biological community e.g.
- spawning sites
- nursery/forage areas
- migratory pathways
- area necessary for critical life stages/functions of an organism
- The existence of special aquatic sites, including (but not limited to)
- marine sanctuaries/refuges
- parks
- monuments
- national seashores
- wilderness areas
- coral reefs
- mangroves

v. Human Factors

- Commercial or recreational activities
- distribution and character of activity
- timing of activity
- level of economic / manpower activity
- Potential direct or indirect impacts on human health

vi. Environmental Factors

- Shoreline character and sediment bearing capacity
- Near shore bethymetry
- Back shore morphology
- Low-energy areas (potential oil accumulation areas)

vii. Logistical Factors

- Shoreline access
- Shore-zone ownership
- Distances to logistic bases (airstrips, wharves, etc)
- Approved disposal sites
- Suitable temporary staging areas
- Suitable command-post locations
- Personnel resources
- Equipment resources
- Tactical Constraints
    - -Geologic
    - -Biologic
    - -Human activities
    - -Cultural resources

viii. Other Factors

- Assimilation Capacity
- Any applicable requirements of an approved Coastal Zone Management Plan (CZMP);
- Such other factors relating to the effects of the discharge as may be appropriate. Marine water quality criteria / standards.

NOTE:

These studies should be tailored to the type of locality (bays, open coasts, shoreline, beach, delta, estuary etc) and coordinated with other studies i.e. biological chemical and also cost / benefit. In addition to this, sensitivity of the area/location play an important part in the EIA process.

The project authorities should consider potential determinants selected for the impact assessment specifically for coastal marine environment as per the checklist placed at Anexure-2.

EIA for Projects of Offshore locations or in High Sea area

1. The baseline studies should be carried out in accordance to the guidelines available under Paris Commission for monitoring methods to be used in the vicinity of platforms of Norwegian State Pollution Control Authority (SFT) for the group of experts on oil pollution of the Paris Commission. .

2. The monitoring programme, sampling stations and parameters to be measured should also be carried out as per above referred Paris Commission.

3. The standards prescribed under Oil Drilling and Gas Extraction industry should be applicable as per MOEF / CPCB notifications, guidelines respectively.

4. The basic methodology of EIA should remain same as described for onland projects or for the projects located in coastal area.

EIA for Pipeline Projects

i) The basic methodology for conducting EIA should remain same as in the case of onland project but information on environmental component should be generated and monitored as per requirements of MOEF.

ii) If the pipeline is passing through sensitive areas , forest area or reserve forest area then impact of corridor being created due to laying of pipeline should be considered in EIA.

iii) Project authorities should follow relevant procedures of land acquisition or transfer for the designated purpose under the provision of Forest Act.

iv) In the event of pipeline passing through river or any other water resource or a populated area the involved risk should be considered while evaluating its impact and accordingly environmental management plan should be proposed for the necessary protection purpose.

WHAT IS REIA?

A RAPID ENVIRONMENTAL IMPACT ASSESSMENT is an activity designed to identify and predict the impact of an action on the bio-geo-physical environmental and on man's health and well being and to interpret and communicate information about the impacts. It includes study of all relevant Bio-geo-physical, socio-economic and cultural environment. It also includes mid term and long term prediction of impacts.

REIA covers one season baseline data for various environmental components viz. air, noise, water, land, biological and socio-economic including parameters of human interest. The one season to be selected for REIA would be winter season because this season would give worst scenario of air pollution.

REIA is a basis for sound decision making. It provides a set of instruments which enable us to visualize the environmental impact of major projects and wide-scale policy plan and alternatively to these. It takes full account of the environmental interest at stake in the course of the decision making process on that particular project or plan. A successful REIA is one which ensures that all relevant impact associated with the proposed project are adequately and fully taken into accounts in the decision making process.Some of the characteristics of REIA are:

- REIA is a continuous, integrated , inter disciplinary and oriented process.
- REIA is a creative process of selecting better alternatives.
- REIA is a process of evaluating long term and secondary effects.

- REIA is an evaluation of existing processes, legislations and institutions.
- REIA is a means of dealing with the transboundary pollution problems.
- REIA is a means of obtaining public participation.
- REIA is a foundation for post project monitoring.

PURPOSE AND NATURE OF REIA

The purpose and nature of REIA is to give the environment its due place in the decision making processes by clearly evaluating the environmental consequences of a proposed activity before action is taken. The concept has ranificatin in the long run for almost all development activity because sustainable development depends on protecting the natural resources base, which is the foundation for further development.

REIA identifies ways of improving projects environmentally, by preventing minimizing, mitigating or compensating for adverse impacts, thus preventing costly remedical measures after the fact.

REIA also provides a formal mechanism for inter agency co-ordination addressing the concerns/views of project affected groups and local NGOs.

EIA report help the project implementing agency in following ways:

- Enable them to address environmental issues in a timely and cost effective fashion.

- Reduce the need for project conditionally during clearance from appropriate authority because appropriate steps can be taken in advance or incorporated into project design, or alternatives to proposed project can be considered.

- Help to avoid costs and delays implementation due to unanticipated environment problems.

- Understanding of the proposed action, i.e. what is and what is planned to be done? What are the materials, manpower and or resources involved?

- To report the results of analysis in a manner such that they can be useful in decision making process.

- To project the proposed action into future and to determine the possible impacts on the environmental quality

APPLICATION OF REIA

Today, there is increasing awareness about the fact that economic development and thereby improvement in social condition is inextricably linked to the pursuit of environmental sound and sustainable development as stated in a declaration at the concluding session of a special character of the united nations environment program's governing council, new perceptions have emerged. The need for environmental management and assessment, the complex interrelationship between environment, development, population and resources and the strain on the environment due to increase in population are being recognized. A comprehensive and regionally integrated approach that emphasizes this

interrelationship can lead to environmentally sound and sustainable socio-economic development. REIA is an effective tool for the realization of this development globally. Several countries have come up with measures for dealing with environmental questions in planning and decision making.

GLOBAL SCENARIO

It is now over a decade since the U.S. National Environmental Policy Act (NEPA) came into force on 1 january,1970. This Legislation was passed to ensure that environmental concerns received adequate attention at all levels of Government policy, decision making and actions in the United States. The basic idea about REIA in the other countries came from U.S.A and now REIA has been introduced by law in several other countries viz. Czechoslovakia(1973), Finland(1984), Canada(1975), France and Sweden(1976), Germany(1975), Switzerland(1985), Netherlands(1986), Norway(1985) , etc.

INDIAN SCENARIO

REIA of development projects was first started in 1978-79 when planning commission requested the then Department of Science and Technology to take up environmental appraisal of River Valley Projects. Subsequently, projects in mining industries, thermal power, ports and harbour were brought under the purview of REIA. Soon after the creation of Union Ministry of Environment and Forests(MOEF) a separate division of REIA has been opened for dealing with environmental questions associated with development. REIA is now mandatory under Environment(Protection) Act, 1986 for 29 categories of Development activities involving investment beyond certain thresholds. The MOEF has constituted Environmental Appraisal Committee comprising multi-disciplinary experts for the projects viz. Mining thermal, River Valley Multi-Purpose and Hydro Electric Infrastructural Development and Miscellaneous Project, Nuclear Power. The MOEF has issued a notification of 28 january, 1983 making REIA a statutory requirement for all projects both in public and private sector.

The MOEF has established the Environmental Appraisal procedure giving clearance to the development projects. Accordingly, once an application for Environmental clearance is revived from a project proponent along with requisite document specified in the REIA notification, the proposal is scrutinized by the technical staff of the ministry prior to placing it before the expert committees. The committees evaluate the environmental impacts of the project based on the data furnished by the project proponent and whenever necessary, site visits and independent assessment of environmental aspects are also undertaken. Based on such examination, the committees make recommendations for approval or rejection of the proposal which are then processed in the Ministry for approval or rejection.

In case of site specific projects such as Mining, River Valley, Ports and Harbors etc., a two stage clearance procedure has been adopted for environmental clearance of the project. This is to ensure that ecologically fragile and environmentally sensitive areas are avoided while locating projects.

The following important points should be given priority during the application of REIA:

- Taking into account the environmental consequences of developmental activities at a early stage.
- The application of REIA request to projects, policies and program at all level of the government.
- The establishment of closed links between REIA and decision makers.

GOALS OF REIA

Goal—1: To protect the environment from damage.

Objective—1: To Ensure that Adequate Environmental Information is available to Decision Makers.

Objective—2: To ensure that environmental factors are taken into account in decision making.

Objective—3: To coordinate decision making between agencies.

Objective—4: To coordinate policies on environmental aspects of decisions between nations or states.

Objective—5: To ensure adequate environmental management over the life of the project.

Goal—2: To improve public participation in governmental decision.

Objective- 1:To involve the public at all stages of REIA.

Goal-3: Economic efficiency

Objective-1: To minimize costs and maximize benefits of approval process.

PROCEDURE OF CONDUCTING REIA

The sequential action of carrying out REIA as an environmental planning tool may be briefly described as follows :

(a) The project proponent checks whether there are any existing regulations to determine if an environmental stud is required. In other words, the project proponent will examine whether any environmental study is required for the type of project being proposed and if so, whether an REIA is required directly.

(b) If no REIA is required for the proposed project, no environmental considerations need be given at the planning stages.

(c) If REIA is required, the project proponent will prepare REIA based of specified terms of reference. The purpose of the REIA is to enable the reviewing agency to screen projects to identify those for which no detailed REIA is required.

(d) The state PCB/MEF reviews the REIA and if the REIA is found unsatisfactory, it is returned to the project proponent for revision and resubmital. If detailed REIA is not warranted, the project is approved from the environmental viewpoint, with prescribed monitoring/mitigation/pollution control measures.

(e) When REIA is insufficient to decide, detailed REIA is prepared by the project proponent, based on the terms of reference.

(f) Public hearings can also be held to take views of interest groups and others.

(g) The state PCB/MEF reviews the REIA report in terms of completeness,. Accuracy, and compliance as well as assessing the appropriateness and adequacy of proposed environmental protection, enhancement and mitigation measures and the monitoring program.

(h) If the REIA report indicates that the project has severe irreversible deleterious impacts on the environments, such that the losses due to the project are much more than the benefits derived, it is rejected on environmental grounds.

(i) If the REIA report is found unsatisfactory or incomplete by the PCB/MEF it is returned to the project proponent with a list of specific parameters which should be revised.

(j) With REIA approved, the project implementation can proceed.

(k) The state PCB/MEF can also conduct spot checks during the implementation of environmental protection, mitigation and enhancement measures provided in the REIA report. The monitoring is also to be periodically reviewed by the regulatory agency.

ACTIVITIES FOR THE CONDUCT OF REIA

ASSESSMENT STEP	WHEN?	BY WHOM?
1. Preliminary activities	-During feasibility study.	- Project management environmental team.
2. Impact identification	- Between feasibility study and preliminary design.	- Environmental team.
3. Baseline study	- During preliminary design.	- Environmental and engineering design.
4.Impact evaluation	- Between preliminary and final design.	- Environmental team and technical specialists.
5. Mitigation measures	- Between preliminary and final design.	- Environmental team with input from engineering team.
6. Comparison of alternatives	- Before final design.	- Environmental team.
7.Documentation	- Before final design.	- Environmental team.
8. Decision-making	- Before final design.	- Project team.
9. Post audits	- After the start of operation.	- Project O & M.

SCOPE OF REIA

In developing countries, the standard of living is still very low and environmental issues are accorded a much lower priority. Therefore, the approach to environmental management is essentially "top-down" and the key to progress lies in convincing the decision makers of the importance of economic-cum-environmental planning as the basis for continuing optional national development. A consequence of this is that funding for REIAs are not as high as they are in industrialized countries. This puts the onus on the environmental agency that budgets and scope of the REIA studies are kept to the minimum required.

While this does not imply that REIA should be slip-shod, a high degree of economy is required. Experience shows that REIA studies can be comprehensive on less resources.

PARTCIPANTS IN THE REIA PROCESS

An important issue in the REIA process is the communication among different groups of participants. The following types of participants are generally required in REIA systems.

THE PROJECT PROPONENT

The project proponent is the person or group of persons who wish to establish or carry out a proposed development activity which is known to have adverse or beneficial impacts on the environmental. The project proponent may be a private company or a government agency or a public sector company. The project proponent need not necessarily be the person preparing the EIS. The EIS can be

prepared by other agency on behalf of project proponent.

THE DECISION MAKER

The decision maker is the department whose decision on the proposed activity is requested by the project proponent. The decision maker can be a central government agency or a state government agency depending on the type and nature of proposed activity. In case of small scale units, state PCB will be the decision making agency while for mega projects such as water resources, power plants, refineries and petrochemical, central government departments will be the decision making agency.

REVIEW COMMITTEES

At state level, there are technical committees set up at state PCB to critically examine the REIA reports and accord environmental clearance to projects. This is followed by Environmental Appraisal Committees (EAC) set up at MEF to review the REIA reports from a scientific/technical point of view. For setting up of these committees, independent experts from various fields both from government and non-government agencies are appointed to look into various aspects from environmental angle.

LEGAL ADVISORS

Depending on the political system of the country, the decision makers may have legal advisors. These legal advisors may be government agencies other than decision makers, or the may be provincial and local government.

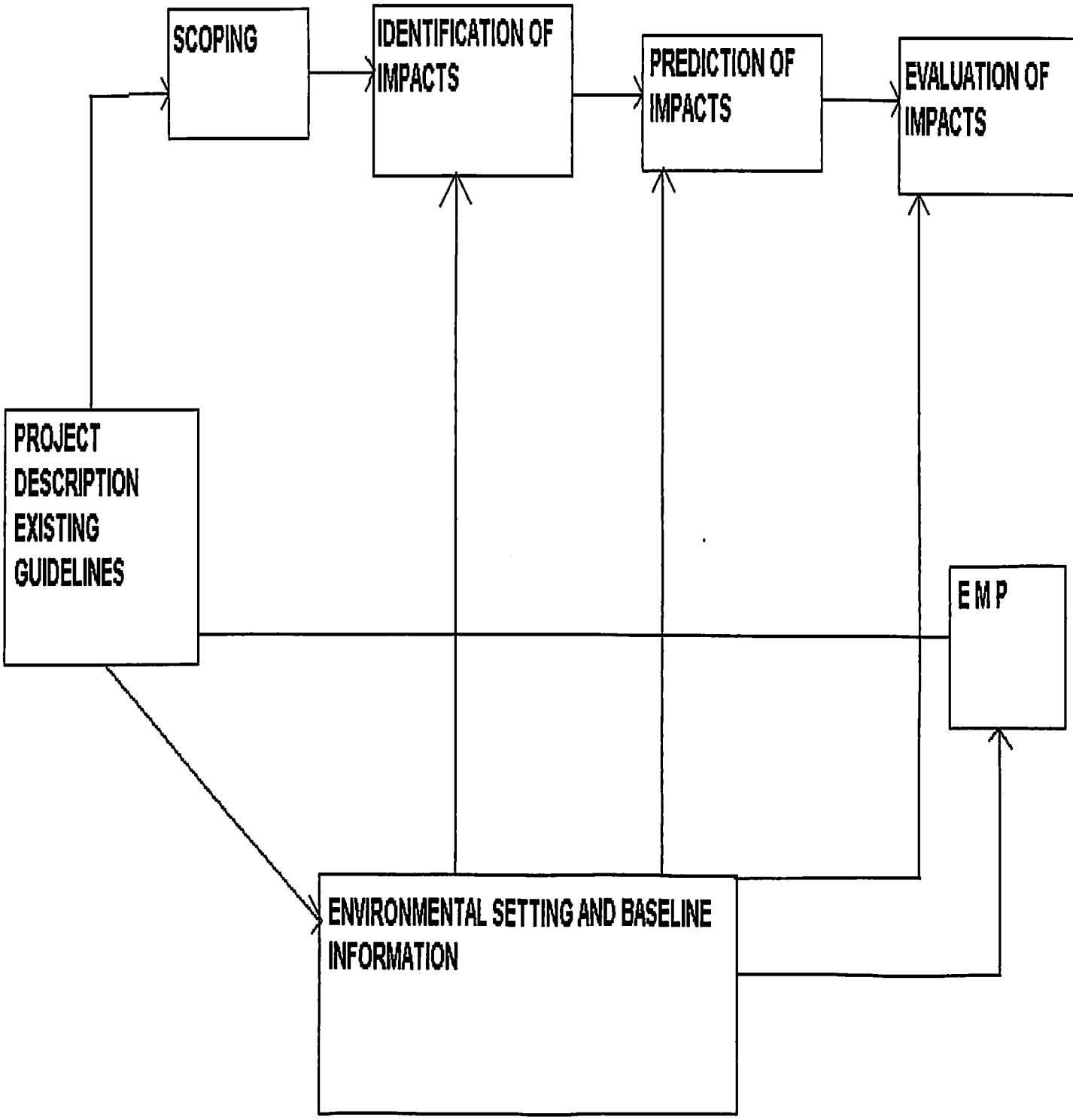
NON-GOVERNMENTAL ORGANISATION

There can be non-governmental organizations representing the general public who have established themselves as interest groups. These agencies may have an interest in the environmental issues or they may have a narrower scope, for example their interest may be focused on the well being of the residents of a particular region.

CONSULTANCY FIRMS

Consultancy firm or agencies who are dealing with works related to environmental management have an important role to play in REIA and preparation of EIS. In most cases they are retained by the project proponent for conducting REIA. In specific cases, they are also appointed by government or competent authority.

REIA FRAMEWORK



In order to provide better criteria for the evaluation of environmental assessment ,it is necessary to consider the activities that are involved in REIA process. REIA process consists of the following major activities:

SCOPING

✓ The first task for the REIA team is to define the scope of the assessment study with the temporal (time) and special (space) boundaries within which the assessment is to be carried out. This step is crucial as it determines which effects of the projects and aspects of the environment will be considered. The aim of this exercise is narrow down the assessment to a manageable size, while ensuring that all important effects of the proposed projects on the environment are considered. During scoping the study teams' outlook is broadened while discussions the project proponent decision maker, the regulatory agencies and others to include all possible issues and concerns raised by previous groups. Based on this primary impacts are selected for the REIA to focus on choosing based on the criteria magnitude geographical extent, and special local sensitivities.

The benefits derived from effective scoping are:

✓ It helps to ensure that real problems are identified early and studies properly.

✓ Helps proper shaping of REIA study

✓ Reduces the size of REIA

✓ Ensures research efforts not wasted on insignificant issues

- ✓ Diminishes the chance of protracted conflicts and delays in project reviews

- ✓ Helpful in structuring the work of conducting an REIA.

2. BASELINE INFORMATION

Collection of baseline information through intensive field monitoring is one of the crucial part of REIA in view of the resources, time and financial inputs required for it.

REIA refers to assessment based on one season monitoring for baseline data collection. In order to establish the baseline status of environmental components, the data is collected with respect to all environmental components viz. air, noise, water, land, biological and socio-economic within an impact zone which is the area covered under 10km radial distance from the center of the project site. This impact zone is specified by MEF their guidelines depending on the type of project.

3.ENVIRONMENTAL VARIABLES

The assessment variables refer to those characteristics of environment used to describe the baseline environmental status and upon which impacts may occur. Appropriate selection and use of variables is an important component of an environmental impact assessment process.

The variables that represent the quality of environment are defined as attributes and changes in these attributes provide indication of changes in the environment.

The environmental attributes that are likely to be affected are to be identified and some of these categorized below.

- Air
- Water
- Land
- Sound
- Ecology
- Human aspects
- Economics
- Resources
- Geology
- Flood/seismic zones
- Hydrogeology
- Meteorology

4.IDENTIFICATION OF IMPACTS

Once scoping is done and baseline data is collected, the identification of potential impacts is carried out. The identification phase of the study will include:

- Compilation of a list of key impacts such as changes in air quality, noise levels, wildlife habitat, species diversity, landscape, social and cultural systems, settlement patterns and employment levels. This can also be done based on experience with similar projects.
- Preparation of list of sources of impacts such as smoke emissions, water consumption, construction jobs, etc. using check lists or questionnaires. This is followed by listing of receptors in the environment such as crops, aquatic organisms, population, ground water sources, etc. which are likely to be affected due to project activities. Where the sources identified earlier are likely to affect the receptors then a potential impact is suspected.
- Identification of impacts through the use of checklists, networks, overlays models and simulations.

5. PREDICTION OF IMPACTS

It involves projecting the baseline environmental setting into the future with or without the project and then performing necessary computations for predicting the impacts of the proposed development. Prediction follows an impact within a single environmental parameter into its subsequent effects in many disciplines. Prediction draws on physical, biological and socio-economic data and techniques.

Sequential procedure for prediction of impacts including evaluation and mitigation measures is described below:

- Review of project actions and existing environment
- Selection of environmental indicators which will be used for describing environment and knowing the probable impacts of the project.
- Description of existing environment based on field surveys & observations
- Undertake prediction exercise with respect to each environmental component and predict the effects of the proposed project on these environmental components
- Propose modifications in project technology which would minimize the adverse impacts due to project
- Evaluate the impacts i.e. adverse & beneficial for all environmental components
- Plan strategies for mitigation of adverse impacts under EMP
- Prepare impact statement
- Finalize EIA report

6.EVALUATION OF IMPACTS

Impact evaluation is done after the baseline status, identification and prediction of impacts. Evaluation is a process that evaluates the predicted adverse impacts to determine whether they are significant enough to warrant mitigation. The decision of significance depends on the following factors:

- Comparison with guidelines, regulations and established standards

- Comparison with the relevant decision makers

- Reference to the preset criteria such as protected sites, features of species etc.

- Consistency with government policy objective

- Acceptability to the local community or general public at large

PROJECTS IN VARIOUS SECTORS

- Major irrigation projects
- River valley projects
- Thermal power projects including atomic power station
- Mining projects
- Industries
- Ports and harbors
- Human settlements relating to new towns
- Tourism projects including beach resorts
- Projects in coastal areas
- Projects in ecologically fragile areas
- Communication projects

PUBLIC PARTICIPATION IN ENVIRONMENTAL DECISION MAKING

Public participation can be defined as a continuous, two way communication process which involves promoting full public understanding of the process And mechanisms through which environmental problems and needs are investigated and solved by responsible agency.

Public participation involves both information feed forward and feed back. Feed forward is the process in which information is communicated from public officials to citizens concerning public policy. Feed back is the communication of information from citizens to public officials regarding public policy. Feed back information should be useful to decision makers in considering timing and content aspects.

OBJECTIVES

There are several objectives of public participation in the environmental impact assessment process, with one or more objectives being relevant to each time phase in the project development.

The objectives are as follows:

- Information, education and liason
- Identification of problem needs and important values
- Idea generation and problem solving

- Reaction and feed back on proposals

- Evaluation of alternatives

- Conflict resolution consensus

First objective is directed towards education of public on EIS, their purpose, and the process of citizen participation. This also includes the dimension of information on the study progress, findings as well as data on potential environmental impacts.

Second objective is related to the determination of environmental resources important to various segments of the public in an area. This objective is also focused on defining areas of environmental problems and needs and the relation of potential solutions being addressed in the project study.

Third objective is directed towards identification of alternatives that may not have been considered in normal planning processes .

Fourth objective attempts to probe public perceptions of the actions and resource interrelations.

Fifth objective is closely related to the reactions and feedback on proposals . in the process of evaluation of alternatives , valuable information can be received about the significance of unqualified and qualified environmental amenities .

Final objective is related to resolving conflicts that exist over the proposed action

PUBLIC PARTICIPATION TECHNIQUES

There are several techniques which can be used to satisfy the feed forward and feedback features of public participation programs.

The most traditional public participation technique is the public hearing. It is a formal meeting for which written statements are received and a transcript is kept.

Public hearing is generally not an appropriate forum for public participation is environmental impact assessment process.

Other available techniques include informal public, information sessions as well as project workshops.

Various public participation techniques and their capabilities have been summarized in table 1.

The capabilities are expressed in terms of communication characteristics and of the various objectives for public participation in environmental rapid impact assessment.

TABLE 1

PUBLIC PARTICIPATION TECHNIQUE	COMMUNICATION CHARACTERISTICS		
	LEVELS OF PUBLIC CONTACT ACHIEVED	ABILITY TO HANDLE SPECIFIC INTEREST	DEGREE OF TWO WAY COMMUNICATION
PUBLIC HEARING	M	L	L
PUBLIC MEETING	M	L	M
INFORMAL SMALL GROUP MEETING	L	M	H
GENERAL PUBLIC INFORMATION	M	L	M
INFORMATION CO-ORDINATION SEMINARS	L	H	H
OPERATING FIELD OFFICES	L	M	L
LOCAL PLANNING VISITS	L	H	H
PLANNING BROCHURES AND WORKBOOKS	L	H	L
INFORMATION BROCHURES AND PAMPHLETS	M	M	L
FIELD TRIPS AND SITES VISITS	L	H	H
PUBLIC DISPLAYS	H	L	M
MODEL DEMONSTRATIONS PROJECTS	M	L	M
MATERIAL FOR MASS MEDIA	H	L	L
RESPONSE TO PUBLIC ENQUIRIES	L	H	M
PRESS RELEASE INVITING COMMENTS	H	L	L
WORKSHOPS	L	H	H
ADVISORY COMMITTEES	L	H	H
TASK FORCES	L	H	H
EMPLOYMENT OF COMMODITY RESIDENTS	L	H	H
COMMUNITY INTEREST ADVOCATES	L	H	H

L- LOW **M- MEDIUM** **H- HIGH**

IDENTIFYING VARIOUS PUBLIC

several ways categorizing various public that might be involved in a public participation for rapid environment impact assessment. One group of public consists of four separate categories:

Persons who are immediately affected by a project and live in the vicinity of the project.

Ecologists ranging from preservationists of those who want to ensure that development is as effectively integrated into the needs of the environment as possible.

Business and commercial developers who would benefit from the initiation of the proposed action.

The part of the general public who enjoy a high standard of living and who do not want to sacrifice this standard in order to preserve wilderness or scenic areas or have pollution free air and water.

The corps of engineers have identified following publics in in conjugation with water resources development projects :

- individual citizens including general public who do not express their preferences or participate in any groups or organization.

- sporting groups.

- conservation /environmental groups.

- farm organizations.
- property owners and users
- business and industrial groups
- professional groups and organizational
- educational institutions , including universities, high schools and vocational schools.
- service clubs and civil organizations, including service clubs in a community such as rotary club, lion club, etc.
- labor unions
- state and local government agencies.
- state and local elected official
- federal agencies
- other groups and organizations like various urban groups, political clubs and associations, minority groups, religious groups and organizations etc.
- media, including staff of newspaper, radio, television and various trade media.

WRITING OF IMPACT STATEMENT

The preparation of impact statement requires enough care. It has been pointed out that mostly impact statements are deficient in several respects. The common deficiencies include:

(a) lack of continuity in writing style

(b) inadequate description of the environmental settings

(c) inadequate documentation and referencing

(d) minimal use of visual display materials graphs/ charts/ photographs/ maps etc. for the environmental setting as well as impact of alternatives.

To overcome these criticisms following suggestions for writing impact statements should be kept in mind:

Since maps, photographs and drawings could be of immense value to reviewers and also to decision makers, they should be incorporated liberally. Care must be taken to include authentic and correct topographic maps (for presentation of area features and terrain, and drainage characteristics), land use and master plan maps (to ascertain secondary effects) and other maps (to depict environmental features, plant and animal species distributions, archeological and historical sites, and socio- economic characteristics). Photographs could be of immense value to decision maker who may be unfamiliar with the project area. Similarly the use of simplified architectural/engineering drawings to depict the proposed

action upon its completion can aid the reviewers/ decision makers in realizing the visual impacts of the proposed action on the environment.

The report should include sources of information and the scientific approaches utilized.

There should be mention of all the relevant environmental factors which were considered but not found adequate for detailed study and left out. If the statements lack this information, it could be assumed that these factors have not been considered at all.

Proper referencing could be of immense utility in ascertaining the reliability of information included in document. There are many referencing techniques, available like foot notes, a numbered list of selected references, of any other most accepted method of referencing.

Detailed information on environmental items could be included in appendices and only summary tables could be included in the text.

Detailed calculations related to prediction and assessment of impacts should be also included in appendices.

The numbering system for sections, tables and figures should be consistent and highlight the continuity.

Never use catch words, as the same may not be understood by the reviews and decision makers.

Efforts should be made to make the document clear and easily understandable.

Vague generalization should not be made in the report. For example "the proponent will exercise supervision and control to prevent air pollution." Or "efforts would be made to develop greenery around the site. Instead of these statements, exact methods of implementation and enforcement be spelled out."

Internal review by persons unfamiliar with project details would improve the texture and complexion of the document and minimize the credibility gap which often results in writing a scientific document of multifarious nature.

Both negative and positive aspects of the proposed action should be presented.

Even though all potential impacts of any proposed action may not be analyzed in the same details, efforts should be made to provide as complete a document as possible within the time frame and allotted budget.

Since the document is to be written by interdisciplinary teams, it is not uncommon to find differences in writing style. This can result in contradictory information and statements in various sections of the document. Thus the most essential step would be to submit the document to internal review committee conflicts of professional opinion or scientific information in various areas should not be omitted but rather they should be included to provide decision makers and reviewers more complete information and to enable better understanding of consequences of the proposed action.

To avoid criticism, it would be better to be as specific as possible within bounds of available data.

ENVIRONMENTAL IMPACT ASSESSMENT OF OIL REFINERIES

Rapid EIA:

The rapid EIA covers one season baseline data for various environmental components via air, noise, water, land biological and socio-economic including parameters of human interests. Since the refinery emits variety of air pollutants and this being severe as compared to other components, the one season to be selected for rapid EIA would be winter season because winter season would give worst scenario of air pollution due to refinery operations due to problems of dispersion of pollutants. Based on the baseline data collected over a period of 3 months during winter season, impacts are identified, predictions are made by employing suitable mathematical modelling techniques, impacts are evaluated and impact statement is prepared. Based on identification, prediction and impact statement, an effective environmental management plan is prepared which incorporates suggestions or recommendations under each environmental component for minimising the adverse impacts.

The above exercise will be of great help to the project authorities as it will enable them to incorporate the suggestions in process technologies, raw materials etc. as also planning of project itself will be perfect both from environment and economy pint of view.

Significant issues of concerns in refinery project:

A: Physical resources:-

Resouce depletion:

During construction of a refinery, huge amount of excavations, foudations and concrete works will be involved. Initially it will also result in cutting of trees and clearing of site, thus causing forest or vegetation resource depletion. Huge quantity of water required for construction work will deplete existing ground water and surface water resources.

Air quality:

The air emissions during construction would be mostly dust emissions and automobile exaust from vehicles or machines used for construction. During comissioning and operation of refinery,the air pollutants of significance would be SPN, SO2,NOX,H2S,ammonia and hydrocarbons.These air emissions will raise the baseline concentrations several folds and consequently will have adverse impact on neighbourhood air quality,man , vegetation and sometime may even produce acid rains.

Surface water hydrology:

The refinery requires water for its processes and for cooling purposes for a typical refinery manufacuring varios petroleum products and processing 4.5 million metric tonnes per annum of raw crude, the water requirements for process and cooling are very high.Thus, this huge uptake of water from existing water resources will have a marked effect on the surface water hydrology. This will also result in improper recharging capacity of ground water and consequently both surface water and ground water resource will get adversely affected.

Surace water quality:

Water quality impacts due to construction and operation of refinery depends on concentration of different pollutants, water conservation measures and process modifications within the refinery.The waste waters if discharged untreated or partially treated will have severe adverse impacts on the recieving water quality making it unfit for drinking or bathing.Also, it will increase the cost of water treatment for downstream users.

Groundwater quality:

Sum of the waste waters containing heavy metals, trace elements and toxic compounds like phenols if improperly disposed and if left to perculate through the ground water would contaminate ground water table.Further oily sludges and other solid waste, produce leachaids that could reach the groundwater table.

Land:

Solid wastes generated from refinery are mainly oily sludges containing trace materials and are normally disposed on land, this being cheapest method. This may lead to leaching of trace elements which will adversely effect crops, vegetation and groundwater.

B: Ecological resources

Aquatic life:

Oily wastewaters if discharged in to water body will form an oil film on surafce and damage aquatic flora and fauna. Emulsified oil may coat and destroy fish, algae and sea food. Settleable oily substances may get coated at the bottom and will destroy benthic organisms and may interfere spawning area.

Forests:

For a refinery project, the site may be located in the forest area and installation of a refinery may require of forest resource. The emissions from refinery may effect the ecosystem in generaland plants in particular. Phytotoxic effects of air and emissions may lower the overall physiological activies of plant life in its surroundings. These may result into decrease in chlorophyll, ascorbic acid, sugars and protein content with corresponding increase in sulphate content of the plants.

C: Human Use Values

Land use:

The advent of refinery set-up at a proposed site leads to other developmental activities in the vicinity of the refinery. With the installion of refinery, ancillary industries will be established in the nearby region which will increase the growth of population centres which will alter the existin land use patterns of the area.

Water Supply:

The public water supplt would get adversely affected due to deterioration of water quality of water supply source resulting in increased cost of water treatment.

D: Quality of life values

Public Health:

The emission of air pollutants from the refinery will have adverse impacts on human health. Some of the process units within the refinery such as compressor, turbines, etc. will generate high noise. The persons working near to these machines may get exposed to high noise levels which may adversely affect their health through hearing impairment, annoyance, ceafness etc. leading to permanent damage of tha ears.

Socio-economic:

The establishment of a refinery will have beneficial impact on the socio-economic environment. The existing quality of life index of the region will increase due to generation of direct and indirect employment opportunities, increase in standard of living and creation of infrastructural facilities for the people as also due to adoption of villages by the refinery project authorities. The availability of petroleum products such as kerosene, petrol, diesel and LPG gas will result in convenience to the local people. For the country, the refinery will save valuable foreign exchange as also it will lead to earning of additional revenue by taxation system.

Environmental Management Plan

Based on the baseline data collected and detailed studies done with regard to the significant issues, mitigative measures can be planned which are as follows:

Air Environment:

Use of low sulphur high stock fuel should be adopted to minimise sulphur dioxide emissions.

To further reduce the levels of so2, sulphur recovery unit can be installed.

Preventive maintainence of different units should be taken up on regular basis.

The carbon monoxide emissions can be eliminated by incinerating the gases in waste heat CO boilers.

Noise Environment:

The high noise generating machines should be provided with enclosures and mufflers.

Workers who are exposed to high noise levels should be provided with protective devices such as ear muffs or ear-plugs.

Germs and green corridoorsshould be created to minimise noise levels in the vicinity of the refinery.

Water Environment:

In plant control measures should be initiated to reduce the waste water flows and concentration of pollutants.

Emphasis should be given to recycle and re-use concepts.

Suitable treatment should be planned and adopted for the effluents created from various operations. The treated effluents can be used for fire fighting and plantation purposes.

Proper management of hazardous wastes has to be ensured with the introduction of checking and testing the dump sites for corrositivity, reactivity, ignitiability and toxicity of the dumped material before and after treatment of these wastes.

Proper management of solid and semi-solid wastes has to be done to minimise leaching effects

Land Environment:

Recycling and re-use of effluents for development of greenbelt should be adopted.

Development of scientifically designed greenbelt on land areas around residential, commercial and within the refinery process units should be undertaken.

Dewatered oily sludges after drying can be used as supplementary fuel to enhance the heat value of the wastes.

Socio-economic Environment:

The establishment of refinery should tahe into account the increase in labour force and corresponding pressure on basic amenities.

Various infrastructurre facilities such as water supply, sanitation, medical facilities, shopping centres etc. should be provided by the project authorities to the workers.

At least one or two villages should be adopted by the refinery authorities and necessary facilities should be provided to the villages.

Health camps and training camps should be conducted by the refinery authorities on regular basis in nearby villages so as to earn their goodwill.

FUTURE OF ENVIRONMENTAL IMPACT ASSESSMENT

REIA processed in India at present suffers from lack of trained man power to carry out comprehensive studies, the criteria for objective screening and scoping are not very well formulated. The threshold values and standards are not available for all the environmental descriptors. Most of the assessment and predictions depend on subjectivity in the identification of impact area. The precise and appropriate evaluation techniques are not available and follow up programs are also lacking.

To overcome these problems a detailed work is needed in the following areas-

- Preparation of explicit guidelines of major development activities viz. industry, water resource development, mining, transportation energy and construction.
- Development and improvement of predictive techniques.
- Development and evaluation techniques for unavoidable impacts of a project.
- Development of software computer aided REIA
- Preparation of development plans based on regional assimilative and supportive capacities
- Development of environmental data base
- Development of training facilities for REIA

NEERI has prepared revised draft guidelines for environmental review of industrial developments for consideration by department of environment.

The highlights are :

- Operational framework for environment review
- Guidelines for state level screening
- Guidelines for scoping
- Guidelines for REIA
- Environmental management plan
- Post project monitoring
- Disaster management plan

The over all thrust is to achieve the goal of sustainable development. Modernization based on ecological principles involves restructuring of the economy.

These structural charges could be brought about by the delinking of economic growth from consumption of ecologically significant resources.

A national environmental plan should be prepared taking into account the following aspects:

- An equitable access to environmental resources must be ensured.

- Since environmental issues are closely linked with developmental policies and practice, environmental goals and actions need to be identified and defined in relation to development objectives and policies.

- The anticipative and preventive policies are the most effective and economical in minimizing potential environmental problems.

- Environmental constraints are often related to the state of technology and socio-economic conditions which need to be improved and managed to achieve sustained economic growth.

- Participation and consensus of the concerned groups must be ensured to ascertain effective developmental and environmental policies and programs.

- Conservation of resources, species and ecosystems must be given proper attention.

FUTURE RESEARCH NEEDS

1. Compilation of complete and accurate environmental data bank particularly the information on geology and soils , ground water , natural plant communities , climate , current census , property records and land use classification.

2. Refinement of techniques for measuring impacts on biological communities

3. Refinement of techniques for measuring impacts on social wellbeing

4. More complete consideration of irreversible impacts

5. Better methods for predicting cumulative Impacts quantification techniques are needed for predicting long term changes induced by a project and for assessing the cumulative impacts of new land uses that may result.

6. Refinement of environmental impact matrices – further research should be performed to systematically assign impact weighing factors , to meaningfully identify areas of impact relevant project components and to separate secondary from primary impacts .

7. More systematic techniques for determining the best use of project sites the environmental carrying capacity concept should be refined for individual projects as well as multiple projects .

8. Further work is needed to accurately identify and weigh the various

environmental indicators to establish air , water and land carrying capacities.

9. Refinement of cost benefit analysis for a particular project

10. Better methods are needed for computing scores for alternative projects to realistically weight both the economic and environmental consequences for particular projects.

11. Environmental sciences priorities for land use research

12. Air and water pollution impact of various land use problems

13. Determination of biological and physical factors that make certain ecological areas inherently fragile

14. Alternative rates of energy consumption resulting from various settlement patterns

15. Ecological aspects of the preservation of inland and coastal wetlands

16. Environs impacts of specific large scale inter basin transfer of water

17. Maintenance cost of synthetic biological communities

18. Criteria for the location of land uses to minimize human stress caused by noise

19. Settlement trends and its effects on supply and demand for environmental resources

20. Effects of changes the supply demand and pricing of environ , resources on settlement patters at national , regional and local levels

21. Policy implications of the relationship among existing central cities , regional hinterlands , new communities and growth centres in logging regions

22. Policy implications of development of central cities and outlying settlements for the lives of minority groups and the poor.

Annexure-I

CHECKLIST FOR DATA COLLECTION IN EIA STUDIES

AMBIENT AIR QUALITY

The ambient air quality within 10 km radius around the proposed site should have to be monitored with respect to the following parameters. The monitoring should be carried out at minimum five (5) locations and throughout the season (for three months), at least twice a week frequency at 24 hourly basis.

Suspended Particulate Matter	SPM
Respirable Particulate Matter	RPM
Oxides of Sulphur	SO2
Oxides of Nitrogen	NO x
Carbon monoxide	CO
Ammonia	NH3
Hydrocarbons (methane & non-methane)	HC

MICRO-METEOROLOGY

The information on Micro-meteorology with respect to the following parameters should be collected by installing an automatic weather sampler at the proposed site. The monitoring should be carried out continuously for one full season and the hourly readings with respect to the following parameters should be recorded.

- Wind speed
- Wind Direction
- Ambient Temperature
- Cloud Cover (based on visual observations)
- Mixing Height
- Relative humidity

WATER QUALITY (Surface / Ground Water)

The information on water quality in the study area should have to be collected by taking samples from various surface water sources and at different locations for ground water. At least a total of 10 locations should be selected and minimum three samples at each location should be collected. The samples should be analysed with respect to all parameter mentioned in IS 10500 – 1991 (Drinking Water Parameters).

TRAFFIC DENSITY AND NOISE LEVEL

Information on Traffic Volume and Ambient Noise levels should be collected within the study area.

The information on traffic volume on major roads/highways within the study area should be collected. The information must pertain to number of vehicles/hour for various categories of vehicles (e.g. light, medium and heavy) and should be continuously recorded for 24 hours. The total volume for 24 hours for all identified categories of vehicles should be reported.

The data on noise levels should be collected at minimum six locations. At each location, the noise levels should be continuously monitored and the hourly equivalent noise levels should be furnished. The information then should be used for computing day, night noise levels.

LAND ENVIRONMENT

The information on land environment should be collected with a view to:
identify the land use/land cover pattern within the study area
analyse the soil quality with respect to relevant parameters of interest.

LAND USE /LAND COVER PATTERN

The information on land use/land cover pattern around the proposed site within the study area (10 km radius) should be collected using the Satelite imageries by Remote Sensing Technique. The information so collected should be utilised for preparing Land Use/Land Cover maps on the scale 1:50000 covering the following features:

- Forests
- Other forms of greenery
- Water bodies
- Built up land
- Waste land
- Crop land
- Wet land

SOIL QUALITY

The soil quality should be analysed with respect to the parameters given below. The samples should be collected at minimum number of six locations and at least three samples should be taken from each location. The selection of locations should be carried out with a view to bring out various salient aspects of the land environment surrounding the proposed site.

Type of soil, Texture, % sand, % silt, % clay, % Sodium Adsorption Ratio (SAR) and Specific Gravity, Bulk Density, Porosity/void ratio, Oil and grease, HC, Ca Mg. K, PH, Chlorides, Sulphates, Carbon, Fe, Cu SN Mn, B. NaCl, Na z-CO3.

FLORA/FAUNA

The information on Flora/Fauna within the study area should be collected based on the secondary information (published data / literature) coupled with limited field surveys. The information should broadly pertains to the following:

- Terrestrial Flora/Fauna including any wild life
- Aquatic Flora/Fauna
- Avi Fauna

SOCIO-ECONOMIC INFRASTRUCTURE

The information within the study area should be collected with respect to demographic characteristics, health status, basic amenities like drinking water resources and water supply, medical facilities, education, sanitation, recreation and other facilities. All the sensitive locations falling within 10 km radius of the project site should be identified and listed out. Information should also have to be collected on all major industrial and commercial activities, monuments of cultural and historical importance, places of scenic beauty within the study area.

The above data should be collected based on the secondary information (Census Data/Published data/Literature) coupled with field surveys/visits.

Annexure - II

CHECKLIST FOR POTENTIAL DETERMINANTS FOR EIA OF COASTAL MARINE PROJECTS / DEVELOPMENT

WATER QUALITY

- Initial Dilution
- Farfield Dilution
- Concentrations of Dissolved Oxygen. Suspended Solids, and pH in Receiving Environment
- Sediment Oxygen Demand
- Sediment Oxygen Demand Following Sediment Resuspension
- Concentrations of toxic substances in receiving Environment
- Light Transmittance
- Aesthetic Considerations (colour, Odour, slicks, etc)
- Fecal Coliform / Entero-cocci Bacteria Concentrations

SEDIMENT QUALITY

- Conventional Sediment Characteristics (e.g. Grain size, Organic Content; Redox Potential)
- Sediment Transport, Deposition and Re-suspension
- Organic and Total Sediment Deposition
- Deposition of Toxic Substances Associated with Particulate
- Behavior of Settled Effluent Particles in Near Surface Sediments
- Concentrations of toxic Substances in the Sediments

SENSITIVE HABITATS

- Presence of Sensitive Habitats (e.g. Coral Reefs, Sea-grass Beds, Kelp Forest)
- Presence of Habitats Critical for Threatened or endangered Species
- Potential for impacts to Sensitive and Critical Habitats
- Potential for impacts to Threatened or Endangered Species

BIOLOGICAL RESOURCES

- Commercial and Recreational Fisheries
- Benthic infaunal Communities
- Demersal Fish and Mega-invertebrate Communities
- Pelagic Fish Communities
- Plankton communities
- Sea surface Micro-layer
- Microbial contamination

AQUATIC TOXICOLOGY

- Bio-accumulation of Toxic Substances
- Acute and Chronic toxicity
- Histopathology
- Toxicant Transport and fate
- Ecological Risk Assessment
- Regulatory toxicology

BIOFOULING AND CORROSION

Submerged structures which are subjected to both biofouling and corrosion

NOISE

Noise level

LIGHT

Influence of light on living resources

AIR POLLUTION

- Meteorological Data
- Ambient Air Quality Data

PUBLIC HEALTH

- Pathogens Affecting Water contact Activities
- Pathogens Affecting Consumption of fish and Shellfish
- Health risk Assessment of Chemically Contaminated Aquatic Organisms
- Health risk Assessment for Chemical Contaminants in Sediment and Water

CONCLUSION

Environmental considerations have generally been neglected in development planning process. Exploitation of nature without due care to it's repercussions could lead to the disruption of social harmony due to loss of human life, disease, destruction of forest/ wildlife resources, degradation of fisheries and all these negate the very objective of development, as has been painfully realized by most of the developed countries. While the objective of development has been to improve the quality of life, man's overpowering desire to enjoy maximum comfort and happiness has caused him to exploit the free goods and services of nature viz. water, air, land and purification capacity to the point where the capacity of environment to stabilize itself has been seriously impaired.

Whether technological development or industrialization is necessary or not has never been a question for debate. Without doubt, technological development has been a life line of all developing countries. It is capable of providing the kind of support needed to enhance the living standards and amenities. It is indeed a vehicle through which the developing countries look into the future with hope. But if it's to be sustained in the long run, in view of enormous inputs of natural resources it requires and the amount of damage it can proliferate if performed with callous disregard to the natural environment, it must encompass environmental considerations at its planning stages. Correct choice of technology that would minimize the impact on environment and enhance the quality of life is a necessity and not a luxury affordable by developed countries alone.

Corrective action taken at a later date will cost more than the preventive measures. Accordingly, considerations to the environmental aspects of

development is no loss but a gain as remedial action at a future date will cost considerably more and the damage done may be irreversible. Any development requires not only monetary cost-benefit but also an impact assessment to look into the environmental impacts and plan for the mitigative measures.

The importance of EIA lies in the fact that the study serves as a baseline for post project management of environmental issues. This makes the precision of the content of EIA report very important. Due care must be taken to ensure that data generated/collected reflects the most representative prevailing conditions. In this reference, proper procedures as laid down in standard literature must be followed.

It has now been accepted that developmental projects do not operate in isolation from their surroundings. They have both positive and negative impacts over other processes and activities occurring concurrent with the project. An EIA identifies key parameters depicting cumulative affects on the ecosystem and looks in to ways and mans to mitigate the negative impacts.

The advent of EIA studies is of relatively recent origin amongst the field of applied sciences and the process of its maturing is still under way. Changes in the technique can be expected in the future with better understanding of toxicology, monitoring and evaluation techniques.

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