

**INDIA - The Hazardous Waste Management
Project**

E-216

Vol. 1

Sectoral Environmental Assessment Report

Submitted to

The World Bank

by

**Ministry of Environment and Forests
New Delhi**

September 1997

This Draft Report has been prepared by the Environmental Management Centre, Mumbai, for the Ministry of Environment and Forests, Government of India. The co-operation extended by the Ministry of Environment and Forests, World Bank, State Pollution Control Boards of Andhra Pradesh, Gujarat, Maharashtra, Tamil Nadu and National Productivity Council is gratefully acknowledged.

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ABBREVIATIONS

APIIC	Andhra Pradesh Industrial Infrastructure Corporation
AUS-AID	Australian Aid
APPCB	Andhra Pradesh Pollution Control Board
APSIDC	Andhra Pradesh State Industrial Development Corporation
BARC	Bhabha Atomic Research Centre
BATNEEC	Best Available Technologies, Not Entailing Excessive Costs
BOB	Bank of Baroda
BOM	Build Operate Manage
CETP	Common Effluent Treatment Plants
CHWTFs	Common Hazardous Waste Treatment and Disposal Facilities
CII	Confederation of Indian Industries
CPCB	Central Pollution Control Board
EAP	Environment Action Program
EIA	Environmental Impact assessment
EMP	Environmental Management Plan
EPTRI	Environmental Protection Training and Research Institute
ETP	Effluent Treatment Plants
FI	Financial Institutions
GACL	Gujarat Alkalies and Chemicals Limited
GDP	Gross Domestic Product
GEAC	Genetic Engineering Approval Committee
GIDC	Gujarat Industrial Development Corporation
GIS	Geographical Information System
GOI	Government of India
GPCB	Gujarat Pollution Control Board
GTZ	Gesellschaft Technische Zusammenarbeit
HWM	Hazardous Waste Management
HWMP	Hazardous Waste Management Project
HWTDF	Hazardous waste treatment and disposal facility
IBSC	Institutional Bio-Safety Committee
ICICI	Industrial Credit and Investment Corporation of India Limited
IDA	International Development Agency
IDC	Industrial Development Corporation
IL&FS	Infrastructure Leasing & Financial Services
IPC	Industrial Pollution Control project
IPP	Industrial Pollution Prevention

IPCL	Indian Petrochemicals Corporation Ltd.
ITF	Interim Trust Fund
MIDC	Maharashtra Industrial Development Corporation
MIS	Management Information System
MOEF	Ministry of Environment and Forests
MPCB	Maharashtra Pollution Control Board
MSW	Municipal Solid Wastes
NEERI	National Environmental Engineering Research Institute
NGO	Non Governmental Organization
NIMBY	Not In My Back Yard
NPC	National Productivity Council
NRC	National Research Council
NRSA	National Remote Sensing Agency
NTS	Non Technical Summary
OECD	Organization for European Community Development
PAP	Project Affected Persons
PCB	Pollution Control Board
PGF	Process Guidance Framework
PIC	Public Information and Consultation
RPF	Resettlement Policy Framework
R&R	Resettlement and Rehabilitation
RTO	Road Transport Officers
SPCB	State Pollution Control Boards
SOE	Statement of Expenditures
SDOE	State Department of Environment
SMI	Small and Medium Scale Industries
SSI	Small Scale Industry
SWOT	Strengths Weaknesses Opportunities and Threats
TBIA	Thane-Belapur Industries Association
TOR	Terms of reference
TNUDF	Tamil Nadu Urban Development Finance Corporation
TNPCB	Tamil-Nadu Pollution Control Board
TRI	Toxic Release Inventory TRI
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WB	World Bank
WMDBI	Waste Minimization Database of India
WMC	Waste Minimization Circles

EXECUTIVE SUMMARY

Preface

This Sectoral Environmental Assessment Report (SEAR) has been prepared in response to the requirements of the World Bank. The purpose of an SEAR is to undertake a sector-wide environmental analysis before investment priorities have been determined as a means to support integration of environmental concerns into long-term development and investment planning. In the context of the proposed project, the SEAR examines approaches to dealing with hazardous waste, and recommends the environmentally sound management options.

This executive Summary is arranged as follows :

- ◆ 1.0 - Introduction
- ◆ 2.0 - Policy, Legal and Institutional framework of India.
- ◆ 3.0 - Status of Hazardous Waste Management in India
- ◆ 4.0 - Sector-wide Strategic Approach
- ◆ 5.0 - Project Description
- ◆ 6.0 - Process Guidance Framework and Public Consultation Process
- ◆ 7.0 - Implementation Arrangements

The SEAR was prepared by the Ministry of Environment and Forests, with the assistance of Environmental Management Centre, Mumbai. The first draft of the SEAR was prepared in February 1997 and reviewed by the World Bank. The revisions recommended were incorporated and a second draft was prepared by August 1997. Public Information and Consultation of the second draft of the SEAR was held in Ahmedabad, Chennai, Hyderabad, Mumbai and New Delhi by the Gujarat State Pollution Control Board, Tamil Nadu State Pollution Control Board, Andhra Pradesh State Pollution Control Board, Maharashtra State Pollution Control Board and the Ministry of Environment and Forests respectively. The recommendations arising from the PIC were incorporated where appropriate and the final SEAR was prepared in September 1997.

1.0 Introduction

1. Rapid urbanization and industrialization in India has resulted in increased needs for proper disposal of industrial wastes. There has been a significant increase in industrial sectors such as pesticides, drugs and pharmaceuticals, textiles, dyes, fertilizer, tanneries, paint, chlor - alkali etc. which have a major potential for generation of hazardous wastes.

Hazardous wastes when not adequately handled and disposed, can cause immediate, short term public health problems as well as long term environmental contamination and degradation of natural resources. Proper treatment and disposal of such hazardous wastes is much more expensive and complex than dealing with the conventional or non-hazardous wastes / residues.

2. It is therefore essential to improve the monitoring, enforcement and physical infrastructure needed for hazardous waste management while promoting recycling, recovery of materials, and avoidance of generation of hazardous wastes. The proposed Hazardous Waste Management Project (HWMP) addresses this urgent need, in line with the recommendations of Government of India's Environmental Action Programme (EAP).

3. The present study has been undertaken to carry out a Sectoral Environmental Assessment (SEA) of the HWMP. Sector Environmental Assessment (SEA) as defined by the Environmental Assessment Source Book Update No. 4 of the World Bank (World Bank, 1993), offers an opportunity for sector-wide environmental analysis before investment priorities have been determined.

In the context of the HWMP, the SEA has been used to develop its design in terms of broad components and supporting projects/sub-projects, and to find solutions, alternatives and strategies which are cost-effective, environmentally sound and socially acceptable.

2.0 Policy, Legal and Institutional framework of India.

4. In addition to the commitment to protect the environment enshrined in the Directive Principles of State Policy, the "Policy Statement for Abatement of Pollution" brought out by the GOI in 1992 also emphasizes the government's commitment to prevent further deterioration of the environment and to shift emphasis from identification of solutions for problem areas towards their actual implementation. One of the problem areas identified is hazardous industrial and commercial wastes and their indiscriminate disposal.

5. - India's EAP, 1994, identifies hazardous industrial and commercial waste and their indiscriminate disposal resulting in land, surface and ground water contamination as one of the priority problem areas. These wastes include heavy metals, cyanides and pesticides, complex organic compounds (such as H-acids) and others are toxic to humans, plants or animals, are flammable, corrosive, or explosive, or have high chemical reactivity. Proper treatment and disposal of these materials is much more expensive and complex when compared to common air and water pollutants.

6. In addition to enacting regulations, and strengthening institutions at national and state levels in this priority area, financial assistance from bi-lateral and multilateral agencies has been obtained for implementation of effective environment improvement measures. The MOEF has now decided to seek World Bank assistance for a program of sound management of hazardous waste in the country. This Sectoral Environment Assessment Report (SEAR) presents an analysis, sectorwise of the existing situation in Hazardous Waste Management and integrates environmental concerns to support long-term investment plans in this area.

7. **Legislation.** The relevant umbrella Act is the Environmental Protection Act (1986). Deriving from this Act, in 1989, the Government of India issued the Hazardous Waste Management and Handling Rules to govern the generation, collection, treatment, transport, storage, disposal and import of hazardous wastes, with responsibility for enforcement vested with the State Pollution Control Boards. Additionally, in 1991, MOEF issued Guidelines for Management and Handling of Hazardous Wastes for (a) generators; (b) transport of hazardous waste; and (c) owners/operators of hazardous storage, treatment and disposal facility. In 1995, MOEF issued Guidelines for the Safe Road transport of Hazardous Chemicals that established basic rules for Hazardous Goods Transport and provided for the establishment of a Transport Emergency Plan and provisions for the Identification and Assessment of Hazards.

8. **Institutions.** The responsibility for monitoring and enforcement of the hazardous waste rules are vested in the State Pollution Control Boards, which grant authorization for import, collection, treatment, storage, transportation, and disposal, and follow up of any accidents in handling hazardous material.

3.0 Status of Hazardous Waste Management in India

9. **Size of the Problem.** A comprehensive picture of hazardous waste generation in India is not available. Based on international and national waste generation factors and a sample of state-wide surveys, hazardous waste generation is estimated at 5.0 million tons/year. As per preliminary estimates, there are approximately 8792 hazardous waste

generators in 20 States. The States of Andhra Pradesh, Gujarat, Maharashtra, and Tamil Nadu together comprise 60% of the hazardous waste generated in the country. The main SEA report describes details on the major hazardous waste generating districts/areas in India (Table A).

Table A. Status of hazardous waste generated in Gujarat, Maharashtra, Andhra Pradesh, and Tamil Nadu

State	No. of districts inventoried	Quantity of Hazardous Waste Generated (million tons/ annum)	Categories in which maximum waste is generated	District / Region showing maximum waste generation
Andhra Pradesh	All districts	0.10	Cat. 12 - 30% Cat.6 - 16%	Ranga Reddy
Gujarat	All districts	0.50	Cat. 12 - 45% Cat. 9 - 43%	Vadodara district
Maharashtra	All districts	1.60	Cat. 12 - 78% Cat. 17 - 12.8%	Thane, Raigad, Pune
Tamil Nadu	All districts	1.40	Cat. 12 - 41.4% Cat. 10 - 28%	North Arcot, Anna, MGR, Coimbatore

Note : Cat.6 - Halogenated Hydrocarbons including solvents; Cat. 9 - Wastes from Dyes and Dye Intermediates; Cat.10 - Waste Oil and Oil Emulsions; Cat. 12 - ETP Sludge; Cat.17 - Off specification and discarded products

10. As per SPCBs, who are responsible for enforcement of the hazardous waste rules, for the 8800 hazardous waste generator units, 6686 have valid authorizations for handling of the hazardous residues. While some individual units have in-house treatment and disposal facilities, there are no centralized plants that can be accessed by small and medium scale units.

11. Disposal is the last option for dealing with hazardous waste. Prior to disposal, efforts should be encouraged to avoid, minimize, recycle and treat the residues. The major portion of hazardous waste generators require landfills for permanent disposal of waste. In the absence of proper and secure landfills, indiscriminate dumping could have disastrous consequences on the environment and health. Considering also rapid industrialization and large imports of waste for recycling, specially metallic waste, there is an urgent need to build infrastructure for proper treatment and disposal of hazardous waste.

12. **Health Impacts.** Exposure to hazardous waste can affect human health through direct exposure or indirectly through contamination of ecosystems. Direct exposure can

lead to chemical contamination which has a detrimental impact on public health and environment.

13. **Environmental Impacts.** Adverse effects on ecosystems (terrestrial and aquatic) result from improper disposal or dumping of hazardous waste. When discharged on land, heavy metals and certain organic compounds are phytotoxic and at relatively low levels of concentration can adversely affect soil productivity for extended periods of time. Residues from pesticides and herbicide manufacture as well as other biocides have been traced to reductions in number of species in areas affected and chronic toxic effects on subsequent generations of birds and other animals. Discharge of acidic and alkaline waste overwhelms the natural buffer capacity of surface waters and soils and may result in the mass reduction of species. Of particular concern is the dispersal into surface waters where widespread contamination may result from a single source.

14. **Key Problems.** The following are the key problems in hazardous waste management: a) insufficient information on the total quantity and types of waste; b) inadequate compliance with regulations; c) lack of awareness regarding risks to health, safety and environment; and d) lack of proper infrastructure for treatment and safe disposal.

15. Though partial information is available regarding location-specific production of hazardous waste, and the current disposal patterns, it is difficult to estimate economic cost of improper disposal of hazardous waste for several reasons in India: lack of epidemiological "dose-response" functions linking the level of exposure to various toxins to negative impacts on human health and environment; (b) lack of data on the size of the population actually exposed to various toxins, by geographic area, and their level of exposure. The exposure can be direct (e.g., through drinking water), or indirect (e.g., through the consumption of toxin-laden fish); (c) lack of data on the ecological impact of toxins in water, soil, and air; (d) potential loss of agricultural production and other ecological services due to contamination; (e) the potential liability posed by toxic contamination of industrial land; and (f) the magnitude of the potential disincentive to new investors, particularly international investors, created by the poor handling facilities for, and the unattractiveness of, hazardous waste. There is therefore an urgent need to address the problem of hazardous waste at a national level and to formulate a comprehensive plan of actions. The proposed project would support these actions.

4.0 Sector-wide Strategic Approach

16. There are three possible ways of approaching the hazardous waste problem in India:

Approach A. Do nothing, and simply accept the economic, social, and environmental impacts of hazardous waste as being an acceptable cost of development into the foreseeable future. However, for an environmentally sensitive and democratic society such as India, this alternative is highly unacceptable. There are several outstanding cases of severe damage to public health and the ecosystem, in India, due to improper management and disposal of hazardous wastes as explained in detail in Chapter 2.0. The cost of inaction will be prohibitive and may jeopardize future industrial growth as well as overall quality of life.

Approach B. Do nothing until the problem becomes so severe that crisis remediation (defined as investment in hazardous waste treatment, and clean-up contaminated sites) and compensation to those affected is called for.

Approach C. Adopt a precautionary strategy, starting with improved hazardous waste management in selected states of high industrial concentrations and/or potentially rapid growth of high hazardous waste generating industries.

17. The proposed project builds on **Approach C** as being the most consistent with the economic, political, and social reality in India today. India has decided to adopt a more precautionary approach to hazardous waste management. With modern hazardous waste management regulations in place, the next step is to improve the monitoring, enforcement and physical infrastructure needed for their effective implementation, while promoting recycling, recovery of materials, and avoidance of generation of hazardous residues and enabling the development of properly designed infrastructure for treatment and disposal.

18. Sectoral Goals. The long-term objective is to ensure that industrial growth in India is environmentally sustainable. In this context, MOEF has taken a phased approach, first dealing with common pollutants, before moving on to more complex issues such as hazardous wastes. The approach has also focused on the most industrialized states in India to begin with. The approach to new industrial units is to ensure that they incorporate environmental safeguards during plant design and operation.

5.0 Project Description

19. The proposed project will (i) assist the MOEF and the participating state governments to strengthen their enforcement and monitoring capacities; (ii) support the development of strategic approaches and application of proven technologies to Indian situation; (iii) provide financial assistance to industrial units to invest in waste avoidance, minimization, and re-use at the plant and process level; and (iv) finance the establishment of Common Hazardous Waste Treatment and Disposal Facilities (CHWTDFs).

20. The Enforcement and Compliance Component. This component will strengthen the monitoring and enforcement capacity of the State Pollution Control Boards in those States where the most serious hazardous waste concerns have arisen. These are the States of Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu. The MOEF has also made provisions in the component to include another 2 State Boards for institutional strengthening for hazardous waste management. The various elements / sub-projects of the institutional component are defined in the main report.

21. The Technical Assistance Component. The Technical Assistance component is directed towards providing assistance to the Boards and the MOEF. This includes training programmes for capacity strengthening of Board personnel in the areas of waste minimization, analytical methods for hazardous chemicals and residue detection, technologies for treatment, disposal, and storage of hazardous wastes as well as for development of the information management systems in the Boards. A detailed description of the activities to be supported are presented in the main report.

22. The Infrastructure Development Component. The component is designed to support priority investments in hazardous waste management. This component will (i) provide financial assistance to industrial units to invest in waste avoidance, minimization, and re-use at the plant and process level, as well as on-site treatment of the hazardous wastes; and (ii) finance a pilot effort for the establishment of CHWTDFs. Eligibility criteria for sub-projects is described below. The project is expected to finance upto 6-8 CHWTDFs. The main SEAR lists the priority areas where these facilities are likely to be located.

23. Eligibility Criteria for Sub-projects under the Investment Component. The investments (sub-projects) to be financed will meet the criteria as listed in the main SEAR. The sub-projects will either consist of schemes for hazardous waste prevention, minimization, recycling or reuse of otherwise hazardous residues or consist of treatment, storage and/or disposal facilities for proper management of hazardous waste. Amongst other conditions, the subprojects will need to be assessed through an Environmental Impact Assessment that meets the requirements of the MOEF regulations and in conformance with applicable World Bank guidelines. When dealing with thermal destruction of residues (incineration), sub-projects will not burn halogen or mercury containing waste. These residues are excluded. The project will fund pilot plant studies required for development of a long term containment and disposal strategy for these residues. Medical and nuclear waste are also excluded from the project scope. In terms of location, the centralized facilities may be located to the extent possible in land zoned for industrial use.

24. Status of Site Identification for CHWTDFs. Efforts are underway towards identifying and notifying sites for the CHWTDFs. Of the 24 sites already identified, eight have been notified in the four participating States. Sites selection process follows the MOEF guidelines and the Process Guidance Framework, including public consultation on the draft EIA.

6.0 Process Guidance Framework and the Public Consultation Process

25. Process Guidance Framework(PGF) for Environmental and Social Assessment of Sub-projects under the Investment Component. The process mentioned herein is a composite of the procedures stipulated by the GOI (MOEF, 1989; MOEF 1994) and the World Bank (World Bank, 1990; World Bank, 1991). MOEF oversees the EIA process. The responsibility for review and approval of EIA report lies with the State Department of Environment (DOE) and the State Pollution Control Board (SPCB). The former is also responsible for notifying the acceptable site for the facility following the approval of the EIA report. The EIA studies are conducted by the proponent with the assistance of a team of consultants. For the FIs, the EIA is a tool through which environmental and social risks, from an investment standpoint, could be determined. The EIA provides the community with the means to communicate with the proponent and government on the project design. The World Bank will review all the EIA reports and Resettlement Action Plans. An outline of the process guidance framework is presented below. A seven step process guidance framework, inter-alia, is detailed in the main SEA Report which contains generic TORs for EIAs, RAPs, and some suggested tools for public consultation.

26. Public Consultation Process During site selection, every proponent is required to select sites that will not involve involuntary resettlement or rehabilitation, or impacts adversely on marginal or vulnerable groups. In any case, a credible Public Consultation Process (PCP) is crucial to the successful development of the project, including the preparation of an acceptable Environmental Management Plan (EMP) and Resettlement Action Plan (RAP), if required. The proponent should engage a NGO group as part of the Consultant team to design and facilitate the implementation of a suitable consultation process. The Consultant/NGO should continuously re-assess the PCP strategy as feedback is received from information dissemination and consultation. Tools for information dissemination and consultation for the Consultant/NGO are detailed in the main SEA Report.

27. Policy Framework for Resettlement In order to meet the resettlement and rehabilitation requirements of the World Bank, sub-projects financed under the proposed project would be required to follow compensation provisions established under the Land

Acquisition Act of 1894 as amended in 1984 and project specific guidelines described in the main text of the report. A policy guideline cabinet note has been prepared by the Ministry of Urban Affairs and Employment of the policy framework for resettlement. This note has been issued to other departments for comments and MOEF is in favour of this note. This proposed policy, in principle is in agreement with the World Bank's resettlement policy framework.

7.0 Implementation Arrangements

28. Project Management. The Ministry will be responsible for overall monitoring and coordination of all project activities. For the monitoring and coordination function, MOEF will be assisted by a team of consultants who will staff a project coordination and monitoring office. Responsibilities of the office are described in the main text of the report. Project implementation will be the responsibility of: (i) the SPCBs of the participating States, each through a dedicated implementation cell; (ii) the ICICI and the BOB. MOEF will monitor implementation by the different agencies and facilitate the routing of resources to the industries involved in the implementation of the corresponding activities.

29. Project Monitoring. MOEF will monitor the overall implementation of the Hazardous Waste Project, including the capacity building activities in the SPCBs. The participating SPCBs will monitor the performance of in-plant and centralized hazardous waste treatment and disposal facilities through operation, closure and post-closure periods. NGOs and community groups will be associated in monitoring activities.

Chapter 1

INTRODUCTION

- 1.1 Problem of Hazardous Wastes
- 1.2 Sectoral Environmental Assessment
- 1.3 Organization of the Report

1.1 Problem of Hazardous Wastes

Rapid urbanization and industrialization in India has resulted in increased needs for proper disposal of industrial wastes. The industrial sector in India has quadrupled in size in the last three decades. There has been a significant increase in industrial sectors such as pesticides, drugs and pharmaceuticals, textiles, dyes, fertilizer, tanneries, paint, chlor-alkali etc. which have a major potential for generation of hazardous wastes.

Hazardous wastes from these industrial sectors contain heavy metals, cyanides, pesticides, complex aromatic compounds and other chemicals, that are toxic to humans, plants or animals, are flammable, corrosive, or explosive, or have high chemical reactivity. Hazardous waste contribution from industrial sources is also critical due to the wide geographical spread of industrial units in the country, thereby leading to region wide impacts.

Hazardous wastes when not adequately handled and disposed, can cause immediate, short term public health problems as well as long term environmental contamination and degradation of natural resources. Proper treatment and disposal of such hazardous wastes is much more expensive and complex than dealing with the conventional or non-hazardous wastes/residues. Experiences in a number of developed countries suggests that cleaning up of hazardous wastes at a later stage is much more expensive in the long term as compared to its prevention at source.

It is therefore essential for the industrialized states of India to improve the monitoring, enforcement and physical infrastructure needed for their effective implementation, while promoting recycling, recovery of materials, and avoidance of generation of hazardous wastes. The proposed Hazardous Waste Management Project (HWMP) addresses this urgent need, in line with the recommendations of Government of India's Environmental Action Programme (EAP).

The objective of the HWMP is to assist in the implementation of a modern and sustainable hazardous waste management system in the country. The project is expected to assist in modernizing the regulatory framework, strengthening the institutions in charge of enforcement and monitoring, and financing priority investments in hazardous waste minimization, treatment, and disposal.

The present study has been undertaken to carry out a Sectoral Environmental Assessment (SEA) of the HWMP.

1.2 Sectoral Environmental Assessment

Sector Environmental Assessment (SEA) as defined by the Environmental Assessment Source Book Update No. 4 of the World Bank (World Bank, 1993), offers an opportunity for sector-wide environmental analysis before investment priorities have been determined. It also supports integration of environmental concerns into long term development and investment planning. SEA is most commonly applied in the context of sector investment programmes involving multiple sub-projects. An illustration of the application of sectoral EA in project planning is shown in Figure 1.0. The figure illustrates the potential role of sectoral EA in the planning of a sectoral investment programme. The SEA analyses a proposed programme and its alternatives thus helping design the final programme including the process of environmental screening and review of sub-projects.

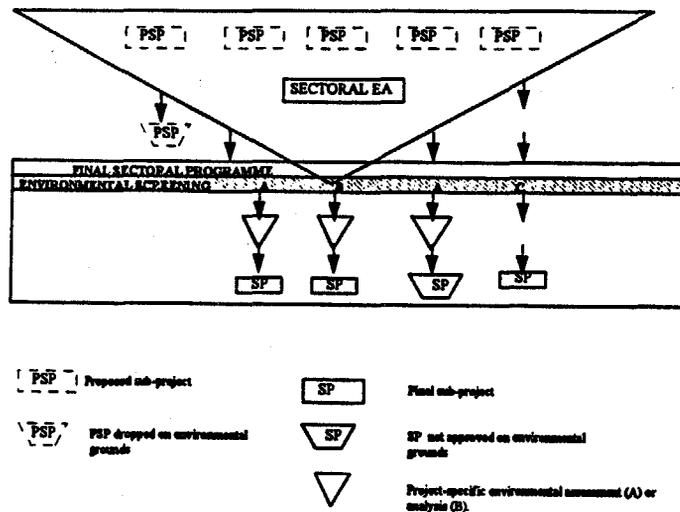


Figure 1.1: Sectoral Environmental Assessment in Programme and Project Planning : An illustration of its application to a sector investment programme (World Bank, 1993)

SEA makes an inquiry into the fundamental alternative of whether to intervene in a situation by a strategy or leave the situation as it is. If the arguments for the intervention are convincing, then alternatives are identified at the broad level of policies and strategies. The policies and strategies at the sector level, in turn, trigger a number of

specific sub-projects, which need to be further addressed at the Project level Environmental Assessment.

In the context of the HWMP, the SEA has been used to develop its design in terms of broad components and supporting projects/sub-projects, and to find solutions, alternatives and strategies which are cost-effective, environmentally sound and socially acceptable.

The development of the SEA Report has been interactive and concurrent consisting of discussions, workshops and public information and consultations. These interactions included various stakeholders such as the State Pollution Control Boards, Financing Institutions, Non Government Organizations, Consultants, Research Institutions etc. As an outcome of the discussions, HWMP with its components and projects/sub-projects has been evolved which reduce/eliminate the project risks and maximize the benefits. In this sense, the development of SEA Report has been a truly dynamic and participatory exercise. Figure 1.2 depicts the various activities undertaken in the finalization of the SEAR.

1.3 Organization of the Report

The report is organized in seven chapters and follows in spirit the contents recommended by the SourceBook Update No.4 of the World Bank. Annex 1-1 presents a correspondence between the SourceBook Update No.4 of the World Bank and this SEAR.

The first Chapter introduces the genesis of environmental management in India. It also identifies the need for a time bound and comprehensive management of hazardous wastes in the country.

The second Chapter focuses on the policy, legal and administrative framework both at the national and sectoral level. The relevant national environmental policies, e.g. The Policy Statement for Abatement of Pollution, 1992, Programmes e.g. Environmental Action Programme, 1994, laws and regulations e.g. Environment (Protection) Act, 1986 etc., have been described in this Chapter. Non-environmental laws e.g. The Central Motor Vehicle Act, 1989, and policies e.g. Forest Policy, Social and Resettlement and Rehabilitation related Policies that have significance for the sector utilization of resources, or pollution have also been described.

The national regulatory framework for EA preparation and review viz., the EIA notification (amended January 1997) has also been described. The SEA analyses the institutional capacity of the Ministry of Environment and Forests (MOEF), Government of India and regulatory agencies such as the Central and State Pollution Control Boards.

The analysis has been done in terms of effectiveness and capacity of these regulatory agencies for providing guidelines, setting and enforcing standards, and reviewing environmental assessments.

This Chapter also analyses hazardous waste management sector specific policies, laws and regulations that have environmental implications, e.g. Hazardous Waste (Management and Handling) Rules, 1989.

Chapter 3.0 highlights the existing status of hazardous waste management in the four states of Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu. This Chapter also describes the existing issues and problems specific to hazardous waste management such as impacts on public health and environmental resources. Based on the review of the national and sectoral legal and regulatory framework, as well as the status of hazardous waste management, the need for the project has been identified.

The fourth Chapter presents a sector-wide strategic approach for hazardous waste management. The rationale and underlying policies of the project together with the strategy adopted for project design is presented in this Chapter.

Chapter 5.0 describes the nature and objectives of the proposed project its components and sub-projects under each component, together with the main environmental issues associated with the sector and these programs. The benefits due to the various components are also highlighted in this Chapter. An analysis of alternatives for investment in infrastructure development is also presented. This analysis considers various policy options together with their pros and cons which in turn will help to develop a solution which balances between the costs, risks and acceptance by the public.

The sixth Chapter analyses likely environmental impacts due to the various components and sub-projects. The project design has been done in such a manner so as to minimize the environmental impacts / risks due to the project. This Chapter also recommends broad options for eliminating or reducing to acceptable levels the environmental impacts by following a Process Guidance Framework (PGF). The PGF draws on findings from the analysis of policy, legal and institutional issues as well as the analysis of impacts and alternatives. It serves as a mitigation plan to minimize the risks that are anticipated due to the project and maximize the objectives of the project. A step wise approach has been suggested in the PGF for selection, appraisal and monitoring of sub-projects in the infrastructure development component. This approach which is suggested at three levels viz., project entry level; project appraisal level and project monitoring level is described in detail in this Chapter.

Figure 1.2 Activity chart showing the preparation for the SEAR

Activity	Time														
	96	97													
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Planning Workshop at Gujarat State Pollution Control Board (GPCB)	■														
Planning Workshop at Andhra Pradesh State Pollution Control Board (APPCB)		■													
Planning Workshop at Tamil Nadu State Pollution Control Board (TNPCB)	■														
Planning Workshop at Maharashtra State Pollution Control Board (MPCB)		■													
Joint Workshop at Ministry of Environment and Forests (MOEF)				■											
Procurement Workshop and finalization of procurement plans							■	■	■	■	■	■	■	■	
Workshop on the Identification and Management of Risks associated with establishment of CHWTDFs							■								
Preparation of Sectoral Environment Assessment Report							■	■							
1st Draft of Sectoral Environment Assessment Report								■							
2nd Draft of Sectoral Environment Assessment Report														■	
Public Information and Consultation at GPCB															
Public Information and Consultation at APPCB															
Public Information and Consultation at MPCB														■	
Public Information and Consultation at TNPCB															
Public Information and Consultation at Ministry of Environment and Forests															
Final Sectoral Environment Assessment Report															■

Chapter 7.0, presents the implementation and associated institutional framework for the proposed project monitoring plan. The monitoring plan recommends periodical review and evaluation through quarterly, semi-annual and annual reports.

Chapter 2

**POLICY, LEGAL AND ADMINISTRATIVE
FRAMEWORK**

- 2.1 Review of Environmental Policies and Programs
- 2.2 Institutional Framework for Environmental Management
- 2.3 Comments on the Legislation, Guidelines and the Institutional Framework for Environmental Management in India
- 2.4 Legislations and Institutional Framework Related to Hazardous Waste Management
- 2.5 Relevant International Conventions

Chapter 2 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

India is the first country which has provided for the protection and improvement of the environment in its Constitution. Article 51-(g) of the Constitution states: *"It should be the duty of every citizen of India to protect and improve the natural environment including forest, lakes, rivers and wildlife and to have compassion for living creatures."*

The "Directive Principles of State Policy", an integral and significant element of India's democratic set-up, also contains a specific provision emphasizing the government's commitment to protecting the environment. These constitutional provisions are implemented through various environmental protection policies and laws.

2.1 Review of Environmental Policies and Programs

The various landmark policies and programs formulated by the Government of India for protection of the environment are described chronologically below.

2.1.1 Policy Statement for Abatement of Pollution - 1992

A proactive policy framework for pollution abatement has been developed by the Government of India (GOI) and issued in 1992 as the Policy Statement for Abatement of Pollution. The GOI's stated policy is "to prevent pollution at source". The salient features of this policy are described in Box 2.1.

Box 2.1 - Policy Statement for Abatement of Pollution (Government of India, 1992)

The Government of India issued a Policy Statement for Abatement of Pollution in February 1992. The Policy statement affirms the government's intention to integrate environmental and economic aspects in development planning, with stress on the preventative aspects of pollution abatement and the promotion of technological inputs to reduce industrial pollutants. The overall policy objective is to integrate environmental considerations into decision making at all levels.

Specific steps identified to meet this objective are :

- Prevent Pollution at source
- Encourage, develop and apply the best available practicable solutions
- Ensure that the polluter pays for the pollution control arrangement
- Focus protection on heavily polluted areas
- Involve the public in decision making
- Increase the safety of industrial operations

To achieve the objectives, maximum use will be made of a mix of instruments in the form of legislation and regulation, fiscal incentives, voluntary agreements, educational programs and information campaigns. The emphasis will be on increased use of regulations and an increase in the development and application of financial incentives.

With specific reference to industries, the Policy emphasizes that "while large and medium industrial units will remain totally responsible for control of their pollution, assistance will be provided to small scale industrial units, particularly those located in rural areas, to aid the implementation of pollution control measures". The Policy specifies that this will be achieved by promotion of development and adoption of cleaner technologies.

2.1.2 Environmental Action Programme, 1994

The Ministry of Environment and Forests (MOEF), Government of India (GOI), issued an Environment Action Program (EAP) - India, in January 1994. The EAP prepared by the Government of India is not a policy statement, but provides a focus for environmental programmes to be implemented in the country.

In this EAP, MOEF has identified seven priority areas which are:

- Conservation and sustainable utilization of biodiversity in selected ecosystems.
- Afforestation, wasteland development, conservation of soil and moisture, and prevention of ground and surface water pollution
- Control of industrial pollution, with emphasis on the reduction and management of wastes, particularly hazardous wastes.
- Access to clean technologies,
- Urban environmental issues,
- Development of an alternative energy plan,
- Scientific understanding of environmental issues, training, creation of environmental awareness, and resource assessment.

Under the EAP, considerable attention is focused on the management of natural resources (forests, soil and water conservation). Further, the EAP identifies reduction and/or management of wastes, particularly hazardous wastes, as one of the top priorities for action. A strong need for financial assistance in this area has been indicated by MOEF and Ministry of Finance (World Bank, 1996).

2.1.3 Social and Resettlement and Rehabilitation related Policies

In addition to policies and programs formulated for protection of natural resources, the GOI has also recognized the need for policies relating to protection of social rights. The Indian Constitution provides for the protection of people affected by developmental projects through the provisions of fundamental rights and the directive principles. These guarantees and scheme of governance are as follows :

Guarantees :

Between the fundamental rights and the directive principles in our Constitution, the rights of project affected persons (in particular tribals and other vulnerable groups) are protected. The fundamental rights are enforceable while the directive principles are not. Nevertheless, their importance in guiding State action cannot be denied. Some of the key guarantees covering life, property, equality and culture are :

- Draft National Policy For Resettlement of Persons Displaced as a Consequence of Acquisition of Land (Ministry of Rural Development)

To comprehensively deal with all issues of resettlement, applying to all projects within the Public Sector, Government Sector and Private Sector for whom land is acquired under any legislation

- Draft Non Governmental Organisation (NGO) Policy

To set right the deficiencies in the above national policy, by including concepts such as avoiding displacement, encouraging participation and alternate means of compensation

- The Orissa Resettlement of Project Affected Persons Policy, 1994

To resettle and rehabilitate the affected persons such that they do not suffer from adverse effects and at least their former standard of living is restored

- Government of Tamil Nadu (Resettlement and Rehabilitation) Policy, 1905

This policy, applicable to involuntary resettlement due to development projects, ensures that all project affected persons (PAPs), will be compensated and rehabilitated to improve or at least restore their living conditions and income earning capacity at the pre-project level and will share in project benefits.

- Government of India's Policy Framework for Resettlement

Guidelines for resettlement for developmental projects will draw upon provisions contained in the draft policy on Rehabilitation proposed by the Ministry of Urban Affairs and Employment, GOI. The draft policy is under discussion. This policy, in principle supports the World Bank's Resettlement Policy Framework.

Scheme of Governance :

No provision in the Constitution is specifically concerned with resettlement and rehabilitation. However various Government agencies and specific Ministries are empowered to deal with adverse social impacts and issues of Resettlement and

Rehabilitation (R&R). Compared to the more specific legal instruments on environmental issues, the legislations, notifications, rules and policies on social issues are less definitive.

Some States have resettlement acts or policies which apply to the irrigation sector. In addition, some public sector units in the energy sector have resettlement policies. While Constitutional provisions provide several guarantees to project-affected persons, international agreements on social and cultural issues have limited application.

2.2 Institutional Framework for Environmental Management

In keeping with the scheme of governance as enshrined in the Constitution, the organizational structure for environmental management in India has developed both in the Centre and the State. The involvement of local level bodies is of recent origin and has as yet to be formalized. The structure within both is similar with the Central agencies having overriding powers for policy formulation. The organizational framework of environmental management in India, as well as the agencies responsible for environmental management and their key functions are shown in Figure 2.1.

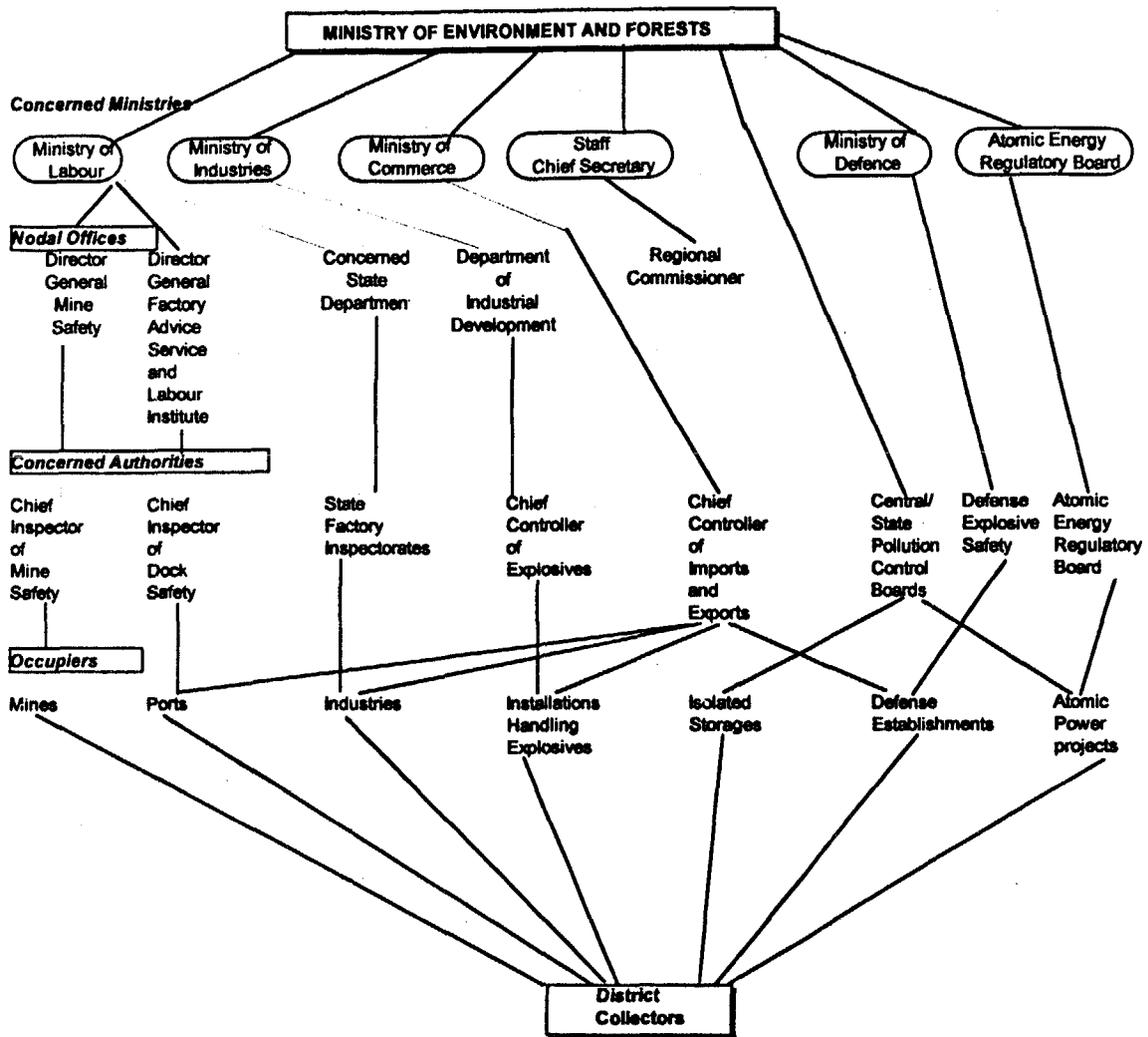


Figure 2.1 Interlinkages between the various agencies involved in environmental management in India
 (Source : Singh A, *Regulating Hazardous Industries in India*, *Steps Quarterly*, Vol. 3, No. 1, 1993)

The organizational structure for environmental management in India at Centre, State and Local levels is discussed below.

2.2.1 Organization Structure for Environmental Management at the Centre

2.2.1.1 Ministry of Environment and Forests

The MOEF, constituted in 1985, is the primary central government agency for planning, promoting and coordinating India's environmental programs. A number of enforcement agencies assist the MOEF in executing its assigned responsibilities. Other Ministries play a supporting role. Enforcement agencies assist the MOEF in executing assigned responsibilities.

The MOEF, is the primary central government agency for planning, promoting and coordinating India's environmental programs. A number of enforcement agencies assist the MOEF in executing its assigned responsibilities. The key functions of MOEF are shown in Box 2.2.

Box 2.2 Key functions of the MOEF (World Bank, 1996)	
Name of the Agency	Key Functions
Ministry of Environment and Forests (MOEF)	<ul style="list-style-type: none">• Environmental policy planning• Ensure effective implementation of legislation• Monitoring and control of pollution• Eco-development• Environmental clearances for industrial and development projects• Environmental research• Promotion of environmental education, training and awareness• Coordination with concerned agencies at the national and international levels• Forest conservation, development and wildlife protection• Biosphere Reserve Program

2.2.1.2 Central Pollution Control Board

The Central Pollution Control Board (CPCB) constituted on September 22, 1974 is responsible for pollution prevention and control. It is a central government body attached to the MOEF.

The executive responsibilities for industrial pollution prevention and control are primarily handled by the CPCB. The CPCB was originally established to implement provisions of the Water (Prevention and Control of Pollution) Act of 1974. The key functions of CPCB are shown in Box 2.3.

Box 2.3 Key functions of the CPCB (World Bank, 1996)

Name of the Agency	Key Functions
<i>Central Pollution Control Board</i>	<ul style="list-style-type: none">• Promote cleanliness of streams and wells• Advise the central government on matters concerning prevention, control and abatement of water and air pollution• Co-ordinate and provide technical and research assistance to State Boards• Information dissemination, training and awareness• Lay down, modify, or annul the standards for a stream or well, and for air quality• Planning and execution of nationwide programs for the prevention, control, or abatement of water and air pollution• Ensure compliance with the provisions of the Environment (Protection) Act of 1986

2.2.1.3 National Environmental Appellate Authority

In addition to this extensive institutional framework, the GOI has recently strengthened the element of public participation in decision making by introduction of the notification on Public Hearing, January 1997. The supporting institutional set-up is the National Environmental Appellate Authority. The Union Cabinet has approved the setting up of this Authority to deal with complaints against development projects that fall under the Environmental Impact Assessment (EIA) Notification, 1988. The aim of setting up of this authority is to enable people directly affected by developmental and industrial projects to present their point of view.

The National Environment Appellate Authority Act, 1997

The Act, effective from January 1997, provides for the establishment of a National Environment Appellate Authority to hear appeals with respect to complaints against development projects that fall under the EIA Notification, 1988, of the Environment (Protection) Act, 1986.

The Authority, to be established by the Government of India, will have its headquarters at New Delhi. It will be headed by a Chairperson who should have been a Judge of the Supreme Court or a Chief Justice of a High Court. The Authority will comprise a Vice Chairperson who should have been Secretary to Government of India for at least two years with expertise in administrative, legal, managerial and technical aspects of environmental problems, and members (not exceeding three) who are professionals in the area of conservation, environmental management, law, planning and development. All the above functionaries shall be appointed by the President of India for a term of office of three years.

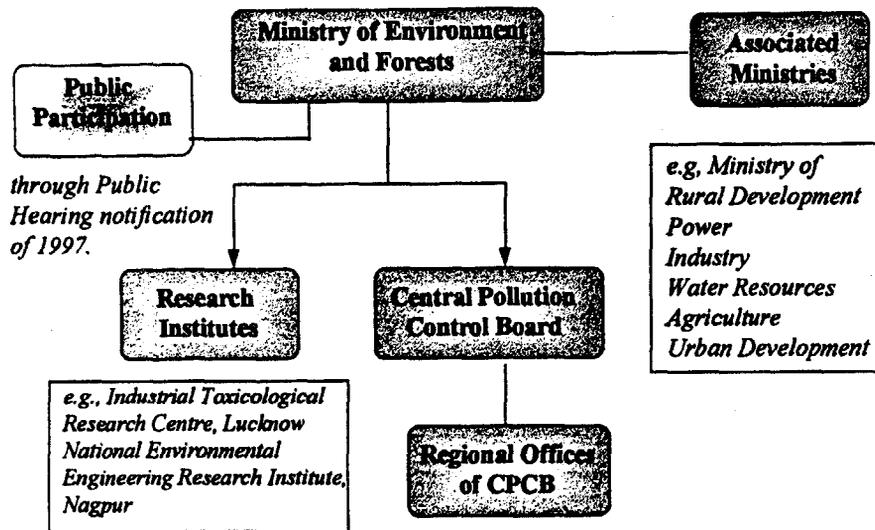
Appeals to the Authority can be made by,

- any person who is likely to be affected by the grant of environmental clearance,
- any person who owns or has control over the project with respect to which an application has been submitted for environmental clearance
- any association of persons likely to be affected by such order and functioning in the field of environment
- the Central Government, where the environmental clearance is granted by the State Government and vice versa
- any local authority, any part of whose local limits is within the neighborhood of the area wherein the project is proposed to be located

The appeal must be made in a prescribed form, within thirty days from the date of the project having been granted clearance. The National Environment Appellate Authority must dispose the appeal within 90 days from the date of filing of the appeal.

Figure 2.2 shows the organizational structure at the Central Government level.

Figure 2.2 - Organization Structure for Environmental Management at the Central Government Level (IL&FS, 1994)



Note :The figure does not include the National Environmental Appellate Authority

2.2.2 Organization Structure for Environmental Management at the State

Policies and regulations set by the CPCB are executed by State Pollution Control Boards (SPCBs). Since the Water Act of 1974, the Central and State Pollution Control Boards have been given the responsibility to administer and enforce environmental legislation (refer Annex 2-1).

The number of technical and scientific personnel in the SPCB vary with the stage of development since constitution, number of pollution sources in the State which is related, among others, to geographical area of the State.

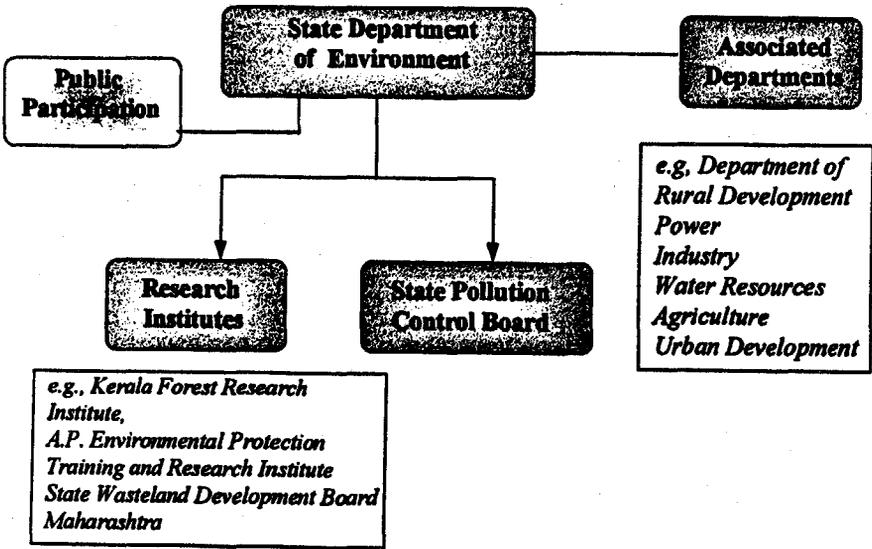
The key functions of SPCBs are shown in Box 2.4.

Box 2.4 Key functions of the SPCB (World Bank, 1996)	
Name of the Agency	Key Functions
State Pollution Control Boards	<ul style="list-style-type: none"> • Planning and execution of state wide programs for prevention, control, or abatement of water and air pollution • Advise the state government on prevention, control, and

- abatement of water and air pollution and siting of industries
- Information dissemination, training and awareness
- Ensure compliance with the provisions of the relevant Acts
- Lay down, modify, or annul the effluent and emission standards
- Ensure legal action against defaulters
- Evolve techno-economic methods for treatment, disposal, and utilization of the effluent.

A structure similar to the Centre also exists at the State Government level and is provided in Figure 2.3 below.

Figure 2.3 - Organization Structure For Environmental Management at the State Government Level (IL&FS, 1994)



2.2.3 Organization Structure for Environmental Management at the Local level

The local urban and rural bodies (i.e. Panchayats) also play a role but this involvement is recent and a formal organization structure has not yet evolved.

2.2.4 Operational Agencies in Resettlement and Rehabilitation Plans Implementation

The main agencies involved in R&R planning and implementation vary in each of the Acts and policies. These agencies are involved in:

- Acquisition of land
- Development of R&R policies (where required)

- Preparation of R&R plans
- Implementation of R&R plans
- Monitoring and evaluation

However, the trend is that these activities are no longer the sole purview of the Government authorities. Voluntary organizations and representatives of displaced/ affected persons are also included. The degree of inclusion and participation varies according to the concerned law or policy

Table 2.1 shows the various agencies responsible for each act of legislation.

Table 2.1
The responsible agencies for implementation of the various legislations.

Act	Responsible Agency
Land Acquisition Act, 1894 (Amended in 1984)	<ul style="list-style-type: none"> • Central/State Government • Collector/District Magistrate/Chief Revenue officer
Maharashtra Project Affected Persons Rehabilitation Act, 1986	<ul style="list-style-type: none"> • Commissioner • Project Authority • Advisory committee
Madhya Pradesh Pariyojana Ke Karan Visthapit Vyakti (Punhsthapan) Adhinayam, 1985	<ul style="list-style-type: none"> (a) Chief Controlling Authority (b) Project Resettlement Officer (c) Advisory Board
Draft National Policy For Resettlement of Persons displaced as a consequence of acquisition of Land	<p>Scheme implemented by the Implementation Committed at the Project level.</p> <ul style="list-style-type: none"> • Project functionary • Collector • NGOs • Representatives of Displaced Persons • Representative of Govt. Department of Welfare etc. • Subject matter specialists • Personnel Manager of the project • Representative of the Department/Ministry concerned
Orissa Resettlement And Rehabilitation Of Project Affected Persons Policy, 1994	<ul style="list-style-type: none"> • Project level <ul style="list-style-type: none"> • One officer for land Acquisition • One officer for R&R along with supporting staff of different disciplines • Developing/Construction wing

	<ul style="list-style-type: none"> • Resettlement Advisory Committee • Government level <ul style="list-style-type: none"> • Separate directorate of Land Acquisition/Resettlement and Rehabilitation • Community Organizations • Voluntary Organization • Volunteers from among the displaced persons
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The MOEF has also constituted an NGO Cell in 1992.

2.3 Comments on the Legislation, Guidelines and the Institutional Framework for Environmental Management in India

2.3.1 Comments on Programmes, Legislation and Guidelines

Implementation of policies require comprehensive legal and regulatory provisions. GOI has enacted comprehensive legislation for environmental protection. Annex 2-1 provides a summary of content and spirit of each of these legislation. A review of the history of the environmental programmes and legislation in India shows the following salient trends:

- Scope of the legislation has evolved from local, isolated legislations enacted specifically for a state to national level legislations which encompass development in the entire country.
- This has in its wake created a supporting institutional framework which shows a distinct hierarchy wherein environmental policies are formulated at the national level by the MOEF. The regulatory arm of the MOEF is the CPCB. The acts and laws are enacted at the central government level with adoption and implementation of these laws at the State level by the Departments of Environment (SDOE). The regulatory arms of the SDOE to implement the laws are the SPCBs.
- The laws initially were enacted to protect resources in a single medium e.g., separate legislations for protection of air and water i.e., a piecemeal approach was adopted. This has in turn evolved into more mature and holistic legislations viz., the Environment (Protection) Act, 1986 which has a multimedia approach.
- The greatest evidence of this multimedia approach has been the EIA notification and the recognition of the need to regulate hazardous wastes. This trend in legislation has

impacted industrial and economic growth in the country. The movement from single to multi media approach in pollution control is responsible for the recent change in industry's approach from pollution control to pollution prevention.

- Legislation has also evolved from mere end-of-the-pipe controls to a systematic planning approach towards environmental protection. Environmental management tools such as EIA, Environmental Audit Statement have been used through rules enacted as part of the Environmental Protection Act, 1986. The provisions of this act also address issues of resource depletion, and rehabilitation of people affected by developmental projects. Additionally a recent landmark provision of Public Hearing in January 1997 in the EP Act, has strengthened public involvement by making "Public Hearing" mandatory for all developmental projects requiring clearance from MOEF.
- Introduction of notifications making environmental audit mandatory for industry and introducing the concept of eco-labelling in legislation shows a gradual move of legislation from being reactive to becoming proactive.
- Environmental protection in the Indian context is, through these legislations, moving from mere control of pollution to an attempt at making development sustainable.

2.3.2 Comments on the Institutional Framework for Environmental Management in India

A review of the existing institutional framework for environmental management in India, leads to following observations,

- MOEF is under pressure due to shortage of adequate technical staff. As a result, it is unable to allocate sufficient time for policy making.
- Zonal offices of CPCB do not have sufficient interaction with the SPCBs. This may result in a lack of co-ordination of implementation of policies especially at the regional level.
- The State Department of Environment (SDOE) is relatively weak in terms of technical manpower in most of the states. This results in variations especially during granting of approvals and processing of environmental clearances. SDOEs draw heavily on SPCBs' resources.

- The SPCBs are under severe pressure due to their enforcement responsibilities. This results in insufficient time for upgradation of technical know-how. Moreover, absence of a formal Planning Cell in the SPCBs has resulted in the lack of a strategic planning.
- It is observed, that due to the pressures of implementation, MOEF, CPCB, SDOE and SPCBs, adopt a reactive rather than proactive or anticipatory approach to environmental management.
- The other major problem that the environmental management agencies face is the compartmentalization / fragmentation of responsibilities between agencies e.g., the Ministry of Water Resources is responsible for allocation of water which influences water quality, whilst ensuring water quality is the responsibility of the MOEF. Such conflicts do not permit adoption of a holistic approach in environmental management for sustainable solutions.

India's environmental management system apparently covers all aspects of environmental protection, however, the system needs strengthening to be able to address the environmental issues that result from consumption of resources and generation of waste. The various legal, financial, technical, institutional, organizational and human resource constraints in implementing environmental policies and programmes are as follows :

Legal

- There is no separate legislation for conservation and protection of lands and the environmentally critical ecosystems of wetlands, mangroves, coral reefs range lands, watersheds, and irrigation command areas.
- Although there is a national water policy, legislation for regulating exploitation of surface and groundwater resources has not yet been formulated.
- The number and variety of fiscal instruments to tackle environmental problems are limited.

Financial

- Incorporation of environmental considerations into development projects requires more resources, which puts more pressure on the already meager amounts of public investment.

Institutional

- The research and development infrastructure is inadequate
- Panchayats and urban local bodies that are to implement the program have not yet been assigned the crucial tasks of conservation and environmental protection
- The constitutional status accorded to local governments has underscored the urgency of evolving a participatory management system.

Organizational

- There are no organizations capable of imparting technical skills for environmental management, such as environmental impact assessment at the local and regional levels.
- Policy makers, administrators, trainers, educators, students, local government authorities, and grassroots individuals and organizations are not adequately trained in environmental sciences and management

Technical

- Accounting for the intrinsic value of natural resource is still a process in its infancy
- Environmental impact assessments for various categories of natural resources and development projects are constrained by a lack of data on resource availability as well as by the pressure to ensure quick development.
- The need to define environmental parameters at local levels is constrained by a lack of data

Human Resources

- There is a lack of high-quality human resources and organizations at the local and regional levels.
- There is only limited public awareness of environmental issues at the school, university, and non formal levels.

MOEF is proposing to address capacity building of all the agencies described above for overall environmental management through a number of initiatives and programmes, one of them being the World Bank assisted Capacity Building Project.

2.4 Legislation and Institutional Framework Related to Hazardous Waste Management

Additionally, legislations specifically to manage hazardous wastes/ substances have also been enacted.

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2.4 Legislation and Institutional Framework Related to Hazardous Waste Management

Additionally, legislations specifically to manage hazardous wastes/ substances have also been enacted.

Hazardous waste management is identified as a priority area in the Environment Action Programme, 1994 prepared by the MOEF. The three main rules in the Environmental Protection Act, 1986, which aim to regulate hazardous substances/ wastes are :

- Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
- Hazardous Waste (Management and Handling) Rules 1989
- Manufacture, Use, Import, Export and Storage of Hazardous microorganisms/ genetically engineered organisms of cells, Rules 1989

These rules are discussed in greater detail below as they are directly of relevance to the hazardous waste sector, which is the focus of the present study.

2.4.1 Hazardous Waste (Management and Handling) Rules 1989

The Hazardous Wastes (Handling and Management) Rules 1989, requires industries to classify wastes into specifically defined categories. This categorization is the basis for identifying whether the waste is "hazardous" or not as defined by the rules. The main provisions of the rules are,

- The *occupier* generating hazardous wastes must take all practical steps to ensure that such wastes are properly handled and disposed off.
- Hazardous wastes must be collected, treated, stored and disposed of only in facilities authorized for this purpose by the SPCBs. Before hazardous wastes are delivered, the facility occupier or *operator* must ensure that the hazardous wastes are packaged in a manner suitable for storage and transport.
- The state government or a person authorized by it must undertake an ongoing program to identify disposal sites and compile periodically, an inventory of disposal sites within the state. The occupier generating hazardous waste and the operator of a facility for collection, reception, treatment, transport, storage and disposal of hazardous waste must maintain records of such operations. When an accident occurs during transport of hazardous wastes, the facility occupier or operator must report the incident immediately to the SPCB.
- Import of hazardous wastes from any country to India for dumping and disposal is prohibited. However, import of such wastes may be allowed for processing or reuse as raw material.

The text of the Rules is placed in Annex 2-2.

2.4.1.1 Responsible Agencies for Implementation of the Rules

The responsibility for monitoring and enforcement of the hazardous waste rules is vested with the SPCBs. They grant authorization for import, collection, treatment, storage, transportation, and disposal of hazardous waste.

In addition to the Rules, MOEF has also developed Guidelines for selection and siting of hazardous waste treatment and disposal sites. These guidelines are a part of the document on "Guidelines for Management and Handling of Hazardous Waste, 1991." The responsibility for identification of disposal sites with proper Environmental Impact Assessment studies has been entrusted to the State Governments.

CPCB has a role as technical adviser to the States and promoter of innovations in hazardous waste management. CPCB has also been engaged to provide enforcement and monitoring function in those areas where the SPCBs have yet to become effective.

In recent years, enforcement of the laws, nominally under the purview of the SPCBs has been strongly supported by an activist judiciary prompted by public interest groups. The combined activities of NGOs and the judiciary have thus contributed to a climate of a more credible enforcement. This is conducive to the achievement of better compliance and investments in environmental protection by industry. The continuous involvement of vigilant NGOs and other community-based groups, is judged as an asset to enforcement programs. The SPCBs and MOEF recognize its value and plan to foster this involvement.

2.4.1.2 Responsibilities of Generators, Operators and Transporters

The Rules and Guidelines clearly define the responsibilities of the occupier or generator of waste as well as transporter and owner of the disposal facility. The Rules and Guidelines are extended to the entire country so that same restrictions are applicable for interstate and intrastate movement of hazardous waste.

The occupier/generator is expected to determine the constituents of the waste to identify whether the waste is 'hazardous'. The operator/ owner of the facility is expected to analyze the waste characteristics. This will have an influence on methods of storage, treatment, and/or disposal.

According to Rules, if a waste is mismanaged by an operator/owner of a facility, even the occupier generating the waste is held liable. This is the principle of vicarious liability. The SPCB authorizes the owner/operator of the facility to operate it only after inspecting the capabilities. However, the Rules require that the occupier/generator shall also see that the operator has adequate facilities. A similar approach is expected to be exercised while selecting the transportation agency for the movement of the wastes.

Storage of Waste

According to the Rules regarding storage of waste, the generator/occupier cannot store the waste on-site for more than 90 days and more than 10 tons weight. Open space storage is not allowed and each site should be clearly marked as "DANGER" and each container as "HAZARDOUS WASTES". The container should always be kept closed (except of course while adding or removing). Only pre-cleaned containers should be

used. Further non-compatible combinations of wastes as shown in Table 2.2 should never be kept close to each other.

Table 2.2
Non-compatible combinations of waste
(Material A is not to be mixed with the material entered under column B in the table)

A	B	Consequences
Alkaline wastes Acetylene sludge	Acid wastes, Solvents	Heat, violent reactions
Asbestos, beryllium and pesticide wastes	Oily, explosive wastes and solvents	Fire, explosion, toxic gas
Reactive metals	Any waste of Group 1-A, 1-B	Fire explosion
Alcohol	Any waste of Group 1A or 1B or 3A	Fire, explosion gases
Alcohols, reactive and unsaturated hydrocarbons	Any waste of Group 1A, 1B or 3A	Fire, explosion violent reaction
Spent CN solution	Group 1 B waste	Toxic HCN gas
Chlorates, nitrates oxidizers and combustibles	Any waste of Group 1B, 2B, 3A, 5A	Fire, explosion, violent reaction

Sturdy safe containers may be reused only after thorough inspection and cleaning. The previous labels should be completely removed and markings obliterated. The only exception for reuse in the container used for anhydrous hydrofluoric acid. Such container should not be reused.

The adverse effects (as per Rule 4) at generation shall be due to specific properties of the scheduled 18 - category hazardous wastes or may be during transportation, storage, treatment or disposal. The effects may be due to the degree of toxic nature, flammability, explosive properties and highly reactive nature of the wastes.

The MOEF is in the process of revising these rules to make the system more comprehensive. These revisions have been proposed based on the recognition of the following deficiencies in the existing legislation.

2.4.2 Deficiencies in the existing Hazardous Waste (Management and Handling) Rules, 1989

Despite the progress already made in modernizing the policy framework, in particular, the regulatory system, additional reforms are still required. Some of the significant areas

where modifications are required in the Hazardous Waste (Management and Handling) Rules, 1989 include the following :

2.4.2.1 Hazardous Waste Not Covered by the Rules.

In most countries, radioactive waste is managed and controlled in a separate organizational framework (i.e., International Atomic Energy Agency and its national members). This is because it is not technically feasible to treat it together with other types of waste and also because it requires complex safety and disposal procedures. The GOI intends to review the situation concerning radioactive wastes and develop a strategy to manage it.

Management of medical wastes has not been addressed in the Hazardous Waste (Management and Handling) Rules, 1989. However, GOI has drafted a separate rule for the management of medical wastes. These rules termed the Bio-Medical Wastes (Management and Handling) Rules, 1997 are presently under review.

Wastes from the use of wood preserving chemicals, laboratory chemicals, use of photographic chemicals, or wastes of explosive nature, are not covered in the rules. Risks involved in their management include possible accidents. In order to deal with these issues, a special management system needs to be developed.

2.4.2.2 Correspondence between the transport rules and hazardous waste management rules

GOI recognizes the need to strengthen the correspondence between regulations dealing with transport of hazardous substances and wastes and the hazardous waste management rules. GOI is committed to ensure that the Transport rules would: (i) first be consistent with the ADR (United Nations) system; (ii) be consistent and supportive of the hazardous waste management rules.

A guide document has also been prepared by the MOEF outlining the requirements for safe transport of hazardous substances. The Central Motor Vehicles Rules 1989 were enacted by GOI to regulate transportation of hazardous chemicals and ensure emergency preparedness. The guide document has been developed to assist in the effective implementation and compliance of these rules. It outlines the requirements for safe transport and also provides supporting detailed information towards implementation of the rules. The guide emphasizes the need for a separate transport emergency plan and its incorporation as a sub-plan in the district off-site emergency plan. It also provides guidelines for the details that are required in the plan.

The contents of the guide also include a brief on the most likely causes of accidents involving hazardous substances transport and their consequences. The rules for hazardous goods transport as specified in the Central Motor Vehicles Rules, 1989 are

described in the guide. In addition to this the guide also describes the various elements of planning that are required for management of transport emergencies. This guide is hoped to be useful for hazardous wastes as well.

The Hazardous Waste (Management and Handling) Rules interfaces with the Central Motor Vehicles Act, 1988 under Rule 7(2). According to this rule, packaging, labeling and transport of hazardous wastes is in accordance with the provisions of the rules issued by the Central Government under the Central Motor Vehicles Act, 1988 and other guidelines issued from time to time.

2.4.2.3 Thresholds

The current rules refer to annual thresholds of generation beyond which the rules are applicable. These limits represent a large burden on the monitoring process and give rise to variants to allow compliance e.g., splitting of hazardous wastes into different categories.

2.4.3 Proposed Improvements to the Hazardous Waste (Management and Handling) Rules, 1989

Despite the relative comprehensive nature of the Hazardous Waste (Management and Handling) Rules, 1989 and in view of the deficiencies recognized above, MOEF has recently proposed to incorporate a number of modifications to strengthen their effectiveness and streamline its provisions. The MOEF is in the process of drafting the revised rules which then will be submitted for approval to the Cabinet. *These proposed revisions are still under discussion.* The full text of the proposed modification is placed in Annex 2-3 while the salient features are shown below.

2.4.3.1 Streamlining of the definitions of Hazardous Waste Streams

Under the proposed new rules, waste streams are defined as hazardous based on their source and concentration of specific constituents. This modified classification should facilitate improved monitoring and compliance with the law.

Origin of Waste Stream

MOEF has proposed a list of processes generating hazardous wastes. This is proposed to make the identification of the hazardous waste stream easier. The corresponding section of the rule states that hazardous wastes are "*Waste Substances which are generated in the process indicated in column-2 of schedule-1 and consists of wholly or partly of the waste substances referred to in column -4 of the same schedule.*" (refer Annex 2-3)

Constituents of Waste Stream

MOEF has proposed a list of waste substances which if present in waste streams above specified concentration limits will designate the waste stream as hazardous. The corresponding section of the rule states "*Waste substances which consists wholly or partly of substances indicated in schedule-2, unless the concentration of the substances is less than the limit indicated in the same schedule.*" (refer Annex 2-3)

2.4.3.2 Definition of terms

The proposed amendments provide specific definitions for some additional terms such as disposal, manifest, storage, transport, transporter, illegal traffic, treatment, environmentally sound management of hazardous wastes etc. These definitions will assist in improved understanding of the rules and hence strengthen monitoring and compliance. The corresponding section where these definitions can be cited in the proposed amendment to the Hazardous Waste (Management and Handling) Rules, 1989 is after Rule 3 (p).

2.4.3.3 Re-allocation of responsibilities of agencies involved in hazardous waste management

As per the existing rules, the responsibility of identification and notification (after doing EIA) of hazardous waste disposal sites rests with the State Government or a person authorized by it.

As per the proposed rules, however the distribution of responsibilities is as follows. This is a proposed modification of Rule 8 of the existing Rules.

1. Responsibility of identification of site for hazardous disposal facility is with the occupiers or their association.
2. Site for common hazardous waste disposal facility shall be identified by state government, occupier or any association.
3. The preliminary and detailed environmental impact assessment of these sites shall be done by state government, occupier or any association.
4. After identification of the site, the occupier or their association shall inform the state government for notification of the site.
5. State government shall cause a public notice inviting objections and suggestions within 30 days. In case of any objection the state government should conduct a public hearing, before notifying the site for hazardous waste disposal.
6. The occupier, association or operator shall design, set up and close the disposal facility as per the norms to be prescribed.

7. Approval of the design and layout of the facility as well as supervision of setting up, operation and closure of the facility will be done by state government.

This proposed re-allocation of responsibilities is presently under discussion.

2.4.3.4 Rules for Import of Hazardous Wastes

MOEF has proposed a list of wastes to be regulated for *import and export*. If the composition of waste includes constituents as specified in the list and they possess hazardous characteristics (such as explosivity, Flammability, ignitability, reactivity, toxicity, corrosivity, etc.) the waste will be designated as hazardous. The corresponding section of the rule states "*Waste substances indicated in Part-A schedule -3 unless they do not possess any of the hazardous characteristics in Part-B of the same schedule. Schedule-3 shall be applicable only for exports and imports*".

2.4.4 Proposed revisions of guidelines for hazardous waste management

In addition to the proposed revisions in the rules, the following recommendations are made for revisions in the guidelines for hazardous waste management.

2.4.4.1 Incorporation of the Manifest system as an integral part of the rules.

The manifest system is today incorporated as an annex but is not mandated. Under the new rules, the manifest system will become an integral part of the rules and the responsibility for implementation will be allocated to the State agencies in concert with the generators. Under the proposed project, resources are being allocated to facilitate prompt implementation of the manifest. This will facilitate monitoring and enforcement of the law.

2.4.4.2 Complementing the list of exclusionary criteria in the site selection process.

The site selection process includes a list of exclusionary criteria to be applied. The process however still appears to be inadequate. Although, there will always be controversy regarding sites selected for treatment and disposal, the set of new exclusionary criteria will greatly reduce these risks.

2.4.4.3 Modernization of the ranking process for site selection

Similarly, the process of selection requires the ranking of alternatives. This is also a step that may result in controversy. Under the new rules, the ranking process is being clarified and made more explicit. In addition to a generic process for ranking of sites, the rules would also include proposed weighting factors that are technology related. For example, for siting an incinerator, the relative weight of the factors, specific for incinerators will be provided.

The above proposed revisions for both the Rules and the Guidelines are tentative. A national brainstorming workshop is proposed, to debate on these prior to their finalisation. The participants proposed for this workshop are representatives from:

- MOEF,
- CPCB,
- NGOs
- Industries and Industry Associations
- Research Institutes,
- Environmental Lawyers,
- Consultants and
- Other relevant departments like Customs, Transport etc.

2.4.5 The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989

The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 were developed under authority conferred by the Environment (Protection) Act, 1986. The principal objectives of the rules are the prevention of major accidents arising from industrial activities, the mitigation of effects of such accidents on people and on the environment and the harmonization of various control measures and agencies to prevent and limit major accidents. The rules specify three levels of requirements:

- General or low-level requirements apply to 434 chemicals and require the industrial unit to take necessary precautions to prevent major accidents, to report those that do arise and take steps to limit consequences, prepare a Material Safety Data Sheet, report imports, and properly label the hazardous chemical handled.
- The medium-level control applies to 179 chemicals and requires that the unit in control of the relevant activity provide workers on site with information, training and necessary equipment to ensure their safety as well as an off-site emergency plan.
- The high-level controls apply to 17 chemicals in quantities that are unsafe. Users of these chemicals must prepare a Safety Report. New industries are required to prepare the Safety Report within five years of beginning operation. An on-site emergency plan for dealing with major accidents is also required. Both medium and high level controls require public disclosure. Information regarding a potential off-site spill or an site accident must be provided to the District Collector for the preparation of an off-site emergency plan before commencement of the activity. Also, the public in the vicinity of the plant needs to be informed of the nature of a major accident that might occur on-site and what to do in case of such an occurrence.

2.4.6 The Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms, Genetically Engineered Microorganisms or Cells Rules, 1989

The Central Government enacted these rules with a view to protecting the environment, nature and health, in connection with the application of gene technology and micro-organisms. The Department of Bio-Technology under the Ministry of Science and Technology is the nodal agency for granting license for manufacture, import and export of micro-organisms and genetically engineered organisms. However, such licenses are issued only after the proposal is cleared from the environmental angle by the MOEF. This rule has been notified by the MOEF in 1989 under the EPA 1986, for according such clearances.

The investor is required to submit an application to the MOEF. The Genetic Engineering Approval Committee constituted by the MOEF examines the application form and makes recommendations. According to this rule, all industries involving hazardous micro-organisms or genetically engineered organisms are required to constitute an Institutional Bio-Safety Committee to oversee the planning of an on-site emergency plan to deal with any accident which may occur due to hazardous micro-organisms.

2.5 Relevant International Conventions

The various international conventions relevant to environmental protection are listed in Annex 2-4. Since the focus of this Sectoral Environmental Assessment report is the management of hazardous waste, the salient features of the BASEL Convention, to which India is signatory, are described in Box 2.5.

Box 2.5 - BASEL Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal in March 1989 (BASEL Convention, 1989)

As early as 1982, United Nations Environmental Programme's (UNEP) Governing Council recognized hazardous wastes as one of the major areas where global instruments had to be developed. A working group was convened, and in 1985 produced the Cairo Guidelines and Principles for Environmentally Sound Management of Hazardous Wastes adopted by UNEP Governing Council in 1987. These Guidelines outlined certain principles guiding the environmentally-sound management of the transboundary movement of hazardous wastes. This paved the way for the drafting and adoption of the BASEL Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal in March 1989. The Convention was adopted by 116 countries and the European Community on 22 March 1989).

The main points in the BASEL Convention are:

- A signatory state cannot send hazardous waste to another signatory state that bans its import or to any other country that has not signed the treaty.
- Every country has the sovereign right to refuse to accept a shipment of hazardous waste.
- The exporting country must first provide detailed information on the intended export to the importing country.
- Shipments of hazardous waste must be packaged, labeled and transported in accordance with international rules and standards.
- The consent of the importing country must be obtained before shipment.
- Should the importing country be unable to dispose of the imported waste in an environmentally sound manner, the exporting country has a duty either to take it back or find another way for the safe disposal of the shipment.
- Illegal traffic in hazardous waste is criminal
- A secretariat is set up to supervise and facilitate implementation of the treaty.

The treaty entered into effect on 5 May 1992.

In the context of hazardous waste, the Agenda 21 prescribes the following programme areas (Agenda 21, 1992) :

- Promoting the prevention and minimization of hazardous waste
- Promoting and strengthening institutional capacities in hazardous waste management
- Promoting and strengthening international cooperation in the management of transboundary movements of hazardous wastes
- Preventing illegal international traffic

International Treaties, Conventions and Protocols on Human Rights and Indigenous People have also been developed in response to adverse social impacts which have culminated in a violation of basic human rights. Many of these have been signed or ratified by India. Three examples are:

- Universal Declaration of Human Rights
- International Covenant on Economic, Social, and Cultural Rights
- International Covenant on Civil and Political Rights and many other instruments on the prevention of discrimination

With special regard to indigenous/tribal peoples, there are guarantees mandating Government to take responsibility for their development, with their active participation.

The policy, legislation and institutional framework for environmental management and specifically for hazardous waste management in the country has been reviewed in this Chapter. In order to understand the status of the sector, the subsequent Chapter 3.0 describes the status of hazardous waste generation and management in India.

Chapter 3

**STATUS OF HAZARDOUS WASTE
MANAGEMENT IN INDIA**

- 3.1 Sources of Hazardous Wastes
- 3.2 Industrial Growth in India
- 3.3 Hazardous Waste Generation Pattern in the Selected States
- 3.4 Status of Implementation of Hazardous Waste (Management and Handling) Rules, 1989 in the project States
- 3.5 Current Environmental Situation
- 3.6 Need for the Project

Chapter 3 STATUS OF HAZARDOUS WASTE MANAGEMENT IN INDIA

3.1 Sources of Hazardous Wastes

Hazardous waste can be generated by a number sources, such as rejects from industrial processes, mining extraction, operation of nuclear facilities, research laboratories, manufacturing of explosives etc.

Industrial operations lead to considerable generation of hazardous wastes and in the case of a rapidly industrializing country like India, the contribution to hazardous wastes from industries could be perhaps the largest. Hazardous waste contribution from industrial sources is also critical due to a wider geographical spread of industrial units in the country, thereby leading to region wide impacts. The main focus of this sectoral report is therefore management of hazardous waste generated by industries.

In order to comprehend the magnitude of the problem due to generation of hazardous wastes by industry, there is a need to understand the trend in the growth of industries. In the following section the trend in the overall growth of industry in India is examined. This information will enable projection of the likely magnitude of the problem of hazardous wastes and to some extent, at least on a qualitative basis, an assessment of the resources and strategies required to manage this hazardous waste.

3.2 Industrial Growth in India

India is the world's eighth-largest economy and tenth most industrialized nation. In 1991, India embarked on an extensive program of fiscal and economic reforms that has gradually engineered a turn-around in the country's pace of development.

The past six years of economic liberalization clearly indicate that the country is moving towards a market economy and greater global integration. The industrial licensing system has been largely dismantled, new investment policies and ownership regulations to attract foreign capital have been initiated, import tariffs have been reduced, and the rupee has been made fully convertible on capital accounts.

The trend in industrial and economic growth in India from 1990 -1995 is shown below as industrial production growth rate and Gross Domestic Product (GDP) growth rate in Figures 3.1 and 3.2 respectively.

Figure 3.1: Industrial Production Growth Rate [%] (CII Report, 1995)

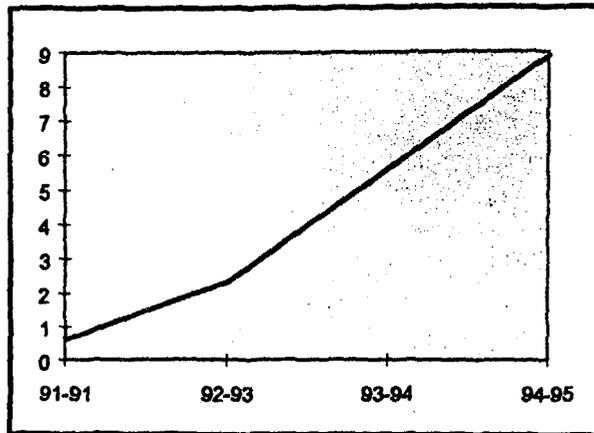
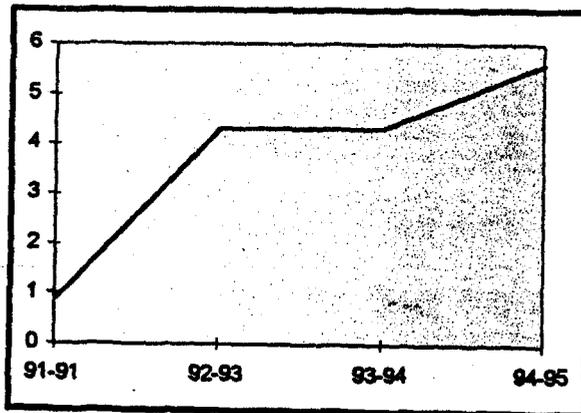


Figure 3.2: Gross Domestic Product Growth Rate [%](CII Report, 1995)



The sector wise distribution of industries in India (1994 data) is shown in Table 3.1.

Table 3.1
Sector-wise Distribution of Major Industries (CII Report, 1995)

Category	Number of Industries
Aluminum Smelter	07
Caustic Soda	25
Cement*	116
Copper Smelter	02
Distillery	177
Dyes & Dye Intermediate	64
Fertilizer	110
Integrated Iron & Steel	08
Leather	70
Oil Refinery	12
Pesticide	71
Petrochemical	49
Basic Drugs & Pharmaceutical	252
Pulp & Paper**	96
Sugar	391
Thermal Power Plant	97
Zinc Smelter	04
Total	1,551
* 200 TPD and above	
** 30 TPD and above	

It may be observed from Table 3.1 that,

- The sugar sector comprises the largest number of industries (391), followed by the pharmaceutical, distillery, cement and fertilizer sectors.
- Agro-based and chemical industries represent 47 percent and 37 percent, respectively, of the total number of industries.

The distribution of industries in the country is such that the states of Maharashtra, Uttar Pradesh, Gujarat, Andhra Pradesh and Tamil Nadu have large concentrations of industries.

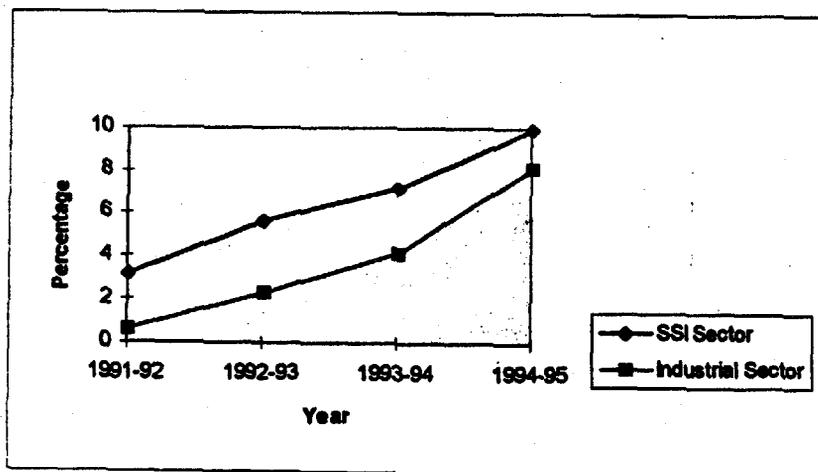
States like Gujarat, Maharashtra Tamil Nadu, and Andhra Pradesh, which are highly industrialized and undergoing industrial expansion, face the problem of toxic waste disposal far more acutely than the less developed states.

In these states, some of the most important sectors of industry such as textiles (spinning, dyeing and weaving), tanneries, food processing, distilleries, chemical manufacturing and foundries have shown a high level of small-scale industry (SSI) involvement. In India, the small-scale sector is defined as any industry whose plant and machinery are valued at less than \$1 million. By this standard, India has over 3 million small-scale units accounting for over 40 percent of the total industrial output in the country.

In general, Indian small-scale industries lack the resources to properly treat their effluents. Untreated or improperly treated effluents from these plants remain one of India's most pressing and vexing environmental problems. A typical case in point is that of Gujarat state where small scale industrial units constitute the largest proportion of industries. The hazardous waste generated from these SSI units constitutes 44% of the total hazardous waste generated in the state whereas the large scale units generate only 13% of the total.

Figure 3.3 shows the trend of growth for SSI sector and total industrial sector. It is clear from the Figure that the growth of the SSI sector is relatively high.

Figure 3.3 Growth Rate of SSI Production (CII Report, 1995)



3.2.1 Assessment of National Hazardous Waste Generation Potential

During the last 30 years, the industrial sector in India has quadrupled in size. Major waste generators in India include the petrochemical, pharmaceutical, pesticide, paint and

dye, petroleum, fertilizer, asbestos, caustic soda, inorganic chemicals and general engineering industries.

The main source of hazardous waste generation and impact on the environment is the Indian chemical industry. The growth of this industrial sector has placed it as the fourth largest in the country. The rapid growth of this sector is unique - especially considering that the industry sells only a small portion of its products directly in the open market. The bulk of its output is raw material for consumer product industries such as plastics, paints and textiles. Consequently, any thrust to meet the country's requirement in one area is usually reflected in the growth of some segment of the chemical industry. Fertilizers and Pesticides are two prime examples of such chemical industries.

There has been a significant increase in industrial sectors such as pesticides, drugs and pharmaceuticals, textiles, dyes, fertilizer, tanneries, paint, chlor-alkali etc. which have a major potential for generation of hazardous wastes. Hazardous wastes from these industrial sectors contain heavy metals, cyanides, pesticides, complex aromatic compounds (such as PCBs) and other chemicals, that are toxic to humans, plants or animals, are flammable, corrosive, or explosive, or have high chemical reactivity. Proper treatment and disposal of such hazardous wastes is much more expensive and complex. Box 3.1, shows selected illustrative cases indicating growth of potential hazardous waste generating industries.

Box 3.1 Selected Illustrative cases showing growth of potential hazardous waste generating industries

India's fertilizer consumption in 1959 was 223,000 tones, but today it has increased to an average of 12 million tones per annum. To attempt to meet this demand halfway, the average capacity of an ammonia plant had gone up from about 200 tones a day in the 1970s to about 1500 tones today.

Many of the developed countries are phasing out dyestuff manufacturing processes that produce hazardous wastes or high level of pollution. Such a changing international industrial trend has spurred the domestic growth, especially in sectors like dyestuff and pigments, which feed a wide array of industries, including textiles, leather, paints and pesticides.

The first pesticide factory was set up in 1948 to produce DDT for malaria control and benzene hexachloride for locust control. Today, India has emerged as the 2nd largest pesticide manufacture in Asia producing over 65,000 tones per annum.

The distribution of hazardous waste generating industries in various states in India is shown in Table 3.2

Table 3.2
State-wise Distribution of Hazardous Waste Generating Industries (MOEF, 1997)

Name of the State	Number of Units
Andhra Pradesh	233
Assam	15
Bihar	37
Chandigarh	23
Goa	02
Gujarat	1346
Haryana	232
Himachal Pradesh	67
Jammu & Kashmir	60
Karnataka	288
Kerala	67
Madhya Pradesh	160
Maharashtra	3427
Orissa	120
Pondicherry	10
Punjab	480
Rajasthan	308
Tamil Nadu	1027
Uttar Pradesh	792
West Bengal	98

As seen from the table, Maharashtra, Gujarat and Tamil Nadu have the maximum number of hazardous waste generators. At this time however, a complete picture of hazardous waste generated in India is not available. The Government of India and various State Governments are in the process of preparing inventories.

Literature shows that the hazardous waste generated can be linked to the type of industrial sector and unit level production. Basically, one needs to use what is called as "indirect methods" of estimating generation of the hazardous wastes. Some of the methods used to estimate hazardous waste generation are described below :

- a) Sector specific hazardous waste generation as linked to number of employees. Such factors have been developed by many countries such as Australia, Canada, Italy, United States of America etc.

A computer program to this effect called INVENT has been developed by United Nations Development Programme, World Bank and the European Investment Bank (Barnard R. et al, 1990). As data on the sectors as well as sector-wise employment was not available, estimates for national hazardous waste potential could not be arrived at. Besides, the waste generation factors have not been compiled for all types of industrial sectors.

- b) Hazardous waste generation as linked to unit level production for select industrial sectors. The World Health Organisation in 1993 has made a compilation to this effect. Example of these factors is,

Industrial Sector	Type of waste generated	Quantity of waste generated
Manufacture of drugs and medicines	Waste containing heavy metals	86 kg/ton of product
	Organic waste	100 kg/ton of product
Paints, varnishes	Paint sludge, solvents, heavy metals (4.5%)	5.8 - 8.3 kg/ton of product
Lead smelting and refining	Slag with heavy metals	410 kg/ton of product
Electroplating of Copper	Waste sludge containing Cu (Cyanide may be also present)	410 kg/ton of Cu anode

Since data on production estimates for each sector was not available, estimates for national hazardous waste potential could not be arrived at using the WHO estimates. Besides, the waste generation factors have not been compiled for all types of industrial sectors.

- c) Hazardous waste generation as linked to macro-economic variables. Guidelines to this effect have been developed in the OECD countries as below.

i) Per unit of GDP

Total generation of hazardous wastes 3000 to 6000 tons/per Billion US\$ /year range to be adjusted according to

- relative contribution of industry to GDP
- relative importance chemical sector within the industry

ii) Per value of output in sector

- 1 ton/15,000 US\$ product output/year in chemical sector
- 1 ton/300,000 US\$ product output/year in other sectors

iii) Per unit of population

- 100 kg/person/year for highly industrialized countries with a strong chemical sector
- 6 kg/person/year for OECD countries with predominantly agricultural economy.

Out of the above models, model based on per unit of population has been used as the other two models are tied to the US currency and do not permit direct application for Indian situation.

Using the population of 904 million (1994-95) and a factor of 6 kg/person/year, recommended for a country with a predominantly agricultural economy, the hazardous waste at the national level may be estimated as 5.4 million tons/year. It may be noted that this is a conservative estimate since the lowest recommended factor has been used for this estimation. One has to be cautious however as the definition of hazardous waste used in the factor (such as 6 kg/person/year) is not known and may not be compatible to the one used in the Indian legislation.

It is indeed difficult to verify the order of this estimate at this stage. For example, inventorization studies conducted in the four states of Gujarat, Maharashtra, Andhra Pradesh, and Tamil Nadu, it is estimated that these states contribute about 3.6 million tons of the total hazardous waste generated in the country. In these estimates, however the sludges from Effluent Treatment Plants (ETPs) take a major share from 30% to as high as 78%. Although under the existing rule, the sludges from ETPs are considered as hazardous, it is possible that on specific analysis, many of the sludges may not be found to be hazardous. Thus, during the course of time, the national estimate is expected to have both kind of adjustment : an upward adjustment as more inventorization is carried out and a possible downward trend as more refined definition and catagorization of hazardous wastes is put in place.

For realistic assessment however, one should not use the hazardous waste generation factors developed elsewhere and to the extent possible attempt to use factors developed based on Indian data. Table 3.3 lists the 'hazardous waste generation factors' reported by ASSOCHAM, New Delhi based on one manufacturing unit of each industrial sector.

Table 3.3

Hazardous Waste Generation Factors from ASSOCHAM

(Source: Proceedings Of Workshop On Waste Management
ASSOCHAM; Feb. 1, 1991, New Delhi)

Hazardous Waste Generation - Inorganic Chemicals Manufacture

Products and Plant Capacity, TPA	Hazardous Waste Stream Components	Waste Generation kg/ton product.
Caustic Soda, 77000	Brine purification sludge containing mercury, 0.5 g/kg sludge and Ca and Mg salts	33
Barium salts, 23000	Filter press sludge containing Ba, Si, Fe and unreacted mineral	86
Fine chemicals manufacture Cr, Co, Cu, Cd, Pb, Hg, Ni, Zn, Sb	Wastes containing all the heavy metal compounds.	6850 (used for heavy metal recovery)
Chrome pigments, 372	Sludge containing Cr, Pb, Mo	48
Sodium dichromate, 21600	Leached residue brownish black in colour. Turns yellow under sun light, contains 0.4-0.8% Cr and 12-14% total chromium.	1200
Potassium dichromate, 18000	Reaction vessels sludge containing NaCl and traces of Cr ⁺⁶ and mainly Cr ⁺³	10

TPA - tons per annum.

Hazardous Waste Generation - Organic Chemicals & Petrochemicals Manufacture

Product and Plant capacity, TPA	Hazardous Waste Stream Compounds	Waste Generation, kg/t product
Aniline, 12000	Tarry waste containing 5% phenyl cyclohexamine, 30% o-an indophenol, 20% tar and traces of nitrobenzene	3.0
Nitrobenzene, 2000	Crude nitrated aromatics from purification	2.5
Nitrotoluene, 3100	Residue from distillation, 40% dinitrotoluene, 10% p, m-NT, 50% o-NT, tarry materials	24
m-Aminophenol, 750	Residue from distillation, 5% sulphuric acid, 5% sulphuric acid, 5% m-nitrobenzene sulphonic acid, 55% 3,3-dinitro-phenyl sulphone and polymeric organic. Sulphite sludge-34% Na ₂ SO ₃ , 58% Na ₂ SO ₄ , 1.5% NaCl, 2% phenolic, 4% water insoluble and 0.5% activated	53

	carbon	2400
Alpha-naphthol, 215	Black odorous tarry residue containing naphthol	125
Beta-naphthol, 1950	Tarry residue containing naphthalene, sulphones, sulphur compounds 2-3% naphthol	213
Ethanolamines 3000	Polyethanolamine and ethanolamine sludge	255
Chlorobenzene, 32000	Resinous material with polychlorinated aromatics	44
Chlorotoluene, 32000	Tarry material containing benzylchloride, trichloro aromatics	1.0
Nitrochlorobenzene, 3315	Residue containing 50-60% dinitrochlorobenzene, 40-50% o-NCB	33
Per-chloroethylene, 39000	Hexachlorobutadiene, chlorobenzene, ethanes and butadienes and tars	308
Epichlorohydrin, 75000	Epichlorohydrine, chloroethane ethers, trichloropropane, tars	57
Caprolactam, 20000	Cyclohexanone, sodium salts of organic acids	1.1 m ³ (liquid waste)
Methylmethacrylate, 55000	Hydroquinone, polymeric residue	86
Polyester, epoxy and phenolic resins, 4450	Organic sludge containing bisphenol-A, Phenolic and resinous matter	20
Explosives, 30000	Activated carbon, nitro bodies	2.2
	Red water from purification of crude trinitrotoluene	500
Petroleum refining, 30000000	Slope oil emulsion solids, 40% oil, 8% solids and 52% water.	13
	API separator.	118
	Crude tank bottoms after melting pit.	13
	Lead tank bottoms	1.6
Transformer and white oil, 1000	Acid sludge containing polysulphonic acid, PCBs, hydrocarbons and sulphuric acid:	300
Urea-Vetro-coke process	Arsenic containing sludge (8-14% As ₂ O ₃).	0.08
	Spent reaching rings contaminated with arsenic. Lime arsenic sludge from wastewater treatment containing 2.0% As ₂ O ₃ .	0.18

TPA-tons per annum.

Hazardous Waste Generation - Organic Chemical Manufacture

Product & Plant capacity, TPA	Hazardous Waste Stream Components	Waste Generation, kg/t product.
Plasticizers, 4050	Organic sludge containing toluene sulphonic acid salt, small amounts of dioctylphthalate and dibutyl-phthalate.	50
Polyvinylchloride, 21000	Tarry semisolid containing alcohols and PVC intermediates, PVC powder of 325 mesh lime sludge containing organic chemical impurities.	1
Acrylonitrile, 2400	HCN-5.9 kg: aceto and acrylo-nitrites 0.33 kg: ammonia 96 kg per tone product	1.3 m ³ (liquid waste)
Acrylonitrile, 8000	Acrylo and higher nitrites	2.0
Rubber chemicals and intermediates, 10700	Brittle solid containing 5-10% 4-N phenylamine, 2-8-4, 4-dinitro triphenylamine and 27-70% C ₇ to C ₂₂ hydrocarbons	73
Dyes and Dye	Blackish-brown sludge containing amino, nitro organics	470
DDT, p-p' dichloro diphenyl trichloroethane, 5000	Tarry waste containing raw materials and reaction products. Highly acidic wastewater containing 185-480 kg H ₂ SO ₄ and 1.05 kg DDT per tone DDT made. Lime sludge from neutralization of wastewater, containing 0.05% DDT on dry basis.	4.0 50.0 m ³ 2000
BHC Hexachlorocyclohexane, 13% g-BHC 518	Residue containing pesticide and benzene. Highly acidic wastewater, lime sludge from neutralization of wastewater containing BHC	19 30 m ³
Endosulfan, 150	Solvent recovery distillation bottoms containing complex organic polymers, hexachloro cyclopentadine, butenediol	100
Malathion, 1080	Semisolid black material with complex organic pesticide residue, intermediates.	10-20
Phorate, 480	Semisolid odorous material containing ethylene captan, formaldehyde and phorate	100
Carbaryl, 235	Semisolid tarry residue containing carbaryl and intermediates.	150
BHC, DDT a carbaryl dusting powders, 3600	Fine dust containing soap-stone, BHC, DDT and carbaryl pesticides.	5

TPA - tons per annum.

Hazardous Waste Generation - Biocides Manufacture and Formulations

Product & Plant capacity, TPA	Hazardous Waste Stream Components	Waste Generation, kg/t product.
DDT, p-p' dichloro diphenyl trichloroethane, 5000	Tarry waste containing raw materials and reaction products.	4.0
	Highly acidic wastewater containing 185-480 kg H ₂ SO ₄ and 1.05 kg DDT per tone DDT made.	50.0 m ³
	Lime sludge from neutralization of wastewater, containing 0.05% DDT on dry basis.	2000
BHC Hexachlorocyclohexane, 13% g-BHC 518	Residue containing pesticide and benzene.	19
	Highly acidic wastewater, lime sludge from neutralization of wastewater containing BHC	30 m ³
Endosulfan, 150	Solvent recovery distillation bottoms containing complex organic polymers, hexachloro cyclopentadine, butenediol	100
Malathion, 1080	Semisolid black material with complex organic pesticide residue, intermediates.	10-20
Phorate, 480	Semisolid odorous material containing ethylene caption, formaldehyde and phorate	100
Carbaryl, 235	Semisolid tarry residue containing carbaryl and intermediates.	150
BHC, DDT, Carbaryl dusting powders, 3600	Fine dust containing soap-stone, BHC, DDT and carbaryl pesticides.	5

TPA - tons per annum.

National Productivity Council (NPC) reported following hazardous waste generation factors (refer Table 3.4) based on inventorization work done over various industrial units in the state of Gujarat. These factors include estimates for the generation of the sludges from the Effluent Treatment Plants (ETPs), apart from the process generated hazardous waste.

Table 3.4
Select Hazardous Waste Generation Factors Reported by National Productivity
Council (NPC, 1995)

S.No.	Industrial Sector	Type of Waste	Specific Waste Generation Factor
1	Dye Intermediates	Iron Sludge	2.5 - 4.0
2	Pigments (Organic & Inorganic)	ETP Sludge	1.0 - 1.2
3	Drugs and Pharmaceuticals	Off - Spec Products	0.5 - 1% of the total Output
4	Pesticide (I) Formulation (ii) Bulk	Off Spec (I) Tarry Waste (ii) Cyanide waste (iii) Spent Catalyst (Phenolic) (iv) Lime Sludge (Pesticides) (v) ETP Sludge (vi) Alkaline (vii) Charcoal Residue	0.5 - 1% of the total output 0.01 - 0.05 0.1 0.004 1.7 0.05 - 1 0.3 0.02
5	Fertilizer	Arsenic Sludge	0.07 - 1 ton per ton of NH ₃
6	Refinery	Crude Tank Buttons Sludge ETP Sludge	1.5 t/1000 of crude oil processed 0.5 ton /1000 of crude oil processed

Table 3.5 below shows estimation of the hazardous waste potential from four major industrial sectors such as pesticides, paints and pigments, petroleum products and caustic soda based on the 1994-95 production estimates.

Table 3.5

Estimation of the Hazardous Waste Generation from Pesticides, Paints and Pigments, Petroleum Products and Caustic Soda industrial Sectors (1994-95 Production Estimates)

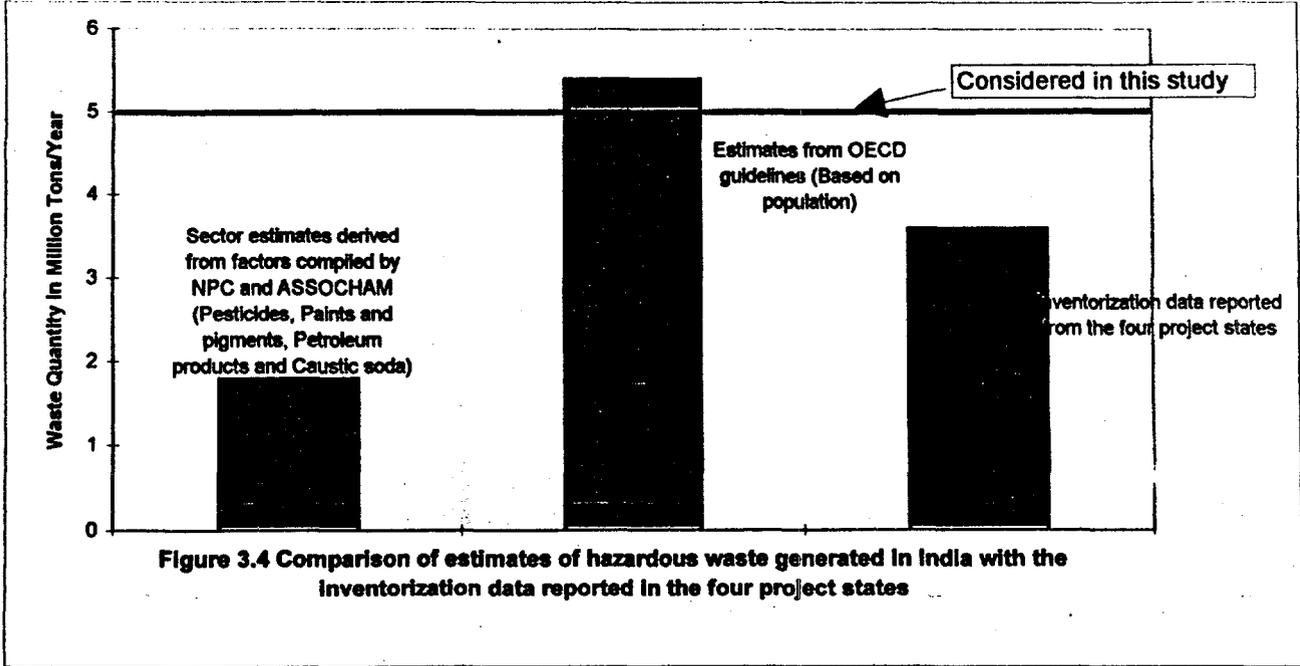
Industry Sector	Avg. Unit Hazardous Waste Generation Factor tons/ton	Production level 1994-1995 tons	Estimated Hazardous Waste tons/year
Pesticides*	0.75	75000	56250
Paints and Pigments*	1.1	140000	154000
Petroleum Products**	0.015	51 million	760000
Caustic Soda**	0.033	1137000	907326
Total			1.8 million tons

* based on NPC data

** based on ASSOCHAM data

Although the hazardous waste generation factors cited above have been used to estimate the likely quantum of hazardous waste generated in the country, it is observed that a substantial updating and validation of these generation factors is required. Firstly, development of the factors need to done be on a much wider sample base for a statistical representation and secondly, the waste classification should be done in accordance with the prevailing rules of hazardous waste classification. Lastly, these factors need to be developed for sub-sectors focusing on specific waste/reject streams. In fact, development/ calibration of hazardous waste generation factors should be a part of every hazardous waste inventorization exercise.

Figure 3.4 shows the estimates arrived at from OECD Guidelines, Sector estimates derived from factors compiled by NPC and ASSOCHAM and the inventorization data reported at the four states. Considering these and the discussions made above, the national hazardous waste generation potential is taken as 5.0 million tons/year in this SEA Report.



3.3 Hazardous Waste Generation Pattern in the Selected States

The data on the hazardous waste generated in the four project states is presented in the following sections in terms of the quantity per annum generated category-wise in each district where the inventorization has been conducted.

3.3.1 Maharashtra

In Maharashtra, annual production of nearly 1.6 million tons of hazardous waste is estimated.

Category-wise generation of hazardous waste from all the districts in Maharashtra state is shown in Figure 3.5. As seen from the figure, maximum generation is reported in category 12 (ETP sludge) amounting to 78% of the total hazardous waste generated in the state. This is followed by category 17 (off-specification and discarded products) which contributes 12.8% of the total waste generated.

Sizable quantum of hazardous waste is generated in Thane, Raigad, Pune and Mumbai. The largest types of hazardous wastes in the State are related to organic chemical manufacture, heavy metals in sludges, highly acidic and alkaline wastes from the manufacture of paints and dyes. There is very little infrastructure for proper disposal of these wastes. Except for a few facilities serving large chemical complexes, most of the waste is disposed off without treatment, often mixed with domestic waste, or otherwise dumped with disastrous consequences for groundwater reservoirs, surface waters or the affected land, raising considerable concerns for health and safety of affected communities.

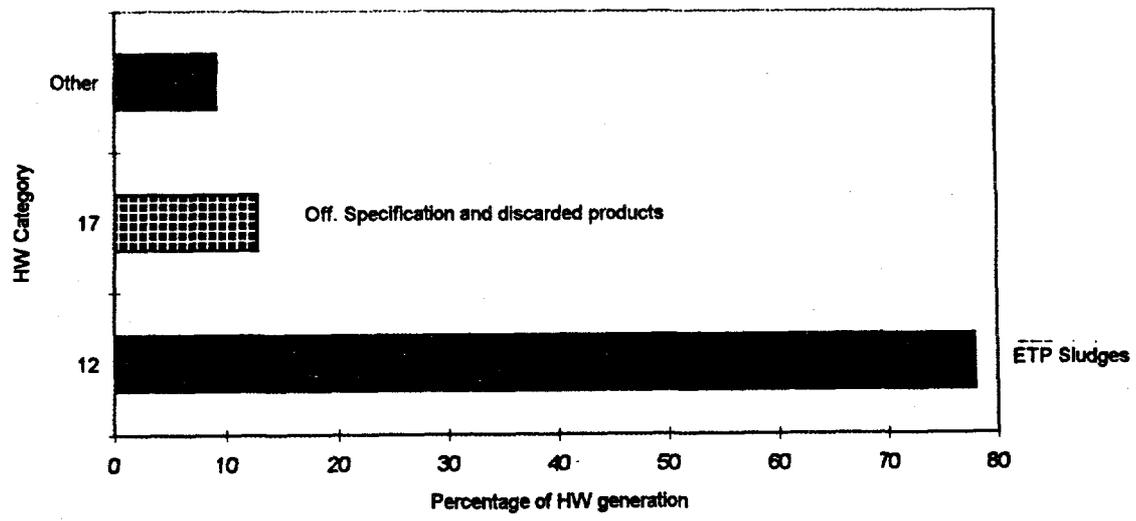


Figure 3.5 Inventorisation of Hazardous Waste in the State of Maharashtra

3.3.2 Gujarat

In Gujarat, annual production of 0.44 million tons of hazardous waste is estimated from the five districts which were inventorized. The districts where the inventorization was conducted were Ahmedabad, Vadodara, Baruch, Surat and Valsad.

Category-wise generation of hazardous waste from the five districts in Gujarat state is shown in Figure 3.6. As seen from the figure, maximum generation is reported in category 12 (ETP sludge) amounting to 45% of the total hazardous waste generated in the inventorized districts. This is followed by category 9 (waste from dyes and dye intermediates) which contribute 43% of the total waste generated in the inventorized districts. Maximum quantity of hazardous waste is generated in Vadodara district. In the state large quantity of hazardous waste is generated by the dye and dye-intermediate units.

3.3.3 Tamil Nadu

In Tamil Nadu annual production of nearly 1.4 million tons of hazardous waste is estimated from the districts inventorized. Category-wise generation of hazardous waste in the state is shown in Figure 3.7. As seen from the figure, maximum generation is reported in category 12 (ETP sludge) amounting to 41.4% of the total hazardous waste generated in the inventorized districts. This is followed by category 10 (waste oil and oil emulsions) which contributes 28% of the total waste generated in the inventorized districts.

Sizable quantity of hazardous waste is generated in Coimbatore, North Arcot, Anna and MGR district. The hazardous waste categories which were the problem wastes in Tamil Nadu are, (i) Halogenated hydrocarbons, (ii) Oily Wastes and (iii) Acidic Wastes.

3.3.4 Andhra Pradesh

In Andhra Pradesh annual production of nearly 0.1 million tons of hazardous waste is estimated from the 16 districts which were inventorized. The Board is in the process of verifying these estimates and more refined figures are expected soon. Category-wise generation of hazardous waste in the state, is shown in Figure 3.8. The maximum generation of hazardous waste is reported in category 12 (Effluent treatment plant sludge) amounting to 30% of the total hazardous waste generated in the inventorized districts. This is followed by category 6 (halogenated hydrocarbons including solvents) which contributes 16% of the total waste generated in the inventorized districts.

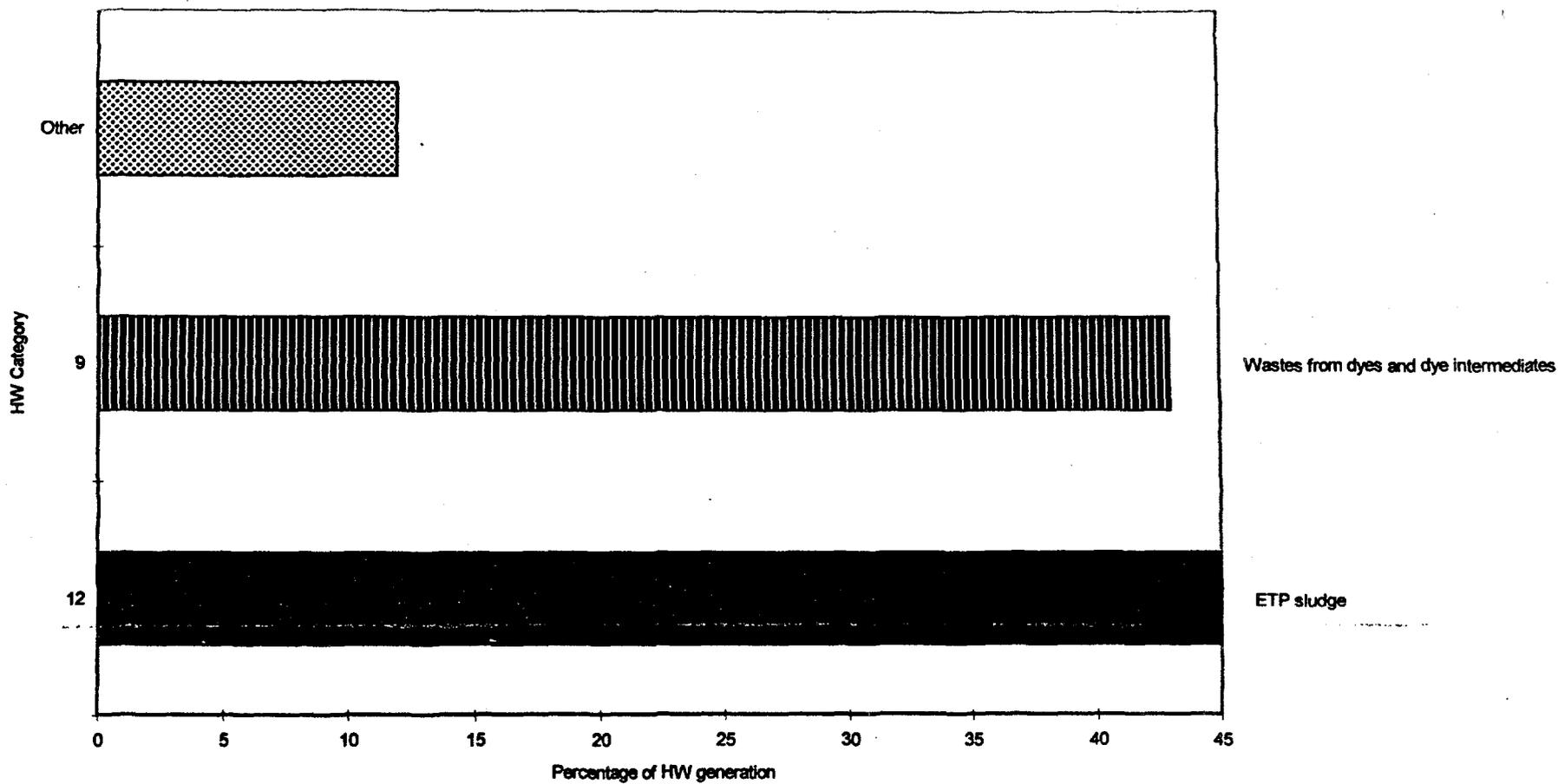
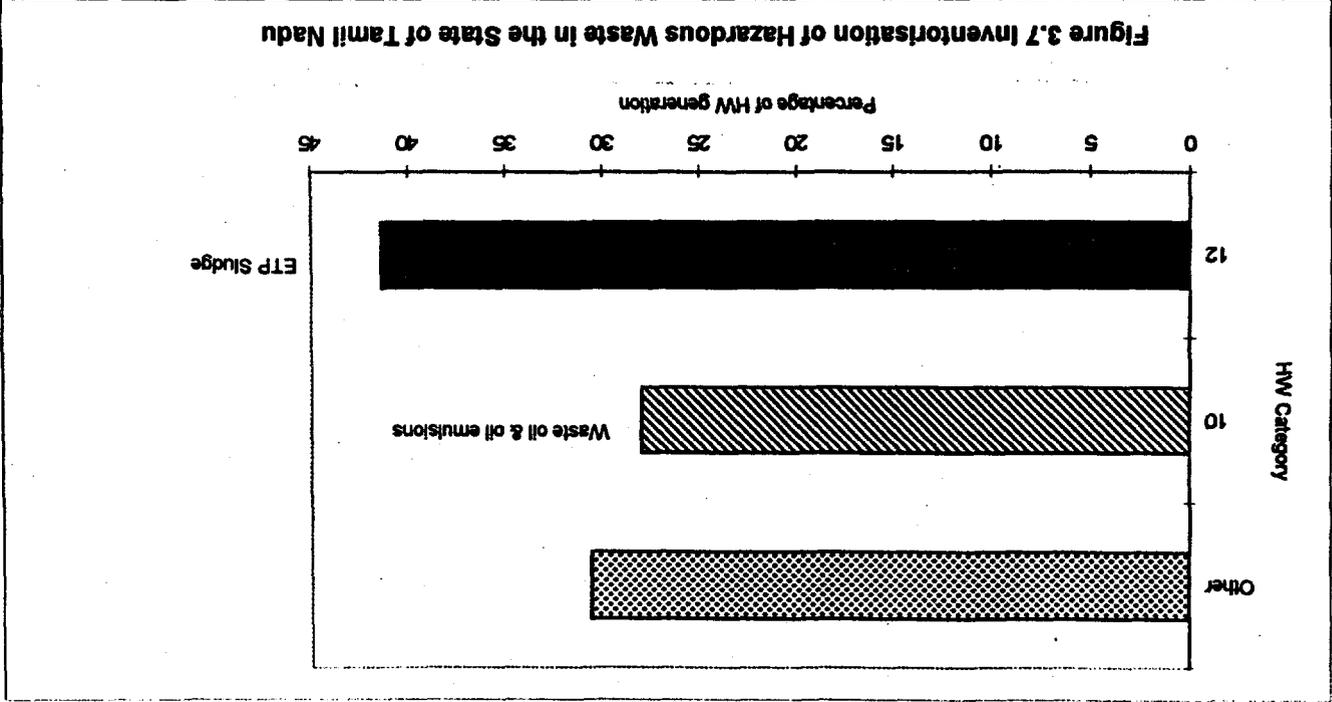
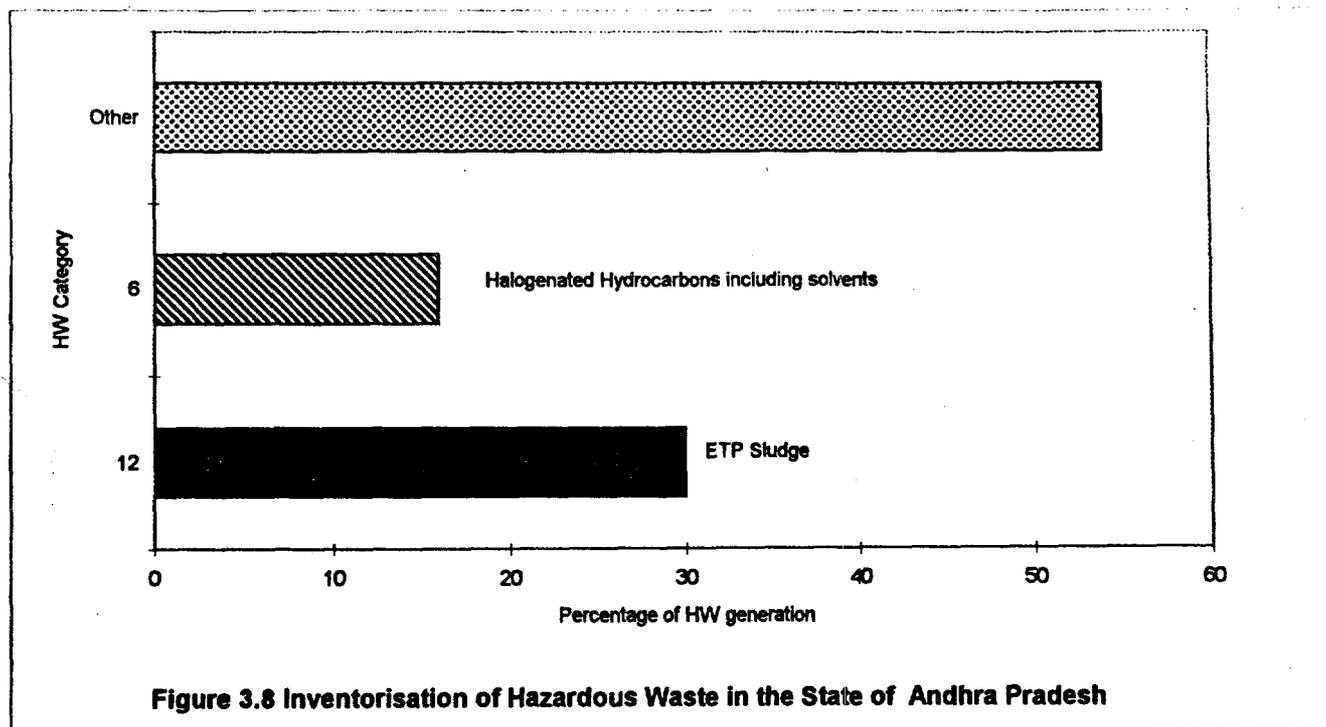


Figure 3.6 Inventorisation of Hazardous Waste in the State of Gujarat

Figure 3.7 Inventorisation of Hazardous Waste in the State of Tamil Nadu





The maximum quantity of hazardous waste is generated in Ranga Reddy and Medak districts. A summary table showing the status of hazardous waste generated in the four states is shown in Table 3.6.

Table 3.6 Status of hazardous waste generated in Gujarat, Maharashtra, Andhra Pradesh, and Tamil Nadu

State	No. of districts inventoried	Quantity of Hazardous Waste Generated (million tons/ annum)	Categories in which maximum waste is generated	District / Region showing maximum waste generation
Andhra Pradesh#	All districts	0.10	Cat. 12 - 30% Cat.6 - 16%	Ranga Reddy
Gujarat	All districts	0.50	Cat. 12 - 45% Cat. 9 - 43%	Vadodara district
Maharashtra#	All districts	1.60	Cat. 12 - 78% Cat. 17 - 12.8%	Thane, Raigad, Pune, Mumbai
Tamil Nadu	All districts	1.40	Cat. 12 - 41.4% Cat. 10 - 28%	North Arcot, Anna, MGR, Coimbatore
Total		3.60		

Note : Cat.6 - Halogenated Hydrocarbons including solvents; Cat. 9 - Wastes from Dyes and Dye Intermediates; Cat.10 - Waste Oil and Oil Emulsions; Cat. 12 - ETP Sludge; Cat.17 - Off specification and discarded products

More refined estimates are expected.

3.4 Status of Implementation of Hazardous Waste (Management and Handling) Rules, 1989 in the four project States

The status of implementation of the Hazardous Waste (Management and Handling) Rules, 1989 in the project states is presented in the following format, below.

- the resources (manpower, laboratory facilities and information systems) available for implementation of these rules
- the number of authorizations issued by the SPCBs of these states. This is being used as an indicator of the extent of the problem in these states.
- the number of Common Hazardous Waste Treatment, and Disposal Facility (CHWTF) sites identified and their status regarding notification, progress of EIA studies etc.

3.4.1 Maharashtra

The resources (manpower, laboratory facilities and information systems) available for implementation of these rules are as follows.

3.4.1.1 Resources

Manpower

The existing distribution of staff at Maharashtra Pollution Control Board (MPCB) consists of 154 technical staff, 55 scientific staff and 275 administrative staff. Additional manpower of scientific and technical personnel, law officers and administrative staff are required to enable implementation of the hazardous waste management rules. Some staff, already sanctioned for hazardous waste management by the government are being posted and necessary infrastructure is being created.

Laboratory

MPCB proposes to have six mobile laboratories for air and water pollution studies increasing the total number of mobile laboratories to eight. The Central laboratory at Navi Mumbai and the regional laboratories at Pune, Aurangabad, Nagpur and Nashik need to be strengthened for hazardous waste sampling and analysis. The Central laboratory to be upgraded to serve as a referral laboratory for the State while the regional laboratories are to be upgraded to serve as laboratories for compliance monitoring. Six field laboratories are proposed to be set up for testing and analysis of hazardous waste samples in chemical zones where hazardous waste generating industries are concentrated.

Information System

Computerization is being done of the Head Office and Regional and sub-regional offices. It is proposed to eventually network the Regional and Sub-regional offices with the Head Office. The present focus of the MPCB is on establishing a Management Information System (MIS). Geographical Information System (GIS) is proposed to be introduced only as a pilot project for identification of sites of hazardous waste facilities and for tracking of hazardous wastes from generation to disposal.

3.4.1.2 Status of Authorization

The implementation of the regulations for hazardous waste management by MPCB are shown in Table 3.7.

Table 3.7**Status of Implementation of Hazardous Waste Management in Maharashtra**

S. No.	Items	No. of units
1	Total number of hazardous waste generating units	3427
2	Authorization granted	3011
3	Closed/ not responding to the requests of the Board for providing information	416

3.4.1.3 Status of CHWTDF

The MPCB has identified few hazardous waste disposal sites near the Maharashtra Industrial Development Corporation (MIDC) industrial estates with details as follows.

- Barvai (Bhokarpada), Panvel in Raigad district. EIA has been done and the site is notified.
- Dabhil, Lote Parshuram in Ratnagiri district. EIA has been done and the site is recommended for notification.
- Village Chal near Taloja, MIDC area in Raigad district. EIA is in progress. Site admeasuring 39 ha. is planned for development as secured landfill site. This site would be available for disposal of hazardous waste in Taloja, Dombivli, Ambernath and Patalganga industrial areas.
- Trans Thane Creek, Thane in Navi Mumbai. Rapid EIA has been done and detailed EIA is in progress. Site is recommended for notification.
- Bableghar near Mahadev Kond on Mhapral - Ambet road in Raigad district. Site is admeasuring 60 ha. It is more than 500 m away from the estuarine zone of River Savitri.
- Kharegaon, Roha in Raigad district. The site is an abandoned quarry which is 10 kms away from Roha MIDC. It is a potential site for development of secured landfill.
- Palm Tembhi at Palghar - Tarapur Road, in Thane district. Potential site for development of secured landfill.

3.4.2 Gujarat

The resources (manpower, laboratory facilities and information systems) available for implementation of these rules are summarized below :

3.4.2.1 Resources

Manpower

There is an overall shortage of manpower, both scientific and administrative. The position as of 1995 was as follows: 39 Engineers; 76 Scientists and Analysts totaling to 345. There is a paucity of technically qualified personnel to handle hazardous waste management. Upgradation of overall staff strength and capability is therefore essential.

Laboratory

The laboratories need to be strengthened with equipment, instrumentation and safety measures specifically for sampling and analysis of hazardous waste.

Information Systems

The information system is not decentralized with respect to decision making and information flow. Presently, a project on GIS application is underway under the assistance of the World Bank for the tracking of hazardous wastes. The staff of GPCB has been receiving training from the Consultants on the use of computers and a refinement of hazardous waste inventorization is in progress for the purpose of tracking.

3.4.2.2 Status on Authorization

The status of implementation of hazardous waste management rules in the state of Gujarat is presented in Table 3.8

Table 3.8
Status of Implementation of Hazardous Waste Management in Gujarat

Sr. No.	Items	No. of units
1	Total number of hazardous waste generating units	1346
2	Authorization granted	1325
3	Directions issued/ under process	14
4	Closed	-

3.4.2.3 Status on CHWTDF

District Level Committees have been formed by the State Government to identify the hazardous waste disposal sites. The state has notified six sites for disposal of hazardous wastes. These are located in Mota Sorva (Bharuch district), Panoli (GIDC, Bharuch district), Vatva (village Vinzol in Ahmedabad district), Odhav (Ahmedabad district), Vapi (GIDC, Valsad) and Sarigam (Valsad). The site notified at Vatva has already been developed while 3 others are in various stages of planning.

3.4.3 Tamil Nadu

The resources (manpower, laboratory facilities and information systems) available with the Tamil Nadu Pollution Control Board (TNPCB) for implementation of the Hazardous Waste (Management and Handling) Rules, 1989 are as follows :

3.4.3.1 Resources

Manpower

The ratio of technical and scientific manpower to administrative manpower in TNPCB is approx. 1:2. Manpower is proposed to be augmented for setting up Hazardous Waste Management Cells at each district office. The recommended strength by the Board is two technical personnel at each such cell.

Laboratories

There are three Advanced Environmental Laboratories in the State. The Advanced Environmental Laboratory at Board's Head Quarters in Chennai is to be upgraded and equipped with state-of-art equipment to make it a referral laboratory for the state for hazardous waste analysis.

The other two existing Advanced Environmental Laboratories are to be equipped with specific instruments to handle hazardous waste sampling and analysis for the surrounding region. The District Environmental Laboratories do not need to be upgraded to the same level as the Advanced Environmental Laboratories. The laboratory strength at the district level has presently been upgraded from three to six by converting three of the existing six Mobile Environmental Laboratories into District Environmental Laboratories.

Information system

The computer hardware available with Board's head office is adequate, however extensive upgradation of the software is needed both for data storage and retrieval for implementation of the various functions of the Board as well as specifically for hazardous waste management. GIS is proposed to be introduced in a phase wise manner with an initial pilot scale exercise.

3.4.3.2 Status of Authorization

The status of implementation of hazardous waste management regulations in the state of Tamil Nadu is presented in Table 3.9.

Table 3.9
Status of Implementation of Hazardous Waste Management in Tamil Nadu

Sr. No.	Items	No. of units
1	Total number of hazardous waste generating units	1027
2	Authorization granted	435
3	Directions issued/ under process	402
4	Closed	-

3.4.3.3 Status of CHWTDF

Nine sites were originally identified by TNPCB for hazardous waste disposal. EIA of two of these nine sites (one at Mannalure and one at Siruseri) have already been conducted.

Environmental Impact Assessment Studies have been conducted through the National Environmental Engineering Research Institute (NEERI) (NEERI, 1996) for sites located at Mannelure village of Gummidipondi Taluk and for site located at Siruseri Village of Chengalpattu Taluk of Chengai MGR District.

The site at Mannelure would cater to the hazardous waste treatment and disposal needs of industries located in and around Manali, Ennore, Ambattur and Northern part of Chengalpattu MGR District.

The site at Siruseri village has been identified for landfilling hazardous wastes generated from Common Effluent Treatment Plant (CETP) at Pammal and from industries located in Southern part of Chengalpattu MGR District.

The Siruseri site has been approved as a CHWTDF site based on the EIA study and the TNPCB is approaching the state government for site notification. The EIA report of the Mannelure site is under scrutiny.

In the case of the remaining sites, the EIA has not been undertaken because the public pressure is very high regarding allocation of the land for hazardous waste disposal.

3.4.4 Andhra Pradesh

The resources (manpower, laboratory facilities and information systems) available with the Andhra Pradesh Pollution Control Board (APPCB) for implementation of these rules are summarized below.

3.4.4.1 Resources

Manpower

The institutional set-up is weak in terms of manpower. There has been no recruitment of technical manpower in the last ten years. Recruitment of technical personnel is the immediate requirement.

The available technical manpower needs to be strengthened both with respect to numbers and training in specialist areas. APPCB is also receiving technical assistance through the Australian Aid (AUS-AID) from the Government of Australia. The specific purpose of the assistance provided by AUS-AID is improvement of industrial waste management procedures and provision of disposal facilities to reduce the amount of hazardous waste currently entering the environment. The focal districts of this project are Hyderabad, Medak and Ranga Reddy. The AUS-AID project is to be developed through the following components :

- Development of a waste management plan for the Jeedimetla Industrial Estate
- Waste minimization / cleaner production programme which includes training of APPCB staff and industry representatives in waste audit techniques to promote waste minimization.
- Technical assistance with operation of the existing Jeedimetla CETP
- Central Treatment Storage and Disposal Facility for disposal of solid industrial wastes from the districts around Hyderabad. AUS-AID's input will be in the form of technical assistance with siting and design of the facility.
- Training in Australia
- Project Management

The AUS-AID does not however provide funds for institutional strengthening such as upgradation of laboratories.

Laboratories

The Central Laboratory at Hyderabad and the Regional Laboratory at Vishakapatnam are not equipped for hazardous waste sampling and analysis and need to be strengthened specifically for hazardous waste analysis. There is a need to equip the central laboratory at Hyderabad with state-of-art equipment and upgrade it to the status of a referral laboratory for the state.

Information Systems

The APPCB is computerizing the activities of the Head Office and its 15 Regional Offices at an estimated cost of Rs. 1.02 crores.

The hardware installation is completed and all the computers in the Head Office are networked. The development of application software to computerize the activities of the APPCB in 20 areas viz., issue of consent orders, issue of no objection certificates, paybills and storage and retrieval of analytical data in the laboratory and data on industries etc. has commenced. Of these 20 modules, eleven are proposed to be taken up on priority basis. This activity is currently in progress. These modules are however not developed on the principles of information systems requirements and do not directly support decision making or strategic planning exercise.

3.4.4.2 Status of Authorization

The implementation of the regulations for hazardous waste management by MPCB are shown in Table 3.10

Table 3.10
Status of Implementation of Hazardous Waste Management
in Andhra Pradesh

Sr. No.	Items	No. of units
1	Total number of hazardous waste generating units	233
2	Authorization granted	229
3	Directions issued/ under process	1
4	Closed	3

3.4.4.3 Status on the CHWTDF

In Andhra Pradesh, one site has been identified at Nellimerla village in Vizianagaram district for establishing a CHWTDF for the disposal of hazardous waste generated by industries in the district of Vishakapatnam, Vizianagaram and Srikakulam. A detailed EIA report including community consultation for this site is completed (EPTRI, 1997) and the site is published by the Government of Andhra Pradesh. The total quantity of waste to be handled in this facility is 76,725 tons. The facility would be constructed as a secured landfill. The area requirement for the site is 60 acres for a design life of 10 years.

Under the AUS-AID project selection of site for establishing a CHWTDF is in progress. This facility will be utilized by industries located in Medak, Hyderabad, and Ranga Reddy districts. So far 19 sites have been identified in Medak and Ranga Reddy district and these sites have been short listed to four sites following the ranking procedure. Based on geological data and community consultation process the final site will be selected. The rapid EIA will be conducted on the final site and this is expected to be completed before September 1997.

3.4.5 Status of Implementation of Hazardous Waste (Management and Handling) Rules, 1989 in the two additional states Supported by the Project

In Uttar Pradesh there are 792 industrial units regulated under the Hazardous Wastes (Management and Handling) Rules, 1989. Of these, 567 units have been granted authorization. Eight sites for treatment and disposal of hazardous wastes have been identified. These are located at Sonbhadra (1) Moradabad (1), Kanpur City (2), Kanpur Dehat (1) and Lucknow (3).

In West Bengal there are 98 industrial units regulated under the the Hazardous Wastes (Management and Handling) Rules, 1989, of which, 18 units have been granted authorization. As regards hazardous waste disposal sites, one site at Haldi has been identified for which EIA study has been completed. Other four sites are under consideration which are located at Durgapur-Asansol, North 24-Parganas, South 24-Parganas and Hooghli-Howrah Belt.

3.5 Current Environmental Situation

One of the main manifestations of the lack of an effective hazardous waste management system in the country has been the strong public reaction leading to a high level of judicial

activism in the country. This has resulted in closure of a number of industries in Gujarat, Tamil Nadu, Andhra Pradesh, West Bengal, Delhi and Uttar Pradesh.

3.5.1 Impact on ecosystems

Adverse effects on ecosystems (terrestrial and aquatic) result from improper disposal or dumping of hazardous waste. When discharged on land, heavy metals and certain organic compounds are phytotoxic and at relatively low levels of concentration can adversely affect soil productivity for extended periods of time. For e.g., uncontrolled releases of chromium contaminated water and solid effluents resulted in contamination of aquifers in the North Arcot area, in Tamil Nadu. The aquifers can therefore no longer be used as sources of fresh water.

Wastes from pesticides and herbicide manufacture as well as other biocides have been traced to reductions in number of species in areas affected and chronic toxic effects on subsequent generations of birds and other animals.

Discharge of acidic and alkaline waste affects the natural buffer capacity of surface waters and soils and may result in reduction of a number of species as a whole. Of particular concern is the dispersal into surface waters where widespread contamination may result from a single source. The potential pathways by which hazardous wastes can enter the ecosystem is shown in Figure 3.9

Some case studies from Gujarat which indicate the extent of adverse impact on the ecosystems are shown in Box 3.2

Box 3.2 Case Studies from Gujarat illustrating adverse impact on the ecosystems (Shankar et al, 1994)

Industrial estates are proliferating in Gujarat however waste disposal has not been a priority consideration for any of them. The Ahmedabad-Vadodara-Surat industrial belt has over 2000 units in the organized sector and more than 63,000 small scale units manufacturing chemicals like soda ash, dyes, yarns and fertilizers. Besides, the state has two other major industrial estates Ankaleshwar and Vapi in the Baruch-Valsad belt.

The Nandesari industrial estate near Vadodara is a major production centre for highly toxic chemicals like H-acid and J-acid, which are not easily biodegradable. An inventory of waste at Nandesari, done in 1993 puts the daily generation of effluents containing solid waste at 120 tones about 70% of which is from industries manufacturing dyes and their intermediates.

Vapi in Valsad district has around 1800 units of which about 450 fall in the category of polluting industries - 50 paper mills, 60 dye intermediate producing units, 200 dye industries, 100 pharmaceutical factories, 25 textile dyeing units and about 10 pesticide plants.

Industries in all these areas usually dump their waste in low laying areas within a 2 km radius. As a result, a major illegal dump yard has sprung up on the banks of the river Daman Ganga. The Vapi Industrial Association has allowed its members to dump waste on a 0.6 ha plot within the estate.

Apart from small and medium industries which have contributed largely to disorganized hazardous waste disposal, large industries such as the Indian Petrochemicals Corp Ltd (IPCL) at Vadodara also appear to have contributed to contamination of the ecosystem through indiscriminate disposal of hazardous wastes.

IPCL, which generates waste in all of the 18 categories classified as hazardous by MOEF, dumps 1800 tones of solid waste every month at a site near Nandesari. The company's onsite waste disposal tract is a semi-open area behind a wall, where waste from its 14 chemical units is dumped as a matter of routine. The IPCL dumpsite is on a hill. Since there is no adequate scientific treatment of the hazardous wastes, they are washed down into the river contaminating the waters.

Pollutants from IPCL include organic acids, hydrocarbons, sulphides, acrylo nitrile and propylene waste. The dumpsite often catches fire in the afternoons. Chemical analysis of the dumpsite leachate shows it contains toxic levels of phenol.

Case studies from Maharashtra shown in Box 3.3 provides an illustration of contamination due to hazardous wastes in the Thane Belapur Industrial Area.

Box 3.3 Case Studies from Maharashtra illustrating adverse impact on the ecosystems (Shankar et al, 1994)

The Thane-Belapur industrial area, in Maharashtra where about 1200 industrial units are housed on a 20 km stretch close to New Bombay creates more than 100 tones of solid waste every day. About 85% of this waste is acidic or alkaline in nature. The area also produces about 5 tones of waste daily, which is difficult to treat because of chemicals like halogens. About 3 tones of waste generated daily can be incinerated but not treated. The bulk of the hazardous industrial waste in this area is co-disposed with municipal waste in municipal dump sites.

The bulk of the industries are located in Thane-Belapur, Kalyan-Ulhas Nagar-Ambarnath, the western shore of Thane creek and around the Patal Ganga river. The water bodies in the vicinity of all these estates are polluted. The water of the Ulhas river has toxic contents and the sedimentation level of mercury and arsenic is also high. Ulhas river empties into the Thane Creek at its northern end. With the river water and other nullahs that open into it, Thane Creek is one of the most polluted sea waters in the country.

Examples of case studies illustrating lack of a hazardous waste management system from Delhi and Rajasthan are shown in Box 3.4

Box 3.4 Case studies from Delhi and Rajasthan illustrating adverse impact on the ecosystems (Bhattacharya et al, 1994; Sharma et al, 1996)

In the Wazirapur Industrial Estate and Shahadara - Maujpur Industrial Estate as well as along the Grant Trunk road in Delhi, small and tiny scale industries processing non-ferrous metals such as Copper, brass, Aluminum as well as steel rolling mills and pickling factories are dumping their heavy metal containing effluents and acids into open cess pools or drains. None of the units have licenses for processing steel.

This has led to permeation of the effluents into the water table and has contaminated the potable water being used by the local residents through handpumps.

In the Bichhri district of Udaipur, Rajasthan, chemicals have contaminated the ground water which is the only source of drinking water for more than 400 agricultural families of the village. The highly acidic industrial waste was stored in unlined pits within the premises or released through the open drain. The toxic chemicals seep into the aquifer and contaminate the ground water.

The villagers have suffered heavy losses in their livelihood, which have decimated both agriculture and livestock. Local people experience skin diseases, nausea and dizziness.

The main cause of the impact is the manufacture of H-acid (or 1-naphthol-8-amino-3,6 disulphonic acid), which is an azo dye. Large quantities of gypsum sludge and acidic effluents are generated during the process.

3.5.2 Impacts on Public Health

Exposure to hazardous waste can affect human health. Direct exposure can lead to disease or chemical contamination. Children are an especially vulnerable group. The release of chemical waste into the environment may result in chronic exposure of the population, leading to chemical poisoning. Other chemicals if released untreated [e.g., cyanides, mercury, Polychlorinated Bi-phenyls (PCBs)] are highly toxic and exposure can lead to disease or death.

A recent review of published literature on the health impact of hazardous waste, published by the National Research Council (NRC) in the United States has concluded that despite limitations in epidemiological studies of dump sites, existing data supports the impact on ill health of affected communities and exposed persons, "including low birthweight, cardiac anomalies, neurobehavioral problems". Some studies have detected excesses of cancer in residents exposed to hazardous waste chemicals.

Case Studies from Gujarat, Rajasthan and Delhi shown in Box 3.5 are a case in point illustrating the likely impacts on public health due to the absence of a comprehensive and systematic hazardous waste management system.

Box 3.5 Case studies showing impacts on public health (Shankar et al, 1994)

- In East Delhi's Kardampuri Colony, toxic fumes containing chemicals such as cyanide, cadmium, selenium and arsenic, also traces of lead, aluminum, and copper were emitted from a heap set afire by a local junk dealer. The local residents were affected by gases that contained chlorine and sulphur.
- Indiscriminate dumping of hazardous waste by Gujarat Alkalies and Chemicals (GACL) at Vapi, Gujarat containing high levels of mercury reportedly caused health problems. Cases of people receiving burns on their feet while walking near the dump sites were registered at the local hospital at Vapi.

- GACL dumps up to 1 tone of mercury sludge, among other things, every day. The volume of mercury sludge is reported to have been much higher in the past. As a result land and groundwater has been extensively contaminated causing a number of public health problems.
- At the municipal open dump at Deonar in Mumbai, Maharashtra, hazardous industrial waste is co-disposed with municipal waste. Burning of these wastes has resulted in severe respiratory problems for both the workers and the residents of the surrounding areas. Workers have also experienced nausea and dizziness.
- In the Bichhri District of Udaipur, Rajasthan, chemicals ruined the ground water which is the only source for more than 400 agricultural families of the village. The highly acidic industrial waste which has contaminated the ground water has resulted in heavy losses in their livelihood, by affecting agriculture and livestock. Local people experience skin diseases, nausea and dizziness. Public agitation resulted in a legal battle and the villagers were compensated by the polluting industries.

3.6 Need for the Project

Considering all the environmental and public health impacts described above, it is essential for the industrialized states of India to improve the monitoring, enforcement and physical infrastructure needed for effective implementation of the legislation and rules, while promoting recycling, recovery of materials, and avoidance of generation of hazardous wastes. The proposed project addresses this urgent need, identified as a priority in the national EAP, and responds to the GOI's request for Bank assistance.

The key issues in hazardous waste management identified by MOEF, which need to be addressed while designing the present project are :

- i. insufficient information on the quantity and risks of the waste;
- ii. inadequate vigilance and enforcement of regulations;
- iii. inadequate awareness of the risks to health, environment and safety;
- iv. lack of proper infrastructure for safe containment or disposal.

These issues can be further characterized as follows:

Insufficient information

Although the government recognizes the localized nature of hazardous waste generators and while significant progress has been made in identifying large concentrations of hazardous waste, further efforts are required to quantify and characterize the volume of hazardous wastes originated by industry. However, despite additional efforts, it is

doubtful that in a large country such as India with a multitude of point sources and the dynamic nature of the industrial sector, the exact amount of hazardous waste being generated at any given point, can be precisely ascertained. This is however no excuse to further postpone the need to address the problem among known groups of generators or in those areas where large concentrations are being released into the environment. The proposed project has been designed to continue and expand a vigorous program to collect and complement information, on the location, nature and characterization of hazardous waste in the country.

Inadequate Vigilance and Enforcement of Regulations

Although some progress has been achieved in strengthening the capacity of the Boards and in the improvement of their analytical capability, the SPCBs are still ill-equipped to deal with the analytical and monitoring requirements posed by hazardous wastes. Further, the Boards lack the planning and information systems that a modern monitoring institution requires to provide a credible enforcement of all acts and regulations in effect in the country. Finally, the Boards have generally been unable to take advantage of an incipient but emergent public involvement in the vigilance of environmental laws. This is because of an absence of proper channels of communication and past difficulties in involving public in the regulatory and implementation activities of the SPCBs.

Inadequate Awareness of Risks

There has been little practice in the application of EIA to hazardous waste problems. This is partly due to the general absence of dedicated infrastructure for treatment and disposal. Moreover, there has been relatively little awareness, due to the non-application of the rules, on the risks and effects of hazardous waste into the surrounding ecosystems and communities.

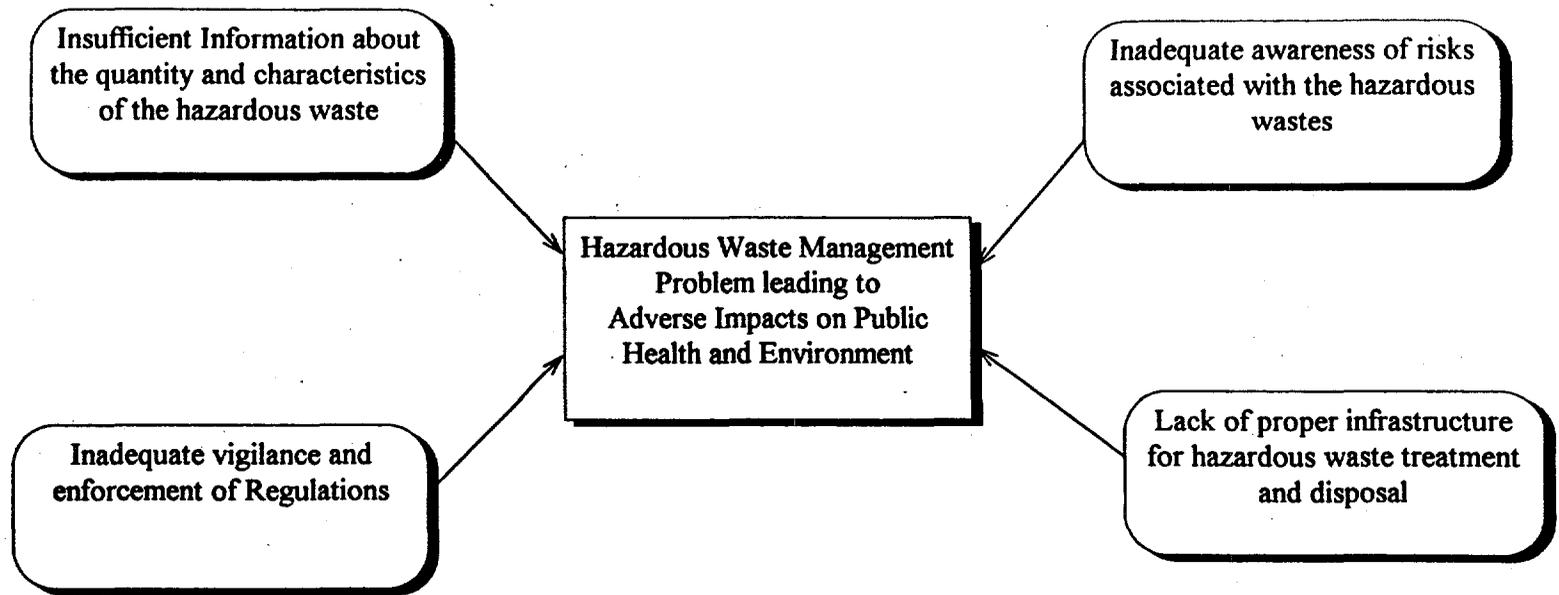
Lack of Proper Infrastructure for Treatment of Disposal

Apart from some dedicated facilities at large chemical companies, India lacks the sort of infrastructure that is required for proper treatment and disposal. There are no secure landfills in India and no common facilities for disposal of hazardous waste. The proposed project will fund a concerted program to promote hazardous waste minimization in addition to treatment efforts at individual facilities. It will also support the development of Government owned pilot CHWTDFs in an attempt to understand the risks associated with such common facilities. Subsequently the experience gained from these pilot efforts may be used to establish CHWTDFs under varying models of ownership.

Figure 3.10 schematically represents the key issues in hazardous waste management as recognized by MOEF. The proposed project will attempt to address these issues so as to develop a comprehensive and systematic hazardous waste management system in the country. In order to address these key issues, the various alternative approaches to

hazardous waste management must be considered while designing the project components. Chapter 4.0 provides a sector-wide strategic approach to hazardous waste management as envisaged in the project.

Figure 3.10 Key issues in Hazardous Waste Management



Chapter 4

SECTOR WIDE STRATEGIC APPROACH

4.1 Alternative Approaches to Hazardous Waste Management

4.2 Costs of No Intervention

4.3 Rationale and Underlying Policies of the Project

4.4 Hazardous Waste Management System

4.5 Project Design Strategy

4.1 Alternative Approaches to Hazardous Waste Management

Sectoral Environmental Assessment (SEA) makes an inquiry into the fundamental alternative of whether to intervene in the situation by a strategy or leave the situation as it is.

If the arguments for the intervention are convincing, then alternatives (or approaches) are identified at the broad level of policies and strategies corresponding to the investments to be made.

In the context of the proposed Hazardous Waste Management Project, following alternatives may be examined.

Approach A. Do nothing, and simply accept the economic, social, and environmental impacts of hazardous waste as being an acceptable cost of development into the foreseeable future. However, for an environmentally sensitive and democratic society such as India, this alternative is highly unacceptable. There are several outstanding cases of severe damage to public health and the ecosystem in India, due to improper management and disposal of hazardous wastes as explained in detail in section 3.5. The cost of inaction will be prohibitive and may jeopardize future industrial growth as well as overall quality of life.

Approach B. Do nothing until the problem becomes so severe that crisis remediation (defined as investment in hazardous waste treatment, and clean-up of contaminated sites) and compensation to those affected is called for.

Approach C. Adopt a precautionary strategy, starting with improved hazardous waste management in selected states of high industrial concentrations and/or potentially rapid growth of high hazardous waste generating industries.

4.2 Costs of No Intervention

Approaches A and B are based on "no intervention". Faced with an increase in the rate of industrialization and urbanization, India cannot afford the "no intervention" approaches. The costs of remediation are many times the costs associated with prevention or treatment of hazardous wastes. Typically, the costs of remediation vary between US\$ 50 to 5,000/ton depending on the type of pollutant and soil-water matrix which needs to be cleaned up.

The United States is the largest producer of hazardous waste with approximately 242.8 (LaGrega et al., 1994) million tons¹ being generated in a year. The clean-up costs of past improper disposal have recently been estimated from US\$20 million to as high as US\$200 million per site.

In section 3.2.1, a national estimate of hazardous waste generation was arrived at 5 million tons/year considering various forecasting methods. At an average cost of US\$ 400 per ton of clean up, the liabilities to clean and restore the hazardous waste contaminated environment would work out to more than 2 billion US\$! A recent report from the Asian Development Bank (ADB) estimates for India the costs of remediation due to uncontrolled disposal of Municipal Solid Wastes (MSW) as 1.1 Billion US\$, *at 1990 base* (Jalal and Rogers, 1997). Hence, it is likely that the costs of remediation for hazardous wastes may even exceed the estimate of 2 billion US\$.

India thus cannot afford to continue undermining its natural resource base through the uncontrolled discharge of hazardous wastes. Clearly this practice needs to be corrected at the earliest possible.

The proposed project builds on Approach C as being the most consistent with the economic, political, and social reality in India today.

4.3 Rationale and Underlying Policies of the Project

India's policy on environmental issues in industry was outlined through the Policy Statement for Abatement of Pollution (1992). In broad terms, the goals of the policy statement were to focus resources on pollution prevention and to emphasize the polluter pays principle. The EAP, summarized in section 2.1.2 also recognizes the management of hazardous wastes as a priority area.

¹ It is important to note that more than 90% of all hazardous waste was categorized as hazardous wastewater (aqueous liquid waste) in this study.

The proposed project design ascribes to the following policy directions:

- The Precautionary Principle
- The Risk Reduction Principle
- The Polluter Pays Principle

4.3.1 The Precautionary Principle

MOEF recognizes that the best approach to hazardous waste management is avoidance (viz. Approach C). By supporting efforts in waste minimization and clean technologies, MOEF seeks to maximize prevention rather than treatment. However, it is also recognized that generation of hazardous wastes cannot be avoided altogether.

4.3.2 The Risk Reduction Principle

The management of hazardous waste involves elements of risk. These risks are associated with the risks surrounding on-site and off-site treatment and disposal facilities as well as transport of hazardous wastes to treatment sites. Cognizant of the limitations created by a limited transport infrastructure and the lack of information on systems and procedures, MOEF intends to reduce transport of hazardous waste/residues² whenever possible. This will be done by encouraging on-site treatment i.e., at the generation point and by localizing treatment facilities as close to the generation point as possible.

On the other hand, MOEF recognizes that a multitude of smaller CHWTDFs will also have the unintended effect of increasing risks and therefore, the sites would have to represent a balance between size and number. MOEF proposes to consider the 'analysis of alternatives' presented in section 5.2.3.1 with the pros and cons to develop an optimal policy for waste treatment and disposal which balances between the costs and risks.

4.3.3 The Polluter Pays Principle

The generation of hazardous waste is a part of the manufacturing process. Therefore, treatment and disposal costs have to be considered a part of the production costs. The generators have to pay for the treatment of hazardous wastes as well as transportation and disposal of residues. CHWTDF developers will have to assess the level of charges that will maximize the benefits. Higher charges will provide incentives to the generators to recycle and pre-treat, and implement cleaner manufacturing processes, thereby reducing the total net waste generated for disposal.

² The term "Residues" is used for the waste remnants produced during the treatment of hazardous waste that require subsequent safe disposal if not additional treatment.

MOEF proposes to ensure that cost sharing instruments for CHWTDFs would include not only the costs of site development and operation but also that of the risk aversion measures such as insurance, eventualities such as the site closure and requirements such as the post-audit monitoring.

4.4 Hazardous Waste Management System

Any integrated waste management approach should follow the hierarchy as follows,

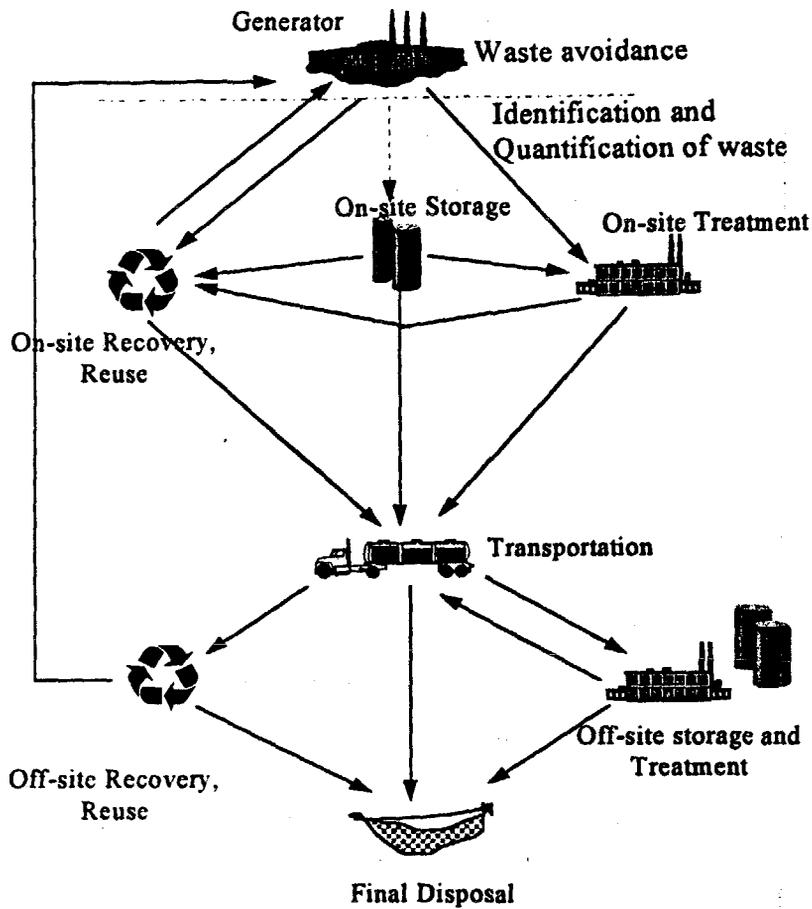
- Waste avoidance (or source reduction),
- On-site reuse, recovery and recycling,
- Off-site reuse, recovery and recycling,
- On-site treatment,
- Off-site treatment, and
- Disposal as a last resort.

Selection of a combination of the above options should minimize risk to human health and environmental resources. Responsible management of the waste by the generator, transporter, operator of the treatment/disposal facilities and the regulatory authority is essential. In all the options, public information and consultation is the key to success.

Figure 4.1 shows the hazardous waste management system. The hierarchy: Source reduction > Reuse or recycling > On-site treatment > Off-site treatment > Final disposal, is a preferential order of hazardous wastes management options.

In principle, the options at the top offer more protection to the environment than those at the bottom. Source reduction, (i.e. reducing the hazardous waste at the source i.e., in the plant) is the most desirable option. In a particular case, when source reduction options have been exhausted, then recycling of the remaining waste should be the next option considered. When recycling opportunities have been exhausted, then treatment is the next priority. Only after treatment options have been exhausted, secure final disposal is to be considered.

Figure 4.1 Hazardous Waste Management Components



Based on Figure 4.1, the important areas in the management of hazardous wastes, requiring development of policies and strategies are,

- Minimization of Hazardous Wastes
- Technologies for Treatment and Disposal
- Transportation of Hazardous Waste/Residues

4.4.1 Minimization of Hazardous Wastes

Minimization of Hazardous waste can be promoted by

- Placing the liabilities and responsibilities for proper management of hazardous wastes with the generators based on "polluters pay" principle;
- Developing and administering industrial sector specific permissible hazardous waste generation thresholds. These thresholds may be developed after processing the industrial production and hazardous waste generation data obtained from the exercise of inventorization.
- Model industries may be identified for use as case studies from the hazardous waste inventorization data, wherein the waste minimization program may be initiated. Using institutions or association of industries, the success stories of hazardous waste minimization may then be spread for achieving a multiplier effect.
- Providing sufficient economic incentives for the adoption of cleaner means of manufacturing and discouraging the hazardous waste generating industries.

In practice, it may be necessary to develop a mix of the technology and policy options, specific to industrial sectors. Even within an industrial sector, the mix of options may vary based on the size of the industry i.e. large, medium and small scale sector.

4.4.2 Technologies for Treatment and Disposal

The technology for treatment and disposal should be adopted to local conditions. The hazardous waste management system should be implemented stepwise through interim solutions. Small scale plants should be considered as the smaller initial investment which will make it easier for companies to construct them. The technologies which should be applied in the developing countries should all be best available technologies, not entailing excessive costs (BATNEEC).

The various options for treatment are:

- physical/chemical treatment
- stabilization
- landfill to stabilized residues
- incineration (cement kiln / rotary kiln / fixed hearth)
- oil/ solvent/ metal recovery

The various options for disposal are :

- co-disposal in sanitary landfills
- special landfill
- landfilling only stabilized residues
- deep well injection
- ocean dumping

While selecting treatment and disposal options, following are the desirable characteristics:

- Technologies chosen should be compatible with the wastes to be treated and disposed,
- There should be a minimum risk potential to the neighboring environment,
- The technology should ensure a prolonged life of the disposal site,
- The technologies should be locally practiced,
- They should be cost effective, especially regarding the costs of operation.

Selection of optimum technology alternative needs to be done on a case to case basis considering the site specific environmental and economic implications. The EIA should consider the analysis of alternatives, integrating the environmental and economic parameters, to come up with the most preferred technology option which is both cost-effective and environmentally acceptable.

4.4.3 Transportation of Hazardous Wastes

Transportation of hazardous wastes and residues to the treatment/disposal facility is frequently associated with substantial costs and considerable risks, even in situations where the transport network is well-developed. MOEF has in place a comprehensive regulation framework, however, a matching monitoring system must complement the regulations.

Rapid uncontrolled urban growth has resulted in a crowded network of transportation routes between industrial areas, with high risks of accidents. Unless the transport infrastructure is well developed, large CHWTDFs may be at a disadvantage. Therefore, the transportation infrastructure plays a prominent role in deciding on the policy of on-site treatment vs. off-site treatment and the number and locations of integrated CHWTDFs for the region. In this report, these issues are addressed in the analysis of alternatives in section 5.2.3.1.

Various alternatives for the transportation of the hazardous waste are interlinked to the policies on on-site and off-site treatment and the CHWTDFs. They include:

- insistence on on-site disposal of wastes having large volumes and high hazardous properties to eliminate risks in their transportation
- limiting number of CHWTDFs to only a few and carrying out extensive transportation of hazardous wastes to limited CHWTDF sites.
- setting up a large number of CHWTDFs to minimize the transportation of hazardous wastes
- avoiding sensitive routes
- scheduling of hazardous waste transportation to avoid peak traffic hours

Each of the alternatives cited above needs to be strategically linked with the selected policy for hazardous waste management. This should emerge from an environmental and economic evaluation of transportation, treatment and disposal systems on a case to case basis.

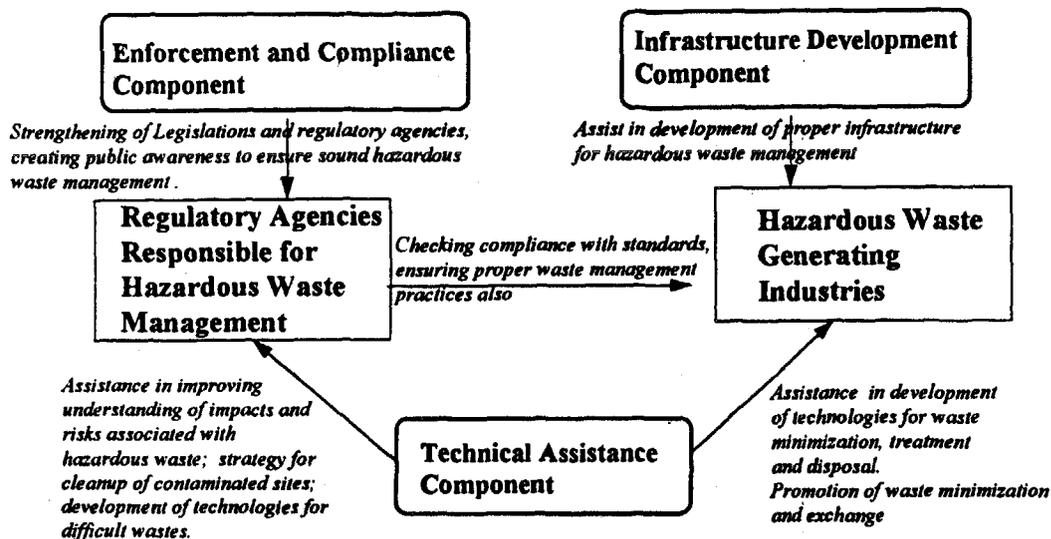
4.5 Project Design Strategy

Based on the key issues, underlying principles and the hazardous waste management system, following areas are considered to be essential in the design of the project.

- Improvement in the enforcement and compliance at SPCBs and MOEF/CPCB.
- Providing technical assistance to all key stakeholders i.e. regulators, industries, research institutions, financial intermediaries in different forms.
- Carrying out infrastructure development for promotion of minimization of hazardous waste at source, reuse, recovery, recycling, treatment and disposal.

The above form the three major components of the structure of the project as Enforcement and Compliance, Technical Assistance and Infrastructure Development. Figure 4.2 illustrates the inter-relationships between these components.

Figure 4.2 Interrelationship between Components of the Hazardous Waste Management Project



The enforcement and compliance component is expected to arrest further deterioration of environment and public health, force the hazardous waste generating industries to adopt measures such as minimization, recycling, reuse, recovery, treatment and disposal. In this component, activities on public information, consultation and outreach may also be taken up to increase the level of public and industrial awareness. Pollution Control Boards (Central as well as State) and MOEF are the focal agencies in the country which need to be strengthened for enforcement and compliance.

The technical assistance component can play a catalytic role between the various role players and stake holders such as the industries, regulatory agencies, research institutions, consultants and contractors to develop/ upgrade skills, collect new information and improve the knowledge base. Technical assistance is envisaged in specific areas of hazardous waste management to enable extensive capacity strengthening across the critical role players.

Typically, hazardous waste management involves components such as identification, minimization, treatment, and disposal. The waste generated should be processed on-site to explore possibilities of recycle, reuse and recovery and further treated for safe storage and disposal on site. Transportation of waste and residues of treated waste, is some times unavoidable due to (i) unavailability of space for treatment and disposal at the place of generation and (ii) the economy of scale, which is indeed relevant for small scale generators.

Finally, wastes or residues when transported to a common site, can be further processed (e.g. segregated or blended) to permit recycle, reuse, recovery or else treated to allow their safe ultimate disposal. The infrastructure development component may provide financial assistance to implement hazardous waste management related schemes at the industry level or at common facilities. Financial intermediaries may be identified which can provide the required assistance following a precautionary approach, the Process Guidance Framework (PGF) as detailed in Chapter 6.

Chapter 5 presents a detailed design of the above project components.

Chapter 5
THE HAZARDOUS WASTE MANAGEMENT
PROJECT

- 5.1 Preamble
- 5.2 Design of the Project Components
- 5.3 Benefits of the Proposed Project
- 5.4 Resolution of Issues in Hazardous Waste Management by the
Project

Chapter 5

THE HAZARDOUS WASTE MANAGEMENT PROJECT

5.1 Preamble

The proposed hazardous waste management project constitutes the third intervention of the World Bank on environmental issues in industry in India. The first two projects, namely, the Industrial Pollution Control (IPC) project and the Industrial Pollution Prevention (IPP) project commenced in the fiscal year 1992 and fiscal year 1995 respectively. The objective of these two projects, was to assist the MOEF in its efforts to prevent environmental degradation caused by industrial operations. The focus of the World Bank's third project however is specifically, hazardous waste management.

Presently, the APPCB receives assistance from AUS-AID (Australian Aid) for improvement of industrial waste management procedures and provision of disposal facilities for hazardous waste management in select districts of Andhra Pradesh. The Central Pollution Control Board receives technical assistance support from Gesselschafte Technische Zusammenarbeit (GTZ) for hazardous waste management. These two initiatives thus focus on capacity strengthening and technical assistance.

The objective of the World Bank's third intervention is to assist in the implementation of a modern and sustainable hazardous waste management system in the country. The project will assist in modernizing the regulatory framework, strengthening the institutions in charge of enforcement and monitoring, and financing priority investments in hazardous waste minimization, treatment, and disposal.

Consistent with the guiding principles and strategies identified in Chapter 4.0, the present project has been designed. The mandates of Agenda 21 with respect to hazardous waste, and that of the BASEL Convention have also been reflected in the design of the project. In addition the lessons learnt from the previous two interventions of the World Bank viz., IPC and IPP projects, are considered in the design of sub-projects especially those related to Enforcement and Compliance component. These experiences have been adequately reflected in developing a Process Guidance Framework and the Public Consultation and Participation (PCP) as outlined later in Chapter 6.0.

5.2 Design of the Project Components

5.2.1 The Enforcement and Compliance Component

This component has been designed to support a program of activities aimed at strengthening the monitoring and enforcement capacity of the SPCBs in those States where the most serious hazardous waste concerns have arisen. These are the States of Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu. The MOEF has also made provisions in this component, to include two additional State SPCBs of Uttar Pradesh and West Bengal for enforcement and compliance strengthening for hazardous waste management. This component in addition will provide assistance to the MOEF, CPCB as well as to financial institutions and state intermediaries, through MOEF. The latter is considered to be essential for the capacity building needed for implementing the infrastructural component.

The enforcement and compliance component has been tailored to meet the perceived needs at each Board and although it encompasses similar themes, it requires to be customized for each SPCB. This has been achieved by MOEF with the assistance of the Environmental Management Centre (EMC), Mumbai, by organizing at the four SPCBs (viz. Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu) strategic planning workshops and one joint workshop at New Delhi. The details of the schedule of the above mentioned workshops are given in Table 5.1 below.

Table 5.1
Schedule of the Strategic Planning Workshops

Sr.No.	Workshop Venue	Date
1	Gujarat Pollution Control Board	July 8-9, 1996
2	Tamil Nadu Pollution Control Board	July 25-26, 1996
3	Andhra Pradesh Pollution Control Board	August 9-10, 1996
4	Maharashtra Pollution Control Board	August 30-31, 1996
5	Joint Workshop with MOEF, New Delhi	October 30, 1997

The objective of the planning workshops was, a more focused positioning of the strategic planning process and needs for interventions such as the institutional strengthening, technical assistance and investments as customized to each State's requirements.

Outcomes of the planning workshops were used to streamline the requirements of each SPCB and design the components and sub-projects under each component, of the project. The various sub-projects of the enforcement and compliance component are presented below.

A) Strengthening of Analytical Capability

This sub-project focuses on upgradation and strengthening of the analytical and monitoring capacity of the SPCBs. It would involve procurement of equipment and instruments for sampling and analysis of hazardous wastes, treated residues as well as for contaminated soil, air and water. The SPCBs will require refurbishment of laboratories with respect to preparation of isolated areas and suitable safety measures for hazardous waste sampling and analysis. Civil works as and where required will also be supported through this sub-project. The instrumentation requirement for the SPCBs of Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu is shown in Annex 5-1.

B) Institutionalization of the Planning Process

A formal planning process will be established at the SPCBs through this element of the enforcement and compliance component.

The key elements of this initiative include:

- the organization of a planning division staffed with skilled personnel expected to develop a strategic management plan. This division will review as well as monitor the performance of the different tasks and actions being implemented by the SPCBs;
- the issuance of annual plans;
- setting up of performance indicators
- the collection and assessment of data on the performance of the SPCBs with respect to the objectives of the project.

This sub-project will assist in the financing of training, equipment and software required for formalizing this planning process.

C) Improving the Information Management Process

Recognizing the importance of information management, the CPCB took an initiative in 1986 to set up computer based information systems at CPCB with the assistance of Indian Institute of Technology, Mumbai, for managing pollution related data. In 1988, the system developed (programmed in CLIPPER) was delivered to SPCBs and 30 officers from SPCBs were trained. The systems include management of water and air quality data, industrial consents, computation of the cess etc. These systems have been currently maintained by the CPCB and the pollution related data is transferred from the SPCBs to CPCB via NICNET.

The SPCBs were also benefited by the systems such as "Waste Minimization Database of India (WMDBI)" developed under the World Bank assisted Industrial Pollution Prevention project. WMDBI contained 100 Indian and nearly 75 success stories on waste minimization.

In 1994, the MOEF sought assistance of Indian Institute of Technology, Mumbai and developed a software called "PARYA" for computerization of the Environmental Statements. PARYA has been programmed in FoxPro system and distributed to each SPCB by MOEF. The Centre for Environmental Studies at the Ana University has been engaged to carry out training of officers of SPCB in this regard.

This sub-project proposes to further extend, restructure and modernize the information management system of the SPCBs and CPCB. The objective is to improve the quality and timeliness of information required by the SPCBs to implement their functions. This will entail information organization to enable easy data storage and ready retrieval. This MIS will form the basis of a sound decision support system. The objective of this sub-project is also to ensure a transparency of information supply to parties outside the SPCBs.

The key elements of this sub-project include :

- Acquisition and installation of a modern MIS that includes a GIS in the States of Tamil Nadu, Andhra Pradesh and Maharashtra. The State of Gujarat is already in the process of acquiring GIS capability;
- Data creation which involves collection and verification of data.
- Implementation of the Manifest System for tracking of hazardous waste movement within the State;
- Development of a Toxic Release Inventory (TRI) covering key generators of hazardous waste in the State; the TRI is expected to contribute to improved enforcement as well as to the development of field data on hazardous waste management; and
- Modernization of the Technical Library.

The project will assist in the funding of the consulting services, training, equipment, documents and software required for upgrading and strengthening the Information Systems.

At CPCB, the project will finance investments in the development of national information systems, such as the National Inventory of Hazardous Waste.

D) Inventories of Hazardous Waste

The SPCBs have already conducted inventorization studies with the assistance of various institutions such as NEERI in Maharashtra, NPC in Gujarat, private consultants in Andhra Pradesh and on their own at the TNPCB. The SPCBs, through this sub-project, will continue to update and complement information on hazardous waste generation, its nature and location as well as undertake studies to determine trends in generation and anticipate regulatory and monitoring needs. The collection and analysis of this data will be supported by the project.

E) Identification and notification of sites for CHWTDF

The process of identification and notification of sites is being supported by the SPCBs and SDOE through various agencies / institutions. This process is the first and most crucial step in the development of a CHWTDF. It is however resource consuming and expensive. The support for consultancies and technical assistance through this sub-project would be extremely beneficial to the SPCBs.

F) Organization of a Community Outreach Effort.

The SPCBs will organize or strengthen a Communication Cell to promote the dissemination of information to the community and to encourage the feedback and consultation process on environmental issues in which the SPCB is involved. The Cell will also be the natural outlet for channeling of information regarding the project as a whole; for individual sub-projects and progress of project at State and National Level. This will accommodate the provisions of the community's right to know.

The project will finance the costs of the materials and consulting services required for initial operation of the Cell. As part of the community outreach program, and in order to provide accurate information to a wide audience on the objectives and impact of the project, MOEF and the SPCBs intend to undertake a pro-active public information outreach strategy. This will target various audiences, such as the media, opinion makers, academics, local government agencies, NGOs and local affected communities and their leaders.

The strategy consists of the use of press releases, (non-technical) fact sheets, a (technical) brochure, presentations and briefings by MOEF and the SPCBs. These efforts will enable MOEF and the SPCBs to keep the public informed throughout the implementation of the project. Funding for these efforts will be financed under this component.

G) Training and Awareness Programmes

Training associated with most of the sub-projects will also be funded by the proposed project. Most of the training needs at the SPCBs have been identified and listed during the planning workshops.

Apart from training of the officers of the SPCB, training would also be imparted to the following

- Customs officials for increased understanding of the import of the hazardous wastes
- Road Transport Officers (RTOs) for understanding the linkages between the Hazardous Waste (Management and Handling) Rules and the Motor Vehicle Rules (1989).
- Industries, especially from the small and medium sector as well as priority waste generators, for waste minimization, safe on-site storage and treatment options

As the role of financing institutions and state intermediaries is crucial in the implementation of the infrastructure component of the project, following activities are proposed through MOEF for their capacity building.

- Training for Financing Intermediaries such as Industrial Credit and Investment Corporation of India (ICICI) and Bank Of Baroda (BOB) to strengthen their capacity for appraisal and monitoring of the proposals for hazardous waste management infrastructure development sub-projects.
- Training for State Industrial Development Corporations and similar agencies involved in development, operation, management and closure of pilot CHWTDFs for hazardous waste management.

Awareness programs for the project as a whole will be organized for all the stakeholders, by the MOEF. SPCBs will organize public awareness programmes to disseminate information regarding various sub-projects such as Waste Minimization and Treatment at Individual Facilities, CHWTDFs, demonstration projects etc. with associated benefits and risks. These programmes will also create public understanding of the risks associated with the 'no intervention' situation.

Annex 5-2 (a) lists the proposed training programmes for each of the selected SPCBs as envisaged by the respective Board during the planning workshops. Annex 5-2 (b) and (c) list the training programmes as suggested to Financing Institutions and NGOs respectively.

H) Support to the MOEF in Policy Making

The project will also finance a program of activities at MOEF in support of its policy making role. Support will be provided for training and for development of policy papers in areas of concern related to hazardous waste. Also the project will support,

- Development of technical standards for residues from treatment and disposal of hazardous wastes,
- Guidelines for engineering design of the treatment and disposal facilities,
- Upgradation of the *Guidelines for Siting of Hazardous Wastes Treatment and Disposal Facilities (HWTDF) and Identification of Assessment of Abandoned Hazardous Waste Disposal Sites in 1991* developed by the MOEF,
- Updating the legislation based on project experience
- Guidelines for directing which wastes will have be treated and/or disposed on-site and which wastes will be permitted to be sent to CHWTDFs. (This issue is extremely critical in ensuring a prolonged life of the CHWTDF, optimal utilization of resources and minimization of transportation and off-site risks). These guidelines are expected to be instrumental in exploring avenues for minimization of wastes by recovery, reuse and recycling.
- Development of the manifest system,
- Guidelines for conducting EIA and Public Consultation and Participation (PCP) for EIA of hazardous waste minimization, treatment and disposal facilities.
- Development of the Resettlement Policy Framework (RPF) in the case of CHWTDFs. Progress has already made in this regard with the Department of Urban Affairs and Employment having made a policy guideline cabinet note of the RPF. This note has been issued to other departments for comments. MOEF is in favour of this note.
- Inculcation of the findings of the technical studies, proposed to be supported through this Project, into policy tools.

In addition, assistance will be given to the MOEF for overall project coordination and for establishing performance indicators.

5.2.2 The Technical Assistance Component

The Technical Assistance component is directed towards providing assistance to the six select SPCBs, CPCB and the MOEF. This component will support activities designed to complement the SPCBs and MOEF and improve the participation and access of the general public to information regarding the management of hazardous waste in the country and other activities of technical nature. These studies were identified considering some of the key issues in hazardous waste management described in Chapter 3.0.

The sub-projects identified under this component may be categorized as,

Environment and Public Health related

- Studies related to Assessment of Impacts (such as dose-response relationships for various hazardous wastes, assessment of impacts of toxins on human health and natural resources at various geographical areas, models etc.)
- Development of strategy for clean-up and rehabilitation of hazardous waste dump sites;

Promotion of Waste Minimization

- Support for the expansion of the Waste Minimization Circles, already initiated by MOEF, to focus on small scale generators of hazardous waste;
- Demonstration projects to support the technical innovations in the field of hazardous waste management;
- Study for the setting up of Waste Exchange Centres¹;

Strategies for Treatment and Disposal of Priority Wastes

- Study on long-term alternatives for containment and disposal of Halogen and Mercury Waste;
- Technology Alternatives for Disposal of Sludge from Effluent Treatment Plants.
- Strategy for management of Polychlorinated Bi-phenyls (PCBs)

Details of the sub-projects are provided below.

A) Studies related to Assessment of Impacts

In tandem with the above sub-project, studies to assess the environmental impacts due to the indiscriminate disposal of hazardous wastes in illegal dump sites is also being supported under this component. The impact on public health and the ecosystem due to contamination of air, water and soil arising from this improper management of hazardous wastes will be studied under this sub-project. The study will involve compilation of relevant international literature to establish the dose-response functions for various types of hazardous wastes. Negative impacts on human health and environment due to accidental spills of hazardous wastes during transportation/ storage/ treatment/ disposal

¹ This sub-project has emerged as a recommendation from the PIC on the SEAR.

on illegal dumping sites will be studied under this sub-project. The study will help in establishing safe exposure limits (during hazardous waste management operations), checking the existing threshold limits for the various wastes, and establishing standards for leachates.

The sub-project will involve identification of various geographical areas in the country, where the human population and the ecosystem are exposed to various toxins due to industrial activities as well as illegal dump sites. The field surveys at the priority sites will be conducted to monitor the level of exposures and the short term as well as long term effect on human health and the ecosystem. The study will also recommend remedial measures.

Relevant international models need to be procured which will help in assessing impacts of toxins in water (surface as well as ground water), soil, and the air. Additionally, specific waste transport models for prediction of impacts on water, soil, and air, if needed, may be developed. The prediction models will be useful in identifying the sites for treatment and disposal of hazardous wastes. The models will also be useful in assessing the damage caused to the environment in case of accidents involving hazardous wastes as well as in planning remedial measures.

B) Strategy for Clean-up and Rehabilitation of Hazardous Waste Dumps

The project will fund the development of an approach for the cleaning and rehabilitation of sites already contaminated by hazardous wastes. The objective of this effort will be to develop a framework that will emphasize the polluter pays principle, while recognizing that rehabilitation of these sites will result in large social benefits. The study will also include efforts to develop/ update the inventory of priority sites.

Hazardous waste dumps are defined as locations where industrial, radioactive or infectious wastes have been deposited in an uncontrolled manner, and the wastes have been released, or have the potential to be released into the surrounding ecosystems. Waste dumps could also include tank farms, drum farms, and abandoned surface or underground storage tanks. This strategy for clean-up of existing waste dumps will complement other initiatives in hazardous waste management undertaken by the MOEF, including legislation to complement and strengthen the BASEL Convention; regulations and investments in hazardous waste transport and disposal; hazardous waste manifest, TRI and GIS; institutional strengthening and laboratory upgrades for the regulatory agencies.

This national study proposes to (i) review international programs and assess their relevance in the context of the domestic situation; (ii) review existing information on the extent of the problem and design a comprehensive assessment effort to obtain a national picture of the problem, including the identification of data gaps and measures to fill in

any missing information; (iii) propose a strategy for identification of priorities for site remediation based on sound economic and environmental criteria; and (iv) assess alternatives and propose a financial mechanism for remediation of priorities.

C) Waste Minimization Circles (WMC)

The project will fund the expansion of the waste minimization activities, which has been successful under the IPP project. The objective of the expansion will be to promote dissemination of best practices on waste avoidance, waste minimization and recycle among small scale generators of hazardous waste(s).

Studies have shown that a major portion of the industrial waste is contributed by Small and Medium scale Industries (SMIs). Although, the quantity of industrial waste generated by individual SMIs may be small, the total quantity of waste generated by all SMIs combined is much higher than the waste generated by large scale units. There are over 3 million SMIs widely scattered throughout India and has lead to a widespread pollution problem.

In general, Indian small-scale industries lack the resources to properly treat their effluents. Untreated or improperly treated effluents from these plants remain one of India's most pressing and vexing environmental problems. A typical case in point is that of Gujarat state where small scale industrial units constitute the largest proportion of industries. The hazardous waste generated from these SSI units constitutes 44% of the total hazardous waste generated in the state whereas the large scale units generate only 13% of the total.

The SMIs with their minimal resources cannot afford the conventional end-of-pipe treatment measures and therefore find it difficult to meet the standards imposed by environmental regulations.

In this context, the concept of waste minimization emerges as an attractive, sustainable option for the waste management in SMIs. Numerous studies have shown the efficacy and potential of waste minimization in India, particularly in SMIs. However, there is a lack of awareness among majority of entrepreneurs regarding the benefits and implementation of waste minimization. Additionally, information dissemination and guidance to industry is also inadequate.

This project aims at increasing awareness, interest and confidence of Indian SMIs in implementing waste minimization techniques in their business programs. It also aims at generating adequate indigenous capacity to create an environment of self-help among industries in the application of waste minimization techniques. To achieve these aims, the project has two distinct principal components. These are:

- (a) Development of a communication strategy for launching an awareness campaign on waste minimization to educate industry personnel on the concept, benefits and methodology of waste minimization; to enable the systematic compilation and dissemination of information on waste minimization in different industrial sectors; and to ensure that the impact of waste minimization is felt uniformly throughout India and the concept will reach a maximum number of entrepreneurs so as to take root as a movement.
- (b) Extension of WMC. The objective of extending WMCs established under the World Bank assisted IPP project, is to promote waste minimization as a movement and not merely as a project activity thus involving/benefiting more and more industries; to build up local capacity at private and/or institutional level in establishing and running WMCs; to enhance the multiplier effect of waste minimization amongst industries; and to widen the platform for discussions and exchange of views/experiences on waste minimization.

Through the WMCs technical innovations in waste minimization may emerge which can be supported under the sub-project described in E) below.

D) Demonstration projects to support technical innovations in the field of hazardous waste management

The project will fund a continuation of the efforts initiated under the IPC project in support of technical innovations in the field of hazardous waste management. These efforts have been successful under the IPC project and have resulted in the development of innovative, highly replicable schemes for pollution management. The projects will consist of a first of its kind commercialization efforts for technologies that aim at avoiding the generation of hazardous waste in India or that promote the recovery of residues for uses that will render them innocuous.

E) Study for the setting up of Waste Exchange Centres

Waste exchange is the communication between waste producers and the market interested in relatively low cost secondary raw materials for production. The objective of promoting waste exchange programme is to:

- make information available to potential users,
- enable industrial wastes to be transferred from one industrial unit to another where it can be used as raw material.

Typical examples of waste exchange are given below :

Sr No	Waste Generator Industries	Waste	Waste User Industries	Usage
1	Chemical	Gypsum containing waste	Cement	Cement Additives
2	Electronics	Organic solvent	Chemical	Painting solvent
3	Plastics	Spent plastic	Plastic	Artificial wood

However, impediments to waste exchange include:

- Limitation of information about waste due to proprietary manufacturing processes,
- Liability associated with the waste exchange,
- economies of waste exchange including tax liabilities,

The role of waste exchange centres will be to develop strategies for overcoming these obstacles. The centres would require to facilitate and promote information on the types of waste that could be exchanged, sources for waste exchange etc.

Under this sub-project, a support will be provided for the study to set up of waste exchange centres. The purpose of this study will be to (i) understand the types of wastes that can be exchanged and develop a database on this information, (ii) the process to be adopted, (iii) the risks associated with the exchange process and insurance to cover these risks and (iv) taxation policy for waste exchange.

F) Study on long-term alternatives for containment and disposal of Halogen and Mercury Waste

The project will fund a national study for assessment of the magnitude of these types of wastes, potential for their minimization and recycling alternatives and for proper containment and disposal. This study may result in the enactment of specific legislation. The need for this project was envisaged since the feasible alternatives for the management of these wastes are not available locally.

G) Technology Alternatives for Disposal of Sludge from Effluent Treatment Plants.

The major portion of the total hazardous wastes generated is ETP sludge (refer section 3.3, Chapter 3). Therefore, it is recommended to support studies to develop viable alternatives for the disposal of these ETP sludges, through this project. The studies will

be conducted to identify the technological options which will help in minimizing the quantities of the ETP sludges and explore alternatives for their treatment and disposal. The results of these studies will also be used in developing policy options regarding the type of ETP sludges which necessarily should be disposed on-site and those which can be sent for off-site disposal.

H) Management of Polychlorinated Bi-phenyls

Polychlorinated biphenyls (PCBs) are recognized as a health and environmental toxin. The electrical industry is the single major consumer of PCBs, mainly in transformers and capacitors. Approximately 13 of the 209 varieties of PCB compounds are considered to have high toxicity. These PCBs are used as coolant in transformers and capacitors used in the power sector. In India, on an average, 5% of power transformers and 60-70% of distribution transformers in the power sector are abandoned because these are burnt due to load fluctuations. The electricity boards, often sell these to scrap dealers after draining out the transformer oil from where PCBs enter the environment. While the manufacture of PCBs has stopped in India, it is important to ensure that old and obsolete PCB materials and equipment that are replaced in power transmission plants are stored and disposed of in an appropriate manner that does not harm human health or the environment. Safe storage and proper waste handling techniques are recommended for PCB management, since a cost effective and acceptable technology has not yet been developed for destruction of these compounds.

The objectives of the sub-project are to (i) improve inventories of PCB compounds; (ii) assess existing management and disposal practices, regulations and guidelines; (iii) risk assessment of PCBs in air, water and soil and in the workplace; (iv) formulate a management plan for disposal of PCB compounds and materials containing PCBs i.e., a) a plan consisting of a short term strategy for PCB storage and cleaning facilities for transformer cleaning; and b) a sustainable long-term strategy for disposal; (v) provide details for a pilot facility to manage the wastes in a prescribed manner and prepare a detailed project report for the disposal of PCBs from the specified region; and (vi) formulate a regulatory framework.

5.2.3 The Infrastructure Development Component

This component is designed to support priority investments in hazardous waste management. Primarily, this component of the project will assist in the minimization of hazardous waste generation. However, in some cases generation of hazardous waste cannot be avoided and requires treatment and/or, ultimately, disposal. For those cases, where treatment and disposal is required by medium and small scale generators, the proposed project will assist in the introduction of institutional models and technologies to

be used for the proper ultimate treatment and safe disposal of hazardous waste/residues. The emphasis in the design of the Infrastructure Development component is on preventing future disposal of hazardous waste by industries. This is proposed to be achieved by promoting actions that will result in the avoidance, recycle or recovery of hazardous wastes. The design of sub-projects under this component thus ascribe to the Polluter Pays principle.

5.2.3.1 Analysis of Alternatives for Investments in Infrastructure Development

The management of hazardous waste involves elements of risk. These risks are associated with the risks surrounding on-site and off-site treatment and disposal facilities as well as transport of hazardous wastes to treatment sites. Cognizant of the limitations created by a limited transport infrastructure and the lack of information on systems and procedures, MOEF intends to reduce transport of hazardous waste/residues whenever possible. This will be done by encouraging on-site treatment i.e., at the generation point and by localizing treatment facilities as close to the generation point as possible.

On the other hand, the MOEF recognizes that a multitude of smaller CHWTDFs will also have the unintended effect of increasing risks and therefore, the sites would have to represent a balance between size and number. Identification of a policy for developing infrastructure for hazardous waste transportation, treatment and disposal collaborates with the principle of strategic management. There may be several policy alternatives regarding infrastructure development for transportation, treatment and disposal of hazardous wastes. MOEF proposes to consider the 'analysis of alternatives' presented below with pros and cons to develop a solution which balances between the costs, risks and acceptance by the public.

These are,

- A. Insist on on-site treatment and on-site disposal for all generators
- B. Insist on on-site treatment but off-site disposal for all generators
- C. Insist on on-site treatment and on-site disposal for all priority generators²
- D. Insist on on-site treatment but off-site disposal for all priority generators
- E. Insist on off-site treatment and off-site disposal for all generators

² Priority generators may be recognized as those who produce either wastes with high hazards which are risk prone during transportation or wastes with large volumes whose on-site disposal may be difficult. For instance, under the proposed amendments to Hazardous Waste (Management and Handling) rules, generators releasing wastes corresponding to Class E and Class A can be categorized as priority generators. An example of high volume hazardous waste is that of ETP sludge. ETP sludges in many cases are typically low hazard but of large volumes. Permitting transfer of sludges to the CHWTDFs may considerably reduce the life of the facility. Priority generators may belong to Small, Medium or Large scale industries and their definition is not restricted only to the Large scale.

Each of the above options have pros and cons that need to be considered, both at the central as well as state level prior to selection of policy options. Highlights of the pros and cons of are described below in Table 5.2.

Table 5.2 Pros and Cons of each of the Alternatives considered for Investments in Infrastructure Development

S.No.	Alternative	Pros	Cons
1	A - Insist on-site treatment and on-site disposal on all generators	<ul style="list-style-type: none"> • No transportation of hazardous wastes and hence aversion of transportation risks. • Establishment of CHWTDFs is not required and hence aversion of risk of public rejection of the site • Generators would be forced to minimize the wastes as the wastes would have to be contained on-site • Minimization of wastes would yield more production related benefits 	<ul style="list-style-type: none"> • The solutions may not be cost-effective and the economic burden on the waste generator can be abnormally high. • The solutions may not be feasible, due to need for space, for small and medium industrial units • Possibilities of waste exchange would not be available • Opportunities for off-site reuse, recycle and recovery would not be possible to access. • Potential on-site risks would be high • Regulation and monitoring of on-site facilities would be difficult for the SPCBs.
2	B - Insist for all generators on-site treatment but off-site disposal	<ul style="list-style-type: none"> • Transportation of treated hazardous wastes i.e. residues would not pose any major risks during transportation • Need to set up only disposal facilities which may not face major resistance from the public. • Generators would be forced to minimize the wastes, to some extent, as the wastes would have to be treated on-site • In the instances of minimization of wastes, benefits from improved levels of production would be accrued. • Less requirement of space on-site as compared to alternative A. 	<ul style="list-style-type: none"> • The solutions may be cost-effective, however the economic burden on the waste generator may be high, especially to those belonging to high hazard-small size industry operations. • The solutions may not be feasible for want of space, especially at the small industrial units • Possibilities of waste exchange would not be available • Opportunities for off-site reuse, recycle and recovery would not be possible to access. • Potential on-site risks would be high • Regulation and monitoring of on-site facilities would be difficult for the SPCBs.

S.No.	Alternative	Pros	Cons
3	C - Insist for all priority generators on-site treatment and on-site disposal	<ul style="list-style-type: none"> • Wastes having high hazard potential will be contained on-site • Priority generators of hazardous wastes would be forced towards minimization as the wastes would have to be treated and contained on-site • In the instances of minimization of wastes, benefits from improved levels of production would be accrued to the priority waste generators. • Less requirement of space of CHWTDF as compared to alternative D. • The solutions may be cost-effective, as the waste generators in the non-priority category can avail of cost-sharing and benefits of economy of scale via CHWTDF. • Access to opportunities for off-site reuse, recycle and recovery would be possible at least for non-priority waste generators. • Possibilities of waste exchange would be available, although to a limited extent, confined to non-priority waste generators. • Potential on-site risks could be moderate as compared to alternative B. • Regulation and monitoring of on-site facilities would be focused and manageable for the SPCBs. 	<ul style="list-style-type: none"> • There may be difficulty in defining priority and non-priority waste generators - with operational problems if the definition is expected to be an evolving one. • The solutions may not be feasible for want of space, if the priority waste generator happens to be a small or medium industrial unit.

S.No.	Alternative	Pros	Cons
4	<p>D - Insist for all priority generators on-site treatment but off-site disposal</p>	<ul style="list-style-type: none"> • Wastes having high hazard potential will be treated on-site however there would be risks in case of wastes which are transported without prior treatment. • Priority generators of hazardous wastes would be forced towards minimization, to some extent, as the wastes would have to be treated on-site. • In the instances of minimization of wastes, benefits from improved levels of production would be accrued to the priority waste generators. • The solutions may be cost-effective, as all waste generators an avail of cost-sharing and benefits of economy of scale via CHWTDF if required. • Access to opportunities for off-site reuse, recycle and recovery would be possible at least to non-priority waste generators. • Possibilities of waste exchange would be available, although to a limited extent, confined to non-priority waste generators. • Potential on-site risks could be moderate as compared to alternative B. • Regulation and monitoring of on-site facilities would be focused and manageable for the SPCBs. 	<ul style="list-style-type: none"> • There may be difficulty in setting up the definition of priority and non-priority waste generator - with operational problems if the definition is expected to be an evolving one. • The solutions may not be feasible for want of space, if the priority waste generator happens to be a small industrial unit. • The priority waste generator may resort to on-site treatment technologies which are cost-effective for treatment but may generate high volumes of treated residues. In such a case, the cost as well as risks of transportation of wastes would be higher. • More requirement of space of CHWTDF as compared to alternatives A, B and C. • There may be higher risks of exhaustion of disposal facilities.

S.No.	Alternative	Pros	Cons
5	E - Insist for all generators off-site treatment and off-site disposal	<ul style="list-style-type: none"> • The solutions will be cost-effective, hence the economic burden on the waste generator will be reduced. • Possibilities of waste exchange would be available to all the waste generators • Access to opportunities for off-site reuse, recycle and recovery would be possible for all the waste generators. • Potential on-site risks would be low. • Regulation and monitoring of on-site facilities would be focused more towards the CHWTDF and hence perhaps manageable to SPCBs. 	<ul style="list-style-type: none"> • Increased (both volume and risk point of view) transportation of hazardous wastes and hence high transportation risks amongst all the alternatives cited above. • A number of CHWTDFs would have to set up and hence there would high risk of public rejection of the site • Generators would not be encouraged to minimize the wastes unless supportive economic instruments are used, such as heavy taxes on wastes generated etc. • As minimization of wastes may not be the preferred option, production related benefits may be not be possible to accrue. • More requirement of space of CHWTDF as compared to all the alternatives viz. A, B, C and D. • There may be higher risks of exhaustion of disposal facilities.

Considering all the above alternatives with their pros and cons, a ranking of the alternatives is done below in Table 5.3 to identify the preferred set of alternatives.

Table 5.3 : Analysis of Policy Alternatives for the Infrastructure Development Component

Sr. No	Policy Alternative	On Site Risk	Off site Risk	Risk of public rejection	Difficulty in waste tracking	Requirement of on site space	Cost effectiveness	Exhaustion of common disposal facility	Difficulty in implementing regulations and monitoring of facilities	Lack of encouragement for taking up waste minimization measures
A	Insist on on-site treatment and on-site disposal for all generators	Very high	None	None	Very High	Very high	Low	None	High	Low
B	Insist on on-site treatment but off-site disposal for all generators	High	Moderate	Low	Moderate	Low	Moderate	High	Moderate	Low
C	Insist on on-site treatment and on-site disposal for all priority generators	High	Low	Moderate	Moderate	Low	Moderate	Low	Moderate	Low
D	Insist on on-site treatment but off-site disposal for all priority generators	High	Moderate	Moderate	Low	Low	High	Moderate	Low	Moderate
E	Insist on off-site treatment and off-site disposal for all generators	Moderate	High	High	Moderate	Low	High	High	Low	High

Based on Table 5.3 Alternative C viz. “ Insist on on-site treatment and on-site disposal for all-priority generators” and Alternative D viz. “Insist on on-site treatment but off-site disposal for all priority generators” emerge as environmentally more acceptable and economically viable alternatives for investments.

To promote implementation of these alternatives, following strategies have been evolved in the Project design.

- Provide assistance to MOEF to develop guidelines for directing which wastes will have be treated and/or disposed on-site and which wastes will be permitted to be sent to CHWTDFs. This issue is extremely critical in ensuring a prolonged life of the CHWDTF, optimal utilization of resources and minimization of transportation and off-site risks. The priority generators will thus get defined in this process. This assistance to MOEF shall be provided through the Enforcement and Compliance component.
- Catalyze small and medium scale industries to form Waste Minimization Circles for identifying opportunities to reduce waste generation at source itself. A sub-project on Waste Minimization Circle has been included in the Technical Assistance Component of the Project.
- Promote demonstration of innovative technologies for the on-site management of hazardous waste. Much of the outcomes of the Waste Minimization Circle related activities can be channeled through this sub-project. This sub-project is included in the Technical Assistance component of the project.

and finally,

- Focus in the financial assistance more on the Waste Minimization and Treatment at Individual Facilities to seize on-site hazardous waste management opportunities. Regarding the pilot CHWTDFs, a precautionary approach may be taken to evolve locally acceptable and sustainable solutions.

5.2.3.2 Sub-Projects under the Infrastructure Development Component

Based on the above analysis, the following two sub-projects have been evolved under the Infrastructure Development component.

A) Waste Minimization and Treatment at Individual Facilities

This sub - project will primarily promote hazardous waste minimization in addition to treatment efforts at the individual facilities by providing investment support. Assistance under this sub-project will be available for investments throughout the country.

Waste minimization techniques focus on source reduction or recycling activities that reduce either the volume or the toxicity of hazardous waste generated. Examples of waste minimization techniques across various industry sectors are listed in Annex 5-3.

B) Pilot Efforts for Establishment of CHWTDFs

In order to brainstorm on the sub-project on CHWTDF, MOEF, with the assistance of EMC, Mumbai, organized a Workshop on Risk Identification and Management at Hyderabad between January 17-18, 1997. In this workshop, the MOEF involved all the important stake-holders such as the SPCBs, Consultants, NGOs, Financing Institutions, Research and Academia etc. and examined various models of CHWTDF ownership. Annex 5-5 provides a summary of the recommendations of this workshop.

The MOEF, based on these discussions and the analysis of alternatives carried out in section 5.2.3.1, believes that the CHWTDFs should be first implemented in areas with a high concentration of generators, to serve *as a pilot*. Based on the technical, commercial, institutional and legal experience, gained from the pilot efforts, development of other CHWTDFs can be undertaken, later.

The purpose of this pilot effort is to assess the viability of establishing infrastructure for hazardous waste transportation, storage, treatment, and disposal. The lessons learnt from the pilot efforts to be established in the 6 participating states will be used for establishment of facilities across the country. Various aspects of CHWTDFs which will be assessed by the proposed sub-project are :

- Feasibility of segregation and categorization of wastes from various generators according to the compatible treatment options.
- Feasibility of transporting wastes from various generators to a common facility.
- Technological viability of processing wastes generated by different generators at a common treatment and disposal facility.
- Economic feasibility of the common treatment and disposal facility.
- Waste generators' willingness to pay for hazardous waste management and importantly,
- Public acceptance of the CHWTDFs

Proposed Model for the Pilot CHWTDF

Under this project the grant portion must be of the order of 80% of the total capital cost proposed for a pilot CHWTDF. Which can be financed via GOI-State-/State Intermediary. The contribution from other stakeholders can be up to 20% of the total capital cost.

Figure 5.1 depicts the ownership model on the principles of “Build Operate Manage” (BOM) for the pilot project.

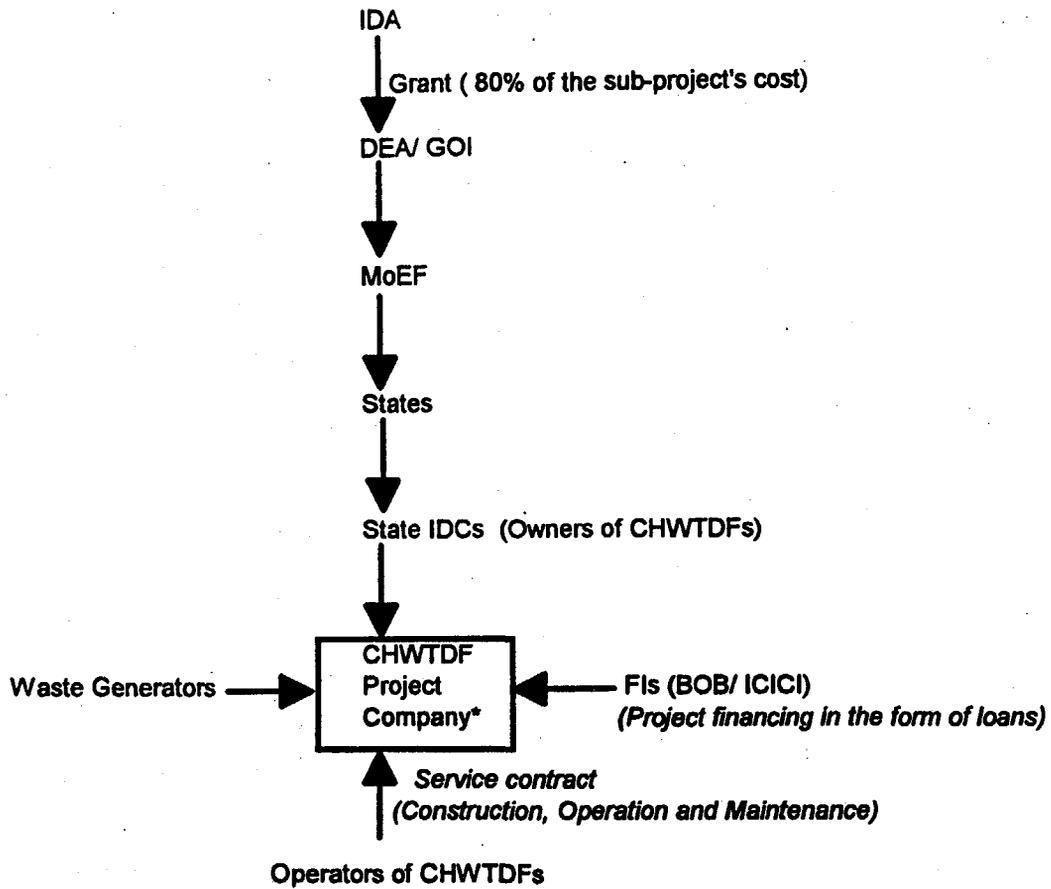
A CHWTDF company may be formed, which may comprise waste generators, operator of the facility, and/or private investor. As the major shareholder, Government will be the owner, and the operations of the company will be controlled by the designated Government agency - e.g., the Industrial Development Corporation (IDC) or the state intermediary.

MOEF in consultation with the SPCBs have identified following state level intermediaries for the promotion of pilot CHWTDFs. These are,

Maharashtra	Maharashtra Industrial Development Corporation (MIDC)
Tamil Nadu	Tamil Nadu Urban Development Finance Corporation (TNUDF)
Gujarat	Gujarat Industrial Development Corporation (GIDC)
Andhra Pradesh	Andhra Pradesh State Industrial Development Corporation (APSIDC) or Andhra Pradesh Industrial Infrastructure Corporation (APIIC)

The Polluter Pays Principle will be used to develop a waste charging system along the following lines.

- The operating and treatment costs will be met by charging the users on a commercial basis.
- The charging rate will be determined on the basis of quantity and characteristics of the waste and will address the risks of waste supply. The charges should ensure the recovery of the capital and operational cost and may be updated every year.
- The waste charges may be collected by the Operator on behalf of the Industrial Development Corporations.



* Contribution from Agencies other than the grant from IDA may be maximum upto 20%

Figure 5.1: Ownership Model for Pilot Projects for CHWTDFs

The BOM model illustrated in Figure 5.1 indicates that the investment at CHWTDF by the IDC/or the State Intermediary will be subsidized. However, the charges to be paid by the Hazardous Waste Generator to IDC will be calculated on a commercial basis towards recovery of capital investments and meeting of the operating costs. A corpus will be set up through the funds generated by running the CHWTDF, which will be used for creating new CHWTDFs. Also lessons learnt from this project will be useful in establishing new CHWTDFs in the state or elsewhere.

In the model described above, the Government has the role of regulatory agency as well as that of a promoter and manager of the facility. Roles of various agencies proposed to be involved in the operation and management of the pilot effort are shown in Box 5.1.

Box 5.1 : Role of various agencies involved in the pilot CHWTDFs

MOEF: ToR for EIA, Reviewing EIA reports as required, Developing design specifications for CHWTDFs, Overall Performance monitoring

Financing Institutions (FIs): Commercial viability and economic life cycle of waste management infrastructure.

World Bank: Reviewing EIA reports, Design details and commercial viability of the project.

SDOE: Selection of sites for pilot CHWTDFs, Reviewing EIA reports as required,

SPCBs: Reviewing EIA reports as required, Hazardous waste tracking, Authorization, Sampling and Compliance Monitoring, ensuring public participation.

Transportation Department: Safety aspects related to Hazardous waste transportation.

Industrial Development Corporation / State Intermediary: Selection of private CHWTDF operator, Preparing CHWTDF project company business plan, financing, development of charging system for the waste generators, ensuring public participation.

The major advantages of the present model are:

- It would be financially viable, since 80% of the capital cost will be contributed from the International Development Agency (IDA) grant.
- The post closure costs could be met by the corpus.
- Conflict of interest in terms of efficient and profitable operation of the facility will be controlled by :

- contracting a private operator by the CHWTDF company with a ceiling (maximum investment up to 20% of the capital cost) being imposed on the operator's stake in the company.
- CHWTDF company would enter into a performance agreement with the operator.

5.3 Benefits of the Proposed Project

The project will assist the MOEF to launch a comprehensive effort intended to alleviate the existing situation by providing financial and technical resources for investments in infrastructure, for strengthening of enforcement agencies and for efforts aimed at dissemination of information and promotion of participation of affected communities in the development of local solutions to hazardous waste problems.

Based on the findings of the discussion on the No Intervention scenario presented in Chapter 4.0, the benefits of the various components and sub-projects of the proposed project are described below.

5.3.1 The Enforcement and Compliance Component

The main benefit of the various sub-projects proposed to be implemented under this component is a strengthening of the monitoring and enforcement capacity of the SPCBs in the project states and institutionalizing a well defined hazardous waste management system. Although the focus of this component is the 6 select states, through the support to the MOEF, it will have a beneficial effect on hazardous waste management across the country. This will be possible through assistance to MOEF for review and modification of the hazardous waste categorization system.

Improvements in the institutional capacity of SPCBs will result in better monitoring and compliance with regulations and better enforcement actions. Investments in information dissemination and strengthening of enforcement agencies will render the long term benefit of credible enforcement of existing laws.

The benefits of each of the elements of this component are enlisted below :

- **Strengthening of analytical capability of SPCBs**

Upgradation of the state pollution control SPCBs' laboratories and the analytical capabilities of the technical personnel is envisaged. Associated technical assistance in the form of training programmes for the laboratory staff of the SPCBs will result in capacity building and improvement. This may entail addition of technically competent manpower

resulting in upgradation of overall staff strength and capability for hazardous waste sampling and analysis.

This improved analytical capability and the facilities of the state-of-art laboratories will lead to greater reliability of analytical data. The main benefit of this strengthening would be an improvement in inventorisation, characterization and therefore better implementation of rules. This improvement in analytical capability would also assist the SPCBs in ensuring accuracy and reliability in monitoring of individual facilities and CHWTDFs.

- **Institutionalization of the planning process**

The focus is on establishing a formal planning process. Formalizing the planning process and institutionalizing it in the SPCBs entails establishment of a planning division, staffed with qualified planners, typically experienced senior professionals drawn from the Board personnel. The major benefit to the SPCBs through this component will include development of a Strategic Management Plan leading to drafting of Action Plans. This would enable systematizing the implementation of policies and plans, prioritizing functions, and ensuring monitoring and accountability of the performance of the Board.

A Strengths Weaknesses Opportunities and Threats (SWOT) analysis, an inherent requirement prior to preparation of a strategic management plan will enable identification of the Board's strengths and weaknesses. This will assist in formulation of a policy by the Board to implement its designated functions. Definition of objectives, strategies, tactics, tasks and action plans to implement this policy would introduce clarity and focus in the Board's functioning.

The strengthening of the planning function and preparation of a strategic management plan would also mean ensuring allocation of responsibilities resulting in optimal utilization of resources and time.

- **Improving the MIS**

MIS is the basis of a strong decision support system. Restructuring and modernizing the information management system of the SPCBs and CPCB through this sub-project will result in improvement of the quality and timeliness of information required by the SPCBs to implement their functions. This will result in information organization enabling easy data storage and ready retrieval. Such an MIS will form the basis of a sound decision support system.

GIS together with a well developed Manifest system would be extremely useful in the tracking of hazardous waste. Additionally, GIS is a useful tool in siting of CHWTDFs.

Improvement of the hardware of the MIS is proposed to be complimented with training of personnel and technical assistance in hardware and software procurement and usage to ensure establishment of an effective MIS.

- **Inventories of Hazardous Wastes**

The need for a reliable and accurate inventory of hazardous wastes can never be emphasized enough, since it is the basis for treatment technology selection as well as design of facilities for treatment, storage and disposal. In some states inventorization has been done but verification of this data is in progress. This sub-project will be useful in establishing a reliable and accurate inventory of hazardous wastes in the 6 selected states initially, to be followed by a similar exercise for other states.

This sub-project would be complemented by the strengthening of the analytical capabilities of the SPCBs to ensure that a reliable inventory is developed.

- **Identification and notification of sites for CHWTDFs**

Development of hazardous waste treatment and disposal facilities is one of the most important component of hazardous waste management. This process is the first and most crucial step in the development of a disposal site/ CHWTDF. The proposed project will thus be helpful in preventing the illegal dumping of the wastes which is likely to be practiced in case of lack of notified hazardous waste treatment and disposal sites.

- **Organization of a Community Outreach Effort.**

Public involvement is the key to the success of project. Through this sub-project, the SPCBs will organize or strengthen a Communication Cell to promote the dissemination of information to the community and to encourage the feedback and consultation process on environmental issues in which the SPCB is involved. These efforts will enable MOEF and the SPCBs to keep the public informed about the project as a whole as well as the performance of the sub-projects.

- **Training and Awareness programmes**

Training is to be imparted to SPCB officials in every sphere to enable capacity building/ strengthening. In addition, training for other government agencies such as Customs,

RTO, industries (especially from small and medium sector) will also be supported. Strengthening of FIs and State Intermediaries is also proposed which is extremely advantageous specially for the investments in non-project states for establishing waste management facilities.

Awareness programs for the project as a whole will be organized for all the stakeholders, by the MOEF. SPCBs will organize public awareness programmes to disseminate information regarding various sub-projects such as Waste Minimization and Treatment at Individual Facilities, CHWDTFs, demonstration projects etc. with associated benefits and risks. These programmes will help in creating public understanding of the risks associated with the 'no intervention' situation.

Additionally the training is proposed to be a sustained exercise which is essential for decision making regarding hazardous waste management.

- **Support to the MOEF and CPCB**

Support to MOEF in policy making, setting standards for end-of-the pipe discharges from treatment and disposal facilities, upgrading existing guidelines where required, and developing new guidelines especially for thresholds for EIA of treatment and disposal facilities, development of the RPF in the case of CHWDTFs and inculcation of the findings of the technical studies, proposed to be supported through this Project, into policy tools is probably the most crucial sub-project in this component.

The main benefits of this sub-project would be a streamlining of the policy of hazardous waste management in the country. Moreover developing of standards and guidelines would assist the SPCBs in implementation of the rules and compliance monitoring.

5.3.2 The Technical Assistance Component

The Technical Assistance component is directed towards supporting activities designed to enhance the technological database at the SPCBs and MOEF for hazardous waste management and improve the participation and access of the general public to information regarding the management of hazardous waste in the country.

A) Strategies for Clean Up and Rehabilitation of Hazardous Waste Dumps

The advantage of this sub-project is that a framework will be developed for clean-up of the hazardous waste sites. The output of this study will be made accessible by MOEF.

The onus of the actual clean-up is however on industry in keeping with the Polluter Pays Principle.

B) Studies on Assessment of Impacts

The study will help in establishing safe exposure limits (during hazardous waste management operations), checking the existing threshold limits for the various wastes, and establishing standards for leachates.

The sub-project will involve identification of various geographical areas in the country, where the human population and the ecosystem are exposed to various toxins due to industrial activities as well as illegal dump sites. The field surveys at the priority sites will be conducted to monitor the level of exposures and the short term as well as long term effect on human health and the ecosystem. The study will also recommend remedial measures.

Waste transport models will be procured and /or developed for prediction of impacts on water, soil, and air. These prediction models will be useful in identifying the sites for treatment and disposal of hazardous wastes. The models will also be useful in assessing the damage caused to the environment in case of accidents involving hazardous wastes as well as in planning remedial measures.

C) Waste Minimization Circles

The focus of this sub-project is to provide assistance to small scale generators in waste minimization efforts. Lack of sufficient technical and financial resources to manage hazardous wastes leads small and medium scale generators to indiscriminately dispose waste. In this context, the concept of waste minimization emerges as an attractive, sustainable option for the waste management in these units. Numerous studies have shown the efficacy and potential of waste minimization in India, particularly in SMIs.

One of the benefits envisaged of this sub-project is increased awareness, interest and confidence of Indian SMIs in implementing waste minimization techniques in their business programs. Generation of adequate indigenous capacity to create an environment of self-help among industries in the application of waste minimization techniques is also another anticipated benefit. The practice of waste minimization promoted through these circles would result in increased production and less burden of treatment and disposal.

D) Demonstration projects to support the technical innovations in the field of hazardous waste management

The main benefits of this technical assistance are introduction of commercialization efforts for technologies that aim at avoiding the generation of hazardous waste in India viz., clean technology or those that promote the recovery of hazardous residues for uses that will render them not hazardous. The demonstration projects will help in promoting full scale application of the innovative technologies at a greatly reduced risk.

E) Study for setting up of Waste Exchange Centres

The main benefit of this sub-project is enabling greater understanding of the process of waste exchange. Additionally these studies will result in a streamlined process of waste exchange through development of guidelines for the process of waste exchange, taxation related to waste exchange and insurance for risks associated with the process. Another benefit that will result from the study will be the ascertainment of the extent of hazardous waste minimization that is possible through this process. Waste exchange centres will provide assistance and promote waste exchange among industries. The promotion of waste exchange would result in increased production and less burden on treatment and disposal facilities.

F) Study on long-term alternatives for containment and disposal of Halogen and Mercury Waste

Some of the benefits anticipated to be derived from this study are a reliable assessment of the magnitude of these types of wastes, assessment of the potential for their minimization and recycling alternatives and strategy for proper containment and disposal. The study would result in development of feasible technology alternatives, presently not available locally, for the management of halogen and mercury wastes.

G) Technology Alternatives for Disposal of Sludge from ETPs

The ETP sludge constitutes the major portion (e.g., 78% of the total hazardous waste generated in Maharashtra) of the total quantity of the hazardous waste generated as seen from the inventorization data (refer section 3.3). The volume of these sludges becomes an issue while considering the option of off-site disposal, especially in CHWTDFs. The issue in question here is exhaustion of the disposal sites necessitating acquisition of more land for establishment of new CHWTDFs. Therefore, development of viable technological options for dealing with ETP sludges will help in reducing the overall burden of the hazardous waste management program to a great extent.

H) Management of Polychlorinated Bi-phenyls

Studies will help in development of viable technological options for management (including storage, handling, transportation and disposal) of PCBs. Therefore, it will help in reducing the adverse impacts on human health and environment due to indiscriminate disposal of PCB containing wastes.

5.3.3 The Infrastructure Development Component

Development of infrastructure for hazardous waste management will greatly improve the disposal and containment system for hazardous waste in India, resulting in large benefits to human health, conservation of natural resources and ecosystems and safety of affected communities.

Many of the facilities required for hazardous waste management such as CHWTDFs, promotion activities for waste avoidance/ minimization are extremely resource intensive. Hence there is a need for investment assistance. The sub-projects in this component will be extremely beneficial in this respect.

The sub-project identified under the investment component focus on support for priority investments in :

- Waste Minimization and Treatment at Individual Facilities
- Pilot Efforts for Establishment of CHWTDFs

A) Waste Minimization and Treatment at Individual Facilities

Promotion of minimization/ prevention of hazardous waste generation efforts will render investments in the form of all these sub-projects sustainable in the long term. The philosophy of this component is in line with the GOI policy of preventing pollution at source.

The advantages of this initiative are increased economic benefits for industries, arising from the adoption of environmentally clean technologies, modernization of processes and improvement of environmental performance. The experience may be used to promote opportunities for recycling and recovery of toxic residues for other generators.

B) Pilot Efforts for Establishment of CHWTDFs

Even if waste avoidance/ minimization is practiced, some wastes would still be generated. Small and medium scale industries lacking technical know-how and financial resources require assistance for setting up treatment facilities. Both these aspects would be

benefited by the sub-project which supports investments in establishment and operation of CHWTDFs. The main objectives of this initiative are:

- (i) To assess technological and economic feasibility of the common treatment and disposal facility,
- (ii) To understand the institutional aspects associated with establishment, operation, closure and post closure of these facilities,
- (iii) To develop risk sharing agreements and contracts
- (iv) To understand the waste generators' willingness to pay for hazardous waste management, and
- (v) To understand public acceptance of the common treatment and disposal facility.

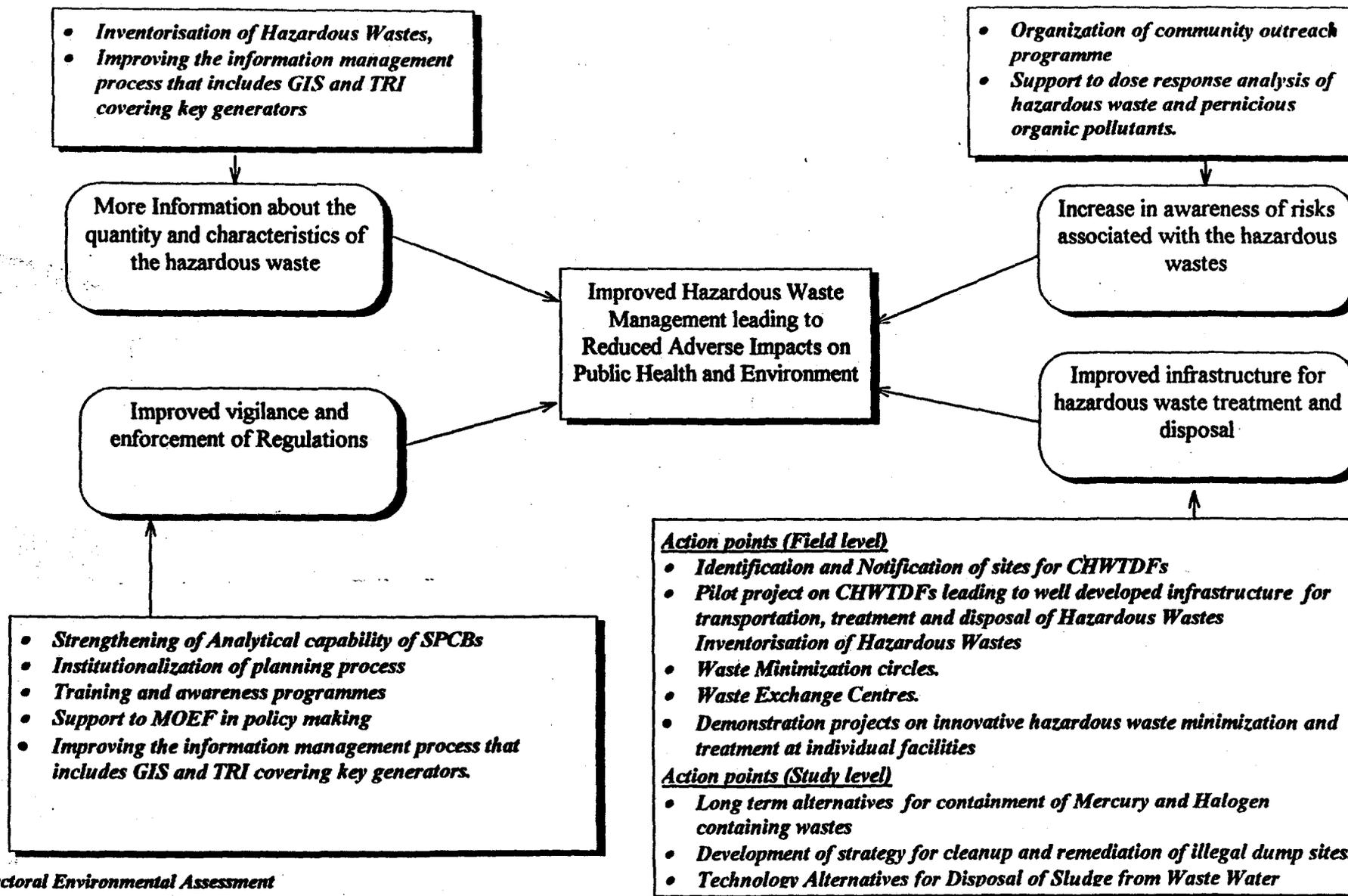
The experiences with the pilot project may be used to improve the model and develop infrastructure for hazardous waste management.

5.4 Resolution of Issues in Hazardous Waste Management by the Project

Figure 5.2 summarizes the influence of the project design on resolution of key issues in hazardous waste management described earlier in Chapter 3.0. As seen from the figure, it is envisaged that through the various components and their sub-projects, the project will result in the development of an improved hazardous waste management system in the country.

For the outline of the project description provided in this chapter, the following Chapter 6.0 builds on the Process Guidance Framework emphasizing the role of Public Consultation and Participation.

Figure 5.2 : Influence of Project Design on Resolution of Key Issues of Hazardous Waste Management



Chapter 6

**PROCESS GUIDANCE FRAMEWORK AND
PUBLIC CONSULTATION PROCESS**

6.1 Mitigation of Risks and Impacts in the Context of SEA

6.2 Mitigation of Risks/Impacts by Project Design

**6.3 Mitigation of Risks/Impacts by The Process Guidance
Framework**

6.4 Public Information and Consultation

Chapter 6

PROCESS GUIDANCE FRAMEWORK AND PUBLIC CONSULTATION PROCESS

6.1 Mitigation of Risks and Impacts in the Context of SEA

At the level of SEA, the projects are identified at a rather conceptual or programmatic level. Here, project details such as location, size or investments, process engineering, designs and drawings etc., are not fully known, *apriori*, to allow for the development of mitigation measures for project specific impacts. Hence, the approach to manage risks/impacts as arising from various projects and sub-projects needs to be evolved from a systematic and preventative point of view. This is normally done in terms of,

- preparing an environmentally sound project structure in terms of components and sub-projects which will resolve several of the possible risks/impacts *by design*
- laying down procedures and requirements for project eligibility, appraisal and monitoring to minimize possible risks/impacts during project implementation. The Process Guidance Framework (PGF) defines such necessary procedures and requirements.

Thus, one of the important outcomes of the SEA exercise is the Project Design itself as well as the development of the associated PGF.

In the context of this SEA, environmental impact is understood as a *change* due to an activity on an environmental component. The change can be positive (i.e. beneficial) or negative (i.e. adverse). An environmentally sound project design will attempt to maximize the positive impacts and reduce the negative impacts to the extent possible and keep them within acceptable limits. This may be achieved by expanding the scope of the project design to include necessary mitigatory and supportive measures in the form of sub-projects.

A PGF addresses the entire Project Cycle i.e. from Project Identification, Implementation, Monitoring till Closure. The interest of the PGF is to ensure that the negative impacts are actually alleviated or remain within acceptable limits at all stages of the Project implementation as well as after Project closure.

Risk is a *chance of failure*. Failure may be due to several reasons such as technical, financial, institutional etc. Risks should be best addressed at the project design stage itself. In fact, if risks are adequately managed at the project design level, then lesser

difficulties arise at the project implementation level. A PGF looks into the management of any *residual risks* during the implementation of the Project, so that chances of failure are either eliminated or are only remote.

6.2 Mitigation of Risks/Impacts by Project Design

The overall risks associated with the project as a whole can be grouped into three categories: technical, institutional, financial and others.

6.2.1 Management of Technical Risks

The Enforcement and Compliance component of the Project focuses on the SPCBs of six selected states. Additionally, two more SPCBs are proposed to be considered for the purpose of strengthening. The Boards in these states lack sufficient technical experience and in-house capabilities for the management of hazardous wastes. To address these concerns, this component of the Project has been designed to cover aspects such as training, computer based information systems, strengthening of laboratories, setting of hazardous waste and toxic release inventories etc. It is anticipated that during the course of the Project, the technical capacity of the SPCBs will substantially improve for effective management of hazardous wastes.

The FIs selected in this Project have a general lending and coordination experience and in fact some of them have a direct experience in handling environmental infrastructure related projects. However, in the specific areas of hazardous waste management, these institutions lack the necessary experience and expertise. The Enforcement and Compliance component of the project includes a sub-project on Training and Awareness for this purpose. This sub-project is expected to provide FIs the necessary skills and knowledge base for identifying, appraising and monitoring the sub-projects of the Infrastructure Development Component.

In addition, sub-projects have also been proposed, under the Enforcement and Compliance component, at the MOEF and CPCB to develop policies and standards, review EIAs, set technical design guidelines etc. This is expected to provide technical directions to SPCBs, FIs, industries as well as consultants and engineering firms, especially in the development of the necessary infrastructure.

Technical risks can arise when technologies not practiced before are implemented for the first time. To alleviate these risks, the Project has made the following two provisions in its design.

- Under the Technical Assistance component, a sub-project on demonstration projects has been included. The demonstration projects will promote innovative technologies for minimization, reuse, recovery, recycling and treatment of hazardous wastes. The techno-economic experience of the demonstration projects will be extremely useful to develop any adaptations necessary for full scale implementation.
- Under the infrastructure component of the project, a sub-project has been included to set up pilot CHWTDFs. The pilot CHWTDF projects will assist in understanding application of full scale technologies for hazardous waste storage, transportation, minimization, reuse, recycle, recovery, treatment and disposal. Since the techno-commercial experience on such facilities is rather low in India, the pilot projects will serve as models for the future. Consequently, risks of setting up of future CHWTDFs are expected to be minimized.

Figure 6.1(a) schematically illustrates the resolution of technical risks by the Project.

6.2.2 Management of Institutional Risks

This project relies mostly on the front line institutions (viz. SPCBs) for the management and implementation of the institutional activities and apex institutions such as MOEF/CPCB for coordination, supervision and guidance. The other important institutions playing a critical role are the financing and intermediary institutions, already identified at the State and the National level.

A major institutional risk is that the above implementing agencies may fail to manage the program effectively or not meet the implementation schedule, given the large number of activities in which they are already involved.

To alleviate such risks, following specific interventions have been proposed in the Enforcement and Compliance component of the Project.

- An assistance is proposed to MOEF by appointing NPC, New Delhi for Project coordination
- All the four SPCBs involved in the implementation of the Project have been directed to set up Project Implementation and Planning Cell to oversee the Project implementation at the State level.

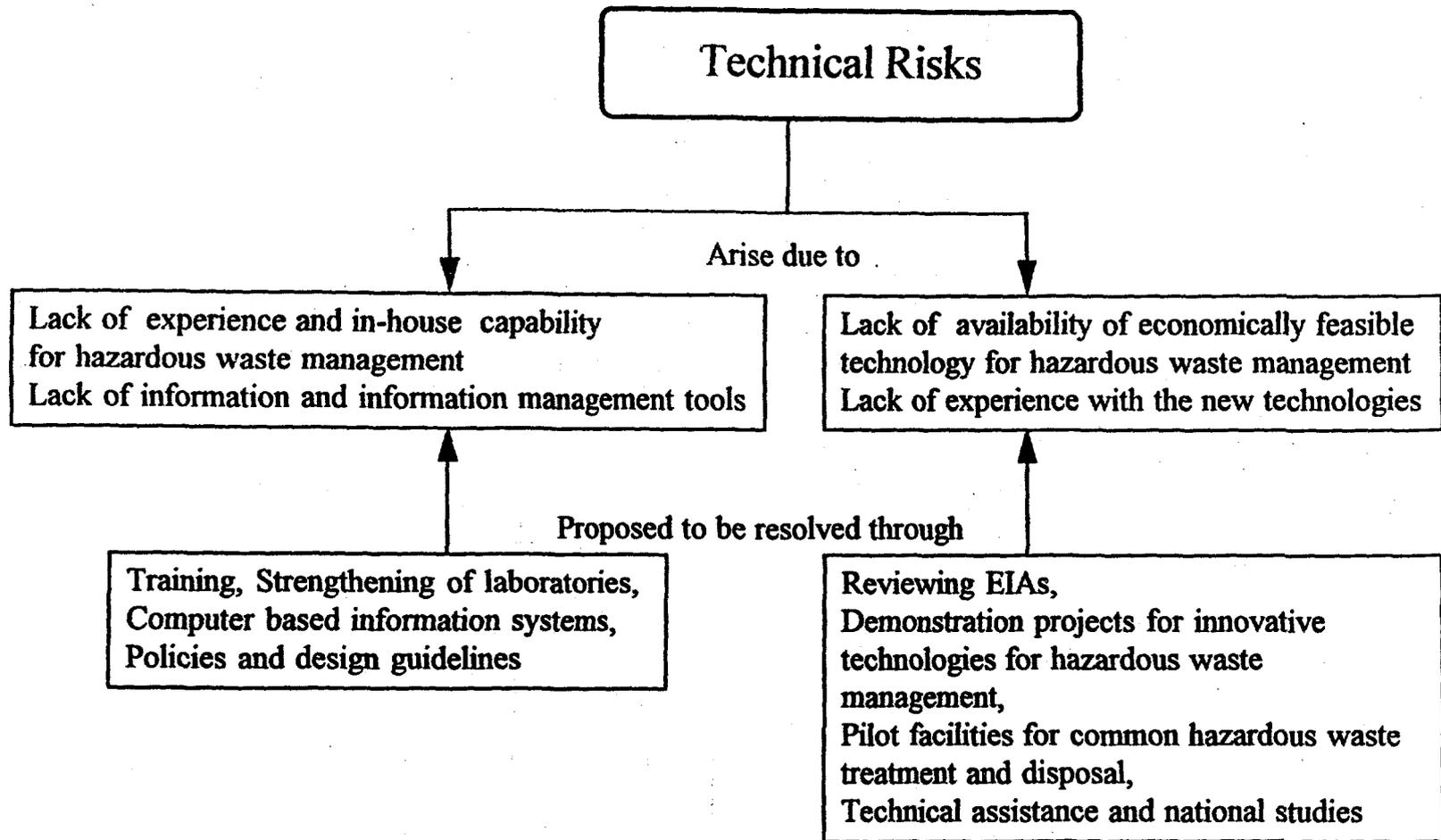


Figure 6.1 (a) : Resolution of Technical Risks

Further, MOEF recognizes that institutional structure (i.e. model of ownership and risk sharing) needs to be critically assessed while setting up of the CHWTDF. To minimize the institution failure risks, the Infrastructure Development Component of the Project proposes that the major ownership of the CHWTDF will remain with the identified state intermediary (i.e. Government), at least for the pilot experiments.

Figure 6.1(b) schematically illustrates the resolution of institutional risks by the Project.

6.2.3 Management of Financial and Other Risks

Financial risks can arise as a consequence of other risks such as technical and institutional. As described in the sections above, the technical and institutional risks have been greatly minimized by the Project design itself. Hence, it is anticipated that the residual financial risks may actually be low. Further, the financial risks are more centered around the Infrastructure Development Component of the Project. A comprehensive PGF (described later) addresses management of such risks via its three step process, set at Project Eligibility, Appraisal and Monitoring levels.

A clear communication of the Project, its scope and objectives, especially in the local, regional as well as national context is the key to the successful implementation of the Project. Risks of rejection and poor appreciation can arise if such a communication has not been done. In this Project therefore, a sub-project has been envisaged called Organization of Community Outreach Effort under the Enforcement and Compliance component. In this program, MOEF/SPCB will employ several methods of public communication and consultation for the Project as a whole as well as its performance. Apart from this initiative, the PGF lays down requirements for Public Participation and Consultation (PCP) during development of the infrastructure oriented sub-projects.

Figure 6.1(c) schematically illustrates the resolution of financial and other risks by the Project.

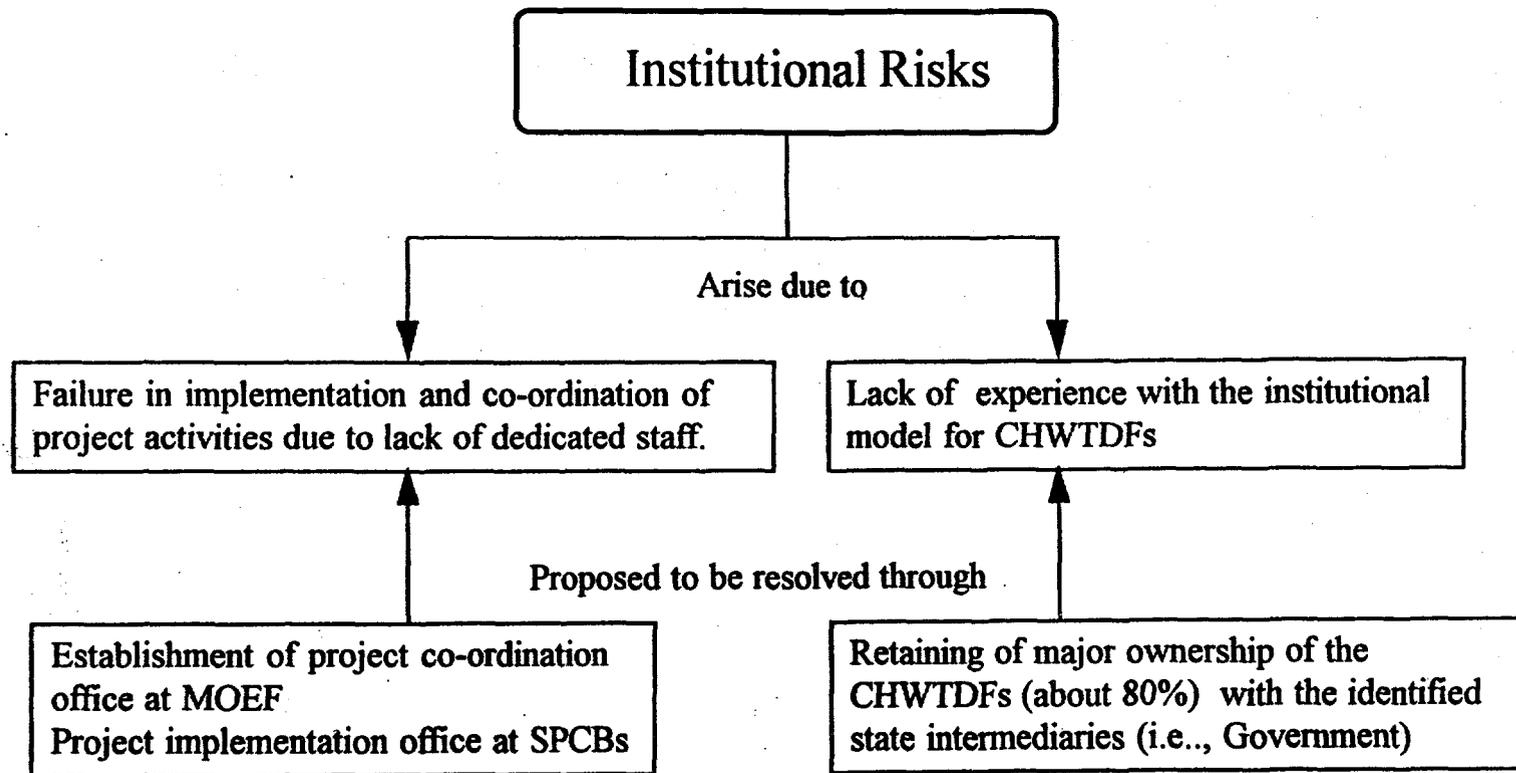


Figure 6.1 (b) : Resolution of Institutional Risks

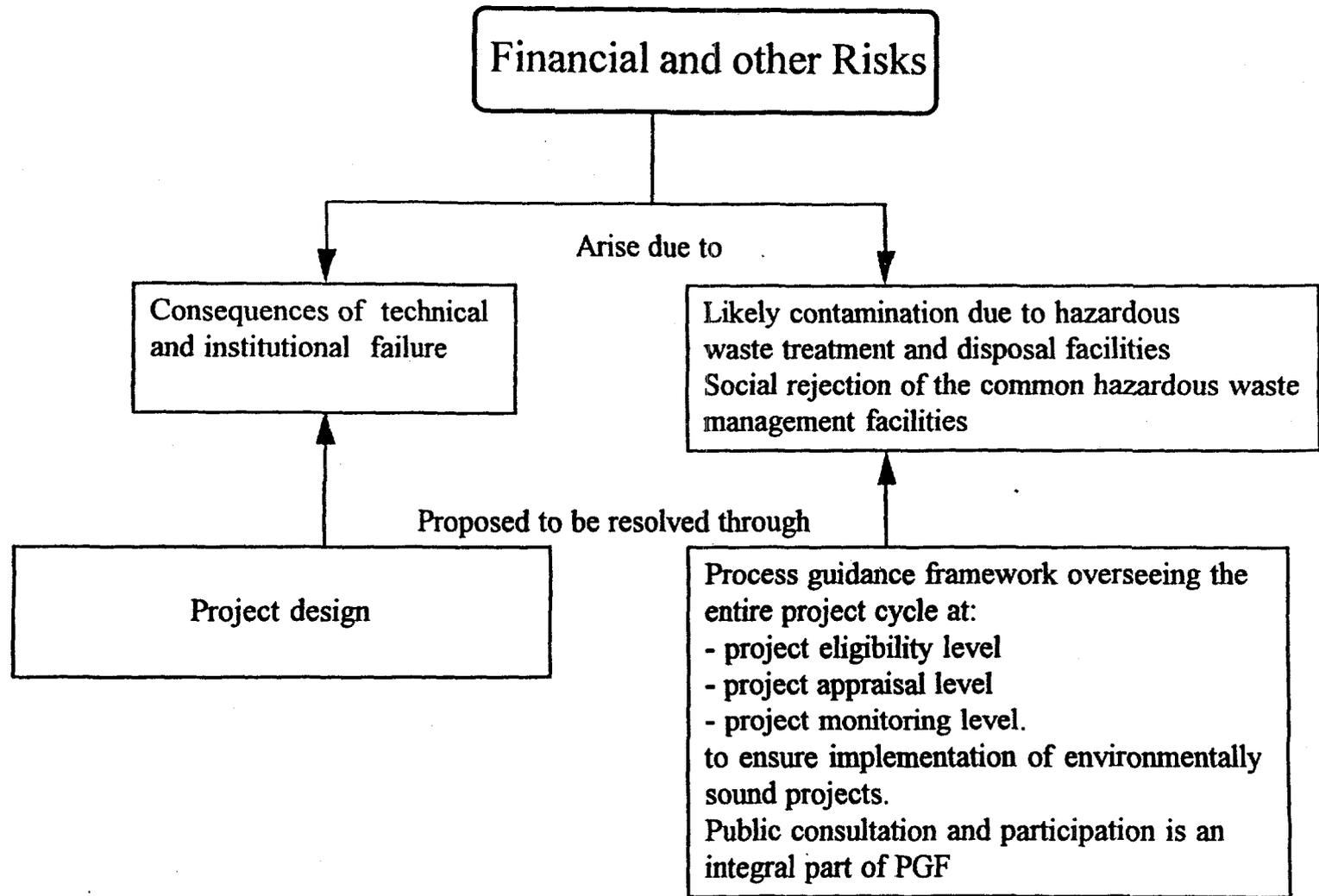


Figure 6.1 (c) : Resolution of Financial and Other Risks

6.3 Mitigation of Risks/Impacts by The Process Guidance Framework

Table 6.1 shows a Impact Assessment Matrix for the Project Components as well Sub-Projects of the Hazardous Waste Management Project, graded over temporal and spatial scales. *Local scale* refers to impact radius of the order of 15 to 25 kms whereas the *regional scale* refers to much larger area of the radius of 200-300 kms.

Table 6.1 Impact Assessment Matrix for Hazardous Waste Management Project

Project Component	Nature of Impact			
	Temporal		Spatial	
	Long Term	Short term	Local	Regional
Enforcement and Monitoring Component				
Strengthening of Analytical Capability	+		+	+
Institutionalization of the Planning Process	+		+	+
Improving the information management process including GIS, MIS and TRI.	+		+	+
Inventorization of Hazardous Waste	+	+	+	+
Identification and Notification of Sites for CHWTDF	+	-	-	+
Training and awareness programmes	+	+	+	+
Support to MOEF and CPCB for Policy Making	+	+	+	+
Infrastructure Development Component				
Waste Minimization and Treatment at Individual Facilities	+	+	-	+
Establishment of Pilot CHWTDFs	+	+	-	+
Technical Assistance Component				
Waste Minimization Circles	+	+	+	+
Strategy for containment and disposal of PCBs	+		+	+
Development of an approach to clean contaminated sites	+		+	+
Study on long-term alternatives for containment and disposal of halogen and mercury containing waste	+		+	+
Development of innovative technologies for Hazardous Waste Management (viz. Demonstration projects)	+		+	+
Technical alternatives for disposal of Sludge from ETPs	+		+	+
Other national studies (such as study on dose-response analysis)	+		+	+

As shown in Table 6.1, most of the adverse impacts anticipated due to the project are associated with the Infrastructure Development Component. No adverse impacts are

anticipated due to the other two components which entail capacity building and strengthening of the enforcement and regulatory agencies as well as other institutions involved in hazardous waste management in the country. In fact, these two components are supportive and assist in reducing the overall project risk to a great extent as discussed in section 6.2.

The Infrastructure Development Component has two components: (i) to assist industrial units to invest in waste avoidance, minimization, re-use and treatment at the plant; and (ii) pilot effort for establishment of the centralized hazardous waste treatment and disposal facilities. The likely environmental and social impacts and the suggested mitigation measures for these two sub-projects are summarized in the Tables 6.2 and 6.3.

Table 6.2 Identification of Risks/Impacts and Mitigation Measures for Waste avoidance, minimization, re-use and treatment at individual units

Type of Impact	Suggested Mitigation Measures
<p><i>Environmental Risks/Impacts</i></p> <ul style="list-style-type: none"> • Emissions of air borne toxins, and impacts on soil, surface and ground water bodies from the treatment and disposal facilities • Release of emissions in the event of accidents during the operations. These may lead to on-site and off-site impacts, in terms of contamination of air, surface and ground water, soil, flora and fauna and health impacts to the surrounding population. 	<ul style="list-style-type: none"> • The environmental impacts can be mitigated by developing guidelines and performance standards for design, operation and management of the hazardous waste management facility, which can be closely monitored during implementation. • The potential impacts due to accidents can be mitigated by making risk assessment mandatory with EIA. The Environmental Impact Assessment will include risk management and disaster management plans for investments under this project.

Type of Impact	Suggested Mitigation Measures
<p><i>Social Risks/Impacts.</i></p> <ul style="list-style-type: none"> • A key social risk with the project is the opposition of the hazardous waste treatment/ storage/ transportation/ disposal activities by the neighboring community. 	<ul style="list-style-type: none"> • To mitigate the social impacts, a structured public communication and consultation process can be employed during the identification and preparation of the individual sub-projects. A clear communication of the disaster management plan is necessary along with local community participation.

Table 6.3 Identification of Risks/Impacts and Mitigation Measures for Pilot CHWTDFs

Type of Impact	Mitigation Measures
<p><i>Environmental Risks/Impacts</i></p> <ul style="list-style-type: none"> • There could be contamination of air, surface and ground water, soil, flora and fauna during CHWTDF operations. There could also be accidents with on-site and off-site impacts resulting in exposure of the surrounding population, spills during transportation, etc. 	<ul style="list-style-type: none"> • The environmental impacts will be mitigated by developing guidelines and performance standards for design, operation and management of the CHWTDFs, which will be closely monitored during implementation. • The potential impacts due to accidents will be mitigated by making risk assessment mandatory with the environmental assessment process. The EIA will include risk management and disaster management plans for investments under this project.

Type of Impact	Mitigation Measures
<p><i>Social Risks/Impacts.</i></p> <ul style="list-style-type: none"> • A key social risk with the project is the rejection of the site for CHWTDF by the community due to impacts of possible relocation, resettlement and decrease in land value near the CHWTDF. 	<ul style="list-style-type: none"> • The sites for CHWTDF will only be from the brownfields (the land zoned for industrial use). The chances of issues regarding resettlement and rehabilitation are thus expected to be rather low. • In any case, to avoid rejection of the site, a structured public consultation process has been built into the EIA and will be employed during the identification and preparation of the individual CHWTDFs. In addition, a program of public outreach will be undertaken by the state agencies and facility operators. A clear communication of the disaster management plan is necessary along with the local community • Any resettlement or rehabilitation arising from the project will be handled as per the entitlement norms in the public consultation and participation framework. These norms are as per the guidelines of the World Bank's Operational Directives.

Considering the above mitigation measures, a PGF has been developed. The PGF framework includes a step wise approach for selection, appraisal and monitoring of sub-projects in the infrastructure development component at three levels viz.,

- Project Eligibility
- Project Appraisal
- Project Monitoring

A schematic representation of this proposed approach is shown in Figure 6.2.

6.3.1 Project Eligibility Level

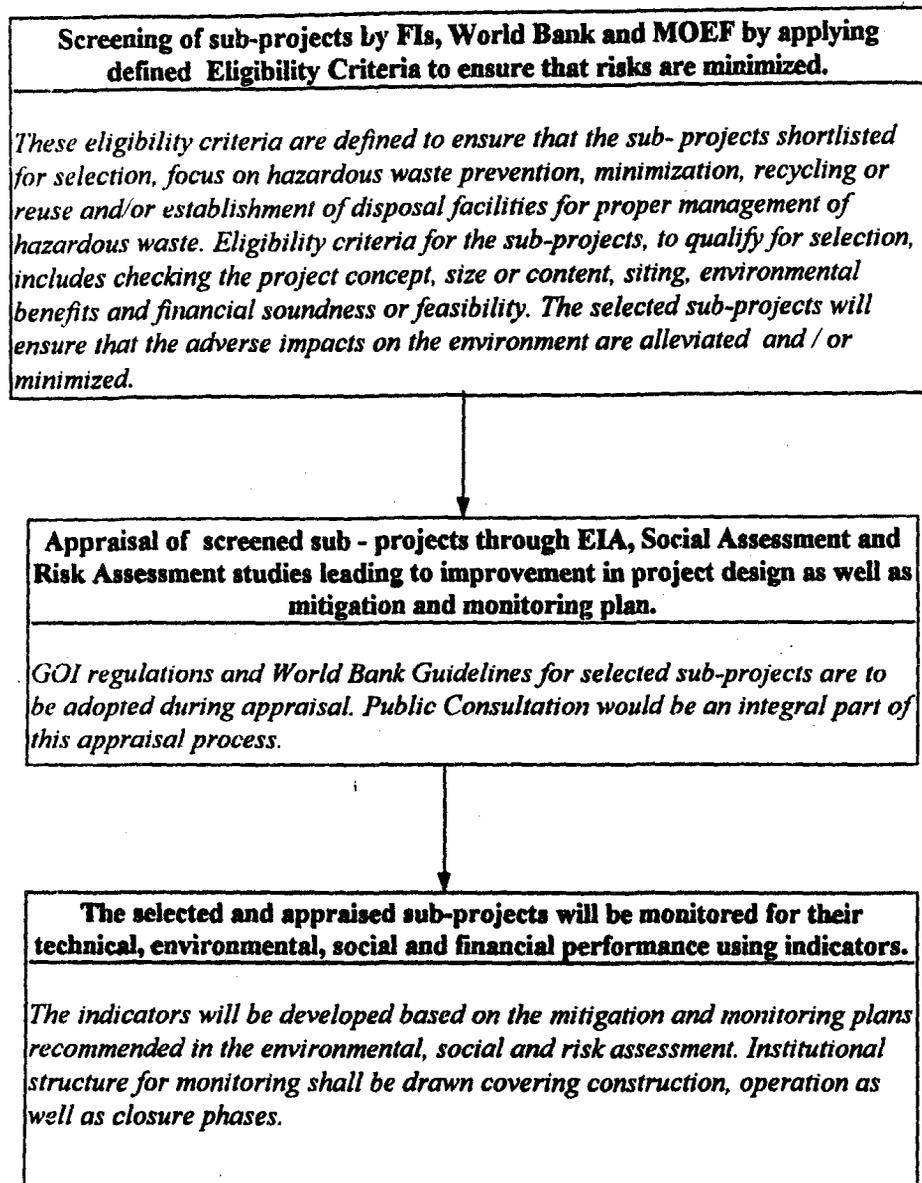
Screening and selection of sub-projects is proposed to be done in a manner such that only those sub-projects that are environmentally sound be selected. This is done by developing a comprehensive project eligibility criteria.

Precautionary measures considered in setting up the eligibility criteria are,

- recommendation that only brownfields (the land zoned for industrial use) shall be considered during site selection for establishment of treatment and disposal facilities,
- site selection to be done such that there are no resettlement related issues. However, in the event that resettlement becomes an issue, then a comprehensive Resettlement Policy Framework (RPF) shall be followed.
- selection of treatment technologies is done such that the problem of hazardous waste is not aggravated due to treatment e.g., wastes containing mercury or halogens will be excluded while considering incineration as a treatment option, or pesticide and petrochemical wastes cannot be co-incinerated together.

Box-6.1 presents the eligibility criteria for sub-projects under the Infrastructure Development component whereas Box-6.2 presents the same for the demonstration project under the Technical Assistance component.

Figure 6.2 The proposed approach for the Process Guidance Framework



Box-6.1 Eligibility Criteria for Sub-projects under the Infrastructure Development Component.

The sub-projects selected under the Infrastructure Development Component will meet the following criteria:

- The sub-projects will be proposed by companies (registered under the Companies Act, 1954), or by Joint Ventures (financing will be limited to the domestic partner), registered in India.
- The sub-projects will either consist of schemes for hazardous waste minimization, recycling or reuse of otherwise hazardous wastes/residues or consist of treatment, storage and/or disposal facilities for proper management of hazardous waste.
- The sub-projects will need to meet the following conditions: (i) shall address hazardous waste management concerns, where the term "hazardous waste" shall be as defined through the related regulations issued by MOEF; (ii) shall result in a positive and substantial environmental impact as assessed through an EIA and shall meet all environmental standards applicable to the nature of the investment; Public Information and Consultation shall be a critical part of the EIA process and (iii) will require, prior to approval, an EIA that meets the requirements as described by MOEF regulations and in conformance with applicable World Bank guidelines;
- In addition to the above and when consisting of a pilot CHWTDF project, shall have provisions that ensure an acceptable management and operation plan that provides for satisfactory risk management and when necessary, closure of the project. The risk management aspects of the plan shall also include the transportation of the hazardous wastes/ residues from the point of origin to the point of treatment, storage or disposal.
- The selection of treatment technology should ensure that the problem will not aggravate due to the technology. For example waste containing mercury or halogens will be excluded while considering incineration as a treatment option.
- The sub-projects should comply with design guidelines (to be developed by CPCB/MOEF) and standards for residues and emissions arising from treatment and disposal of hazardous wastes.
- In terms of size, the project will favor local solutions for localized problems. This will be achieved by restricting the level of financing and the maximum size of sub-

grants. In terms of location, the central facilities will be located in land zoned for industrial use (brownfields).

- Finally, all sub-projects shall also meet the following financial criteria: (i) the sub-project and the enterprise shall meet acceptable financial benchmarks with respect to such indicators as debt-equity ratio, debt service coverage, liquidity ratio and financial rate of return that are acceptable to the participating FIs and to the World Bank; (ii) all sub-projects will be appraised by the FIs and would be required to submit annual implementation reports regarding progress in implementation and disbursements; (iii) the maximum allocation of resources to a single sub-project shall not exceed 10% of the value of the credit line at each FI. The minimum size criteria, if followed, should be such that it is possible to benefit a wide segment of the small and medium hazardous waste generating units from this scheme.
- For CHWTDFs, the project sponsors are expected to provide for at least 20% of the total project cost.
- For individual sub-projects, the project sponsors are expected to provide for at least 25% of the total project cost.

Box-6.2 Eligibility Criteria for Demonstration Projects under the Technical Assistance Component

As detailed during the description of the project components in Chapter 5, one of the sub-projects entitled Demonstration Projects, under the Technical Assistance Component, will support continuation of the efforts initiated under the IPC project in support of technical innovations in the field of hazardous waste management. These efforts are expected to result in the development of innovative techniques for waste management. The projects will consist of first of a kind commercialization efforts for technologies that aim at avoiding the generation of hazardous waste in India or that promote the recovery of residues for uses that will render them non-hazardous.

Sub-projects eligible for financing under this scheme will meet the following criteria:

- the schemes will represent first of a kind attempts in India at commercialization of hazardous waste management alternatives, where hazardous waste is as defined in the applicable rules;

- the sponsor will be a company as defined under the Company Act, however, the technical collaboration could be provided by a University, a Research Institute or any other party with the required technical expertise;
- the sub-project will require a feasibility report documenting the benefits and risks associated to the proposal clearly illustrating the potential for replication of the scheme in India; and an EIA, as required or alternatively an assessment of the environmental benefits associated with the sub-project;
- the sponsor will have to provide at least 60% of the costs as equity or other means of finance; and
- the sponsor must meet all other financial criteria as required by BOB and/or ICICI.

6.3.2 Project Appraisal Level

Appraisal of selected sub-projects is proposed to be done to ensure that any environmental, social or technical risks likely to arise from the sub-projects are recognized at the early stages of the sub-projects. Following this, suitable measures to minimize/ alleviate these risks are proposed to be developed. These measures will be evolved in the form of environmental management and monitoring Plans, resettlement action plan in the event of any resettlement required and risk management plan emerging from defined studies such as the environmental, social and risk assessments respectively.

Both the GOI and the World Bank have well established guidelines and regulations for such studies which will be followed for development of the mitigation plans. To ensure that the proposed mitigation plans are incorporated during implementation of the sub-projects, monitoring plans will also be developed from these studies.

GOI has enacted several legislations and rules for environmental protection which are reviewed in Chapter 2.0 of this SEAR. As described earlier, the MOEF issued the *Hazardous Waste Management and Handling* in 1989, followed by the publication of *Guidelines for Siting of Hazardous Wastes Treatment and Disposal Facilities (HWTDF) and Identification of Assessment of Abandoned Hazardous Waste Disposal Sites* in 1991 for management of hazardous wastes in the country. These rules and guidelines are expected to be modernized in this Project.

6.3.2.1 Environmental Impact Assessment

Government of India and the World Bank require EIA to be undertaken prior to the construction of a facility. The EIA will identify the various environmental and community consequences of the proposed development, in order to:

- (a) ensure the resolution of potential environmental issues and community concerns early in the implementation of a proposed facility by incorporating necessary safeguards in the design;
- (b) minimize risk to the proponent;
- (c) avoid delays and extra costs which may subsequently arise due to unanticipated environmental problems; and
- (d) ensure that the concerns of residents and communities are addressed and plans made for the rehabilitation and resettlement of those residing in and around the selected sites for development, if required.

The notification issued by the MOEF in 1997 spells out the EIA procedure along with Public Hearing, to be followed in respect of prescribed projects. Accordingly, all individual investment projects at companies will need EIA either at the state or the central level. Though CHWTDFs do not appear in the list of prescribed projects, MOEF's guidelines for CHWTDFs require an EIA prior to approval of a site for the facility. The guidelines developed by the MOEF, recommend a two stage selection procedure for CHWTDFs: (i) technical screening process based upon economic, engineering and environmental suitability; and (ii) public approval process.

The SDOE is responsible for notifying sites for CHWTDF, after the approval of the EIA. Public involvement, as part of the EIA process is recognized both by the EIA notification and the guidelines.

Annex-6.1 presents a recommended seven step process for EIA of CHWTDF and Annex-6.2 includes a sample Terms of Reference (ToR) for the EIA study.

6.3.2.2 Resettlement and Rehabilitation of Project Affected Persons

In contrast to the environmental legislation which exists in India, no similar comprehensive framework or legislation exists for the general social impacts of developmental projects, particularly for Resettlement and Rehabilitation (R&R). Legislation and policy on social issues are in a nascent stage of development in India. The Land Acquisition Act of 1894 (as amended in 1994) is applicable all over India, irrespective of the project, and vests power in the state to acquire private land for public purpose. Maharashtra and Madhya Pradesh have formulated specific legislation on R&R. In Chapter 2 of this SEAR, an overview of the framework was presented.

While the setting up of CHWTDFs, an avoidance and minimization strategy is strongly recommended by this PGF. In the first instance, land acquisition, displacement and

damage to property should be avoided, and if not, such impacts should be minimized to the extent possible.

In some cases, the construction of CHWTDF's may involve involuntary resettlement of people living within the site chosen for the facility (including those within the buffer zone). One of the primary tasks in resettlement is to identify an appropriate site for resettling the affected population. Once selected, infrastructure development, conservation of cultural practices, capacity of the new site to support the population in terms of resource availability etc. have to be factored in.

While there is often a preference for a land-for-land compensation, opportunities for cash compensation, and skill assessment and development need to be considered. The issues of host communities already living in the new site also need to be addressed. There may be instances where marginalized and vulnerable groups (economically and socially disadvantaged groups), the elderly, women, children, physically handicapped, and indigenous people may be affected. Social mitigation strategies have to take such groups into consideration and prepare plans with their participation. Therefore, the PGF recommends that a social assessment should be undertaken along with EIA to assess the extent of the problem, and to recommend solutions.

The World Bank OD 4.30 on *Involuntary Resettlement* describes the Bank's policy and procedures on involuntary resettlement as well as conditions that borrowers are expected to meet in operations involving resettlement. The objective of the Bank's policy is to ensure that populations displaced by a project also benefit from the project and that standards of living are improved, or at a minimum, restored.

The entitlement framework for project affected individuals, families and establishments will draw upon provisions contained in the World Bank's Resettlement Policy Framework as detailed in Annex 6.3. The Ministry of Urban Affairs and Employment, GOI is also developing a policy in this direction which in principle supports the World Bank's Resettlement Policy Framework.

Boxes 6.3 and 6.4 below summarize the checklists as appropriate for the appraisal of CHWTDFs and Individual Company facilities. These checklists may be used by the FI, State Intermediaries and the Technical Committees for ensuring the translation of the spirit of this PGF.

**Box-6.3 Checklist for Appraisal of Infrastructure Development Projects :
Common Hazardous Waste Treatment and Disposal Facilities**

Do sites shortlisted for evaluation belong to brownfields? (Note: Greenfields are not acceptable as well as any greenfield which has been later reallocated as brownfield will also not be acceptable)

Have the shortlisted site/s met the siting guidelines developed by the MOEF?

(Note: Under this Project, the guidelines presently available, are expected to be modernized)

Apart from brownfield as the criteria, following points need to be checked for the purpose of shortlisting.

- Site should be close to a majority of the large hazardous waste generators to minimize the transportation distances.
- Site should be large enough to allow for at least 10 years of the design life, development of the green belts as well as a buffer zone.
- Site should not have any settlements and should not be in the proximity of an ecologically sensitive area. (This aspect has been already stipulated in the MOEF's siting guidelines for CHWTDFs)
- Routes for transportation of the hazardous waste should not lead via congested roads, populated areas and ecologically sensitive areas.

Whether the sub-project complies with design guidelines (to be developed by CPCB/MOEF) and standards for residues and emissions arising from treatment and disposal of hazardous wastes?

Whether the shortlisted sites have been subjected to the amended quantitative ranking process?

Have the local NGOs been informed and invited to assist in the Public Consultation Process needed for the final selection of the site?

Has the environmental impact assessment been done following the amended hazardous waste management rules (refer to Rule 8 in Annex 2-3), steps as described in Annex 6-1 and by adhering to the Terms of Reference such as those outlined in Annex 6-2?

If resettlement is inevitable then whether the Resettlement Policy Framework as detailed in Annex 6-3 has been followed?

Has the risk management and communication been carried out to address risks during transportation, temporary storage if applicable, treatment and disposal of hazardous wastes? (Note: Risk management includes emergency preparedness involving the community in the neighborhood and around major transportation routes)

Have issues related to the following been deliberated upon in setting up the contracts and legal covenants amongst the parties concerned? Unless a clear allocation of these risks is done through contracts and insurance, financing of the project should not proceed.

- Societal rejection risks
- Waste supply risks
- Waste transportation risks
- Technological risks
- Institution Failure risks (these should also look into the *entry* and *exit* policies)

Whether the charging framework considers the costs of site closure and post-closure operations?

Whether any cross-subsidization has been considered for setting charges for small and medium scale industries?

Once the site has been notified, has there been any directive issued in the concerned planning department to control any urbanization or industrial development likely to sprawl in the proximity of the site?

**Box-6.4 Checklist for Appraisal of Infrastructure Development Projects :
Hazardous Waste Minimization, Treatment and Disposal at Individual Facilities**

Does the proposed project address hazardous wastes, as defined under the amended Hazardous Waste (Management and Handling Rules) cited in Annex 2-3?

(Note: Management of medical wastes and solid wastes are not to be financed under this line of assistance)

Are the estimated investments at the individual facilities within the norm of 10% of the total credit available for each FI?

If a minimum size of investment is preferred by the FI, then whether the same has been established in consultation with World Bank and MOEF, especially to ensure that the investments are also accessible to the small and medium hazardous waste generators?

The project may be ranked in a manner as found fit by the Technical Committee (described later), however it is essential that the following criteria and rules be considered in developing the project ranking system.

- A. Financial soundness of the Company

Companies with low financial soundness may not qualify for assistance.

- B. Type and extent of hazardous wastes which can be minimized because of the project : expressed in terms of absolute quantity (tons/year) as well as in terms of a percentage.

(i) Companies minimizing high volume and high hazard wastes should be given first preference

(ii) Companies minimizing low volume high hazard or high volume low hazard should be given equal preference

In the case of (i) and (ii), companies with even a moderate or bare acceptable level of financial soundness should be preferred than companies with high financial soundness but minimizing only low volume and low hazardous wastes.

- C. Type and extent of hazardous wastes which could be treated, recycled, reused and disposed on-site because of the project : expressed in terms of absolute quantity (tons/year) as well as in terms of a percentage. (*Note: These wastes may be presently be stored on-site and are generated in the production cycle*)

Companies presently dumping on their sites, high volume and high hazard hazardous wastes , should get a preference. In this case, the FIs should encourage the companies to build in waste minimization at source, recycle, reuse and recovery sub-projects and not merely consider project investments to simply clean the existing on-site dumps.

Apart from the above, following points need to be checked for the purpose of shortlisting.

- Whether the technologies proposed are locally available and whether the systems can be operated and monitored by local agencies? Preference should be given to locally available solutions to the extent possible. If technologies are to be accessed from outside India, then the FI should ensure that adequate training component has been built into the assistance.
- Whether the technologies proposed have significant on-site risks? Technologies with high risk potential should be discouraged and if permitted then should accompany with adequate control and instrumentation as well as emergency preparedness program.
- Technologies which allow for reuse, recycle, recovery should be preferred over those which attempt only treatment and disposal of hazardous wastes.

Has the environmental impact assessment been done following the EIA Notification as well as amended hazardous waste management rules (refer to Rule 8 in Annex 2-3)

Has any public information and consultation been carried out with the assistance of a local NGO to share the benefits and risks of the investment project?

If resettlement is inevitable then whether the Resettlement Policy Framework as detailed in Annex 6-3 has been followed?

Has the risk management and communication been carried out to address risks during transportation, temporary storage if applicable, treatment and disposal of hazardous wastes? (Note: Risk management includes emergency preparedness involving the community in the neighborhood and around major transportation routes)

Does the sub-project comply with design guidelines (to be developed by CPCB/MOEF) and standards for residues and emissions arising from treatment and disposal of hazardous wastes?

6.3.3 Project Monitoring Level

During implementation of the selected and appraised sub-projects, indicators will be used to monitor their performance. These performance indicators will be used to monitor the sub-projects at every stage ranging from construction through operation and closure. To ensure careful and systematic monitoring, the institutional set-up and the agencies that will conduct the monitoring activity will be clearly defined after the projects have been appraised. This is a very crucial step since it is through rigorous monitoring of the performance of the sub-projects that the project proposes to ensure minimization of residual risks likely due to the selected and appraised sub-projects.

The performance indicators should be developed by MOEF in consultation with the World Bank *a priori* as suggested by the PIC of this SEAR. Performance indicators should not merely be financial disbursement or procurement oriented or linked only to the milestones of completion, but should in addition include items such as below,

- Type and quantities of hazardous waste additionally inventorized
- Specific hazardous waste generation factors (i.e. at unit production level)
- Type and quantities of hazardous waste minimized
- Type and quantities of hazardous waste recycled and reused
- Type and quantities of hazardous waste treated and disposed
- Number of CHWTDFs identified, constructed and operated
- Number of individual company investments granted, constructed and operated
- Quantities of hazardous waste tackled at the small and medium industries
- Quantities of hazardous waste tackled at large industries
- Number of samples analyzed at the laboratories of SPCBs and those analyzed for hazardous characteristics
- Number of courses/seminars/workshops carried out and staff trained/exposed at SPCBs, MOEF/CPCB FI, State Intermediaries, Industries and Associations, NGOs

6.4 Public Information and Consultation

The involvement of public in the project will be in two forms : (i) Information and consultation of the project design with representative groups, and (ii) Public consultation and participation at the sub-projects level.

6.4.1 Public Information and Consultation (PIC) of this SEAR

The PGF suggested above has been reviewed for its comprehensives and adequacy by the MOEF and the World Bank. The MOEF carried out an extensive Public Information and Consultation (PIC) exercise at five locations which included 222 participants. The details of the program are shown below.

Location	Dates of PIC on SEAR
Gandhi Nagar	August 14, 1997
Hyderabad	August 19, 1997
Mumbai	August 26, 1997
Chennai	September 1, 1997
New Delhi	September 3, 1997

The PICs were organized over half day and selected stakeholders were invited to participate. These stakeholders invited included representatives from Government Agencies such as, State Department of Environment, Industrial Development Corporations, Directorate of Industrial Safety and Health, Customs Department, and Transport Commissioner's Office; Industry Associations/ Industries; Research Institutions/ Academe/ Health Professionals; Reputed Waste Management Consultants; Media persons; Leading NGOs/ Environmental Lawyers and FIs like BOB and ICICI who have a stake in the project.

To facilitate public dissemination of the contents of the SEAR, a Non-Technical Summary (NTS) of the SEAR was prepared¹. The NTS was made available in English and the local language of the States where the PIC meetings were held. The NTS was also made available to any interested citizens of India an announcement to this effect was made in the national and local newspapers. A full text of the draft SEAR was also made available to interested stakeholders.

¹ The NTS is a summary of the main findings and conclusions of the study and how they were reached. It avoids to the extent possible, technical terms, lists of data and detailed explanations

During the course of PIC, the project design as well as the PGF underwent a public review for its completeness and adequacy. A separate report on the PIC has been prepared detailing the procedure followed as well recording of the proceedings.

Many of the recommendations made in the PIC were already incorporated in the second draft of the SEAR. These recommendations are listed below,

- A need to develop performance indicators *apriori* to monitor the project was stressed.
- Project outreach should be done by the SPCBs and MOEF on a regular and proactive basis
- There is a need to modernize the existing hazardous waste management related regulations. The definitions should be clear to communicate and unambiguous for enforcement.
- Standards should be set for the residues and emissions arising from the treatment and disposal of hazardous wastes. Monitoring procedures needed for the purpose of vigilance should also be spelt out.
- Inventorization of hazardous waste should be a continued exercise. Guidelines should be evolved for the inventorization.
- It was observed that use of incinerators as a treatment option should be considered with precaution.
- Sludges from the effluent treatment plants form a major portion of the state wide hazardous waste inventory. Studies should be undertaken to tackle this problem.
- Awareness on technological innovations in hazardous waste management to be brought to industry particularly medium and small scale industries.
- Since the States may eventually manage a multiple number of CHWTDFs, strategic considerations need to be made to evolve the policy of on-site and off-site handling of the hazardous wastes, which would lead to prolonged life of the CHWTDFs.
- There is a need to update the existing Guidelines regarding site selection, site ranking criteria, design, operation and closure of the CHWTDF.

Further to above, following additional recommendations were made as essentially emerged from the PIC. Most of these recommendations were considered to be useful and effective to include them in the scope of the program. The project design as well as the process guidance framework in the final SEAR reflects this consideration.

- Incentives should be provided to small scale industries practicing hazardous waste minimization/recycle/recovery. These incentives may be in the form of tax benefits or other such fiscal incentives. For instance, the small and medium scale units should be subsidized for usage of CHWTDFs. Guidelines for developing charges, specifically for these units, need to be developed.
- Development of national industry specific waste generation factors should be taken as an extension of the exercise of hazardous waste inventorization. These waste generation factors can be used as indicators for benchmarking.
- The activities on Waste Minimization Circles should be more proactive, well publicized and accessible to a larger fraction of the small and medium industries. Roundtables should be set up on waste minimization as well as when reports to monitor the project performance are discussed.
- Waste exchange should be studied and promoted by identifying probable by-products/ recyclable wastes in various industrial units. Formation of waste exchange bureaus are recommended at SPCBs or in partnership with Industry Associations. The MOEF should develop guidelines for insurance related to risks associated with the waste exchange process and the taxation policy for waste exchange.
- Provisions may be made in the present project to constitute awards and provide incentives for practice of hazardous waste minimization.
- NGOs may be invited to assist in the tasks related to public consultation and participation. NGO involvement should be high since they are not adversaries but partners in development. NGOs may also participate in the independent assessment, especially for the assessment of the CHWTDFs.
- Agencies like Geological Survey of India, National Remote Sensing Agency, Bhabha Atomic Research Centre (BARC) should be part of the technical committee during the process of site selection for CHWTDFs. Satellite imagery may be useful in site selection for treatment and disposal facilities and even for detecting the contaminated dump sites.

- Disaster management plans should be requested in the appraisal of the CHWTDFs as well as for the infrastructure development projects at the individual facilities, if found relevant. These plans should involve citizens' groups, emergency services and government agencies
- Insurance is an issue which needs to be examined for compensations with respect to the liabilities and risks associated with CHWTDFs. MOEF should develop guidelines for insurance and associated compensations for the various risks.
- A corpus, similar to the Superfund may be developed keeping with the Polluter Pays Principle, for making contributions to the cleaning of the illegal dump sites.
- Wherever applicable, site selection for CHWTDF and for disposal of industrial solid waste may be done simultaneously in adjoining sites.
- The eligibility criteria for CHWTDF should clearly state that only "brownfields" should be considered during site selection. A rider must be attached in the eligibility criteria to ensure that "greenfields" acquired and termed "brownfields" should not be used.
- During the site selection process for CHWTDFs, the area of land to be acquired should consider area required for green belt and buffer zone. It should also be linked to land use or development policy. In other words a minimum size should be prescribed for CHWTDFs considering all these aspects.
- During collection of hazardous waste for transportation to CHWTDFs, a cluster approach is recommended for small and medium scale industrial units to ensure lower transportation costs.
- The financing procedure at the BOB/ICICI should be simplified to the extent possible. The FIs should consider small projects also for loan assistance as well and should not restrict only to large infrastructure development projects.
- The FIs, while evaluating the proposals should place equal weightage on the credit worthiness of the industry as well as the hazardous waste mitigation potential.
- The FIs should integrate the aspects of minimization with the treatment and disposal of existing dumps of hazardous wastes on the site in order to lead to a total solution to the problem.

- Technical committees should be formed at the FIs for appraisal of proposals seeking assistance under the Infrastructure Development Component. Representation of NGOs is essential on these technical committees to ensure public participation and consultation at the sub-project level.
- Strengthening of educational and research institutions may be considered through the hazardous waste management project. This may include strengthening of (a) laboratories and (b) technical capacity of the institutions in the area of hazardous waste management through training. Educational institutes should be able to offer advanced courses related to management of hazardous wastes.
- An information package should be created out of the information that emerges from the national studies. These information packages (databases, reports etc.) should be made accessible to any interested person/institution.
- Planning workshops that were conducted at the four SPCBs as preparation for the project should be also conducted at CPCB and at the other two SPCBs, followed by public information and consultation exercises.

6.4.2 PCP for the Sub-Projects

The PIC will be followed by SPCB-led information outreach to potentially affected communities around specific investment sub-projects. Once the project becomes operational, the public outreach programme will continue throughout the life of the project.

The Project proposes to provide support to enhance public involvement through the sub-project "Organization of a Community Outreach Effort" under the Enforcement and Compliance Component. Through this sub-project, the SPCBs will organize or strengthen a communication cell to promote the diffusion of information to the community and to encourage the feedback and consultation process on environmental issues in which the SPCBs are involved. The cell will also be the natural outlet for channeling of information regarding the Project thereby facilitating the community's right to know.

The project will finance the costs of the material and consulting services required for initial operation of the cell. As part of the community outreach effort, and in order to provide accurate information to a wide audience on the objectives and impact of the project, MOEF and the SPCBs intend to undertake a pro-active public information outreach strategy. This will target various audiences, such as the media, opinion makers, academics, local government agencies, NGOs and local affected communities and their leaders. The strategy consists of the use of press releases, (non-technical) fact sheets, a

(technical) brochure, presentations and briefings by MOEF and the SPCBs. These efforts will enable MOEF and the SPCBs to keep the public informed throughout the implementation of the project.

Among the various sub-projects proposed, it is envisaged that significant risks especially that of community rejection are associated with the establishment of pilot CHWTDFs. It therefore appears to be necessary to discuss the proposed process of public consultation and participation for this sub-project.

6.4.3 PCP for CHWTDFs

Apart from PIC for the project as a whole, public involvement will be an integral part of individual sub-projects as and when they are implemented. The process of selecting sites for new facilities should essentially be done through public information and consultation. Even if a site is geologically and environmentally suitable for establishment of a CHWTDF, lack of a timely and well planned and conducted PIC may lead to litigation which can delay placing the facility into operation and add to the mounting costs. Almost all efforts to develop new, modern facilities have failed because of an obstacle much greater than market forces: public opposition. While every aspect of developing and operating a facility is conducted under close scrutiny, nothing seems to raise as much opposition as siting a new facility. The situation has given rise to a new acronym, NIMBY (Not in My Back Yard). A typical case in point is that of Tamil Nadu where seven out of the nine sites identified by the Tamil Nadu SPCB were rejected by the public. On the other hand, under the AUS-AID assistance to the APPCB, a PCP model is being explored which utilizes the local NGOs for the purpose of public communication, for identification of CHWTDF.

Hazardous waste management facilities arouse public opposition primarily because of risk perception, public mistrust, inequities in risk sharing, and other factors. The typical lay person perceives a facility in his or her community as,

- imposed upon the community (involuntarily encountered),
- having no real benefit, and
- representing an unknown but substantial risk.

A recommended public involvement process for development of the sub-project supporting the establishment of CHWTDFs is as follows.

A credible PCP is crucial to the successful development of the project, including the preparation of an acceptable Environmental Management Plan (EMP) and Resettlement Action Plan (RAP), if required. The proponent should engage a NGO group as part of the Consultant team to design and facilitate the implementation of a suitable consultation

process. The Consultant/NGO should continuously re-assess the PCP strategy as feedback is received from information dissemination and consultation. Tools for information dissemination and consultation are attached. The Consultant/NGO should :

- (a) identify the stakeholders - directly affected people, representative Community Based Organizations and NGOs, local media correspondent, medical professionals, traditional leaders, district and state government agencies, waste generators etc., and convene them in a body that represents the stakeholders. The group should meet periodically during the preparation of the EIA to discuss the emerging findings of the assessment;
- (b) assist the representative group in preparing and disseminating public information in the appropriate local language - *prior to the EIA study* on project objectives -- types of hazardous waste managed and the role of the facility in avoiding negative impacts on health and welfare by proper disposal etc. -- and scope of the draft ToR for the EIA; *post study* on the summary of the draft EIA report, risk avoidance measures; use may be made of non-technical brochures, leaflets, posters, briefings and presentations, public meetings (including visual aids), involvement of the media and provision of public access to the reports.
- (c) assist the group in establishing mechanisms and conduits for consulting communities and representative NGOs when undertaking the steps and tasks described in the EIA ToR. These would include inputs into the scoping of the EIA ToR, conducting socio-economic and community opinion surveys, evaluating alternatives, formulating entitlement packages and drafting EMP, and RAP for the final EIA report;
- (d) keep record of information and consultation activities - type of activity and mechanisms used, date and location, names of groups and individuals invited, types of attendees, issues raised, responses given and the impact upon subsequent decisions; and
- (e) track the progress of implementing EMP, RAP, Indigenous People Development Plan (if required) during facility development and operation through community monitoring activities.

MOEF has identified some tools for PCP which are placed in Annex 6-4.

For the application of the PGF itself, it is recommended that technical committees are set up by BOB/ICICI and State Intermediaries with a following composition. Box-6.5 and

6.6 provide illustrative composition of such committees. As evident from the PIC of the SEAR, it is essential that NGO representation is requested on these committees.

Box-6.5 Suggested Composition of the Technical Committee at BOB/ICICI

- Senior Staff of BOB/ICICI from their Project Financing Divisions
- Representative of the MOEF
- Representative nominated by the World Bank
- Representative of the Concerned State Pollution Control Board/State Dept. of Environment
- Two representatives from Research and Technology Development Institutions (e.g. National Environmental Engineering Research Institute, Indian Institute of Technology)
- Two representatives of Non-Government Organizations

Box-6.6 Suggested Composition of Technical Committee at State Intermediaries for setting up of CHWTDFs

- Representative of the MOEF
- Representative from the World Bank
- Representative of the Concerned State Pollution Control Board/State Dept. of Environment
- Representatives from BARC, Geological Survey of India (GSI), National Remote Sensing Agency (NRSA)
- Two representatives from Research and Technology Development Institutions (e.g. National Environmental Engineering Research Institute, Indian Institute of Technology)
- Concerned District Collector
- Two representatives of Non-Government Organizations

Chapter 7

IMPLEMENTATION ARRANGEMENTS

7.1 Project Management

7.2 Project Coordination and Monitoring

7.3 Project Performance Monitoring

7.4 Implementation Schedule

7.5 Project Costs and Financing

Chapter 7 IMPLEMENTATION ARRANGEMENTS

MOEF will be responsible for the overall monitoring and coordination of all project activities. In this function, it will be assisted by a team of professionals of the NPC, which will staff a project coordination and monitoring office. Project implementation will be the responsibility of:

- The SPCBs of the participating States, each through a dedicated implementation cell;
- ICICI and BOB.
- State IDC (or an alternative agency)

MOEF will review and monitor implementation by the different agencies and facilitate the routing of resources to the State and National agencies involved in the implementation of the Institutional and Technical Assistance components.

7.1 Project Management

7.1.1 Enforcement and Compliance Component

The SPCBs in each participating state will coordinate, implement and monitor the activities under this component. Under this arrangement, GOI will receive the credit and make it available to the SPCBs. The SPCBs have total responsibility for:

- procurement activities and implementation of procedures in accordance with Bank guidelines;
- organization, management and implementation of the training program;
- restructuring of the Board and appointment of the required personnel to fill the posts associated with the project, including: Director of Planning, Manager of the Project and Manager of the Communication Cell.

Roles of various agencies at the various levels of the project sub-components are shown in the Figure 7.1.

Figure 7.1 Schematic showing distribution of responsibilities of the various agencies for the sub-projects under Enforcement and Compliance Component

SPCBs	SDOE
<ul style="list-style-type: none"> • Strengthening of Analytical Capability • Institutionalization of the Planning Process • Improving the Information Management Process • Inventories of Hazardous Waste • Assist SDOE in Identification and notification of sites for CHWTDF • Training and Awareness Programmes • Organization of Community Outreach programme 	<ul style="list-style-type: none"> • Identification and/or notification of sites for CHWTDF
CPCB	MOEF
<ul style="list-style-type: none"> • Improving the information management process • Inventories of Hazardous Waste • Assist MOEF in amendment of the Hazardous Waste (Management and Handling) Rules and other legislation • Assist MOEF in the setting of standards and Guidelines for various sub-projects • Training and Awareness Programmes • Organization of Community Outreach programme 	<ul style="list-style-type: none"> • Review the EIA of selected sites • Training and Awareness Programmes • Policy making, Amending Hazardous Waste (Management and Handling Rules) and other legislation • Developing standards and guidelines for storage, transportation, treatment and disposal of hazardous wastes • Finalize the RPF • Organization of Community outreach programme

7.1.2 Technical Assistance Component

MOEF will have the responsibility for coordination activities under this component. However, the ultimate responsibility for execution of the WMC and for other technical studies will be in the hands of identified national agencies or other third parties. To minimize delays experienced in the World Bank funded IPC and IPP projects, all decisions and notifications regarding authority for execution of project activities will be made or issued before negotiation on the project.

As for the demonstration projects, the ultimate responsibility will be in the hands of BOB/ICICI who will manage the resources on behalf of MOEF. It will be imperative that the eligibility criteria laid down by MOEF for demonstration projects is strictly followed. MOEF will make allocations under a line item to cover the anticipated disbursements associated with the allocation of grants during each of the fiscal years of duration of the

project. Responsibilities of various agencies for the sub-projects under technical Assistance Components are shown in the Figure 7.2.

Figure 7.2 Schematic showing distribution of responsibilities of the various agencies for the sub-projects under Technical Assistance Component

MOEF/CPCB	SPCB
<p>Initiating the studies on the following areas:</p> <ul style="list-style-type: none"> • Development of an approach to clean contaminated sites; • Identification and assessment of long-term alternatives for containment and disposal of halogen and mercury containing waste and other technical studies. • Support to dose-response analysis of hazardous waste and pernicious organic pollutants. • Technical Alternatives for Disposal of Sludge from ETPs. • Support for the expansion of the WMC already initiated by MOEF, to focus on small scale generators of hazardous waste; • The project will also support a limited effort to promote demonstration projects for waste minimization and prevention of generation of hazardous wastes/residues. • Finalize the eligibility criteria for demonstration projects under the Technical Assistance Component in consultation with the World Bank • Translating the findings of the above mentioned areas into guidelines and communicating them to SPCBs and industries. • Carry out wider dissemination to the public and scientific community at large, through publications and databases 	<ul style="list-style-type: none"> • Implementation of the guidelines recommended by MOEF based on the studies and findings. • Monitoring of the Demonstration projects
	BOB/ICICI

7.1.3 Infrastructure Development Component

Identification and appraisal of investments (sub-projects) funded under the project will be the responsibility of the BOB/ICICI and the State Intermediaries. The proposed implementation procedure is described below:

- All decisions regarding financial appraisal and funding of the CHWTDFs will be exclusively in the hands of the Financial Intermediaries. However the guidelines laid

down by MOEF on eligibility, appraisal and monitoring, in its PGF will have to be strictly followed and adhered to.

- Allocation of the sub-grant will be done by the FIs, once the respective SPCB or MOEF (as applicable) has provided clearance to that specific sub-project.
- MOEF will incorporate into its budget the line-items under which expenditures will be disbursed using project proceeds during each of the fiscal years of duration of the project. These will include allocations that are sufficient to cover the anticipated expenditures associated with sub-grants to be allocated during each fiscal year.

In terms of the PGF developed in Chapter 6, the responsibilities will be allocated as shown in Table 7.1.

Table 7.1 : Suggested Responsibility Allocation for Implementing the Infrastructure Development Component

Agency	Responsibility at PGF Level		
	Eligibility	Appraisal	Monitoring
MOEF	Finalize the eligibility criteria for infrastructure sub-projects in consultation with the World Bank	<p>Review EIA studies for sub-projects when referred.</p> <p>Provide standards and guidelines to enable appraisal of the sub-projects for hazardous waste treatment, storage and disposal facilities.</p> <p>Review the Institutional, Legal and Financial models developed for Pilot CHWDTFs</p> <p>Emphasize on PCP Process specially for CHWDTFs.</p>	<p>Develop and assign Performance Indicators for Sub-Projects in consultation with the World Bank</p> <p>Monitor and Coordinate overall project implementation and report on the Performance of the sub-projects.</p> <p>Monitor some of the critical sub-projects from the Infrastructure development component and request for public consultation if necessary</p> <p>Bring out the experiences or lessons learned from the pilot CHWDTFs in the form of guidelines for other CHWDTFs to follow.</p>
CPCB	Assist MOEF in finalizing the eligibility criteria	Develop necessary standards and guidelines for assisting MOEF.	Develop necessary standards and guidelines for assisting MOEF/BOB/ICICI/State Intermediaries for Project Monitoring

SPCB	Ensure application of the recommended eligibility criteria	<p>Review EIA studies for sub-projects and assist SDOE in site notification.</p> <p>Review the Institutional, Legal and Financial models developed for Pilot CHWTDFs</p> <p>Emphasize on PCP Process especially for CHWTDFs.</p> <p>Ensure appraisal of the various sub-projects based on the standards and guidelines laid down by MOEF/CPCB</p>	<p>Carry out inspections and monitoring of sub-projects based on the standards and guidelines laid down by MOEF/CPCB</p> <p>Carry out specialized monitoring such as the Post-Closure of the CHWTDF</p>
BOB/ICICI and State Intermediaries	Ensure application of the recommended eligibility criteria	<p>Review the Institutional, Legal and Financial models developed for Pilot CHWTDFs</p> <p>Emphasize on PCP Process especially for CHWTDFs.</p> <p>Ensure appraisal of the various sub-projects based on the standards and guidelines laid down by MOEF/CPCB and the World Bank</p>	<p>Carry out inspections and monitoring of sub-projects based on the standards and guidelines laid down by MOEF/CPCB and the World Bank</p>

7.2 Project Coordination and Monitoring

7.2.1 Responsibilities of the Project Management Office at MOEF

Overall project coordination and monitoring is in the hands of MOEF. However, in order to facilitate coordination and monitoring, MOEF will engage the services of the NPC to staff and operate a Project Office. The responsibilities of the project office are:

- to provide assistance in facilitating and coordinating project activities by the different beneficiaries;
- to review, anticipate and recommend budgetary allocations;
- to document and assist in the processing of disbursements;
- to provide administrative assistance to MOEF in coordination activities;
- to review implementation of project activities and report on their status based on the performance indicators developed by MOEF and the World Bank;

- to draft the quarterly status reports for the World Bank based on data and analysis directly collected from the different implementation agencies;
- to provide support and advice to anticipate and resolve implementation problems;
- to provide continuous communication linkage between project beneficiaries and MOEF;
- to assist MOEF in public outreach of the project.

The project office will be staffed by members of the NPC or other agencies working on their behalf. The project office will have a staff of four full time personnel.

7.2.2 Responsibilities of the Project Implementation Cell at SPCBs

The SPCBs in the four participating states should establish Implementation Cells for purposes of implementation of all project activities under their purview. During appraisal, confirmation will be sought on the constitution and staffing of the implementation cells. The Implementation Cells at the respective Boards will have the following responsibilities:

- coordinate all project activities at the State Level;
- coordinate and report on all project activities under the responsibility of the SPCB;
- undertake all procurement activities related to the institutional strengthening component;
- Ensure that the PGF developed is strictly followed;
- Review and clear the EIAs prepared for projects presented under the infrastructure component;
- promote public awareness and emphasize on PCP;
- prepare the semi-annual reports, on project implementation, to MOEF.

7.3 Project Performance Monitoring

Sound project management requires a well-defined program for monitoring the end result of the project performance. This would entail developing of the performance indicators close monitoring of project impacts, to the extent they can be measured and compared with the expected outcomes of the project. Often, these outcomes are difficult to quantify, and usually spread over an extended period of time. In practical terms, more immediate measures of project performance are required. Hence, project performance monitoring and review would focus on measures of project implementation as inputs, procedures, and outputs that would indicate whether the project is following the key elements of its design. To enable a comprehensive evaluation, performance indicators

should be developed integrating environmental as well as economic parameters. The key assumption here is that the project design would result in the desired impact. Performance monitoring will be through Semi-Annual Progress Reports, Mid-Term Review, and Project Completion Report.

Semi-Annual Reports.

The key document for performance monitoring would be Semi-Annual Progress Reports prepared by the Project Management Office at the MOEF, and submitted to the Bank. These reports would summarize information gathered from various implementing agencies at the national and state level, and would:

- (a) provide summary information on the status of project implementation;
- (b) assist to ensure accountability in project management and evaluate the effectiveness of project implementation procedures;
- (c) indicate project benefits; and
- (d) identify areas which need critical attention from regulatory agencies or the World Bank.

The Project Management Office would be responsible for preparing the Semi-Annual Progress Reports, and would coordinate with the project participants to obtain the required information.

Mid-term Review

While close monitoring would be conducted through the Semi-Annual Progress Reports, a detailed mid-term review of the project will be conducted with a mission and field visits. During the review, implementation performance of all the components and participants in the project will be evaluated, evidence regarding project impact would be examined, and any mid-course design or implementation corrections, if required, identified and executed.

Project Completion Report

The objective of the Project Completion Report is to analyze the state of the project at the completion of implementation, and to compare the benefits currently accrued with those targeted at project inception, as a means to evaluate the effectiveness of project

design and implementation. Besides helping self-evaluation, the Project Completion Report would provide means of disseminating lessons learned. It will cover the entire project cycle, including an assessment of the original project objectives and design, of the modalities of implementation, and the major changes made during the course of project implementation, and the resulting impacts on project performance and benefits.

MOEF/SPCB will ensure that all the outputs/reports outlined above are shared with the relevant stakeholders and made a part of the public outreach activities. MOEF should also publicize to the scientific community the results of the studies / projects in the Technical Assistance component. Specifically, MOEF should bring out the experiences or lessons learned from the pilot CHWDTFs in the form of guidelines for other CHWDTFs to follow.

7.4 Implementation Schedule

The proposed project is expected to be implemented in seven years from mid 1997 to 2004. The proposed project is scheduled for completion by March, 2004. A suggested implementation schedule is shown in the Table 7.2.

Waste Management Project Implementation Schedule

	Task Name	1998	1999	2000	2001	2002	2003	2004
A	Enforcement and Compliance Component							
i	Strengthening of Analytical Capability	■						
ii	Institutionalization of the Planning Process	■						
iii	Improving the Information Management Process including GIS and TRI							
	a. Procurement of Hardware components	■	■					
	b. Procurement of Software component		■	■				
iv	Inventories of Hazardous Waste	■	■					
v	Identification and Notification of Sites for secure destruction and disposal of hazardous wastes	■	■					
vi	Modernization of Technical Library							
	a. Establishment of Library	■						
	b. Procurement of new books, journals etc.	■	■	■	■	■	■	■
vii	Organization of Community Outreach Efforts	■	■	■	■	■	■	■
viii	Training	■	■	■	■	■	■	■
ix	Support to MOEF and CPCB in policy making	■	■	■	■	■	■	■
B	Technical Assistance Component							
i	Expansion of WMC	■	■	■	■	■	■	■
ii	Development of Strategy to clean contaminated sites	■	■					
iii	demonstration projects on innovative technologies for prevention of generation of hazardous residues	■	■					
iv	Support to dose-response analysis of hazardous waste and pernicious organic pollutants	■	■					
v	Identification and assessment of alternative for containment and disposal of halogen and mercury containing waste	■	■					
vi	Technology Alternatives for Disposal of Sludge from ETPs	■	■					
C	Infrastructure Development Component							
i	Assistance in waste avoidance, recycle, recovery and treatment of hazardous waste at individual facilities	■	■	■	■	■	■	■
ii	Pilot projects for common treatment and disposal facilities		■	■	■	■	■	■

7.5 Project Costs and Financing

The total cost of the proposed project is about 290 US\$ Million. The proposed project would be financed through two Bank loans of US\$50 million equivalent each, provided to BOB and ICICI, an Interim Trust Fund (ITF) credit of US\$76.0 million equivalent, additional loans extended by the FIs to the project sponsors, equity contributions and budgetary allocations from GOI. The proposed Bank loans and the proceeds of the ITF credit would finance about 64% of the project costs.

Table 7.3 presents a summary of costs of the project. Cost allocations for the project components and some of the sub-projects is shown in Figure 7.3. It should be noted that the details in Table 7.3 and Figure 7.3 are under discussions and not finalized. They however reflect the proposed order of the allocations.

Component	Local		Foreign		Total		% Foreign Exchange
	US\$ million	Rs. million	US\$ million	Rs. million	US\$ million	Rs. million	
Enforcement							
<i>SPCBs/CPCB/MOEF</i>							
Civil Works	6.76		0.00		6.76		00
Training	2.58		1.11		3.69		30
Equipment/Software	4.82		7.23		12.05		60
Consulting Services	2.50		5.83		8.34		70
Operation	6.00		0.00		6.00		00
Base Cost	22.67		14.17		36.04		38
<i>Contingencies</i>							
Physical	1.67		1.02		2.69		38
Price	1.46		0.89		2.35		38
Unallocated ^(b)	1.31		4.81		6.12		78.6
Subtotal	27.11		20.89		48.00		43.5
Infrastructure							
<i>CIWTDFs</i>	33.25		33.25		66.50		50
<i>Individual Subprojects</i>	8.00		96.00		180.00		60
Subtotal	117.25		129.25		246.50		67
National Initiatives							
<i>Demonstration</i>	7.50		7.5		15.00		50
<i>WMC</i>	0.48		0.12		0.60		20
<i>Technical Studies</i>	1.50		2.40		3.90		40
Subtotal	9.48		10.02		19.50		
Total	153.84		154.16		314.00		50

^(a) Excluding taxes and duties

^(b) Including 11% unallocated for requests from SPCBs yet to be received; 1US\$=36 Rs.

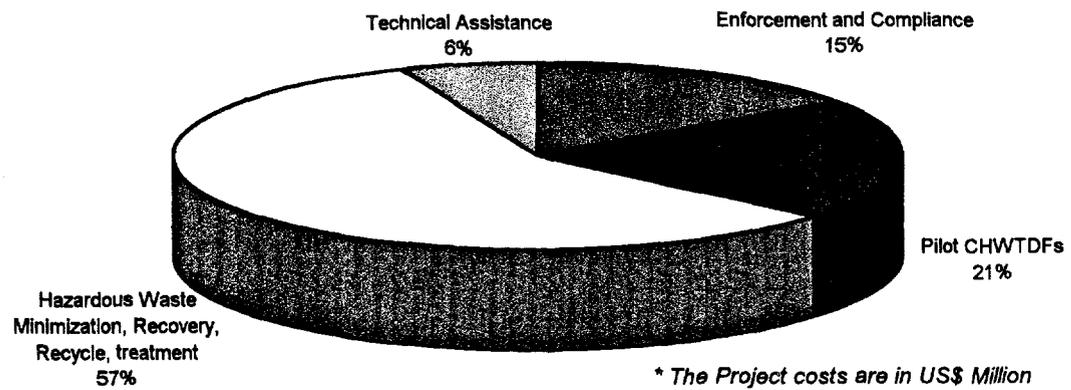


Figure 7.3 Cost allocations for the Major Project Components

7.5.1 Enforcement and Monitoring Component

The costs of the activities supported through the component are estimated at US\$44 million and will be financed through the proceeds of the ITF credit (US\$34 million equivalent) and contributions from GOI and the project beneficiaries (SPCBs). The credit will finance part of the cost of training, equipment and consulting services. The balance plus all of the operation and recurrent costs will be funded by GOI and the project beneficiaries.

7.5.2 Technical Assistance Component

The costs of the activities supported through the technical assistance component are estimated at US\$19.5 million and will be financed through the proceeds of the ITF credit (US\$8.8 million equivalent) and contributions from the GOI and the project beneficiaries.

7.5.3 Infrastructure Development Component

The CHWTDFs will be funded as follows: (i) project sponsors are expected to provide for at least 20% of the total project costs; (ii) the GOI will finance the balance of the State's participation in the CHWTDF. Eligible sub-projects presented by individual companies will be financed as follows: (i) project sponsors are expected to provide at least 25% of the total project costs; (ii) the balance can be financed through the proceeds of the lines of credit with ICICI and BOB and/or other domestic loans.

ANNEXES

- 1-1- Correspondence between SEAR and the Environmental Assessment Source Book Update No. 4
 - 2-1- Supportive Legislations
 - 2-2 - Hazardous Waste (Management and Handling) Rules 1989
 - 2-3 - Proposed recommendations to the Hazardous Waste (Management and Handling) Rules, 1989
 - 2-4 - International Conventions relevant to Environmental Protection where GOI has been signatory
 - 5-1- List of Instruments proposed by the SPCBs during the Planning Workshops
 - 5-2 (a) -Training Programmes proposed by the SPCBs during the Planning Workshops
 - 5-2 (b) - Training Programmes proposed for the State Intermediaries and FIs
 - 5-2 (c) - Training Programmes proposed for NGOs
 - 5-3 - Technical Assistance Studies proposed by the SPCBs during the Planning Workshops
 - 5-4 - Typical Examples of Waste Minimization Techniques
 - 5-5 - Recommendations from the Workshop on Identification and Management of Risks at CHWTDFs
 - 6-1 - Suggested EIA Process for CHWTDF
 - 6-2 - Model TOR for EIA of CHWTDFs
 - 6-3- Resettlement Policy Framework
 - 6-4 - Suggested Tools for Public Information and Consultation

Annex 1-1
Correspondence between SEAR and the
Environmental Assessment Source Book Update No.4

Correspondence between SEAR and the Environmental Assessment Source Book Update No. 4

Sr. No	Topics to be covered as per Environmental Assessment Source Book Update No. 4	Corresponding Relevant Sections in this SEAR
1	Policy, Legal and Administrative Framework	
1a	<p><i>The National framework</i></p> <p>This section should analyze the national environmental, legal, regulatory and institutional framework. The relevant national environmental policies, laws and regulations should be assessed for completeness and appropriateness in light of the particular conditions and problems of the sector, and gaps and weaknesses noted.</p> <p>The SEA should look closely at the institutional capacity of the national agencies in terms of effectiveness and capacity for providing guidelines, setting and enforcing standards, and reviewing environmental assessments.</p>	<p>1.0 INTRODUCTION</p> <p>1.1 Problem of Hazardous Wastes</p> <p>1.2 Sectoral Environmental Assessment</p> <p>1.3 Organization of the report</p> <p>2.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK</p> <p>2.1 Review of Environmental Policies and Programs</p> <p>2.1.1 Policy Statement for Abatement of Pollution - 1992</p> <p>2.1.2 Environmental Action Program, 1994</p> <p>2.1.3 Social and Resettlement and Rehabilitation related Policies</p> <p>2.2 Institutional Framework for Environmental Management</p> <p>2.2.1 Organization Structure for Environmental Management at the Centre</p> <p>2.2.2 Organization Structure for Environmental Management at the State</p> <p>2.2.3 Organization Structure for Environmental Management at the Local level</p> <p>2.2.4 Operational Agencies in Resettlement and Rehabilitation Plans Implementation</p> <p>2.3 Comments on the Institutional Framework for Environmental Management in India</p> <p>2.3.1 Comments on Programs, Legislation and Guidelines</p> <p>2.3.2 Comments on the Institutional Framework for Environment Management in India</p>
1b	<p><i>The Sector framework</i></p> <p>The relevant sector specific policies, laws and regulations should be assessed for completeness and appropriateness in light of the particular conditions and problems of the sector, and gaps and weaknesses noted.</p> <p>It should also identify how environmental responsibilities are distributed among sector institutions and assess their capacity to administer these tasks.</p>	<p>2.4 Legislation and Institutional Framework Related to Hazardous Waste Management</p> <p>2.4.1 Hazardous Waste (Management and Handling) Rules 1989</p> <p>2.4.1.1 Responsible Agencies for Implementation of the Rules</p> <p>2.4.1.2 Responsibilities of Generators, Operators and Transporters</p> <p>2.4.2 Deficiencies in the existing Hazardous Waste (Management and Handling) Rules, 1989</p> <p>2.4.2.1 Hazardous Waste Not Covered by the Rules.</p> <p>2.4.2.2 Correspondence between the transport rules and hazardous waste management rules</p> <p>2.4.2.3 Threshold</p> <p>2.4.3 Proposed Improvements to the Hazardous Waste</p>

	<p>The SEA should look closely at the institutional capacity of the national and state agencies in terms of effectiveness and capacity for providing guidelines, setting and enforcing standards, and reviewing environmental assessments.</p>	<p>(Management and Handling) Rules, 1989</p> <p>2.4.3.1 Streamlining of the definitions of Hazardous Waste Streams</p> <p>2.4.3.2 Definition of terms</p> <p>2.4.3.3 Re-allocation of responsibilities of Agencies involved in Hazardous Waste Management</p> <p>2.4.3.4 Rules for Import of Hazardous Wastes</p> <p>2.4.4 Proposed revisions of guidelines for hazardous waste management.</p> <p>2.4.4.1 Incorporation of the Manifest system as an integral part of the rules.</p> <p>2.4.4.2 Complementing the list of exclusionary criteria in the site selection process.</p> <p>2.4.4.3 Modernization of the ranking process for site selection</p> <p>2.4.5 The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989</p> <p>2.4.6 The Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms, Genetically Engineered Microorganisms or Cells Rules, 1989</p> <p>2.5 Relevant International Conventions</p>
2	<p>Project Description</p> <p>The nature and objectives of the program, plan, series of projects or other context to which the SEA is attached should be described, and the main environmental issues associated with the sector and these programs, identified.</p>	<p>5.0 THE HAZARDOUS WASTE MANAGEMENT PROJECT</p> <p>5.1 Preamble</p> <p>5.2 Design of the Project Components</p> <p>5.2.1 The Enforcement and Compliance Component</p> <p>5.2.2 The Technical Assistance Component</p> <p>5.2.3 The Infrastructure Development Component</p> <p>5.2.3.1 Analysis of Alternatives for Investments in Infrastructure Development</p> <p>5.2.3.2 Sub-Projects under the Infrastructure Development Component</p> <p>5.3 Benefits of the proposed project</p> <p>5.3.1 The Enforcement and Compliance Component</p> <p>5.3.2 Technical Assistance Component</p> <p>5.3.3 The Infrastructure Development Component</p> <p>5.4 Resolution of Issues in Hazardous Waste Management by the Project.</p>
3	<p>Baseline Data</p> <p>This section should describe and evaluate the current environmental situation in the sector. Where a project specific EA would describe conditions such as ambient air and water quality or existing impacts from pollution around a proposed project site, the SEA should concentrate on the issues and problems that are typical of the sector as a whole. An important function of this section is to note major data gaps.</p>	<p>3.0 STATUS OF HAZARDOUS WASTE MANAGEMENT IN INDIA</p> <p>3.1 Sources of Hazardous Wastes</p> <p>3.2 Industrial Growth in India</p> <p>3.3 Hazardous Waste Generation Pattern in the Selected States</p> <p>3.3.1 Maharashtra</p> <p>3.3.2 Gujarat</p> <p>3.3.3 Tamil Nadu</p> <p>3.3.4 Andhra Pradesh</p> <p>3.4 Status of Implementation of Hazardous Waste (Management and Handling) Rules, 1989 in the four project States</p> <p>3.4.1 Maharashtra</p> <p>3.4.2 Gujarat</p> <p>3.4.3 Tamil Nadu</p> <p>3.4.4 Andhra Pradesh</p> <p>3.4.5 Status of Implementation of Hazardous Waste</p>

		<p>(Management and Handling) Rules, 1989 in the two additional states Supported by the Project</p> <p>3.5 Current Environmental Situation</p> <p>3.5.1 Impact on ecosystems</p> <p>3.5.2 Impacts on Public Health</p> <p>3.6 Need for the Project</p>
4	<p>Environmental Impacts</p> <p>The SEA should assess the likely environmental impacts due to the components of the project and should recommend an appropriate course of action to address them, including carrying out a project-specific EAs.</p> <p>All cumulative effects should be considered: positive and negative, direct and indirect, long-term and short term. Cumulative impacts on environmentally important and sensitive areas are also important in cases where the sector activities heavily affect these areas and/or resources.</p> <p>The sectoral EA is an appropriate instrument for considering issues related to long-term sustainable development. Specifically, the SEA may contain a discussion of how a proposed investment program may influence long term productivity of environmental resources affected the program.</p>	<p>Table 6.1 Impact Assessment Matrix for hazardous waste management project</p> <p>Table 6.2 Identification of Risks/Impacts and Mitigation Measures for Waste avoidance, minimization, re-use and treatment at individual units</p> <p>Table 6.3 Identification of Risks/Impacts and Mitigation Measures for Pilot CHWTFs</p>
5	<p>Analysis of Alternatives</p> <p>A major purpose of a SEA is to do a thorough analysis of alternative investment options and strategies in terms of environmental costs and benefits. A comparative analysis of alternative programs is highly recommended, applying indicators of environmental and social impacts and methods to evaluate and compare the indicators and ultimately the alternative options.</p> <p>The sectoral EA can also be used to evaluate the environmental effects of sector policy alternatives. The analysis could conclude with a list of sector proposals, ranked according to environmental preference. The analysis of impacts and alternatives</p>	<p>4 SECTOR WIDE STRATEGIC APPROACH</p> <p>4.1 Alternative Approaches to Hazardous Waste Management</p> <p>4.2 Costs of No Intervention</p> <p>4.3 Rationale and Underlying Policies of the Project</p> <p>4.3.1 The Precautionary Principle</p> <p>4.3.2 The Risk Reduction Principle</p> <p>4.3.3 The Polluter Pays Principle</p> <p>4.4 Hazardous Waste Management System</p> <p>4.4.1 Minimization of Hazardous Wastes</p> <p>4.4.2 Technologies for Treatment and Disposal</p> <p>4.4.3 Transportation of Hazardous Wastes</p> <p>4.5 Project Design Strategy</p> <p>5.2.3.1 Analysis of Alternatives for Investments in Infrastructure Development</p>

	<p>should result in a recommendation for an optimal investment strategy, in terms of environmental and social costs and benefits.</p>	
6	<p>Mitigation Plan</p> <p>SEA should recommend broad options for eliminating, reducing to acceptable levels, or mitigating environmental impacts. SEA mitigation recommendations should draw on findings from the analysis of policy, legal and institutional issues as well as the analysis of impacts and alternatives.</p> <p>A SEA is an effective tool for designing and recommending mitigation measures that can be implemented only at the national or sectoral level for regulatory or economic reasons. In a sector program involving multiple investments, the SEA may be better placed than project-specific EAs to consider sector wide mitigation solutions that require economies of scale in order to be cost effective.</p>	<p>6.0 PROCESS GUIDANCE FRAMEWORK AND PUBLIC CONSULTATION PROCESS</p> <p>6.1 Mitigation of Risks and Impacts in the Context of SEA 6.2 Mitigation of Risks/Impacts by Project Design 6.2.1 Management of Technical Risks 6.2.2 Management of Institutional Risks 6.2.3 Management of Financial and Other Risks 6.3 Mitigation of Risks/Impacts by The Process Guidance Framework 6.3.1 Project Eligibility Level 6.3.2 Project Appraisal Level 6.3.2.1 Environmental Impact Assessment 6.3.2.2 Resettlement and Rehabilitation of Project Affected Persons 6.3.3 Project Monitoring Level</p>
7	<p>Environmental Management and Training</p> <p>The SEA should recommend an institutional plan for improving environmental management in the sector, based on findings of the previous sections. The plan might recommend training of existing staff, hiring of additional staff, reorganization of units or agencies, or redefinition of roles and responsibilities.</p> <p>This section might also include recommendations on policy and regulatory instruments for environmental management and enforcement in the sector. A screening process to separate those sub-project needing a project specific EA from those not requiring further analysis should be designed, if it is not already in place.</p>	<p>5.2.1 The Enforcement and Compliance Component <i>(The Enforcement and Compliance component includes sub-project for training of all relevant agencies such as, MOEF, CPCB, SPCBs, Custom Officials, RTO, Fis, State IDCs etc.)</i></p> <p>Annex 5-2 Training programs proposed for SPCBs, Fis, IDCs</p>

8	<p>Environmental Monitoring Plan</p> <p>The SEA should provide general guidelines for long-term sector-wide environmental monitoring to ensure adequate implementation of investments. A monitoring plan should use the findings of the baseline data section as basis to measure progress in mid-term review and final evaluation. The plan should also recommend measures needed to collect and organize missing data.</p>	<p>7.1 Project Management 7.1.1 Enforcement and Compliance Component 7.1.2 Technical Assistance Component 7.1.3 Infrastructure Development Component 7.2 Project Coordination and Monitoring 7.2.1 Responsibilities of the Project Management Office at MOEF 7.2.2 Responsibilities of the Project Implementation Cell at SPCBs 7.3 Project Performance Monitoring 7.4 Implementation Schedule</p>
9	<p>Public Consultation</p> <p>SEA normally covers an entire sector and is conducted before concrete investment decisions are made. Therefore, it may not always be possible to consult representatives of all potentially affected people during preparation of the SEA. Often, it is more feasible and appropriate to carry out consultations with national NGOs (for example, for nature protection), scientific experts, relevant government agencies, and perhaps also industrial and commercial interests. A successfully implemented consultation process will help ensure public support for the final sector program.</p>	<p>6.4 Public Information and Consultation 6.4.1 Public Information and Consultation (PIC) of this SEAR 6.4.2 Public Consultation and Participation (PCP) for the sub-projects 6.4.3 Public Consultation and Participation (PCP) for CHWTDFs</p>

Annex 2-1
Supportive Legislations

ANNEX 2-1 Supportive Legislations

The Government of India has formulated a number of environmental legislations to implement the policies. The salient features of the landmark laws are described chronologically below.

Water, Air and Land pollution related legislation

The Water (Prevention and Control of Pollution) Act, 1974.

The Water (Prevention and Control of Pollution) Act, 1974 provides for the prevention and control of water pollution and maintaining or restoring good quality of water for any establishment.

The act assigns functions and powers to the central and state boards for prevention and control of water pollution and all related matters. On a case-by-case basis or where there may be union territory involved, the act allows for the constitution of a joint board i.e., by two or more governments of contiguous states or by the central government.

Subject to the provisions of the act, functions and powers of central as well as the state boards have been delineated individually and with respect to each other. For the prevention and control of water pollution, the state government has the power to restrict the application of the act to certain areas, obtain information, take samples of effluents and follow appropriate procedures thereafter, enter and inspect an establishment, prohibit use of streams or wells for disposal of pollution material, restrict new outlets and discharges, restrict existing discharge of sewage of trade effluent, and refuse or withdraw any consent by the state board.

The Central Board as well as the state boards are eligible for contributions from the central government and state governments respectively to enable the boards to perform their functions appropriately. The act also prescribes stringent penalties for those who operate their industry without the valid consent or in violation of consent conditions.

To overcome the administrative and practical difficulties in implementing the provisions an amendment was enacted called "*The Water (Prevention and Control of Pollution) Amendment Act, 1988*".

The Water (Prevention and Control of Pollution) Cess Act, 1977.

This act provides for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs) for the prevention and control of water pollution constituted under the

Water (Prevention and Control of Pollution) Act, 1974. It also covers specifications on affixing of meters, furnishing of returns, assessment of cess, interest payable for delay in payment of cess, and penalty for nonpayment of cess within the specified time.

Salient features of this act are :

- The assessing authority under the act levies and collect a cess based on the amount of water consumed and the purpose for which the water is used.
- The concerned industries are required to install standard water meters for measuring and recording the quantity of water consumed.
- Based on cess returns to be furnished by the industry every month, the amount of cess is assessed by the assessing authorities.
- Aggrieved persons may appeal the assessment to the Appellate Authority.
- The act also provides for a 25 percent rebate on the cess, payable to those industries that consume water within the quantity prescribed for that category of industries and also comply with prescribed effluent standards.

The Air (Prevention and Control of Pollution) Act, 1981

The objective of the Air Act is to prevent, control and reduce air pollution including noise pollution and to establish boards at the States/Union Territories to achieve this.

This act prohibits the construction or operation of any industrial plant without the consent of the SPCBs. The act assigns powers and functions to the CPCB and SPCBs for prevention and control of air pollution and all other related matters. The act states that state boards for the prevention and control of water pollution are to be the state boards for the prevention and control of air pollution. In addition, the CPCB can exercise the power and perform the functions of a state board in the Union Territories.

For the prevention and control of air pollution the state government in construction with SPCB has the power to set standards for emissions from automobiles, impose restrictions on use of certain industrial plants, and prohibit emissions of air pollutants in excess of the standards laid down by the SPCB. It can also make an application to court for restraining persons from causing air pollution. In addition, it also has the power of entry and inspection, power to obtain information and power to take samples of air emission and conduct the appropriate follow-up. The CPCB as well as the SPCBs are eligible for contributions from the central government and state government, respectively, to perform their functions appropriately. The act also allows for appropriate penalties and procedures for noncompliance.

In order to facilitate the implementation of this act, an amendment was enacted viz., The Air (Prevention and Control of Pollution) Amendment Act, 1987.

The Environment (Protection) Act 1986

This act is umbrella legislation that provides a single focus for the protection of the environment and seeks to plug the loopholes of earlier legislation relating to the environment. Several sets of rules relating to various aspects of the management of hazardous chemical, wastes, micro-organisms, and so on, have been written under this act.

Salient features of this act are :

- The central government may restrict an industry, operation or process, or class of industries or operations from a particular area.
- Emissions and effluent standards with respect to 61 categories of industries have been developed.
- The standards with respect to pollutants are to be achieved within a period of one year from the date of their notification.
- If a particular State Pollution Control Board desires, it may reduce the time limit and also specify more stringent standards with respect to a specified category of industries within their jurisdiction.
- The SPCB cannot relax either the time limit or the standards.
- Industries that require consent under the Water Act, Air Act or both, or authorization under the Hazardous Waste (Management and Handling) Rules, 1989, are required to submit an Environmental Audit Statement to the concerned State Pollution Control Board on or before September 30 each year.

Under the EP Act a number of notifications and rules have been enacted whereby environmental audit and environmental impact assessment for development projects have become mandatory. In addition, rules under the EP Act have also been enacted for the management of hazardous wastes and hazardous substances.

The Public Liability Insurance Act. 1991.

The Public Liability Insurance Act was enacted on January 23, 1991, to provide immediate relief to persons affected by accidents while handling hazardous substances.

The act requires that :

- Where death or injury to any person (other than a workman) or damage to any property has resulted from an accident, the owner is liable to give relief on a "no fault basis."
- Every owner must take out, before he starts handling hazardous substances, one or more liability insurance policies equal to its paid up capital or Rs. 500 million, whichever is less. the policy has to be renewed every year.

- New undertakings must apply for liability insurance before starting their activity. Accidents are verified by the District Collector, who may hold an inquiry into the claim (s) and may make an award determining the amount of relief.
- The central government will set up an Environmental Relief Fund to be utilized for paying, in accordance with the provision of the Act.
- The owner also has to pay an amount equal to its annual premium to the central governments Environment Relief Fund.
- The reimbursement of relief to the extent of Rs. 2500 per person is allowed in case of fatal accidents in addition to the reimbursement of medical expenses up to Rs. 12,500.
- The liability of the insurer is limited to Rs. 50 million per accident up to Rs. 150 million per year or up to the tenure of the policy. Any excess claims will be paid from the environment relief fund or by the owner.
- Owners must provide the final compensation, if any, arising out of legal proceedings.
- The Public Liability Insurance Amendment Act specifies the responsibilities of different participants under the liability law.

Environmental Audit Notification, 1992

This notification applies to every person carrying on an industry, operation or process requiring consent to operate under the Water Act, Air Act, or both, or authorization under the Hazardous Wastes (Management and Handling Rules), 1989, issued under the Environment (Protection) Act, 1986.

The notification requires that an environmental statement for the financial year ending March 31 be submitted to the concerned State Pollution Control Board on or before September 30 every year, beginning in 1993. The realization that industry and environment should go hand in hand so as to achieve sustainable development was brought in realization to consider environmental protection a bare necessity.

" Environmental Audit" is a technique being introduced for integrating the interest of the industry and the environment so that these could be mutually supportive. The policy Statement for Abatement of Pollution by the Government of India, provides for submission of environmental statement by all concerned industries audit. Environmental Auditing is a management tool comprising a systematic, documented, periodic and objective evaluation of how well the management systems are performing with the aim of waste prevention and reduction, assessing compliance with regulatory requirements, facilitating control of environmental practices by a Company's management and placing environmental information in the public domain.

The Environmental Impact Assessment Notification, 1994 (as amended May 1994)

Environmental clearance of development activities from the MOEF till January 1994, was only an administrative requirement intended for mega projects undertaken by the

Government or Public Sector Undertakings. However, through enactment of this Notification in January 1994 (amended in May 1994), the MOEF made Environment Impact Assessment statutory for 29 different identified activities. These projects listed under Schedule-I of the EIA Notification are required to obtain environmental clearance from the Central Government. Even if any of these projects fall under the delicensed category of the New Industrial Policy, they are still required to get environmental clearance from the Central Government to be able to get established and function.

The 29 projects listed in Schedule-I of the EIA Notification broadly fall under the following sectors :

- Industries
- Mining
- Thermal Power Plants
- River Valley
- Ports, Harbors and Airports
- Communication
- Atomic Energy
- Transport (Rail, Road, Highway)
- Tourism (including hotels, beach resorts)

Besides this, site specific projects such as mining, pit head thermal power stations, hydropower, major irrigation projects, ports and harbors will also have to obtain separate site clearance from the Central Government (or the State Government as the case maybe) as specified in the EIA Notification.

In the case of industries, the Notification further identifies specific sectors wherein only if the investment exceeds Rs. 50 crores is EIA required.

The Government of India (Ministry of Environment and Forests) also notifies, through this enactment certain areas as ecologically sensitive/fragile areas from time to time and all development projects which are to be located in these notified areas need to obtain environmental clearance from the Central Government irrespective of whether they are listed under Schedule-I of the EIA Notification or not.

This EIA Notification also includes details of procedures for obtaining environmental clearance and for public involvement besides setting time schedules for decision taking.

***Environmental (Protection) Rules - "Notice of Environmental Public Hearing",
January 1997***

The Cabinet Secretariat on January 15, 1997 made public hearings mandatory before giving environmental clearance to any industrial project or activity, both private and government. This was done through a notification amending sub section (1) and clause

(v) of sub-section (2) of section 3 of the EPA, 1986 read with clause (d) of sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986.

The hearings would be conducted with respect to all the 29 industrial sectors that are enumerated in the EIA notification of 1994. The aim of this notification is to enable people directly affected by the developmental and industrial projects, as well as Non Governmental Organizations (NGOs) to present their point of view and to ensure transparency in the process of EIA.

Forest and Wildlife Resources related legislation

Wildlife (Protection) Act 1972

The wildlife (Protection) Act, 1972 is a unified national act superseding previous specific state laws and the Indian Forest Act, 1927, which enables the constitution and management of areas as national parks, sanctuaries, game reserves, and closed areas. It also specifies the procedures for establishing protected areas, the management parameters for them, and the procedures for allowing or disallowing diverse uses within them. Under this act, national parks are given a higher level of importance than sanctuaries, since no grazing or private land holding or right is permitted within them.

The act also provides for denotification of sanctuaries for certain human uses. It specifies for hunting of wild animals with respect to license needed, maintenance of records of wild animals killed, restrictions of hunting etc. It provides for the declaration of any area to be a sanctuary, national park or game reserve by the state government, if it is considered that the area is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance for the purpose of protecting propagating wildlife or its environment. In addition, the act also prohibits the trade of wild animals or animal articles and trophies from certain animals.

Wildlife (Protection) Amendment Act, 1991

It provides for the protection of specified plants and the establishment of a Central Zoo Authority and the recognition of Zoos.

Forest (Conservation) Act, 1980 and 1988 Amendments

The act provides for the conservation of forests and matters related to the same. It calls for restrictions on the dereservation of forests or use of forest land for non-forest purposes i.e. the clearing of any forest land for the cultivation of tea, coffee, spices, rubber, palms, oil bearing plants, horticultural crops or medicinal plants, or any purpose other than reforestation. It also provides for the constitution of advisory committees and outlines the jurisdictions of government departments and provides the central government with power to make rules for carrying out the provisions of the act.

Social and Resettlement and Rehabilitation related legislation

Legislation and policy on social issues are in a nascent stage of development in India. The Land Acquisition Act, with amendments, enacted thereto by various States, is applicable all over India, irrespective of the project. Maharashtra and Madhya Pradesh are the only States which have formulated specific legislation on Resettlement and Rehabilitation as of November 1995.

Land Acquisition Act, 1894 as amended in 1984.

This Act enables the State to acquire private land for public purpose. This sovereign power of the State can be delegated to public bodies and Corporations. Progressive liberalization and industrialization has resulted in the increase of compulsory acquisition. The Act ensures that no person is deprived of land except under law and entitles the affected person (land owner, tenant or licensee) to a hearing before acquisition, with due and adequate compensation made thereafter.

Only land owners, tenants and licensees are possible compensation recipients. The landless, agricultural and non-agricultural labourers, artisans, forest produce collectors are excluded. The Act only deals with cash compensation, at a percent of market value. The Act also provides several methods of valuing the compensation. Several States are using negotiations as a means to fix compensation and acquire land

Grievance/Redressal mechanisms are also in place and affected persons may seek the intervention of the Supreme Court

Maharashtra Project Affected Persons Rehabilitation Act, 1986

This Act enables the State to rehabilitate persons affected by irrigation projects in the State of Maharashtra.

National Forest Policy, 1988

The National Forest Policy focused on a new strategy of forest conservation which included preservation, maintenance, sustainable utilization, restoration, and enhancement of the natural environment. The objectives governing the forest policy are listed in Box below:

Objectives governing the National Forest Policy

- Maintenance of environmental stability through preservation and where necessary, restoration of the ecological balance that has been adversely distributed by serious depletion of the forests of the country.
- Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country.
- Checking soil erosion and deterioration in the catchment areas of rivers, lakes and reservoirs in the interest of soil and water conservation, for mitigating floods and droughts, and for the retardation of salutation of reservoirs.
- Checking the extension of sand dunes in the desert areas of Rajasthan and along the coastal tracts.
- Increasing substantially the forest tree cover in the country through massive afforestation and social forestry programs, especially on all denuded, degraded and unproductive lands.
- Meeting the requirements of fuelwood, fodder and minor forest produce and small timber of the rural and tribal populations
- Increasing the productivity of forests to meet essential national needs.
- Encouraging efficient utilization of forest produce by maximizing substitution of wood.
- Creating a massive peoples movement with the involvement of women, for achieving these objectives and to minimize pressure on existing forests.

In addition, the policy outlines the essentials of forest management, strategies of afforestation, social forestry and farm forestry, wildlife conservation, forest-based industries, and forest education and research.

Policy on Fiscal Incentives to Encourage Control and Prevention of Pollution.

The Government of India offers several incentives to ensure that industries are motivated to comply with the various environmental standards prescribed under different acts and rules to control and prevent pollution. Some of the major fiscal incentives are as follows:

Exemption from income tax

In order to ensure enthusiastic public involvement, particularly of the corporate sector and private individuals, donations given by a taxpayer to any association or institution for programs on conservation of nature and natural resources are exempt from income tax.

The secretary of the MOEF approves such institutions and associations.

Depreciation allowance

A depreciation allowance of 30 percent is allowed on device and systems installed by industrial units for minimizing pollution or for conservation of natural resources. Investment allowance. An investment allowance at the rate of 35 percent of the actual costs of new machinery or plant to assist in the control of pollution and protection of the environment is granted.

The central government has notified a list of machinery and plant on which investment allowance is granted.

Exemption from tax on capital gains

The purpose of this incentive is to encourage industries to shift from congested urban areas. Capital gains arising from transfer of buildings or lands used for business purposes are exempt from tax if these are used for acquiring or for constructing buildings for the purpose of business at a new place.

Excise and duty exemption on utilization of flyash, phosphogypsum, and so on

Excise duty is exempted on the production of low-cost building materials and components. Excise duty is exempted on the production of building materials using fly-ash or phosphogypsum as raw material in 25 percent or greater quantities. Custom duty is exempted on the import of equipment, machinery and capital goods required for the production of building material such as bricks, light weight aggregates, light weight concrete elements, and so on, using flyash or phosphogypsum. Reduction in excise duty up to 15 percent is allowed on prefab components required for housing.

Annex 2-2
Hazardous Waste (Management and Handling)
Rules 1989

Hazardous Waste (Management and Handling) Rules 1989

Ministry of Environment and Forests (Department of Environment, Forests and Wildlife)
NOTIFICATION, New Delhi, the 28th July, 1989

S.O. 594(E).--In exercise of the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules, namely :-

Short title and commencement.

1. (1) These rules may be called the Hazardous Wastes (Management and Handling) Rules, 1989.
- (2) They shall come into force on the date of their publication in the Official Gazette.

Application

2. These rules shall apply to hazardous wastes as specified in Schedule and shall not apply to-
 - (a) waste water and exhaust gases as covered under the provisions of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and rules made thereunder;
 - (b) wastes arising out of the operation from ships beyond five kilometers as covered under the provisions of the Merchant Shipping Act, 1958 (44 of 1958) and the rules made thereunder;
 - (c) radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made thereunder;

Definitions

3. In these rules, unless the context otherwise requires,-
 - (a) "Act" means the Environment (Protection) Act, 1986 (29 of 1986);
 - (b) "applicant" means a person or an organization that applies, in Form 1, for granting of authorization to perform specific activities connected with handling of hazardous waste::

- (c) "authorization" means permission for collection, reception, treatment, transport, storage and disposal of hazardous wastes granted by the competent authority in Form 2;
- (d) "authorized person" means a person or an organization authorized by the competent authority to collect, treat, transport, store or dispose of hazardous wastes in accordance with the guidelines to be issued by the competent authority from time to time;
- (e) "export" with its grammatical variation and cognate expression, means taking out of India to a place outside India;
- (f) "exporter" means any person under the jurisdiction of the exporting country who exports hazardous wastes and the exporting country itself; who exports hazardous wastes
- (g) "facility" means any location wherein the processes, incidental to the waste generation collection, reception, treatment, storage and disposal are carried out;
- (h) "Form" means Form appended to these rules;
- (i) "hazardous wastes" means categories of wastes specified in the Schedule;
- (j) "hazardous wastes site" means a place for collection, reception, treatment, storage and disposal of hazardous wastes which has been duly approved by the competent authority;
- (k) "import" with its grammatical variations and cognate expressions, means bringing into India from a place outside India;
- (l) "importer" means an occupier or any person who imports hazardous wastes;
- (m) "operator of a facility" means a person who owns or operates a facility for collection, reception, treatment, storage and disposal of hazardous wastes;
- (n) "Schedule" means Schedule appended to these rules;
- (o) "State Pollution Control Board" means the Board appointed under sub-section (1) of the section 4 of the Water (Prevention and Control of Pollution) Act 1974 (6 of 1974); and under Section 4 of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981);
- (p) "transboundary movement" means any movement of hazardous wastes or other wastes from an area under the national jurisdiction of one country to or through an

area under the national jurisdiction of another country or to or through an area not under the national jurisdiction of any country, provided at least two countries are involved in the movement;

- (q) the words and expressions used in these rules and not defined but defined in the Act, shall have the meanings respectively assigned to them in the Am

Responsibility of the occupier for handling of wastes

4. (1) The occupier generating hazardous wastes listed column (2) of the Schedule in quantities equal to or exceeding the limits given in column (3) of the said Schedule, shall take all practical steps to ensure that such wastes are properly handled and disposed of without any adverse effects which may result from such wastes and the occupier shall also be responsible for proper collection, reception, treatment, storage and disposal of these wastes either himself or through the operator of a facility.

(2) The occupier or any other person acting on his behalf who intends to get his hazardous waste treated by the operator of a facility under sub-rule (1), shall give to the operator of a facility, such information as may be specified by the State Pollution Control Board;

5. (1) Hazardous wastes shall be collected, treated, stored and disposed of only in such facilities as may be authorized for this purpose.

(2) Every occupier generating hazardous wastes and having a facility for collection, reception, treatment, transport storage and disposal of such wastes shall make an application in Form 1 to the State Pollution Control Board for the grant of authorization for any of the above activities :

Provided that the occupier not having a facility for the collection, reception, treatment, transport, storage and disposal of hazardous wastes shall make an application to the State Pollution Control Board in Form 1 for the grant of authorization within a period of six months from the date of commencement of these rules.

(3) Any person who intends to be an operator of a facility for the collection, reception, treatment, transport, storage and disposal of hazardous wastes, Shall make an application in Form 1 to the State Pollution Control Board for the grant of authorization for any of the above activities :

Provided that the operator engaged in the business of the collection, reception, treatment, transport, storage and disposal of hazardous wastes shall make an application to the State Pollution control Board in Form 1 for the grant of authorization within a period of six months from the date of commencement of these rules.

(4) The State Pollution Control Board shall not issue an authorization unless it is satisfied that the operator of a facility or an occupier, as the case may be, possesses appropriate facilities, technical capabilities and equipment to handle hazardous wastes safely.

(5) The authorization to operate a facility shall be issued in Form 2 and shall be subject to conditions laid down therein.

(6) (i) An authorization granted under this rule shall unless sooner suspended or canceled, be in force for a period of two years from the date of issue or from the date of renewal.

(ii) An application for the renewal of an authorization shall be made in Form 1, before its expiry.

(iii) The authorization shall continue to be in force until it is renewed or revoked.

(7) The State Pollution Control Board, may, after giving reasonable opportunity of being heard to the applicant refuse to grant any authorization.

Power to suspend or cancel an authorization

6. (1) The State Pollution Control Board may cancel an authorization issued under these rules or suspend it for such period as it thinks fit, if in its opinion, the authorized person has failed to comply with any of the conditions of the authorization or with any provisions of the Act or these rules, after giving the authorized person an opportunity to show cause and after recording reasons therefor.

(2) Upon suspension or cancellation of the authorization and during the pendency of an appeal under rule 12, the State Pollution Control Board may give directions to the persons whose authorization has been suspended or canceled for the safe storage of the hazardous wastes, and such person shall comply with such directions.

Packaging, labeling and transport of hazardous wastes

7. (1) Before hazardous wastes is delivered at the hazardous waste site, the occupier or operator of a facility shall ensure that the hazardous wastes is packaged in a manner suitable for storage and transport and the labeling and packaging shall be easily visible and be able to withstand physical conditions and climate factors.

(2) Packaging, labeling and transport of hazardous wastes shall be in accordance with the provisions of the rules issued by the Central Government under the Motor Vehicles Act, 1988 and other guidelines issued from time to time.

Inventory of disposal Sites

8. (1) The State Government or a person authorized by it shall undertake a continuing programme to identify the sites and compile and publish periodically an inventory of disposal sites within the State for the disposal of hazardous wastes.

(2) The State Government or a person authorized by it shall undertake an environmental impact study before identifying a site as waste disposal site in the State.

(3) The State Government or a person authorized by it shall undertake a continuing programme to compile and publish an inventory of sites within the State at which hazardous wastes have at any time been stored or disposed of and such inventory shall contain, besides the location and description, information relating to the amount, nature and toxicity of hazardous wastes at each such site as may be associated with such site.

Records and returns

9. (1) The occupier generating hazardous waste and operator of a facility for" collection, reception, treatment, transport, storage and disposal of hazardous waste shall maintain records of such operations in Form 3.

(2) The occupier and operator of a facility shall send annual returns to the State Pollution Control Board in Form 4.

Accident Reporting and follow up

10. Where an accident occurs at the facility or on a hazardous waste site or during transportation of hazardous wastes, the occupier or operator of a facility shall report immediately to the State Pollution Control Board about the accident in Form 5.

Import of Hazardous Wastes

11. (1) Import of hazardous wastes from any country to India shall not be permitted for dumping and disposal of such wastes. However, import of such wastes may be allowed for processing or re-use as raw material, after examining each case on merit by the State Pollution Control Board or by an officer authorized in this behalf.

(2) The exporting country or the exporter as the case may be, of hazardous wastes shall communicate in Form 6 to the Central Government (the Ministry of Environment and Forests) of the proposed trans-boundary movement of hazardous wastes.

(3) The Central Government shall, after examining the communication received under sub-rule (2) and on being satisfied that the import of such hazardous wastes is to be used for processing or reuse as raw material grant permission for the import of such wastes

subject to such conditions as the Central Government may specify in this behalf and if, however, the Central Government is not satisfied with the communication received under sub-rule (2), may refuse permission to import such hazardous wastes.

(4) Any importer importing hazardous wastes shall provide necessary information as to the type of hazardous wastes he is to import, in Form 6, to the concerned State Pollution Control Board/the Central Pollution Control Board in the case of Union Territories.

(5) The State Pollution Control Board shall examine the information received under the sub-rule (4) and issue such instructions to the importers as it considers necessary.

(6) The Central Government or the State Pollution Control Board, as the case may be, shall inform the concerned Port Authority to take appropriate steps regarding the safe handling of the hazardous wastes at the time of off-loading the same.

(7) Any person importing hazardous wastes shall maintain the records of the hazardous wastes imported as specified in Form 7 and the records so maintained shall be open for inspection by the State Pollution Control Board/the Ministry of Environment and Forests/the Central Pollution Control Board in the case of Union Territories or an officer appointed by them in this behalf.

India is a signatory of the Basel convention. Under consideration by MOEF is a strengthening of legislation regarding the import of materials of hazardous nature. In the medium term, GOI expects to legislate prohibiting the import of hazardous waste.

Appeal

12. (1) An appeal shall lie, against any order of suspension or cancellation or refusal of an authorization by the State Pollution Control Board to the State Government and to the Ministry of Environment and Forests in the case of the Central Pollution Control Board.

(2) Every appeal shall be in writing and shall be accompanied by a copy of the order appealed against and shall be presented within thirty days of the order passed.

Form 1 - [see rule 3(b) 5(2), (3) and (6) (ii)]

This form is an application for authorizations/ renewal of authorization for collection/ reception/ treatment/ transport/ storage/ disposal of hazardous wastes.

Form 2 - [see rule 3 (c) and 5(5)]

This is a form is an authorization for operating a facility for collection, reception, treatment, storage, transport and disposal of hazardous wastes.

Form 3 - [see rule 9(1)]

Format for maintaining records of hazardous wastes at the facility.

Form 4 - [see rule 9(2)]

Format for the submission of returns, regarding disposal of hazardous waste

Form 5 - [see rule 10]

Format to maintain records in the event of occurrence of an accident

Form 6 - [see rule 11(2) and (4)]

Format for notification and movement of wastes for export.

Form 7 - [see rule 11(7)]

Format for maintaining records of hazardous wastes imported.

Annex 2-3
Proposed recommendations to the
Hazardous Waste (Management and Handling)
Rules, 1989

**Proposed recommendations to the
Hazardous Waste (Management and Handling) Rules, 1989**

**Ministry of Environment & Forests
NOTIFICATION**

S.O. In exercise of the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Hazardous Wastes (Management & Handling) Rules, 1989, namely-

1. (1) These rules may be called the Hazardous Wastes (Management & Handling) Amendment Rules, 1997;
- (2.) They shall come into force on the date of their publication in the official Gazette;
3. In the Hazardous Wastes (Management & Handling) Rules, 1989, (herein after referred to as the said rules) in rule 2; -
 - (b) after the words " These rules shall apply to" the words " handling of" will be inserted.
 - (c) after the words "as specified in" the word "schedule" shall be substituted by the word "schedules".
3. In rule 3 of the said rules :-
 - (a) for rule 3 (i) , the following shall be substituted namely:-
 - " i. Waste Substances which are generated in the process indicated in column-2 of schedule-1 and consists of wholly or partly of the waste substances referred to in column -4 of the same schedule:
 - ii. waste substances which consists wholly or partly of substances indicated in schedule-2, unless the concentration of the substances is less than the limit indicated in the same schedule: and
 - iii. waste substances indicated in Part-A schedule -3 unless they do not possess any of the hazardous characteristics in Part-B of the same schedule. Schedule-3 shall be applicable only for exports and imports.
 - (b) after rule 3(p) the following rules, shall be inserted namely:-
 - "3(q) 'disposal' means deposit, treatment, storage and recovery of any hazardous wastes;
 - 3 (r) 'manifest' means transporting document originated and signed by the generator in accordance with Rule 7(3) & 7(4);
 - 3 (s) 'storage' means holding hazardous wastes for a temporary period, at the end of which the hazardous waste is treated and disposed of;
 - 3 (t) 'transport' means movement of hazardous waste by air, rail, road or water;
 - 3 (u) 'transporter' means a person engaged in the off-site transportation of hazardous waste by air, rail, road or water;

3 (v) 'treatment' means a method, technique or process, designed to change the physical, chemical or biological characteristics or composition of any hazardous waste so as to render such wastes harmless;

3 (w) "Environmentally Sound Management of Hazardous Wastes" means taking all practicable steps to ensure that the hazardous wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes;

3 (x) "Illegal Traffic" means any domestic and/or transboundary movement of hazardous wastes as specified in Rule 14;"

(c) Rule 3 (q) shall consequently be renumbered as "3(Y)".

4. In rule 4 of the said rules:-

(d) after the words "responsibility of occupier" and before the words "for handling of" the words "and operator of a facility" shall be inserted.;

(b) after sub-rule (2) the following sub-rule shall be inserted. namely :-

"(3) The operator of a facility, shall take all practical steps to ensure that the wastes listed in schedule-1,2,3 are properly handled, and disposed of without any adverse effects which may result from such wastes and the operator of the facility shall also be responsible for proper storage of these wastes till the time it is disposed of."

5. In rule 5 of the said rules :-

(e) in sub-rule (2) and sub-rule (3) after the words" Form 1" the following shall be inserted namely :-

"accompanied with such fees as may be prescribed , for processing application for authorization including analysis if required;"

(b) after sub-rule (4) the following sub-rule shall be inserted namely:-

"(5) The authorization application shall be processed by the state pollution control boards with in 90 days of the receipt of the application ,complete in all respects."

(c) consequently sub-rule (5), sub-rule (6) and sub-rule (7) shall be read as sub-rule (6), sub-rule (7) and sub-rule (8) respectively ;

(d) after new sub-rule (8), the following sub-rules shall be inserted:

"(9) The State Pollution Control Board, shall renew the authorization granted, after examining each case on merit, subject to the following:-

i) on submission of annual returns by the occupier/operator of facility in Form 4

ii) on evidence of reduction in the waste generated or recycled/reused

iii) on fulfillment of conditions prescribed in the authorization regarding management in an environmentally sound manner of wastes and

iv) on remittance of fee as may be prescribed.

(1) The Member-Secretary, State Pollution Control Board or any officer designated by the Board shall be responsible to grant/refuse authorization."

6. In Rule 7 of the said rules:-

(a) in sub-rule (1) after the words " hazardous wastes is packaged" the words " based on the composition " shall be inserted;

(b) in sub-rule (2) :-

(i) after the words "provisions of the rules" the words "to be" shall be inserted;

(ii) after the sentence ending with the words "time to time.", the following shall be inserted;

"All hazardous waste containers shall be provided with a general label as given in Form 8."

(c) after sub-rule (2), the following sub-rules shall be inserted namely:-

"(3) No transporter shall accept hazardous wastes from an Occupier unless it is accompanied by 5 copies of the manifest (Form 9). The transporter shall then sign and date a copy of the manifest and return it to the occupier and retain the remaining four copies to be used as prescribed in Sub rule (4)

(4) Occupier shall provide the transporter with Six copies of the manifest as per the colour codes indicated below:

Copy 1 (White)	Forwarded to the Pollution Control Board by the occupier/
Copy 2 (Light Yellow)	Signed by the transporter and retained by the occupier/.
Copy 3 (Pink)	Retained by the operator of a facility.
Copy 4 (Orange)	Returned to the transporter by the operator of facility after accepting
Copy 5 (Green)	Forward to Pollution Control Board by the operator of facility after disposal.
Copy 6 (Blue)	Returned to the occupier by the operator of the facility after disposal.

(5) The Occupier shall provide the transporter with relevant information in Form 10, regarding the hazardous nature of the wastes and appropriate actions to be taken in case of an emergency".

7. Rule 8, of the said rules shall be substituted by the following rule namely:-

" 8. Disposal Sites :- (1) The occupier or their Association shall be responsible

for identifying sites for establishing hazardous wastes disposal facility;

(2) The State Government , occupier or any association shall identify sites for common hazardous wastes disposal facility in the state ;

(3) The State Government, occupier or any association shall after preliminary impact assessment studies identify possible sites for disposal facility. They shall then undertake an Environmental Impact Assessment of these sites for selecting an appropriate site for hazardous waste disposal facility ;

- (4) The occupier or association after identification as prescribed in sub-rule 3 shall inform the state Government for notification of the site ;
- (5) The State Government shall after identification or on receipt of information regarding identification by an occupier or association shall cause a public notice inviting objections and suggestions within 30 days ;
- (6) The state Government shall on receipt of any objection conduct a public hearing as per the procedure notified for Environmental Impact Assessment ;
- (7) The state Government shall then acquire or inform the concerned occupier or association to acquire the site before notifying the same. It shall also undertake to compile and publish periodically an inventory of such disposal sites in the state;”

8. After rule 8 the following rules shall be inserted :-

- “ 8A. Design and setting up of disposal facility :- (1) The occupier, association or operator as the case may be shall design and set up disposal facility as per norms to be prescribed;
- (2) The occupier, association or operator shall before setting up a disposal facility get approved from the State Government/State Pollution Control Board, the design and the layout of the facility;
- (3) The State Pollution Control Board shall supervise the setting and operation of a facility from time to time.

- 8B. Operation and closure of landfill site :- (1) The occupier or the operator as the case may be shall be responsible for safe and environmentally sound operation of the facility as per design norms approved by the State Government;
- (2) The occupier or the operator shall ensure that the closure of the landfill is as per the design approved by the State Government.”

9. Rule-11 alongwith sub-rule (1) to (7) of the said rules shall be substituted by the following :

- “11 - Policy on Import and Export of Hazardous Wastes :- (1) Import and/or export of hazardous wastes for dumping and disposal from the country to any country or from any country to India shall not be permitted;
- 0Import and/or export of hazardous wastes shall only be permitted as essential raw material for reprocessing or reuse, if not available in the country;
- (1) The Ministry of Environment & Forests shall be the nodal Ministry to deal with transboundary movement of hazardous waste and other concerned authorities for regulation of export and import is as detailed in Schedule;
- (2) The decision of the Central Government shall be final.

(3) Any occupier importing or exporting hazardous waste shall provide detailed information in Form 7 to the Customs authorities.

(4) Any occupier exporting or importing hazardous waste from or to the country shall abide by the commitments of the Central Government under the Basel Convention to which it is a signatory.”

5. After Rule-11, the following rules shall be inserted namely :-

“(12) Import of Hazardous Waste :- (1) Every occupier importing hazardous

waste shall apply to the concerned State pollution Control Board, 60 days in advance in Form-6A for permission to import;

6The concerned State Pollution Control Board shall examine the application received from the occupier and grant permission with stipulations for safe transport, storage and processing within 30 days;

7Permission granted to the occupier for import of hazardous waste shall be valid for one calendar year from the date of issue;

(4) The State Pollution Control Boards shall inform the Ministry of Environment & Forests , the Central Pollution Control Board, and the concerned Port and Customs authorities about the grant of permission;

(5) An application for license to the DGFT to import shall be accompanied with the permission granted for imports as per rule 12 and the authorization granted as per rule 5 and with a copy of the permission granted to the exporter as per Rule 13;

(6) The Port and Custom authorities shall ensure that the shipping document is accompanied with a copy of the permission granted to the exporter and an authenticated copy of the test report of analysis of the hazardous waste shipped;

(7) The occupier having valid permission to import shall inform the concerned State and Central Pollution Control Board and the Port authorities of the arrival of the consignment 10 days in advance;

(8) The occupier importing hazardous waste shall maintain the records of hazardous waste imports as specified in Form 7 and the record so maintained shall be available for inspection;

(13). Export of Hazardous Waste :- (1) The exporting country or the exporter as the case may be of hazardous waste shall apply 90 days in advance in Form 6A to the Ministry of Environment & Forests, Government of India seeking permission for the proposed export and transboundary movement;

(2) The Ministry of Environment and Forests on receipt of the application from an exporter or an exporting country in Form 6A, under sub-rule(1) shall examine the case on merit and grant/refuse permission for export to the country;

(3) The Ministry of Environment and Forests shall inform the exporter and the exporting country of the decision taken and endorse a copy of the same to the Central Pollution Control Board and the concerned State Pollution Control Board;

(4) The exporter shall ensure that no consignment is shipped prior to the requisite permission being granted. The exporter shall also ensure that the shipping document is accompanied with a copy of the permission and an authenticated copy of the test report of analysis of the hazardous waste;

(5) The occupier exporting hazardous waste to any other country shall seek permission from the competent authority in that country prior to any shipment;

(6) Every occupier exporting hazardous waste shall inform the Central Government, Ministry of Environment & Forests of the permission sought for exporting, permission granted for export and details of the export in Form 6A.

(14). **Illegal Traffic :-** (1) The movement of hazardous wastes from/to the

country shall be considered illegal:

(i) if it is without prior permission of the Government;

or

() if the permission has been obtained through falsification,

misrepresentation or fraud; or

(iii) it does not conform to the shipping details provided in the document;

(2) In case of illegal movement, the hazardous wastes in question;

(i) shall be shipped back to the exporter in the exporting country; or

(ii) disposed of within 30 days from the date of off-loading;

(2) In case of illegal transboundary movement of hazardous wastes the occupier exporting hazardous waste from the country or the exporter exporting hazardous waste to the country and importer importing hazardous waste into the country shall ensure that the wastes in question is shipped/disposed of in an environmentally sound manner within 30 days from the date of off-loading;

(3) The exporting country shall bear the costs incurred for the disposal of such wastes."

4. Rule-12 of the said rules will now be renumbered as Rule-15 and will be substituted with the following rule namely;-

“15. Appeal - (1) An appeal shall lie, against any order of suspension or cancellation or refusal of an authorization by the State Pollution Control Board to the Secretary, Department of Environment or the concerned department of the State Government and to the Joint Secretary, Hazardous Substances Management Division, Ministry of environment & Forests in case of Central Pollution Control Board.

0 Every appeal shall be in writing and shall be accompanied by a copy of the order appealed against and shall be presented within thirty days of the order passed.”

12. In Form 3 of the said rules after item 7 data on environmental surveillance the following shall be inserted;-

“8 details of the hazardous wastes reused and recycled

Date	Total quantity of hazardous waste generated	Details of hazardous waste minimisation activity	Material received	Final quantity of waste generated	Net reduction in waste generation quantity & %
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Place :
Date :

Signature
Designation”

13. In Form 4 of the said rules after item 3 the following words shall be inserted;-

“Place

Signature

Date

Designation”

14. In Form 5 of the said rules after Item 7 “The sites” taken to prevent the recurrence of such an accident” the following shall be inserted;-

“Place

Signature

Date

Designation”

15. Form 6 of the said rules is being substituted by New Form 6.

16. Form 7 of the said rules is being substituted by New Form 7

17. Schedule-1 of the said rules is being substituted by a new schedule-1

18. Three new Schedules 2, 3, 4 are being inserted in the said rules.

SCHEDULE - 1

[See rule 3(i) i]
LIST OF PROCESSES GENERATING HAZARDOUS WASTES

S.No. 1.	Processes 2.	3.	Wastes 4.
1.	Petrochemical processes and pyrolytic operations	1.1	oven debris
		1.2	oil-water sludge mixture
		1.3	oil-containing bleaching earth
		1.4	acid tar
		1.5	sulphur-containing residue from sulphur removal
		1.6	oil-water mixture
		1.7	oil-containing sludge
		1.8	oil emulsion
		1.9	oil-containing acid
		1.10	tar residue made with coal tar
		1.11	sludge from waste water purification
		1.12	residual liquid and paste-like organic substances made with aromatic, aliphatic and naphenic hydrocarbons
		1.13	residue from alkali wash of fuels
2.	Natural gas production	2.1	mercury-containing sludge
		2.2	mercury-containing filter material
		2.3	sulphur-containing residues
3.	Production or use of zinc; production of zinc oxide	3.1	zinc ashes
		3.2	zinc slags
		3.3	jarosite
4.	Production or use of lead	4.1	lead ashes
		4.2	lead slags
		4.3	lead-containing filter material
5.	Production or use of cadmium	5.1	cadmium-containing filter material
6.	Production or use of arsenic	6.1	arsenic-containing filter material
7.	Production of cast iron	7.1	cupola oven dust
8.	Production of crude iron and steel with oxy-steel converters or electro-ovens	8.1	blast-furnace gas dust
		8.2	filter material
		8.3	fly ash
		8.4	other exhaust dust
9.	Production of aluminium (primary or secondary production)	9.1	filter material
		9.2	cathode residues
		9.3	oven debris

10.	Non-ferro metallurgical processes	10.1	heavy metal-containing oven debris
		10.2	arsenic chalk
11.	Hardening of steel	11.1	cyanide-, nitrate-, or nitrite-containing sludge
		11.2	hardening salt
12.	Production or use of asbestos or asbestos-containing materials	12.1	asbestos-containing residue
13.	Production of chlorine by means of the diaphragm-electolyses process	13.1	asbestos-containing residue
14.	Phenol production	14.1	phenol mixture
		14.2	phenol-water mixture
15.	Metalworking	15.1	selenium-containing metal waste
		15.2	beryllium-containing metal waste
		15.3	coolant made with oil products
		15.4	oil-water sludge mixture
16.	Metal surface treatment, such as stching, staining, polishing, galvanising, cleaning, degreasing and hot dip galvanising	16.1	acid, acid residue or acid mixture
		16.2	alkali, alkali residue or alkali mixture
		16.3	galvanic bath and (half-) concentrate made with sulphide, chromium (VI), cyanide, copper, zinc, cadmium, nickel or tin
		16.4	copper etching fluid
		16.5	halogen-free sludge from a bath which used organic solvents
		16.6	halogen-containing sludge from a bath with organic solvents
		16.7	phosphating sludge
		16.8	halogen-containing organic degreasing bath
		16.9	sludge from staining bath
17.	Treatment of galvanis and similar with baths and water purification in metal surface treatment	17.1	metal hydroxide sludge chromium, cadmium copper, zinc, nickel or silver
		17.2	heavy metal-containing eluate from ion exchangers
		17.3	heavy metal-containing half-concentrates from membrane systems
18.	Production of acids or ammonia	18.1	acid-containing residues
		18.2	ammonia-containing residues
19.	Production or use of solvents	19.1	contaminated halogen-free aromatic, aliphatic or naphthenic solvents
		19.2	contaminated halogen-free solvents made with phenols, ketones, ethers, acetates, alcohols, or glycols
		19.3	contaminated halogen-containing aromatic, aliphatic or naphthenic solvents
		19.4	contaminated halogen-containing solvents made with phenols
		19.5	contaminated solvents or mixtures of solvents made with organic nitrogen-containing aromatics, naphthenes or aliphatics

		19.6	contaminated solvents or mixtures of solvents made with organic sulphur compounds
		19.7	distillation residue
20.	Removal of coatings from ships, bridges and locks, electricity pylons and road markings by blasting	20.1	blasting material contaminated with coating residues
21.	Production or use of coatings paints, lacquers, varnishes and plastics, and of inks	21.1	residues of coatings or such as inks if not completely hardened
		21.2	sludge from waste water purification in production processes
22.	Production or use of glues, cements, adhesive and resins	22.1	glue, cement or adhesive residue (not made with vegetable or animal materials) if not completely dried out
		22.2	resin oil residue
23.	Production or use of latex	23.1	latex or latex emulsion residue if not completely polymerised or coagulated
24.	Production or use of paint removers	24.1	paint remover residue
25.	Printing and copying with liquid toner	25.1	printing ink residue
		25.2	silkscreen printing ink residue
		25.3	lacquer residue
		25.4	liquid toner residue
		25.5	residue of cleaning agents made with organic solvents
		25.6	etching fluid residue
		25.7	dispersive oil residue
		25.8	oxidising agent residue
26.	Production or use of photo-chemicals	26.1	developer residue
		26.2	fixer residue
		26.3	bleaching fixer residue
27.	Production or use of organic peroxides	27.1	organic peroxide residue
28.	Production or use of halogen-containing hydrocarbons or of aromatic, aliphatic or naphthenic hydrocarbons	28.1	residue of fluid or pasty organic materials made with halogen-containing hydrocarbons
		28.2	residue of fluid or pasty organic materials made with aromatic, aliphatic or naphthenic hydrocarbons
29.	Production or use of organic nitrogen compounds or organic	29.1	residue of fluid or pasty organic materials made with oxygen compounds organic nitrogen or oxygen compounds (other than vegetable or animal carbohydrates, proteins, fats and fatty acids)
30.	Production or use of materials made with silicones (excluding cements)	30.1	silicone oil residue
		30.2	silicone-containing residues
31.	Production of canvas and textiles	31.1	textile chemical residue
32.	Production or use of plastics or raw materials for them	32.1	halogen-free residue of additives for plastics (e.g. dyestuffs, stabilisers, or flame retardants)

	32.2	halogen-containing residue of additives for plastics
	32.3	halogen-free residue of plasticisers for plastics
	32.4	halogen-containing residue of plasticisers for plastics
	32.5	residue from the preparation of vinylchloride monomer
	32.6	residue from the preparation of acrylonitrile monomer
	32.7	residue of liquid or pastry rubber emulsion or rubber solution if not polymerised
	32.8	sludge from waste water purification from rubber production if not polymerised
	32.9	PVC-containing residues if not polymerised
33.	Production of cosmetics	33.1 residue of chemical raw materials and additives (other than vegetable and animal carbohydrates, proteins, fats and fatty acids)
34.	Production, of pharmaceuticals	34.1 residues from the production of medicines (other than vegetable and animal carbohydrates, proteins, fats and fatty acids)
35.	Production, formulation or	35.1 production or formulation use of pesticides residue
		35.2 sludge from waste water treatment
		35.3 hexa or hexa-containing residue made with hexa-chlorocyclohexane or hexachlorobenzene
		35.4 residues from the use of pesticides
36.	Production, formulation or use of wood preservatives	36.1 production for formulation residue
		36.2 sludge from the waste water purification
		36.3 residue from the use of wood preservatives
		36.4 wood alkali bath
37.	Cleaning, emptying and maintenance of tanks and separators of vessels vehicles and of mobile and stationary storage tanks, washing water	37.1 oil-containing cargo residue, washing water and sludge
		37.2 chemical-containing cargo residue and sludge
		37.3 oil-water sludge mixture and oil-containing air filters from oil, fat, sludge or petrol separation
38.	Cleaning of barrels which have held chemical substances	38.1 chemical-containing residue from barrel cleaning
		38.2 sludge from waste water purification
39.	Purification processes for air and water	39.1 sludge from waste water treatment from artificial fertilizer production
		39.2 sludge from the treatment of waste water containing hydrofluoric acid
		39.3 heavy metal-containing residue from used-ion exchange material in the water purification
		39.4 flue gas cleaning residue

40.	Purification processes for organic water	40.1	filters and filter material which have organic liquids on them, e.g. mineral oil, synthetic oil and organic chlorine compounds
41.	Waste treatment processes, e.g. incineration, distillation and separation and concentration techniques	41.1	slags from the incineration of exclusively chemical waste
		41.2	fly ash from incineration of waste, except exclusively communal sewage sludge
		41.3	flue gas cleaning residue
		41.4	residue from the burning of cables
		41.5	battery acid
		41.6	distillation residue from the work-up of contaminated halogen-free organic solvents
		41.7	distillation residue from the work-up of contaminated halogen-containing organic solvents
42.	The shredding of object made chiefly of metal, plastic or rubber	42.1	shredder waste
43.	Performance of maintenance and repair work on vehicles and	43.1	oil-water mixtures, oil-containing sludge and oil emulsion
		43.2	filters and filter material which have organic liquids on them, e.g. mineral oil, synthetic oil and organic chlorine compounds
44.	Every action relating to and every use of lubricating and system oil	44.1	spent oil
		44.2	other spent lubricating and system oil

SCHEDULE - 2

[See rule 3(i) (ii)]

LIST OF WASTE SUBSTANCES WITH CONCENTRATION LIMITS

Classes

Class A

Concentration limit: 50 mg/kg

A1	Antimony and antimony compounds
A2	Arsenic and arsenic compounds
A3	beryllium and cadmium compounds
A4	Cadmium and beryllium compounds
A5	Chromium (VI) compounds
A6	Mercury and mercury compounds
A7	Selenium and selenium compounds
A8	Tellurium and tellurium compounds
A9	Thallium and thallium compounds
A10	Inorganic cyanide compounds (cyanides)
A11	Metal carbonyls
A12	Naphtalene
A13	Anthracene
A14	Phenanthrene
A15	Chrysene, benzo(a) anthracene, fluoranthene, benzo(a) pyrene, benzo(K)fluoranthene, indeno(1, 2, 3-cd) pyrene and benzo(ghi)perylene
A16	Halogenated fused aromatic rings, e.g. polychlorobiphenyls plus derivatives
A17	Halogenated aromatic compounds
A18	Benzene
A19	Dieldrin, aldrin, and endrin
A20	Organotin compounds

Class B

Concentration limit: 5,000 mg/kg

B1	Chromium (III) compounds
B2	Cobalt compounds
B3	Copper compounds
B4	Lead and lead compounds
B5	Molybdenum compounds
B6	Nickel compounds
B7	Tin compounds
B8	Vanadium compounds
B9	Tungsten compounds
B10	Silver compounds
B11	Organic halogen compounds
B12	Organic phosphorus compounds
B13	Organic peroxides

B14	Organic nitro-and nitroso-compounds
B15	Organic azo-and azo-oxy compounds
B16	Nitriles
B17	Amines
B18	(Iso-and thio-) cyanates
B19	Phenol and phenolic compounds
B20	Merceptans
B21	Asbestos
B22	Drilling, cutting, grinding and rolling oil or emulsions thereof
B23	Halogen-silanes
B24	Hydrazine(s)
B25	Fluorine
B26	Chlorine
B27	Bromine
B28	White phosphorus
B29	Ferrosilicon and alloys
B30	Manganese-silicon
B31	Halogen-containing substances which produce acidic vapours on contact with damp air or water, e.g. silicon tetrachloride, aluminium chloride, titanium tetrachloride

Class C

Concentration limit: 20,000 mg/kg

C1	Ammonia and ammonium compounds
C2	Inorganic peroxides
C3	Barium compounds, except barium sulphate
C4	Fluorine compounds
C5	Phosphorus compounds, except the phosphates of aluminium, calcium and iron
C6	Bromates, (hypo)bromites
C7	Chlorates, (hypo)chlorites
C8	Aromatic compounds
C9	Organic silicon compounds
C10	Organic sulphur compounds
C11	Iodates
C12	Nitrates, nitrites
C13	Sulphides
C14	Zinc compounds
C15	Salts of per-acids
C16	Acid halides, acid amides
C17	Acid anhydrides

Class D

Concentration limit: 50,000 mg/kg

D1	Sulphur
D2	Inorganic acids
D3	Metal bisulphates
D4	Oxides and hydroxides except those of: hydrogen, carbon, silicon, iron, aluminium, titanium, manganese, magnesium, calcium

- D5 Aliphatic and naphthenic hydrocarbons
- D6 Organic oxygen compounds
- D7 Organic nitrogen compounds
- D8 Nitrides
- D9 Hydrides

Class E

No concentration limit

- E.1 Highly flammable substances
- E.2 Substances which generate dangerous quantities of highly flammable gases on contact with water or damp air.

Schedule - 3

[See Rule 3 (I) iii]

(Part - A)

LISTS OF WASTE TO BE REGULATED FOR IMPORTS AND EXPORTS

LIST - A					
Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
A1		Waste having as constituents or contaminants, excluding metal wastes in massive form			
A1		Beryllium; beryllium compounds (see B2)	Y 20		
A1		Selenium; selenium compounds (see B2)	Y 25		
A1		Cadmium; cadmium compounds (see B2)	Y 26		
A1		Antimony; antimony compounds (see B2)	Y 27		
A1		Tellurium; tellurium compounds (see B2)	Y 28		
A1	AA030	Lead; Lead compounds (see B2)	Y 31		262020
A1	AA030	Lead ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake, but excluding such wastes specified on list B	Y 31		262020
		End of A1			
A2		Waste having as constituents or contaminants			
A2	AA090	Arsenic; arsenic compounds (see A3)	Y 24		ex 280480
A2	AA080	Thallium; thallium compounds (see A3)	Y 30		ex 811291
A2	AA100	Mercury; mercury compounds (see A3)	Y 29		ex 280540
A2	AA100	Mercury ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake, but excluding such wastes specified on list B	Y 29		ex 280540
		End of A2			
A3		Metal waste and waste consisting of alloys of the following metals, but excluding such wastes specified on List B			
A3		Mercury (see A2)	Y 29		ex 280540
A3		Beryllium (see B2)	Y 20		
A3	AA090	Arsenic (see A2)	Y 24		ex 280480
A3		Selenium (see B2)	Y 25		ex 280490
A3		Cadmium (see B2)	Y 26		ex 810710
A3		Antimony (see B2)	Y 27		ex 811000
A3		Tellurium (see B2)	Y 28		ex 280450
A3	AA080	Thallium (see A2)	Y 30		ex 811291
		End of A3			
A4		Wastes having as constituents			
A4		Metal carbonyls	Y 19		
A4		Hexavalent chromium compounds	Y 21		
		End of A4			
A5	AA120	Galvanic sludges	Y 17	II6.1,II12	

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
A6	AA130	Liquors from the pickling of metals	Y17		
A7	AA140	Leaching residues from zinc processing, dusts and sludges such as jarosite, hematite, goethite, etc.	Y23		
A8	AA160	Precious metal ash, sludge, dust and other residues such as			
A8	AA161	Precious metal ash from incineration of printed circuit boards, but excluding such wastes specified on List B (see B29)			
	AA161	Photographic film ash (see B30)			
		End of A8			
A9	AA170	Lead-acid batteries, whole or crushed	Y31		
A10		Unsorted waste batteries excluding mixtures of only List B batteries. Waste batteries not specified on List B containing Schedule 1 and 2 wastes to an extent to render them hazardous (see B15)	Y31		
	AA180	Used batteries or accumulators, whole or crushed, other than lead-acid batteries, and waste and scrap arising from the production of batteries and accumulators, not elsewhere specified or included (see B15)			
	AA010	Dross, scalings, and other wastes from the manufacture of iron and steel			ex 261900
C2	AA020	Zinc ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake, but excluding such wastes specified on List B (see B1, B3, and C2: detailed guidance is also available)	Y23		ex 262019
C1	AA040	Copper ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake, but excluding such wastes specified on List B (see B1, B3, and C1: detailed guidance is also available)	Y22		ex 262030
	AA050	Aluminium ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake, but excluding such wastes specified on List B (see B1, B5 and GA140)			ex 262040
	AA060	Vanadium ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake, but excluding such wastes specified on List B (see B1)			ex 262050
	AA070	Ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake containing metals or metal compounds not elsewhere specified or included			262090
	AA110	Residues from alumina production not elsewhere specified or included (see B37, AB090, AB100)			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
	A1150	Unrefined calcium sulphite and calcium sulphate from flue gas desulphurisation (FGD)			
A18	AC010	Waste from the production or processing of petroleum coke and bitumen	Y11		271390
A19	AC030	Waste mineral oils unfit for their originally intended use	Y8		
A20	AC040 RC030	Wastes that contain, consist of or are contaminated with leaded anti-knock compound sludges or leaded petrol (gasoline) sludges	Y31		
A21	AC050	Thermal (heat transfer) fluids			
A22	AC090	Wastes from production, formulation and use of resins, latex, plasticisers, glues/adhesives, but excluding such wastes specified on List B			
A23	AC100	Nitrocellulose	Y15		392590
A24	AC110	Phenol, phenol compounds including chlorophenol in the form of liquids or sludges	Y39		
A25	AC120 RA010	Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyls (PCB) and/or polychlorinated terphenyls (PCT) and/or polychlorinated naphthalenes (PCN) and/or polybrominated biphenyls (PBB), including any other polybrominated analogues of these compounds, at a concentration level of 50mg/kg or more.	Y10, Y45		411000
A26	AC130	Ethers not including those specified on List B			
A27	AC180	Leather dust, ash, sludges and flours when containing hexavalent chromium compounds or biocides	Y21, Y4		411000
A28	AC190	Fluff: light fraction from shredding			
A29	AC200	Organic phosphorous compounds	Y37		
A30	AC210	Non-halogenated organic solvents but excluding such wastes specified on List B or List C	Y41		
A31	AC220	Halogenated organic solvents	Y42		
A32	AC230	Halogenated or unhalogenated non-aqueous distillation residues arising from organic solvent recovery operations	Y18		
A33	AC240	Wastes arising from the production of aliphatic halogenated hydrocarbons (such as chloromethanes, dichloroethane, vinyl chloride, allyl chloride and epichlorhydrin)	Y45		
	AC020	Asphalt cement wastes			
	AC060	Hydraulic fluids			
010	AC070	Waste brake fluids			
	AC080	Antifreeze fluids			
	AC140	Triethylamine catalysts for setting foundry sands			
	AC170	Treated cork and wood wastes			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
	AA150	Precious metal-bearing residues in solid form which contain traces of inorganic cyanides			
	AA190	Magnesium waste and scrap that is flammable, pyrophoric or emits, upon contact with water, flammable gases in dangerous quantities (see B1)			810420
A11		Coal fired power-plant fly ash containing Schedule 2 substances in concentrations sufficient to exhibit Part-B characteristics (see B32 and GA040)			
A12		Electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on List A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Schedule 2 constituents (e.g.cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Part-B (see B8)			
A13	AB040	Glass waste from cathode-ray tubes and other activated glass	Y31		700100
A14	AD110	Waste acidic or basic solutions, but excluding such wastes specified on List B	Y34, Y35		
A15	AB060	Inorganic fluorine compounds in the form of liquids or sludges but excluding such wastes specified on List B or List C			
A16	AB080	Waste catalysts but excluding such wastes specified on List B or List C	Y31		
A17	AB140	Gypsum arising from chemical industry processes, when containing Schedule-2 constituents to the extent that it exhibits a Part-B hazardous characteristic			
	AB010	Ash, residue, slag, dross, skimming, scaling, dust, powder, sludge and cake, not elsewhere specified or included (seeB3)			262100
	AB020	Residues arising from the combustion of municipal/household wastes			
	AB030	Wastes from non-cyanide based systems which arise from surface treatment of metals			
	AB050	Calcium fluoride sludge			252921
	AB070	Sands used in foundry operations			
	AB090	Waste hydrates of alumina (see AA110)			
	AB100	Waste alumina (see AA110)			
	AB120	Inorganic halide compounds, not elsewhere specified or included			
	AB130	Used blasting grit			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
C12	AC250	Surface active agents (surfactants)			
	AC260	Liquid pig manure; faeces			
	AC270	Sewage sludge			
A34		Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects.			
A35	AD010	Wastes from the production, preparation, and use of pharmaceutical products but excluding such wastes specified on List B or List C	Y2		
A36	AD020	Wastes from the production, formulation, and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, out-dated, or unfit for their originally-intended use.	Y4		
A37		Waste consisting of or containing off-specification and outdated chemicals corresponding to Schedule 1 & 2 categories and exhibiting Part-B hazard characteristics			
A38	AD030	Wastes from the manufacture, formulation, and use of wood preserving chemicals	Y5, Y22, Y24		
A39	AD040	Wastes that contain, consist of, or are contaminated with inorganic cyanides, excepting precious metal-bearing residues in solid form containing traces of inorganic cyanides	Y33, Y7, Y38		
A39	AD050	Wastes that contain, consist of, or are contaminated with organic cyanides	Y38		
A40	AD060	Waste oils/water, hydrocarbons/water mixtures, emulsions	Y9		
A41	AD070	Wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish, excluding any such waste specified on List B or List C			
A42	AD080	Wastes of an explosive nature but excluding such wastes specified on List B or List C	Y15		
A43	AD140	Wastes from industrial pollution control devices for cleaning of industrial off-gases but excluding such wastes specified on List B or List C	Y18		
A44	AD170	Spent activated carbon not included on List B			2803
A45		Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on human health and/or the environment are not known			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
A46		Waste packages and containers containing Schedule 1 & 2 substances in concentrations sufficient to exhibit Part-B hazard characteristics			
	AD090	Wastes from production, formulation, and use of reprographic and photographic chemicals and materials not elsewhere specified or included	Y16		
	AD100	Wastes from non-cyanide based systems which arise from surface treatment of plastics			
	AD120	Ion exchange resins			
	AD130	Single use cameras with batteries (see B50)			
	AD150	Naturally occurring organic material used as a filter medium (such as biofilters)			
	AD160	Municipal/household wastes	Y46, Y47		
	AD170	Spent activated carbon having hazardous characteristics and resulting from its use in the inorganic chemical, organic chemical, and pharmaceutical industries, waste water treatment, gas/air cleaning processes and similar applications	Y2, Y18		2803
A47	RA020	Waste tarry residues (excluding asphalt cements) arising from refining, distillation and any pyrolytic treatment of organic materials	Y11		
A48		Parings and other waste of leather or of composition leather, not suitable for the manufacture of leather articles, containing hexavalent chromium compounds or biocides	Y21, Y4		
A49	RB010	Asbestos (dusts and fibres)	Y36		
A50		Wastes that contain, consist of or are contaminated with any of the following:			
A50	RC010	any congener of polychlorinated dibenzofuran	Y43		
A50	RC020	any congener of polychlorinated dibenzodioxin	Y44		
		End of A50			
A52	RC040	Wastes that contain, consist of, or are contaminated with peroxides			

LIST - B

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B1		Metal and metal-alloy wastes in metallic, non-dispersible form :			
B1	GA010	Precious metals : gold			ex 711210
B1	GA020	Precious metals : the platinum group			ex 711220
B1	GA030	Precious metals : other including silver but excluding mercury			ex 711290
B1	GA040	Waste and scrap of cast iron			720410
B1	GA050	Waste and scrap of stainless steel			720421
B1	GA060	Waste and scrap of other alloy steels			720429
B1	GA070	Waste and scrap of tinned iron or steel			740430
B1	GA080	Turnings, shavings, chips, milling waste, filings, trimmings and stampings of iron or steel, whether or not in bundles			720441
B1	GA090	Other ferrous waste and scrap			720449
B1	GA100	Remelting scrap ingots			720450
B1	GA110	Used iron and steel rails			730210
B1	GA120	Copper scrap			740400
B1	GA130	Nickel scrap			750300
B1	GA140	Aluminium waste and scrap (AA050)			760200
B1	GA160	Zinc waste and scrap (see AA020, B3 and C2)			790200
B1	GA170	Tin scrap			800200
B1	GA180	Tungsten scrap			ex 810191
B1	GA190	Molybdenum scrap			ex 810291
B1	GA200	Tantalum scrap			ex 810310
B1	GA210	Magnesium scrap excluding wastes in AA190			810420
B1	GA220	Cobalt scrap			ex 810510
B1	GA230	Bismuth scrap			ex 810600
B1	GA250	Titanium scrap			ex 810810
B1	GA260	Zirconium scrap			ex 810910
B1	GA280	Manganese scrap			ex 811100
B1	GA300	Chromium waste and scrap			ex 811220
B1	GA310	Germanium scrap			ex 811230
B1	GA320	Vanadium scrap (see AA060)			ex 811240
B1	GA330	Scrap of Hafnium			
B1	GA340	Scrap of Indium			
B1	GA350	Scrap of Niobium			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B1	GA360	Scrap of Rhenium			
B1	GA370	Scrap of Gallium			
B1		Thorium scrap			
B1	GA420	Rare earths scrap			ex 280530
		End of B1			
B2		Clean, uncontaminated metal scrap, including alloys, in bulk finished form (sheet, plate, beams, rods, etc), of :			
B2	GA290	Beryllium scrap			ex 811211
B2	GA400	Selenium scrap			ex 280490
B2	GA240	Cadmium scrap			
B2	GA270	Antimony scrap			
B2	GA410	Tellurium scrap			
B2	GA150	Lead scrap (but excluding lead-acid batteries)			
		End of B2			
B3		Metal-bearing wastes arising from melting, smelting, and refining of metals, including specified zinc containing drosses :			
B3	GB010	Hard zinc spelter			262011
B3	GB021	Galvanising slab zinc top dross (>90% Zn)			
B3	GB022	Galvanising slab zinc bottom dross (>92% Zn)			
B3	G023	Zinc die casting dross (>85% Zn)			
B3	GB024	Hop dip galvanisers slab zinc dross (batch) (>92% Zn)			
B3	GB025	Zinc skimmings			
B3	GB040	Slags from precious metals processing for further refining			262090
B3	GB050	Tantalum-bearing tin slags with less than 0.5% tin			
		End of B3			
B4		[Selenium and] tellurium in metallic elemental form including powder			
B5	AA050	Aluminium skimmings (or skins) excluding salt slag (see AA050 on list A)			
B6		Slags from copper processing for further processing or refining not containing arsenic, lead, or cadmium to an extent that they exhibit Part-B hazard characteristics			
B7		Other waste containing metal :			
B7		Electronic assemblies consisting only of metals or alloys			
B7		Precious metals and alloy wastes (gold, silver, the platinum group, but not mercury) in a dispersible, non-liquid form with appropriate packaging and labelling			
		End of B7			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B8	GC020	Electrical and electronic assemblies or scrap (including printed circuit boards) not containing components such as accumulators and other batteries included on List A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCH-capacitors, or not contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they do not possess any of the characteristics contained in Part-B (see A12)			
B9	GC010	Electrical and electronic assemblies (including printed circuit board, electronic components and wires) valid for direct re-use, and not for recycling or final disposal			
B10		Scrap assemblies from electrical power generation not contaminated with lubricating oil or PCB or PCT to an extent that they possess Part-B characteristics			
	GC030	Vessels and other floating structures for breaking up, properly emptied of any cargo and other materials arising from the operation of the vessel which may have been classified as a dangerous substance or waste			
	GC040	Motor Vehicle wrecks, drained of liquids			890800
	GC050	Spent Fluid Catalytic Cracking (FCC) Catalysts (e.g. aluminium oxide, zeolites)			
B11		Cleaned spent precious metal-bearing catalysts			
B12		Spent catalysts excluding liquids used as catalysts, containing any of:			
B12	GC060	Transition metals:			
B12	GC060	Scandium, Titanium			
B12	GC060	Vanadium, Chromium			
B12	GC060	Manganese, Iron			
B12	GC060	Cobalt, Nickel			
B12	GC060	Copper, Zinc			
B12	GC060	Yttrium, Zirconium			
B12	GC060	Niobium, Molybdenum			
B12	GC060	Hafnium, Tantalum			
B12	GC060	Tungsten, Rhenium			
B12	GC060	Lanthanides (rare earth metals)			
B12	GC060	Lanthanum, Cerium			
B12	GC060	Praesodinium, Neody			
B12	GC060	Samarium, Europium			
B12	GC060	Gadolinium, Terbium			
B12	GC060	Dysprosium, Holmium			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B12	GC060	Erbium, Thulium			
B12	GC060	Ytterbium, Lutetium			
		End of B12			
B13	GC070	Granulated slag arising from the manufacture of iron and steel but excluding those slags which have been specifically produced to meet both national and relevant international requirements and standards			ex 261900
B15		Waste batteries conforming to a specification, excluding those made with lead, cadmium, or mercury (see A10 and AA 180)			
B16	GC080	Mill scaling arising from the manufacture of iron and steel			ex 261900
B17		Copper mill-scale (copper oxide)			
B18		Refractory metals-containing residues			
B19		Precious metal-bearing residues in solid form which contain traces of inorganic cyanides			
		Wastes from mining operations in non dispersible form			
B20	GD010	Natural graphite waste			250490
B20	GD020	Slate waste, whether or not roughly trimmed or merely cut, by sawing or otherwise			251490
B20	GD030	Mica waste			252530
B20	GD040	Leucite, nepheline and nepheline syenite waste			252930
B20	GD050	Feldspar waste			252910
B20	GD060	Fluorspar waste			252921 252922
B20	GD070	Silica wastes in solid form excluding those used in foundry operations			281122
B21		Wastes consisting mainly of water-based/latex paints and hardened varnishes, not containing organic solvents, heavy metals or biocides to an extent to render them hazardous			
B22		Waste food dyes			
B23		Waste acidic or basic solutions with a pH greater than 2 and less than 11.5, which are not corrosive or otherwise hazardous			
B24		Polymer ethers and non-hazardous monomer ethers incapable of forming peroxides			
B25		Glass waste in non-dispersible form			
B25	GE010	Cullet and other waste and scrap of glass except for glass from cathode-ray tubes and other activated glasses			700100
	GE020	Glass fibre wastes			
B26	GF010	Ceramic wastes in non-dispersible form			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B26	GF020	Cermet wastes and scrap (metal ceramic composites)			811300
B27		Calcium fluoride sludge			
B28		Gypsum arising from chemical industry processes not including on List A			
B20		Precious metal ash from the incineration of printed circuit boards (see A8)			
B30		Precious metal ash from the incineration of photographic film (see A8)			
		Other wastes containing principally inorganic constituents			
B31	GG010	Partially refined calcium sulphate produced from flue gas desulphurisation (FGD)			
B31	GG020	Waste gypsum wallboard or plasterboard arising from the demolition of buildings			
	GG030	Bottom ash and slag tap from coal fired power plants			2621
B31	GG080	Slag from copper production, chemically stabilised, having a high iron content (above 20%) and processed according to industrial specifications (e.g DIN 4301 and DIN 8201) mainly for construction and abrasive applications			262100
B31	GG090	Sulphur in solid form			
B31	GG100	Limestone from the production of calcium cyanamide (having a pH of less than 9)			
B31	GG120	Sodium, potassium, calcium chlorides			
B31	GG130	Carborundum (silicon carbide)			
B31	GG140	Broken concrete			
B31	GG150	Lithium-tantalum and lithium-niobium containing glass scraps			262090
		End of B31			
B32		Coal fired power plant fly ash not included on List A			
B33		Waste anode butts from steel and aluminium production, made of petroleum coke or bitumen and cleaned to normal industry specifications (excluding anode butts from chlor alkali electrolyses and from metallurgical industry) (see C6 and GG050)			
	GG050	Anode butts of petroleum coke and/or bitumen (see B33 and C6)			
B34	GG060	Spent activated carbon resulting from the treatment of potable water and processes of the food industry and vitamin production			2803

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B35		Wastes from production, formulation, and use of resins, latex, plasticisers, glues/adhesives, not listed on List A, e.g latex and glues on basis of casein, starch, dextrin, cellulose ethers, polyvinyl alcohols, and free from solvents to an extent that they lack Part-B characteristics			
B36	GG110	Bauxite residue ("red mud") (pH moderated to less than 11.5)			
B37		Waste hydrates of aluminium and waste alumina and residues from alumina production, excluding such wastes arising from gas cleaning, flocculation or filtration processes			
		Solid plastic waste :			
		The following plastic or mixed plastic materials, provided they are not mixed with other wastes and are prepared to a specification :			
		scrap plastic of			
B38	GH014	polypropylene			391590
B38	GH014	polyethelene terephthalate			391590
B38		polyacetals			
B38	GH014	polyamides			391590
B38	GH014	polybutylene terephthalate			391590
B38		polycarbonates			
B38		polyethers			
B38	GH014	polyphenylene sulphides			391590
B38	GH014	acrylic polymers			391590
B38	GH014	polyurethane (not containing chlorofluorocarbons)			391590
B38	GH014	polysiloxanes			391590
B38	GH014	polymethyl methacrylate			391590
B38	GH014	polyvinyl alcohol			391590
B38	GH014	polyvinyl butryl			391590
B38	GH014	polyvinyl acetate			391590
		All ether polymers and co-polymers of :			
B38	GH011	ethylene			391590
B38	GH012	styrene			391520
B38	GH014	acrylonitrile			391590
B38	GH014	butadiene			391590
B38		alkanes C10 - C13 (plasticiser)			
		Cured waste resins or condensation products			
B38	GH014	urea formaldehyde resins			391590
B38	GH014	phenol formaldehyde resins			391590
B38	GH014	melamine formaldehyde resins			391590
B38	GH014	epoxy resins			391590

Harmonized No.	OECD No.	Description of material	Annex I	Annex III	Custom code
B38	GI1014	alkyd resins			39159
B38	GI1014	polyamides			39159
	GI1013	Waste, parings, and scrap of plastics of polymers of vinyl chloride			39151
	GI1014	Waste, parings, and scrap of plastics of polymers or co-polymers of styrene copolymer and polymers of fluorinated ethylene (Teflon, PTFE)			39159
		The following wastes of paper, paperboard and paper products, provided they are not mixed with other wastes and are prepared to a specification :			
B39	GI012	Waste and scrap of paper or paperboard of unbleached paper or paperboard or of corrugated paper or paperboard, made mainly of bleached chemical pulp, not coloured in the mass			47072
B39	GI013	Waste and scrap of paper or paperboard made mainly of mechanical pulp (for example, newspapers, journals, and similar printed matter)			47073
B39	GI014	Other wastes of paper, paperboard and paper products, including but not limited to, laminated paperboard and unsorted scrap			47079
		The following textile wastes, provided they are not mixed with other wastes and are prepared to specification :			
B40	GJ010	Silk waste (including cocoons unsuitable for reeling, yarn waste and garnetted stock)			500
B40	GJ011	Silk waste, not carded or combed			50031
B40	GJ012	Other silk waste			50039
B40	GJ020	Waste of wool or fine or coarse animal hair, including yarn waste but excluding garnetted stock			510
B40	GJ021	Noils of wool or of fine animal hair			51031
B40	GJ022	Other waste of wool or fine animal hair			51032
B40	GJ023	Waste of coarse animal hair			51033
B40	GJ030	Cotton waste (including yarn waste and garnetted stock)			520
B40	GJ031	Yarn waste (including thread waste)			52021
B40	GJ032	Garnetted stock			52029
B40	GJ033	Other cotton waste			52029
B40	GJ040	Flax tow and waste			53013
B40	GJ050	Tow and waste (including yarn waste and garnetted stock) of true hemp (<i>Cannabis sativa</i> L.)			53029

Base No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B40	GJ060	Tow and waste (including yarn waste and garnetted stock) of jute and other textile bast fibres (excluding flax, true hemp, and ramie)			530390
B40	GJ070	Tow and waste (including yarn waste and garnetted stock) of sisal and other textile fibres of the genus <i>Agave</i>			530490
B40	GJ080	Tow, noils, and waste (including yarn waste and garnetted stock) of coconut			530519
B40	GJ090	Tow, noils and waste (including yarn waste and garnetted stock) of abaca (Manila hemp or <i>Musa textilis</i> Nee)			530529
B40	GJ100	Tow, noils, and waste (including yarn waste and garnetted stock) of ramie and other vegetable textile fibres, not elsewhere specified or included			530599
B40	GJ110	Waste (including noils, yarn waste and garnetted stock) of man-made fibres			5505
B40	GJ111	Waste of synthetic fibres			550510
B40	GJ112	Waste of artificial fibres			550520
B40	GJ120	Worn clothing and other worn textile articles			630900
B40	GJ130 GJ131 GJ132	Used rags, scrap twine, cordage, rope and cables, and worn out articles of twine, cordage, rope or cables of textile materials, sorted or other			631010 631090
		The following rubber wastes, provided they are not mixed with other wastes			
B41	GK010	Waste parings and scrap of rubber			400400
B41	GK030	Waste and scrap of hard rubber (e.g ebonite)			401700
B41		Other rubber wastes (excluding such wastes specified on List C)			
B42	GK020	Waste pneumatic tyres, excluding those destined for disposal			401220
B43	GL010	Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets, or similar forms			440130
		Waste arising from agro-food industries provided it is not infectious			
B44	GM070	Wine Lees			ex 2307
B44	GM080	Dried and sterilised vegetable waste, residues and byproducts, whether or not in the form of pellets, of a kind used in animal feeding, not elsewhere specified or included			ex 2308
B44	GM090	Degras; residues resulting from the treatment of fatty substances or animal or vegetable waxes			152200
B44	GM100	Waste of bones and horn-cores, unworked, defatted, simply prepared (but not cut to shape), treated with acid or degelatinised			50690
B44	GM110	Fish waste			ex 051191

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
C5		Waste anode butts from chlor alkali electrolysis and from metallurgical industry			
C6		Beryllia ceramic components			
C7		Asbestos (forms other than dust and fibre) (Y 36)			
C8		Ceramic-based fibres of physico-chemicals characteristics similar to those of asbestos			
C9		Waste brake fluids			
C10		Silver halides			
C11		Surface active agents (surfactants)			

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
B44	GM120	Cocoa shells, husks, skins and other cocoa waste			180200
B44	GM130	Wastes from the agro-food industry excluding byproducts which meet national and international requirements and standards for human or animal consumption			
B52	GN010	Waste of pigs, hogs, or boards bristles and hair, or of badger hair and other brushmaking hair			
B52	GN020	Horsehair waste, whether or not put up as a layer with or without supporting material			ex 050300
B52	GN030	Waste of skins and other parts of birds, with their feathers or down, of feathers and parts of feathers (whether or not with trimmed edges) and down, not further worked than cleaned, disinfected or treated for preservation)			ex 050590
B45	GN040	Parings and other waste of leather or of composition leather not suitable for the manufacture of leather articles, excluding leather sludges, not containing hexavalent chromium compounds and biocides (note the related entry on List A)			ex 411000
B46		Leather dust, ash, sludges or flours not containing hexavalent chromium compounds or biocides (note the related entry on List A)			
B47	GO010	Waste of human hair			ex 050100
B47	GO020	Waste straw			
B47	GO030	Deactivated fungus mycelium from penicillin production to be used as animal feed			
B48		Photographic film containing silver halides and metallic silver			
B49	GC040	Photographic paper containing silver halides and metallic silver			
B50	GC050	Single use cameras, without batteries or with batteries that are not included on List A (see AD 130)			
B51	AC150	Chlorofluorocarbons	Y 45		
B51	AC160	Halons	Y 45		

LIST - C

Basel No.	OECD No.	Description of material	Annex I	Annex III	Customs code
		Wastes of undetermined status			
C1		Copper compounds			
C2		Zinc compounds			
C3		Residues arising from industrial waste disposal operations			
C4		Plastic-covered scrap electrical cables			

Schedule - 3

(Part - B)

LIST OF HAZARDOUS CHARACTERISTICS

- H1 Explosive
An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such speed as to cause damage to the surroundings.
- H3 Flammable liquids
The word "flammable" has the same meaning as "inflammable". Flammable liquids are liquids, or mixture of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc., but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 60.5 degrees centigrade, closed-cup test, or not more than 65.6 degrees centigrade, open-cup test. (Since the results of open-cup tests and of closed-cup tests are not strictly comparable and even individual results by the same test are often variable, regulations varying from the above figures to make allowance for such differences would be within the spirit of this definition).
- H4.1 Flammable solids
Solids, or waste solids, other than those classed as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction; self-reactive and related substances which are liable to undergo a strongly exothermic reaction.
- H4.2 Substances or wastes liable to spontaneous combustion
Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire.
- H4.3 Substances or wastes, in contact with water emit flammable gases.
Substances or wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
- H5.1 Oxidizing
Substances or wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen causes, or contribute to, the combustion of other materials.
- H5.2 Organic Peroxides
Organic substances or wastes which contain the bivalent-O-O-structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition.

- H6.1 **Poisonous (Acute)**
Substances or wastes liable either to cause death or serious injury or to harm health if swallowed or inhaled or by skin contact.
- H6.2 **Infectious substances**
Substances or wastes containing viable micro organisms or their toxins which are known or suspected to cause disease in animals or humans.
- H8 **Corrosives**
Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissues, or, in the case of leakage, will materially damage or even destroy, other goods or the means of transport; they may also cause other hazards.
- H10 **Liberation of toxic gases in contact with air or water**
Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
- H11 **Toxic (delayed or chronic)**
Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity.
- H12 **Ecotoxic**
Substances or wastes which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems.
- H13 **Capable, by any means, after disposal, of yielding another material, eg., leachate which possesses any of the characteristics listed above.**

FORM 6 A

[See Rule 12(1) and 13(2)]

Application for importing hazardous/reclamable wastes as raw materials

From :
.....
.....

To : WHEN MAILED BY EXPORTER WHEN MAILED BY IMPORTER

The Secretary
Ministry of Environment & Forests
Paryavaran Bhavan, CGO Complex
Lodi Road,
New Delhi - 110 003.

The Member Secretary,
Central Pollution Control Board
Parivesh Bhavan
East Arjun Nagar
Delhi - 110 032.

Sir,

I/we apply for no objection of authorisation under sub-rule (1) of rule 12 (for importer)/ rule 13 (for exporter) of the Hazardous Wastes (Management & Handling) Rules, 1989 amended in 1997 for importing hazardous/reclamable wastes to use as raw materials.

FOR OFFICE USE ONLY

1. Code No. :
2. Whether the unit is situated in a critically polluted area as identified by the Ministry of Environment and Forests :

TO BE FILLED IN BY APPLICANT

PART 1 : (To be filled by Exporter)

1. Name and Address of the Exporter
2. Details of material (hazardous wastes in the form of raw material) to be exported.

S.No.	Particulars	Six digit Code No.*	Purity expected	Quantity	Whether any special handling requirement?

2. The material permitted shall be fully insured for transit as well as for any accidental occurrence and its cleanup operation.

3. The exported material shall be taken back, if it creates a genuine Environmental hazard or shall take all such measures to treat and dispose in an environmentally benign manner upto the satisfaction of concerned SPCB. All such costs involved in such operation shall be borne by Exporter and/or Importer.

PART 2 : (To be filled in by Importer)

1. Name and Address :
2. Whether Authorisation is obtained in Form 2 : Yes / No
on application made in Form 1
3. Details of material to be imported

S.No.	Particulars	Six digit Code No.*	Purity expected	Quantity	Whether any special handling requirement?

* (Here enter as reference nomenclature, the equivalent six digit code no. from European Waste Catalogue EWC, issued pursuant to the Article 1(a) of Council Directive 75/442/EEC on waste or its equivalent as the case may be)

4. Whether you have received such imported hazardous wastes in the form of raw materials in the past and if yes give details

S.No.	Name of Material	Country of Export	Year	Quantity in Tones

5. Whether the importer has :

(a) Adequate facility to handle to imported hazardous waste in the form of his raw material Yes / No

(b) Adequate facility to handle the hazardous wastes generated by the use of such imported hazardous wastes in the form of his raw material Yes / No

(c) Requisite laboratory testing facility Yes / No

6. Break-up of the imported material

- (a) The total quantity applied for T
- (b) Out of (a) above, how much quantity after initial in-situ purification, will be available as raw material T
- (c) Out of (b) above, how much quantity will be converted to be the useful product or co-product T

7. Means of Transport (Road, Rail, inland waterway, sea, air) including country of export, transit and import, also point of entry and exit where these have been designated.

8. Information on special handling requirements including emergency provision in case of accident.

(Attach separate sheet)

9. Undertaking :

I hereby solemnly undertake that

- 1. the full consignment shall be cleared in one lot by arranging authorised transporter under my supervision with due prior intimation to the Board, District Collector and Police station and the imported material shall be admitted in an enclosure especially provided in the premises.
- 2. The material permitted shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation.
- 3. The record of consumption and fate of the imported material shall be monitored and report sent to the Board every fortnight.
- 4. At every step of consumption of 25, 50, 75 and 100% of the imported material, the situation in the store shall be shown to the Board authority at our cost.
- 5. The hazardous wastes which gets generated in our premises by the use of imported hazardous wastes in the form of raw material, shall be treated and disposed of and only as per conditions of authorisation.
- 6. I/We agree to share the cost and joint to exporter in undertaking the measures as per undertaking given by Exporter at Part A column No.12(3) of this Form

7. I am aware that there are significant penalties for submitting a false certificate/
undertaking/ disobedience of the rules and lawful orders including the
possibility of fine and imprisonment.

Exporter

Signature
Designation

Date
Place

Importer

Signature
Designation

Date
Place

FORM 6 B

[See Rule 12(8)]

(Format for maintaining records of hazardous waste imported and exported)

1. Name and address of the importer :
2. Date and reference number of issuance of permission to import hazardous wastes :
3. Description of hazardous waste :
 - a) Physical form :
 - b) Chemical form :
 - c) Total volume and weight (in kilograms) :
4. Description of storage, treatment and reuse of hazardous waste :
 - a) Date :
 - b) Method of Storage :
 - c) Method of treatment and reuse (give details) :

FORM-7
[See rule 11(5)]

TRANSBOUNDARY MOVEMENT DOCUMENT

1 I) Exporter (name, address) Contact person : Tel : Fax/ Telex :		3 I) Corresponding to Notification No.	4. Serial Number of shipment
1 II) Waste generator (name, address) Site of generation: Contact person : Tel : Fax/ Telex :		3 ii) Movement subject to (1)	single notification general notification
2. Importer (name, address) Contact person : Tel : Fax/ Telex :		8. Disposer (name, address) Contact person : Tel : Fax/ Telex :	
5. 1 st Carrier (name, address) Registration No: Tel : Fax/ Telex :		9. Method of disposal (2) : Technology employed :	D code : R code :
6. 2 nd Carrier (3)(name, address) Registration No : Tel : Fax/ Telex :		7. Last Carrier (name, address) Registration No : Tel : Fax/ Telex :	
10. Identify of means of transport Date/location of transfer : Signature of Carrier's representative		11. Identify of means of transport Date/location of transfer : Signature of Carrier's representative	12. Identify of means of transport Date/location of transfer : Signature of Carrier's representative
13. Name and chemical composition of the waste		14. Physical characteristics	
15. Waste Identification code In country of export: IWC: In country of import: EWC: H.S.: other (specify) :		17. Actual Quantity Kgs Litres	18. Package (2) Type : Number :
16. OECD Classification (1) amber <input type="checkbox"/> other <input type="checkbox"/> red and number <input type="checkbox"/>		19. UN classification UN Shipping Name : UN Number : UN Class H Number Y Number	

List of abbreviations used in the movement document

DISPOSAL (NO RECOVERY)		RECOVERY OPERATIONS	
<p>D1 Deposit into or onto land (e.g., landfill, etc.)</p> <p>D2 Land treatment, (e.g., biodegradation of liquid or sludge discards in soils, etc.)</p> <p>D3 Deep injection, (e.g., injection or pumpable discards into waste, salt domes or naturally occurring repositories, etc.)</p> <p>D4 Surface impoundment (e.g., placement of liquid or sludge discards into pits, ponds or lagoons, etc.)</p> <p>D5 Specially engineered landfill, (e.g., placement into line discrete cells which capped and isolated from another and the environment, etc.)</p> <p>D6 Release into a water body except seas/oceans</p> <p>D7 Release into seas/oceans including sea-bed insertion</p> <p>D8 Biological treatment not specified elsewhere in this list which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12</p> <p>D9 Physico-chemical treatment not specified elsewhere in this list which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12 (e.g., evaporation, drying calcination, etc.)</p> <p>D10 Incineration on land</p> <p>D11 Incineration at sea</p> <p>D12 Permanent storage, (e.g., emplacement of containers in a mine, etc.)</p> <p>D13 Blending or mixing prior to submission to any of the operations numbered D1 to D12</p> <p>D14 Repackaging prior to submission to any of the operations numbered D1 to D12</p> <p>D15 Storage pending any of the D1 to D12 operations</p>		<p>R1 Use as a fuel (other than in direct incineration) or other means to generate energy</p> <p>R2 Solvent reclamation/regeneration</p> <p>R3 Recycling/reclamation of organic substances which are not used as solvents</p> <p>R4 Recycling/reclamation of metals and metal compounds</p> <p>R5 Recycling/reclamation of other inorganic materials</p> <p>R6 Regeneration of acids or bases</p> <p>R7 Recovery of components used for pollution abatement</p> <p>R8 Recovery of components from catalysts</p> <p>R9 Used oil re-refining or other reuses of previously used oil</p> <p>R10 Land treatment resulting in benefit to agriculture or ecological improvement</p> <p>R11 Uses of residual materials obtained from any of the operations numbered R1 to R10</p> <p>R12 Exchange of wastes for submission to any of the operations numbered R1 to R11</p> <p>R13 Accumulation of material intended for any of the operations numbered R1 to R12</p>	
PHYSICAL CHARACTERISTICS		UN CLASS AND H NUMBER	
<p>1. Powdery/powder</p> <p>2. Solid</p> <p>3. Viscous/paste</p> <p>4. Sludgy</p> <p>5. Liquid</p> <p>6. Gaseous</p> <p>7. Other (specify)</p>		<p>UN Class/ H Number</p> <p>1 H1 Explosive</p> <p>3 H3 Inflammable liquids</p> <p>4.1 H4.1 Inflammable acids</p> <p>4.2 H4.2 Substances or wastes liable to spontaneous combustion</p> <p>4.3 H4.3 Substances or wastes which, in contact with water, emit inflammable gases</p> <p>5.1 H5.1 Oxidising</p> <p>5.2 H5.2 Organic pesticides</p> <p>6.1 H6.1 Poisonous (acute)</p> <p>6.2 H6.2 Infectious substances</p> <p>8 H8 Corrosive</p> <p>9 H10 Liberation of toxic gases in contact with air or water</p> <p>9 H11 Toxic (delayed or chronic)</p> <p>9 H12 Ecotoxic</p> <p>9 H13 Capable, after disposal, of yielding another material, eg., leachate, which possesses any of the characteristics listed above.</p>	
PACKAGING TYPES	MODES OF TRANSPORT		
<p>1. Drum</p> <p>2. Wooden barrel</p> <p>3. Jerrican</p> <p>4. Box</p> <p>5. Bag</p>	<p>6. Composite packaging</p> <p>7. Pressure receptacle</p> <p>8. Bulk</p> <p>R = Road</p> <p>T = Train/Rail</p> <p>S = Sea</p> <p>A = Air</p> <p>W = Inland Waterways</p>		

FOR USE BY CUSTOMS OFFICES

25. COUNTRY OF EXPORT/DESPATCH OR CUSTOMS OFFICE OF EXIT The waste described overleaf has left the country on Stamp : Signature :	26. STAMPS OF CUSTOM OFFICES OF TRANSIT COUNTRIES			
	Name of country : Entry Departure		Name of country : Entry Departure	
27. COUNTRY OF IMPORT/DESTINATION The waste described overleaf has left the country on Stamp : Signature :	Name of country : Entry Departure		Name of country : Entry Departure	

FORM-8

[See Rule 7(2)]

Marking of Hazardous Waste Containers

HAZARDOUS WASTE

Handle with Care

Waste Category No.....	Compatible Group
Total Quantity	Date of Storage.....
Contents :	
Sender's Name & Address	Receiver's Name & Address
Phone.....	Phone.....
Telefax No.....	Telefax No.....
Telex No.....	Telex No.....
Contact Person.....	Contact Person.....
In case of emergency please contact	

Note :

1. Background colour of label - fluorescent yellow.
2. The words 'HAZARDOUS WASTES' & 'HANDLE WITH CARE' to be prominent written in red
3. Label should be of non-washable material.

21. Transporter's Acknowledgement of Receipt of Materials		
Typed Name & Stamp	Signature	Month Day Year <input type="text"/> <input type="text"/>
22. Discrepancy Note Space		
23. Facility Owner or Operator's Certification of Receipt of Hazardous Waste		
Typed Name & Stamp	Signature	Month Day Year <input type="text"/> <input type="text"/>

Transport Emergency (TREM) Card

1. Characteristics of Waste :

S.No.	Type of Waste	Physical Properties/	Chemical Constituents	Exposure Hazards	First Aid Requirements

2. Procedure to be followed in case of fire :

3. Procedure to be followed in case of explosion :

4. Procedure to be followed in case of explosion :

5. For expert services, please contact :

- i) Name & Address :
- ii) Telephone No. :

(Name and Signature of Occupier)

Annex 2-4
International Conventions relevant to
Environmental Protection where
GOI has been signatory

**International Conventions relevant to Environmental
Protection where GOI has been signatory**

1. Convention Relative to the Preservation of Fauna and Flora in their Natural State (London, 1936)
2. International Convention for the Regulation of Whaling (Washington, 1946)
3. International Plant Protection Convention (Rome, 1951)
4. The Antarctic Treaty (Washington, 1959)
5. Convention concerning the Protection of Workers Against Ionizing Radiation (Geneva, 1960)
6. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Brussels, 1975)
7. International Convention on Civil Liability for Oil Pollution Damage (Brussels, 1975)
8. Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (RAMSAR, 1972)
9. Convention concerning the Protection of World Cultural and Natural Heritage (Paris, 1972)
10. Convention on International Trades in Endangered Species of Wild Fauna and Flora (Washington DC, 1943)
11. Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL)
12. Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979)
13. Convention on the Conservation of Antarctic Marine Living Resources (Canberra, 1980)
14. United Nations Convention on the Law of the Sea (Montego Bay, 1982)

15. International Tropical Timber Agreement (Geneva, 1983)
16. Montreal Protocol on Substances that Deplete Ozone Layer (1987)
17. Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, (1989)
18. Convention on Climate Change (Rio, 1992)
19. Convention on Biological Diversity (Rio, 1992)
20. Rio Declaration on Environment and Development (Rio, 1992)
21. Agenda 21, the operational programmes for sustainable development also adopted at the UNCED, Rio de Janeiro (June 1992).

Annex 5-1
List of Instruments proposed by the SPCBs during
the Planning Workshops

**List of Instruments proposed by the SPCBs during
the Planning Workshops**

Andhra Pradesh

S.No.	Item
1.	A.A.S.
2.	GC/FID/ ECD/DPLC
3.	Mili Q System
4.	Side loading Balance
5.	UV-VIS Double Beam Spectrophotometer
6.	Top Loading Balance
7.	Source Air Sampler
8.	HV Air Sampler with rotameter calibrator
9.	Micro Milipore Suction with Motor
10.	Rotary Shaker
11.	Zero head space extractor
12.	Flash Point Tester
13.	Bomb Colorimeter
14.	Volatile Organic Sampling
15.	Spectronic-21
16.	Automatic sampler
17.	Depth sampler with 30 Mtr. rope & pulley
18.	Field sampling kits (for air sampling)
19.	Tedler sampling bags
20.	Inverted Thermometer
21.	Karl Fisher titrator
22.	Stack combustion gas analyzer

23.	Eye/face waste safety shower
24.	a) Gas detector for C12, 12, H2S, CS2, SO3, NH3, HCl, Hexane & Trylene dioxide b) Toxic Gas monitor
25.	pH Meter, Pentype
25(a)	Evaporators
26.	COD Assembly with Spectro photometer
27.	Vaccum pump
28.	Ekman Dredge
29.	BOD Incubator
30.	Centrifuge
31.	Heating Mantles Six Seater
31(a)	Heating Mantles 5 lts capacity
32	Corrosivity Tester
33	Freezers with digital temp indicator
34	D.O. meter with probe
35	UPS 5 KVA
36	UPS 2 KVA
37	Diesel Generator 100 KVA
38	Wireless communication
39	Sampling Van
40	Fume Hood
41	Refrigerator
42	Kjeldahl Apparatus
43	Micropipettes
44	Personal protective equipment & breathing apparatus
45	Dispensers Glass
46	Vehicles gas analyser

Information Systems (Computers)

S.No.	Description
1.	PC - 586
2.	Lap Tops
3.	Laser Jet Printer
4.	Desk Jet Printer
5.	Software
6.	Data Creation
7.	MIS & GIS

Maharashtra - For Central Laboratories

S.No.	Equipment
1	AAS Flame/Graphite Furnace
2	Nitrogen Analyser (TKN Analyser)
3	GC with ECD/FID
4	Vehicle
5	Milli Q System with reverse osmosis
6	Fume Hoods
7	Side loading balance
8	UV-VIS double beam Spectrophotometer
9	Voltage Regulator (Serva)
10	Glove Box
11	top loading electronic balance
12	Refrigerator
13	Continuous Extractor
14	Bacterial Incubator
15	Fax
16	Muffle Furnace
17	Hot Air Oven
18	Freezer
19	Kjeldhal Apparatus
20	Flow Meter
21	Air Compressor
22	pH Meter
23	Evaporators
24	Autoclave
25	COD Assembly
26	Vaccum Pump
27	Microdigestors
28	Conductivity Meter

29	Color Meter
30	Turbidity Meter
31	Reference Thermometer
32	Ekman Dredge
33	Colony Meter
34	NDIR-CO analyser
35	Source Air Sampler
36	High Volume Air sampler with rotameter Calibrator
37	Micropipettes
38	Current meter
39	Millipore suction system for SS
40	Toxic Gas Monitors
41	Mobile Phones
42	BOD Incubator
43	Centrifuge (jar test app.)
44	Flask Shaker
45	Hot plates
46	Heating Mantles
47	Magnetic Stirrer with hot plates
48	Rotary shaker
49	Stop watch
50	Water Bath
51	Research Microscope (Inverted Type)
52	Flame Photometer
53	Ammonia Distillation Assembly
54	Automatic Burettes
55	Telephone (OYT) with Modern
56	Sampling Van

57	Zero head space extractor
58	Flash point tester
59	Corrosivity test-Fabricated
60	Bomb colorimeter
61	Volatile organic sampling
62	GC/MS with purge and trap
63	Lab furniture (Working tables, Cupboards, Chemical racks, etc.)

Regional Laboratories

S.No.	Equipment
1	AAS Flame with hydrid emission
2	HPLC
3	Milli Q system with reverse osmosis
4	Fume Hoods
5	Side loading balance (monopan balance)
6	Voltage Regulator (servo)
7	UV-VIS double beam Spectrophotometer
8	Glove Box
9	Top loading electronic balance
10	Refrigerator
11	Fax/E-Mail
12	Muffle Furnace
13	Hot Air Oven
14	Refrigerated Centrifuge
15	Freezer
16	Flow Meter
17	pH Meter
18	Autoclave
19	COD Assembly
20	Conductivity Meter
21	Turbidity Meter

22	Ekman Dredge
23	Micropipettes
24	BOD Incubator
25	Hot plates
26	Heating Mantles
27	Magnetic Stirrer with hot plates
28	Rotary shaker
29	Water Bath

Information Systems - Hardware

Computers and peripherals at Head Office	PC 586-3 (1 server with 20 terminals and 2 PCs) Deskjet Printer - 1	PC 386-2 Dotmatrix Printers - 2	PC 586 - 5 Lab Tops - 5 Laser Printer - 1
Computers and peripherals at ROs (9+2 new ROs)	PC 586 - 9 (one at each RO) with two terminals per machine	PC 386 on lease Dot Matrix Printers - 9	PC 586 - 9 Deskjet Printers - 11
Computers and peripherals at ROs (20 nos)	None	None	PC 586 - 20 Deskjet Printers - 20
Computers and peripherals at Central Lab	PC 586 - 1 with two terminals	PC 386 - 1 Dot Matrix Printer - 1	Laser Printer - 1

Tamil Nadu

S.No.	Description
1.	Pulverising Machine
2.	Rotary shaker
3.	Rotary Evaporator
4.	Deep Freezer
5.	Spectrophotomer (Adv.model)
6.	Tox Analyser
7.	TOC Analyser
8.	Flash Point Tester
9.	Corrosivity Test Apparatus
10.	Toxic Gas Detector
11.	Reactivity Test Apparatus
12.	Auto Analyser for Cyanide
13.	EKMAN Dredge
14.	Automatic Sampler
15.	Air conditioners (2 KVA)
16.	UPS 5 KVA
17.	Vehicles - Jeep
18.	Van (Ambulance Type)
19.	Van (Tempo Traveller)
20.	Macropipette Controller
21.	Bottle top Dispensate
22.	Personal Protective Equipment for Emergency Response Van.

Sl.No.	Description
II. LAB GLASSWARES	
1.	Digital Burette 50 ml cap
2.	Accu-jet; Pipette Controller for Pipettes from 0.1 to 110 ml.
3.	Automatic Titrator (Micro processor Controlled)

Sl.No.	Description
III. COMPUTER REQUIREMENT	
A. HARDWARE	
1.	PC's (Pentium 586)
2.	Ink Jet Plotter
3.	Laser Printer
B. SOFTWARE	
1.	Environmental Appli - cation software
2.	GIS related software
3.	M.I.S.
4.	Data creations

Gujarat

Item
<i>A. General Assembly</i>
Leachate preparation assembly
BOD assembly including incubator
COD assembly including digester
Conductivity Meter
Electronic balance
pH Meter/Redox Potentiometer
Refrigerators
Oven
Muffle furnace
Shaker
Magnetic Stirrer
<i>B. Specific Instruments</i>
Atomic Absorption Spectrophotometer
Gas Chromatography (Mass Spectrometer)
Infrared Spectrometer
High Pressure Liquid Chromatography (HPLC)
<i>Total Organic Carbon Equipment</i>
AOX/EOX Detector
Spectrophotometer
Shear Testing Assembly
Pore Pressure Apparatus & Shear Box Assembly
<i>Hydrometer Test Assembly</i>
Static Cone Penitrometer or Atterburg's Liquid Limit Device
<i>Proctor Mould Assembly</i>
Jodhpur Permeameter with all accessories
Core Cutter (for Sampling)
Set of IS sieves
Pycrometer
Penitrometer
Plate load assembly for bearing capacity test
GC with auto injection system
Mass spectrograph
NMR
Automatic air quality monitoring system
<i>C. Field Instruments/Kits</i>
Sampling Auger
Miniature Photo-ionization monitor
Dipper
Portable test kits for SO ₄ , NO ₃ , CN etc. and heavy metals
Portable Gas Analyzer

Item
Portable Gas Chromatograph
Computers for the laboratory - Pentium
Laboratory and Field Equipment (A+B+C) and computers for the laboratory
Air conditioners for laboratories
Laboratory building and interior

Annex 5-2

**5-2 (a) - Training Programmes proposed by the
SPCBs during the Planning Workshops**

**5-2 (b) - Training Programmes proposed for the
State Intermediaries and FIs**

5-2 (c) - Training Programmes proposed for NGOs

Training Programmes proposed by the SPCBs during the Planning Workshops

Proposed Training Areas for SPCBs

Planning Level

1. Hazardous waste (management and handling) rules
2. Criteria for CHWTDF site selection
3. Review of EIA reports for CHWTDFs
4. Technology options for treatment and disposal of hazardous waste
5. Technology options for site remediation
6. Responsibilities allocation of the stakeholders (Generators/ Occupier/ Transporters) for sharing of risks
7. Technical, social and institutional risks associated with the CHWTDF
8. Technical, social and institutional risks associated with the hazardous waste transportation
9. Environmental monitoring including Post-Project Monitoring around CHWTDFs
10. Closure of the CHWTDF
11. Public awareness programs for NGOs and public representatives
12. Communication of information regarding the ongoing project

Implementation Level

1. Identification and characterization of hazardous wastes
2. Sampling and analytical methods for hazardous waste field assessments
3. Hazardous waste management practices for minimization, storage, treatment and disposal.
4. EIA of the CHWTDF site
5. Responsibilities of the stakeholders (Generators/ Occupier/ Transporters)
6. Packaging and labeling system for transportation of hazardous wastes
7. Technical, social and institutional risks associated with the CHWTDF
8. Technical, social and institutional risks associated with the hazardous waste transportation
9. Performance monitoring of incinerators, secured landfill disposal sites, effluent treatment plants for hazardous wastes.
10. Closure of the CHWTDF
11. Tracking of Hazardous Wastes
12. Information Systems and Data base management and applications

Training Programmes proposed for the State Intermediaries and FIs

Proposed Training Areas for State Intermediaries

Project Planning Level

1. Hazardous waste (management and handling) rules
2. Criteria for CHWTDF site selection
Hazardous waste management practices for minimization, storage, treatment, disposal.
3. EIA of the CHWTDF site
4. Planning and Design of CHWTDFs
5. Responsibilities of the stakeholders (Generators/ Occupier/ Transporters)
6. Technical, social and institutional risks associated with the CHWTDF
7. Emergency and contingency planning
8. Leachate and off gas management system
9. Environmental monitoring of the CHWTDF
10. Closure of the CHWTDF

Project Implementation Level

1. Hazardous waste (management and handling) rules
2. Identification and characterization of Hazardous wastes
Hazardous waste management practices for minimization, storage, treatment, disposal.
3. Operation of the CHWTDF
4. EIA of the CHWTDF site
5. Responsibilities of the stakeholders (Generators/ Occupier/ Transporters)
6. Packaging and labeling system for transportation of the hazardous wastes
7. Record keeping and reporting
8. Leachate and off gas management system
9. Environmental monitoring including post-project monitoring of the CHWTDFs
10. Closure of the CHWTDF

Proposed Training Areas for FIs

Top Level

1. Introduction to Hazardous Waste Management
2. Process Guidance Framework for Investment Component of the Hazardous Waste Management Project

Projects Level

1. Introduction to Hazardous Waste Management
2. Introduction to the Legal and Policy Framework and Guidelines
3. Environmental Impact Assessment (Including Public Information and Consultation of Projects (*Projects to cover Individual Company Level and Common Hazardous Waste Treatment and Disposal Facilities*))
4. Application of Project Eligibility Criteria, Project Appraisal and Writing of the Terms of Reference
5. Alternative technology options for Hazardous Waste Minimization in various industry sectors.
6. Alternative technology options for Hazardous Waste Treatment and Disposal
7. Estimation of Project Costs
8. Identification, Allocation and Management of Project Risks (*Projects to cover Individual Company Level and Common Hazardous Waste Treatment and Disposal Facilities*)

Commissioned Working Papers

Working papers will serve as practical desk guides for the Bank staff in executing the projects. These may be shared in budget by ICICI and BoB as well as by the State Intermediaries if so desired. More areas may be included for Working Papers accordingly.

1. A Status on Hardware and Software Deficiencies on Technologies for Management of Hazardous Wastes
2. Model contracts for Different Ownership-Operational Structures
3. Guidelines for Estimates of Costs

Marketing and Outreach

Recognizing the barriers for implementation of hazardous waste management related projects both at the Company level and for Common Hazardous Waste Treatment and Disposal Facilities, it is envisaged that the ICICI/BOB may like to organize Outreach programs to explain to the Clients the Scheme, Procedures and Benefits.

Training Programmes proposed for NGOs

Proposed Training Areas for NGOs

1. Hazardous waste (management and handling) rules
2. Hazardous waste management practices
3. Problems due to insufficient infrastructure for hazardous waste management
4. Responsibilities of the stakeholders (Generators/ Occupier/ Transporters)
5. Technical, social and institutional risks associated with the CHWTDF
6. Technical, social and institutional risks associated with the hazardous waste transportation
7. Environmental monitoring of the site
8. Closure of the CHWTDF
9. Post project monitoring of the site
10. Public awareness programs

Annex 5-3
Technical Assistance Studies proposed by the
SPCBs during the Planning Workshops

**Technical Assistance Studies proposed by the SPCBs during the
Planning Workshops**

(A)

- Identification of training areas, trainers, trainees, contents of training programmes and ToR for trainers
- Review and interpretation of the existing hazardous waste inventORIZATION reports
- Methodology for inventORIZATION of hazardous wastes in the State

(B)

- Laboratory design and planning
- An Intercalibration exercise for all the laboratories involved in hazardous waste analysis.
- Sampling and analytical methods for hazardous wastes .

(C)

- Preparation of ToR for screening EIA, detailed EIA and inventORIZATION
- Development of a strategic plan for Promotion of hazardous waste minimization
- Strategic planning for the regional hazardous waste management system

(D)

- Planning for economic models such as hazardous waste generation tax and other alternatives
- Implementation of the hazardous waste minimization promotion activities.

(E)

- Review of the existing procedure for treatment and disposal site identification
- Identification of the candidate sites for CHWTDFs
- Screening level EIA for potential sites for CHWTDFs
- Detailed EIA of identified sites for CHWTDFs
- Design and planning of CHWTDFs

(F)

- Identification of locally suitable treatment technologies for the regions
- Organization and management of CHWTDFs
- Operation and maintenance of the CHWTDFs

(G)

- Technical assistance for selection of station locations for tracking and for manifest design linked to GIS.
- Monitoring of the treatment / disposal facilities
- Post project monitoring of the disposal facilities

(H)

- Inventorization, Prioritization and development of Action Plans for existing dump sites
- Remediation of old disposal sites

(I)

- Communicating Information to the Hazardous Waste Generators
- To increase public participation in the hazardous waste management planing

Annex 5-4
Typical Examples of Waste Minimization
Techniques

Typical Examples of Waste Minimization Techniques

Technique category	Industry	Technique
Inventory management	Textiles	<ul style="list-style-type: none"> • Review all chemical purchases
	Organic chemicals	<ul style="list-style-type: none"> • Review all new products purchased
Material change	Printing	<ul style="list-style-type: none"> • Substitute water-based for solvent-based ink
	Pharmaceuticals	<ul style="list-style-type: none"> • Replace solvent-based tablet-coating process with a water-based process
	Aerospace	<ul style="list-style-type: none"> • Replace cyanide cadmium-plating based bath with non cyanide bath
	Ink manufacture	<ul style="list-style-type: none"> • Remove cadmium pigment from products
Production modification	Chemical reaction	<ul style="list-style-type: none"> • Optimize reaction variables and reactor design • Optimize reactant addition method • Eliminate use of toxic catalysts
	Surface coating	<ul style="list-style-type: none"> • Use airless air-assisted spray guns • Use electrostatic spray coating system • Control viscosity with heat units • Use high-solid coatings
In-plant recycling and Recovery and reuse	Metal fabricators	<ul style="list-style-type: none"> • Recover synthetic cutting fluids using a centrifuge system
	Paint fabricating	<ul style="list-style-type: none"> • Use distillation unit to recover cleaning solvents
	Printing	<ul style="list-style-type: none"> • Use vapor-recovery system to recover solvents
	Metal fabrication	<ul style="list-style-type: none"> • Recover synthetic cutting fluid using a centrifuge system
	Wastewater treatment	<ul style="list-style-type: none"> • Reuse waste caustic solids to treat acid waste stream
	Chemicals	<ul style="list-style-type: none"> • Use spent electrolyte spent from one decision as raw material in another • Purify hydrochloric acid in waste stream and sell as a product
Volume reduction	Pesticide formulation	<ul style="list-style-type: none"> • Use separate bag houses at each process line and recycle collected dust into product
	Paint formulation	<ul style="list-style-type: none"> • Segregate and reuse tank cleaning solvents in paint formulations

Annex 5-5
Recommendations from the Workshop on
Identification and Management of Risks at
CHWTDFs

Recommendations from the Workshop on Identification and Management of Risks at CHWTDFs

In order to identify and manage the risks at CHWTDFs and discuss various institutional models, MOEF organized a workshop at Hyderabad between January 18-19, 1997. This workshop was attended by all the stakeholders such as the SPCBs, Industries and Associations, NGOs, Consultants and Research Institutions and Financing institutions.

The main objectives of the workshop were :

- identification of the risks (technological, financial, legal, social, environmental) associated with the establishment, ownership, operation and closure of hazardous waste treatment and disposal facilities.
- proposing a framework for risk management, including the identification of institutional solutions, by all parties involved.
- operationalization of the proposed framework into a model set of provisions for a contract on operation and management of the proposed facilities or a risk-sharing agreement.

The outputs that emerged from the workshop included

- Recognition of risks in financing, constructing and operating common facilities for the treatment and disposal of hazardous wastes
- Models for ownership of CHWTDFs
- Aspects related to model contracts for addressing of the risks.

The salient recommendations of the workshop are shown in Box below:

Salient recommendations of the Workshop on Management of Risks while setting Common Treatment, Storage and Disposal Facilities (CHWTDF) for Hazardous Wastes held at Hyderabad on January 17-18, 1997.

1. The most significant risks associated with the setting up of CHWTDFs that were identified, in order of priority, are :

- *Community rejection risk*
- Risk of institutional failure of the project i.e., the risk of the institutional component of the project not being on par with the technological component which could lead to failure of the project
- Risk of failure of relationship between government and private sector in setting up the project

2. Pre-requisites to mitigate the risks were identified as follows :

Policy

- Immediate need for government review of the guidelines and legislation for hazardous waste management. A national level workshop to brainstorm on this issue was recommended.
- Government policy on waste management which includes hazardous waste minimization, on-site management, recycle and recovery of resources and energy also needs to be clearly defined.
- The need to include CHWTDF as a project to be assessed under the EIA notification.
- A recommended pre-requisite was to consider the CHWTDF as a industry whereby all the rules and regulations and the regulatory standards governing industrial projects would automatically apply to these facilities.

Guidelines

- Need for guidelines on siting and buffer zones for CHWTDFs, design, operation and management of these facilities and for closure and post closure monitoring and remediation of these facility sites was also recommended.
- The above mentioned guidelines and policy related issues are crucial since the economics of CHWTDF depends on the supply and type of waste to the facilities.
- There is a need for a well defined programme and guidelines for Public Information and Consulting so as to overcome the NIMBY issue and bias in the community.

Institutional Set-up

- Capacity strengthening of SPCB officials to assess CHWTDFs is crucial. This is possible through training, follow-up by strengthening and transfer of skills to other personnel associated with the project and continuous upgradation of this technical upgradation.

A significant residual risk which should be addressed vide clauses in the agreements between the government and the project company is the sharing of risks due to impacts after closure. One of the recommended schemes to mitigate this risk is to set up a corpus by the CHWTDF project company and place it in custody of the government to be used later for closure and post closure monitoring.

Annex 6-1
Suggested EIA Process for CHWTDF

Suggested EIA Process for CHWTDFs

The process recommended in this PGF is a composite of the procedures stipulated by the GOI and the World Bank. MOEF oversees the EIA process. The responsibility for review and approval of EIA report lies with the State Department of Environment (DOE) and the State Pollution Control Board (SPCB). The former is also responsible for notifying the acceptable site for the facility following the approval of the EIA report. The EIA studies are conducted by the proponent with the assistance of a team of consultants. For the FIs, the EIA is a tool through which environmental and social risks, from an investment standpoint, could be determined. The EIA provides the community with the means to communicate with the proponent. The World Bank will also review all the EIA reports and Resettlement Action Plans.

- (a) **Step 1 - Problem Definition - Quantum and Study Area.** The proponent should define the nature and size of the hazardous waste problem and the “captive region”¹ that the facility intends servicing. The study area, at the minimum, should include the industrial estate/zone from where the waste is generated, the haulage routes, candidate areas where the facility could be located and the areas likely to be affected by potential impacts. Densely populated areas and sensitive receptors should be avoided;
- (b) **Step 2 - Selection of Candidate Sites** Within the preferred candidate area, a long-list of notional sites should be identified and preliminary analysis undertaken of environmental, socio-economic, transportation and landuse factors. From this exercise would emerge a short list of candidate sites that need to be subjected to detailed investigations (see step 4.). In the case of a facility being located within a legally defined established industrial estate, the proponent may proceed with the detailed investigations for that site. However, if disposal of the treated waste is to be at a separate site, then the proponent should follow this step. Preliminary assessment of land acquisition should be undertaken. The findings of this step should lead to the drafting of the detailed Terms of Reference for the EIA study. A Model TOR is placed in Annex 6-2.

¹ Region refers to a large industrial zone or estate having a conglomerate of industrial units generating hazardous wastes. If the waste generated from this region is to be treated and disposed of at the proposed facility, then it is known as the “captive region” for that facility. Area is a sub-set of a region where similar physical, geographical and geological characteristics are found. Within an area, alternative sites (small parcels of land) indicate potential locations for specific facilities.

- (c) **Step 3 - Scoping and Finalization of ToR.** Based on feedback received from steps 1 and 2, the proponent should translate the generic ToR for EIA into a site(s) specific one. A non-technical version of the draft, in the local language, should be disseminated and discussed with community representatives including environmental NGOs. Guidelines for this are suggested in the text on Public Consultation Process in Annex 6-4 of this report. Following these discussions, the proponent will revise the ToR, if required, and submit the finalized version to MOEF, DOE/SPCB and FI for clearance;
- (d) **Step 4 - Conducting study and survey.** The proponent should undertake the study and surveys according to the agreed ToR. Consultation with the community will be guided by the public consultation process;
- (e) **Step 5 - Compilation of draft report.** Following the conclusion of the study, the proponent should prepare the report according to the agreed format. In general, the EIA report should include the EMP, an RAP, an Indigenous Peoples Development Plan (IPDP), if applicable. A summary of the draft report should be disseminated to communities concerned as well as representative organizations and discussed with these groups; their concerns should be addressed when finalizing the report;
- (f) **Step 6 - Approval of EIA report and Site Notification.** The final report will be submitted to MOEF, DOE/SPCB and FIs for review and approval. The State Department of Environment and the SPCB could set-up an Expert Committee to review the EIA report. The reports shall also be provided for review of the World Bank. The Committee will be convened by the SPCB to review the findings. In the course of evaluating the report, the Committee may make field visits and hold public hearings, if required, to make a decision on the EIA report. The Committee could approve the report or seek additional information from the proponent. Once it is satisfied with the EIA conclusions and recommendations, the Committee could recommend to the SPCB to grant approval. Following which the DOE will notify the site. The EMP, RAP and IPDP should be incorporated in the design of the facility; and
- (g) **Step 7 - Implementation.** There will be continuous monitoring during project implementation by regulatory authorities and possibly also by community groups with support from reputable NGOs.

Annex 6-2
Resettlement Policy Framework

Model Terms Of Reference for EIA of CHWTDFs

(This is written in generic form for the use of facility proponents and their Consultants as a best practices guide. Based on local conditions, the proponent should write a specific scope of studies and then obtain concurrence from the relevant regulatory authority before commencement of the studies)

Introduction The proponent should write this section. The proponent should state the purpose of the ToR, identify the development project to be assessed and explain the executing arrangements for the EIA including any variations to the process outlined above. This section should also include an overview of the hazardous waste management situation in the State of the proposed facility. It should identify the principal sectors of waste generators. Explain the reasons for the setting-up the proposed facility. The results of the site selection process should be summarized here.

Objectives The proponent should explain the specific objectives of the assignment.

Study Area As determined previously, the proponent should specify the study area and indicate it in a map of appropriate scale.

Scope of Work The text below describes the specific tasks the Consultant team is expected to perform. The following should be used as a guide, and the proponent if required could expand the scope. Minimum requirements have been specified below, however, the specific needs will vary with selection of site and choice of technology or process.

- (a) **Task 1- Project Description** The Consultant should provide a description of the scope and physical characteristics of the proposed facility. This will include information on the system (incinerator, physico-chemical treatment, engineered landfill or a combination of the three) to be studied, unit processes to be operated, handling and haulage methods to be employed and the types, quantities of waste to be processed, closure and restoration of landfill;
- (b) **Task 2 - Project Alternatives** The Consultant should make a systematic comparison of alternatives taking into account environmental and social costs and benefits. **Sites** - The Consultant should follow the MOEF, which recommends a sequential multi-level screening process for selection of candidate sites – *Level I : Constraint Mapping; Level II: Potential Selection; Level III: Community and Environmental impacts*. The “surviving” candidate sites are further screened by a ranking methodology. Additional factors that need to be considered include land ownership, cultural and archeological properties, tribal people, population

- at-risk adjacent to sites and along transport route). The Consultant should document the site selection exercise and conclude with the reasons for selecting the most suitable site. (b) Routes - The Consultant should compare the different haulage routes for the trucking the waste from the generators to the site. (c) Technologies - Compare the alternate methods of treatment and disposal (integrated facility versus landfill) and technology options for each facility unit, considered and their environmental and social impacts and costs. Include the alternative of not constructing the project, in order to demonstrate environmental conditions without it. The basis for the selection of the recommended option for the project design must be stated;

(c) Task 3- Existing Environment and Baseline Conditions Data Collection

When drafting this section of the ToR, the proponent should clearly specify the data that the consultant should collect. To undertake the successful preparation of an EIA report, site specific information will be required to institute a baseline environmental survey in and around each site. This will draw upon existing, available information from state agencies and research organisations and third parties, supplemented as necessary by a field monitoring program. The data requirements will vary according to the site conditions and the technology processes to be employed. Broadly the following forms of data categories should be covered:

- physical - geology, topography, soils, climate and meteorology, ambient air quality, surface and groundwater hydrology, existing water quality status, existing sources of air emissions;
- biological - an inventory of flora and fauna, sensitive habitats and endangered species, and parks and reserves;
- socio-economic conditions - human factors: population, community structure, employment, distribution of income, goods and services, recreation, public health, presence of tribal groups, their customs, aspirations and attitudes. Land features: land ownership, landuse and zoning, proximity of site to residential and economic locations and archaeological and historical properties, planned development activities, transport access and availability of utilities and services.

(d) Task 4 - Determination of the Potential Impacts. The Consultant will begin by identifying positive and negative impacts likely to result from the proposed project, interpreting "environmental" throughout the EIA study to include socio-economic impacts as well as impacts on the natural environment. Following this, the Consultant should prepare a description of the likely changes in the prevailing environmental conditions that may

be brought about by establishing the proposed waste management facility. This part of the study should distinguish between effects on the immediate vicinity of the facility from repercussions further away and should identify both short term and long term environmental impacts. Where practicable, the size and severity of effects should be quantified, and attention should be drawn to specific issues of uncertainty and trade-off between competing/conflicting impacts. The extent and quality of available data, key data gaps and uncertainties associated with predictions should be described. Topics that do not require further attention should be specified. Any impacts that are irreversible and/or cannot be avoided or mitigate should be identified.

- (e) Task 5 - Analysis and Evaluation of Risks The Consultant should identify the impacts that can translate to potential risks in the construction and operation phases, and risk analysis performed.
- (f) Task 6 - Formulation of Environmental Management Plan
 - (i) Mitigation Plan. For each significant negative impact or major risk, the Consultant should recommend and describe a measure to avoid or mitigate (reduce to acceptable levels) or when unavoidable, to compensate for the damage. If needed, the Consultant should prepare the plan in two parts -- one for impacts and the other for risks. The description the text should include an estimate of capital and recurring costs and should identify the party(ies) responsible for implementation. A disaster management plan also should be included. The Consultant should propose options for compensation to affected parties for impacts which cannot be mitigated. If the project affected people exceeds 200, the consultant should prepare a separate Resettlement Action Plan. The complete set of recommended measures - in the management plan (EMP) - should also be presented in a summary table. Allocation of institutional responsibilities should be clearly specified. Where possible, mitigation measures that will be the responsibility of the construction contractor or equipment supplier, should be included as contract clauses in the respective tender/bid documents. The O&M phase mitigation measures should be incorporated in the relevant legal documents. In addition, the government agency responsible for implementation and supervision should be identified.
 - (ii) Monitoring Plan. The Consultant should specify the types of monitoring needed for measuring potential environmental and social impacts during construction and operation phases. As part

of the on-going work of the PCP, the Consultant should include opportunities for community monitoring by stakeholders with possible technical assistance from external body such as a research institution. As in the case of the mitigation plan, requirements should be specific as to what is to be monitored, how and by whom (with clear delineation of responsibilities between the Proponent/Operator, Community Groups and State Agency). Cost estimates are necessary and where monitoring reports are to be prepared, the recipient responsible for review and any corrective action should be identified.

- (g) Task 7 - Resettlement Action Plan If the project affected or displaced people exceed 200, then the Consultant should prepare a detailed Resettlement and Rehabilitation Action Plan. Otherwise the consultant should prepare a social management plan

13. Report. The EIA Report should be concise and limited to significant environmental issues. The following format is based on the Schedule II of the EIA Notification of MOEF and World Bank Operational Directive 4.01:

- (a) Executive Summary
- (b) Chapter 1 - Process of undertaking the study and compiling the report.
- (c) Chapter 2 - Description of the Proposed Project
- (d) Chapter 3 - Description of the Environment
- (e) Chapter 4 - Analysis of Alternatives
- (f) Chapter 5 - Significant Environmental Impacts
- (g) Chapter 6 - Risk Analysis
- (h) Chapter 7 - Environmental Management Plan
 - (i) Mitigation Plan
 - (ii) Monitoring Plan
- (i) Chapter 8 - Resettlement Action Plan/Indigenous People Development Plan
- (j) Annexes -
 - (i) Data and unpublished references

14. Consultant Team The proponent should appoint competent and qualified Consultant team to undertake the assignment. The team should be a multi-disciplinary one, headed by a Team Leader knowledgeable in undertaking EIA studies and a good understanding of HWTDF. It is unlikely that a single firm will be able to provide all the expertise required, and would need to collaborate with other firms. The consultant team should include a NGO group to undertake the PCP. This NGO should have links to community based organizations. The Consultant team should include: chemical engineers, civil and environmental engineers (process engineering, project design,

pollution control and environmental quality), planners (landuse and topography), biologists (fauna, flora, water and air quality), chemistry (environmental monitoring), hydrologists (surface and ground water, leachate control), sociologists (socio-economic survey, community participation), meteorologists/chemistry (air quality assessment), financial analysts (costing). The composition of the team would depend on the type of facility and choice of location.

Annex 6-3
Resettlement Policy Framework

ANNEX 6-3

Resettlement Policy Framework

Resettlement Framework

The centralized Hazardous Waste Treatment and Disposal Facilities to be financed under the project will be established on land zoned for industrial use (brown fields). Every effort will be made to select sites which will either not require or will minimize relocation of people residing on or using the land in question for businesses or cultivation. However, in some circumstances land acquisition for CHWTDFs and for surrounding safety zones (where these cannot be used for residence or cultivation/ grazing) will affect people through loss of assets or loss of livelihood and may require relocation of project affected persons. Where this is the case, compensation, resettlement and rehabilitation of people affected by the acquisition of land, houses or other assets under the project will take place in accordance with this Policy Framework for Resettlement.

The objective of this Resettlement Framework is to ensure that all Project Affected Persons (PAPs) receive compensation for their losses and are provided with rehabilitation measures to assist them to improve, or at least maintain, their pre-project living standards, income-earning capacity, and production levels.

The Resettlement Framework defines the principles and objectives, legal and institutional framework, eligibility criteria of PAPs, entitlements, people's participation arrangements, modes of compensation and rehabilitation, and grievance procedures that will guide compensation, rehabilitation and resettlement related to land acquisition for school sites under the Hazardous Waste Management Project.

Project Affected People

PAPs include persons who, on the cut-off date used to determine the eligibility of PAPs, are residing on and/or utilizing land for cultivation or shops within areas which have been identified under the Hazardous Waste Management Project for acquisition for either CHWTDFs or for safety zones surrounding these. People who have settled on or made use of such land after this cut-off date will not be eligible for any compensation under this Resettlement Framework. Based on this criterion, people affected by land acquisition will be considered PAPs irrespective of whether they (a) are holding legal title as owners or tenants, (b) are members of Scheduled Tribal communities using the area under common property arrangements, or (c) are squatters on the land in question. The PAPs will be identified through a land acquisition assessment before the cut-off date, which is defined as the date of notification of site.

PAPs are classified as follows:

- Persons losing a part or all of the agricultural land they use to a CHWTDF site and safety zone.
- Persons whose houses have to be partly or fully demolished to make room for a CHWTDF site and safety zone.

- Persons whose businesses are affected (temporarily or permanently) by being shifted to make room for a CHWTDF site and safety zone.
- Persons who have crops and/or trees within the area acquired for a CHWTDF site and safety zone.

Household (HH): A household is a group of persons who commonly live together and take their meals from a common kitchen

Replacement Value: means market value excluding depreciation. The replacement value of land will be determined through a land market survey

Cut-off date: is used to determine the eligibility of PAPs. The cut-off date will be date of notification under the relevant land acquisition act regarding the site for a hazardous waste treatment and disposal facility. A survey/inventory will identify the residents or users of the land and other assets to be acquired before the cut-off date to prevent fraudulent claims for compensation by people settling on the site after notification.

Land: The term land refers to land acquired under the Land Acquisition Act, or through private transactions. All land provided under the entitlement framework will be provided with secure tenure.

Principles and Objectives

The principles and objectives regarding compensation and resettlement caused by land acquisition for sites and safety zones for CHWTDFs are:

- (a) All PAPs who on the cut-off date referred to above are residing on and/or utilizing land for cultivation or shops within areas which are identified for subsequent acquisition for sites and safety zones for CHWTDFs, are entitled to be provided with rehabilitation measures sufficient to enable them to improve or at least maintain their pre-project living standards and income earning capacity. Lack of individual legal rights to the assets lost will not bar the PAP from entitlement to the rehabilitation measures listed below. Thus, both squatters and members of Scheduled Tribes using the area in question under common property arrangements qualify as PAPs.
- (b) The rehabilitation measures to be provided are (i) compensation at replacement costs for houses and other structures payable in cash without depreciation;² (ii) agricultural land for land of equal productive capacity acceptable to the PAP or, at the PAPs option, compensation in cash at full replacement cost; (iii) replacement of land for housing or shops of equal size acceptable to the PAP (displaced squatters will be provided with title to a house site and the replacement costs for their house); (iv) compensation for standing crops, fuelwood and timber trees equals the market value of the harvested crop/trees calculated as the average value for the past three years, for fruit and fodder trees it is equivalent to the market value of five years

² The replacement cost of a house, shop, well or other structure comprises the current costs of materials on site plus labor for construction of a similar structure.

production based on the average value of the preceding five years, and (v) relocation grants and subsistence allowances (see Entitlement Framework, Annex 6.2 (a)).

- (c) The replacement costs for houses and other structures (e.g. shops) will be determined by the current market price for building materials on site and for labor for the construction of a similar or improved structure. No deduction will be made in the compensation for depreciation or for building materials salvaged by the PAP from the demolished house.
- (d) Expenses such as registration fees, transfer taxes, documentary stamp tax and notarial fees will be paid by the project sponsor³ for property transfers made through land acquisition.
- (e) Unless they choose otherwise, affected persons will be resettled as close as possible to their original village/site of residence.
- (f) The resettlement transition period will be minimized to the extent possible and all compensation will be provided to the PAPs prior to the actual relocation and/or acquisition of land and assets. For each CHWTDF site the start-up date for civil works will be contingent on the prior completion of all compensation and resettlement measures.
- (g) Plans for acquisition of land and other assets and provision of rehabilitation measures will be carried out with the informed consultation of the PAPs, who will receive prior information of the rehabilitation options open to them. Institutionalized arrangements will be established to facilitate communication during the planning and implementation of resettlement, and an effective and readily understandable grievance redress process will be established.
- (h) Financial and physical resources for resettlement will be made available as and when required by the relevant project sponsor (or a counterpart government agency where agreed).
- (i) Adequate institutional arrangements including staffing (and, where required, staff training) will be established before land acquisition activities are started to ensure effective and timely design, planning, consultation, compilation of inventories of lost assets, as well as compensation measures and resettlement.
- (j) Effective and timely supervision, monitoring and evaluation of the planning and implementation of the compensation measures and resettlement will be carried out.

Surveys and Resettlement Plans

Following a land acquisition screening to establish whether the site identified for a CHWTDF is used by potential PAPs, each project sponsor will provide an inventory

³ Unless legally valid alternative arrangements have been entered into; e.g. implementation of mitigation measures by the relevant state government.

assets to be acquired and a census of PAPs for the CHWTDF site for which land acquisition is required. The inventory and census will be undertaken prior to notification and will comprise (a) baseline information on the number of people affected, the type and quantity of assets lost or damaged, and (b) the compensation and other rehabilitation entitlements for each affected person above the age of 18 years. Parallel to the inventory or shortly after this a socio-economic survey should be undertaken to (c) assess the sources and levels of income of PAPs in order to establish a base-line for income restoration, and (b) identify local leaders and spokespersons who can represent the PAPs vis-a-vis the project.

A summary compensation cum resettlement plan will be prepared for each CHWTDF site where people lose assets or livelihood as a result of land acquisition specifying (a) the process of consultation and community participation preceding the drafting of the plan, (b) the number and categories of project affected people, (c) valuation of and compensation for lost or damaged assets, (d) if required, measures in addition to compensation payments to restore incomes, (e) a detailed budget, and (f) a time-bound schedule for implementation, monitoring and evaluation. In cases where more than 150 persons are affected by land acquisition in connection with the establishment of a CHWTDF a Resettlement Action Plan (RAP) satisfactory to the Bank will be prepared by the project sponsor in accordance with this Resettlement Framework. The RAP will be furnished to the Bank for approval.⁴

Following the inventory and survey, the PAPs identified as entitled to compensation and/or other support for income restoration will be issued a identity card with their photograph. This identity card will record the assets lost and the compensation to which the PAP is entitled.

Legal Framework

There is currently no comprehensive national mandate or policy on resettlement and rehabilitation in India. A draft national policy for Rehabilitation of persons displaced as a consequence of Acquisition of Land is under discussion in the various Ministries. In order to meet the resettlement and rehabilitation requirements of World Bank's Operational Directive 4.30, projects financed under the Hazardous Waste Management Project would be required to follow compensation provisions established under the Land Acquisition Act, 1894 as amended in 1984, and project specific guidelines described in the Entitlement Framework in Annex 6.3 (a)

Implementation Arrangements

The primary responsibility for preparation and implementation of mitigation plans (viz. RAPs) rests with the respective project sponsors, while the financial intermediary (ICICI, BOB) bears the responsibility for oversight.⁵ However, in concession agreements

⁴ Where fewer than 150 persons are to be relocated, a brief plan adhering to the entitlement framework and describing the compensation for assets lost, logistical support for moving, and the relocation assistance provided may be the only requirement.

⁵ The financial intermediaries are the Industrial Credit and Investment Corporation of India (ICICI) and the Bank of Baroda (BoB).

between government counterpart agencies and the project sponsor, alternative arrangements (for example, implementation of mitigation plans by the government) might be agreed. All mandatory permit requirements and clearance in respect of a project will have to be procured by the project sponsor. The specific nature of this responsibility would vary with the type of arrangements for land acquisition and resettlement with counterpart government agencies. There are three possible scenarios:

The project sponsor purchases the required land from willing sellers with clear ownership titles. Land transfer through such regular market mechanism does not require any resultant resettlement, unless the land so purchased has encumbrances such as squatter settlements or tenants. In case the land has encumbrances, resettlement will need to be carried out by the project sponsor in accordance with the provisions detailed in the Entitlement Framework.

The counterpart government agency under a formal agreement with the project sponsor, arranges to acquire the land under local land acquisition procedures and transfer it free of all encumbrances to the project sponsor. In such cases, since mitigation measures need to be completed before transfer of land, the cost of mitigation would initially be borne by the counterpart government agency. However, the cost could be reimbursed to the government agency or could form the government equity in the project. Mitigation would still need to be carried out in accordance with the Entitlement Framework.

The counterpart government agency, under a formal agreement with the project sponsor, arranges to acquire land under the land acquisition procedures and transfer it with all encumbrances to the project sponsor. In such cases, the responsibility for mitigation will rest with the project sponsor. The agreement between the government and the project sponsor should clearly reflect the division of mitigation responsibilities.

Whatever implementation arrangements out of the above possible scenarios are agreed upon would need to be clearly enshrined in the project legal agreements.

During sub-project preparation, the financial intermediary will be responsible for providing advice and guidance to the sponsor to ensure that RAPs meet the provisions of the Resettlement Framework. The RAPs need to be reviewed and cleared by the World Bank as a condition of approval of the sub-projects.

Valuation of Assets to be Compensated

The sponsor of a particular sub-project requiring compensation to PAPs will establish a Property Valuation Committee for the valuation of assets to be acquired. Apart from resettlement staff from the sponsor, the relevant officials from the District Commissioner/District Collector's office (Land Acquisition Officer), and representatives from the stakeholder group. To ensure that valuation of land and structures is set at replacement costs, a market survey of land and property values will be undertaken to establish a baseline for valuation of the assets to be acquired. This survey will draw on information from local commercial and cooperative bank managers, professional estimators, building contractors and PAPs.

Grievance redress procedures

The Process Guidance Framework (PGF) requires the proponent to establish a stakeholder group for consultation and participation as part of the Environmental Impact Assessment Process. This stakeholder group, which will also include PAPs, and representatives from the District Commissioner's office, will provide the forum for grievance appeals of various kinds (e.g. non-inclusion in PAP lists, disagreement with compensation values, compensation delays, etc). The project sponsor is required to provide support to the stakeholder group in preparing and disseminating information in the appropriate local language, and in establishing mechanisms and conduits for consulting with the wider community. If the PAPs are not satisfied with the response from the District Commissioner, the next level of appeal would be the Secretary at the State Department of Revenue, or special bodies that are available for appeal as in the case of Tamil Nadu, or the courts.

Monitoring and Supervision

The responsibility for monitoring and supervision rests with the financial intermediary, with the assistance of the stakeholder group. The Expert Committees to be established by the participating states to review the EIA report, will be responsible for overall management of the process (Annex 6.3 (b)).

Independent external monitoring would be provided by a qualified research institute or NGO to be selected during project implementation based on the location of the respective sites. The external monitoring will provide verification of internal reporting, independent assessment of implementation and impacts, and suggestions for adjustments in delivery mechanisms and procedures, if required. To function effectively, the organization responsible for external monitoring should be independent of the project sponsor, the financial intermediaries and governmental agencies involved in the resettlement implementation. The following activities will be standard functions of the external monitors:

- I. Verification of internal reports, by field check of delivery of the following:
 - A. payment of compensation including its levels and timing
 - B. land readjustment
 - C. preparation and adequacy of resettlement sites
 - D. house construction
 - E. provision of employment, its adequacy and income levels
 - F. training
 - G. rehabilitation of vulnerable groups
 - H. infrastructure repair, relocation or replacement
 - I. enterprise relocation, compensation and its adequacy
 - J. transition allowances

Entitlement Framework

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
<p>1. Loss of land</p> <p>a. Homestead</p> <p>(i) with valid title, or customary or usufruct rights</p> <p>(ii) squatters</p> <p>b. Agricultural land</p> <p>(i) with valid title, or customary or usufruct rights</p> <p>(ii) tenants, sharecroppers, leaseholder, encroachers</p> <p>c. Commercial/ Industrial/Institutional</p> <p>(i) with valid title, or customary or usufruct rights</p> <p>(ii) tenant, leaseholder</p> <p>(iii) squatter</p>	<p>(i) Household head</p> <p>(ii) Household head</p> <p>(i) Titleholders</p> <p>(ii) Household head</p> <p>(i) Titleholder</p> <p>(ii) Unit</p> <p>(iii) Unit</p>	<p>(i) equivalent area of land subject to availability (State Govt./Voluntary sellers at existing market rate) within a radius of 25 km. or cash compensation at replacement costs as per National Draft Policy + rehabilitation assistance</p> <p>(ii) alternative site as per draft National Policy.</p> <p>(i) alternate land of equiv. production potential subject to</p> <ul style="list-style-type: none"> - agriculture based PAPs (rendered landless by project or left with landholdings that are not economically viable) - availability (State Govt./Voluntary sellers at existing rate) within a radius of 25 km. - maximum limit is land ceiling limit or cash payment as per National Draft Policy + rehabilitation assistance. <p>(ii) Depending on impact:</p> <ul style="list-style-type: none"> - if farm remains viable; compensation equivalent to two years' average production value. - if the farm is rendered un-viable; support for income restoration through alternative income generation (can include job training for employment at CHWTDF or establishment of small business. If business, and credit for establishment will be provided following training). <p>(i) cash as per National Draft Policy + rehabilitation assistance.</p> <p>(ii) equivalent leased land, reimbursement for unexpired lease, transition allowance equivalent to 6 months income</p> <p>(iii) equivalent plot and transition allowance equivalent to 6 months income</p>	Govt/ Sponsor
<p>2. Loss of structure</p> <p>a. House</p> <p>(i) with valid title, or customary or usufruct rights</p> <p>(ii) tenant, leaseholder</p> <p>(iii) squatters, pavement dwellers</p> <p>b. Commercial/ Industrial/ Institutional</p> <p>(i) with valid title, or customary or usufruct rights</p> <p>(ii) tenant, leaseholder</p> <p>(iii) squatters, pavement dwellers</p>	<p>(i) Household</p> <p>(ii) Household</p> <p>(iii) Household</p> <p>(i) Unit</p> <p>(ii) Unit</p> <p>(iii) Unit</p>	<p>(i) cash compensation as per National Draft Policy + rehabilitation assistance.</p> <p>(ii) transition allowance equivalent to 6 months rent to locate alternative residence + reimbursement for unexpired lease.</p> <p>(iii) basic dwelling unit as per government norms or cash payment for basic dwelling unit</p> <p>(i) cash compensation as per National Draft Policy + rehabilitation assistance.</p> <p>(ii) transition allowance equivalent to 6 months income + reimbursement for unexpired lease.</p> <p>(iii) basic unit as per government norms or cash payment for basic unit</p>	Govt/ Sponsor

<p>3. Loss of livelihood/trade/occupation (i) Wage employment/agriculture/commercial/ industrial/institutional</p>	<p>(i) Individual</p>	<p>(i) income restoration support by hazardous waste facilities: - training and employment with the CHWTDF where feasible. - employment in reconstructed enterprise or package for re-employment for starting a business, and transition allowance equivalent to 1 year wages in case of permanent closure and equivalent to closed time in case of temporary closure.</p>	<p>Sponsor</p>
<p>4. Loss of access to common resources and facilities (i) Rural common property resources</p>	<p>(i)HH/community</p>	<p>(i) replacement CPRs/amenities or providing minimum Government standard</p>	<p>Govt/ Sponsor</p>
<p>(ii) Urban civic amenities</p>	<p>(ii)HH/community</p>	<p>(ii) access to equivalent amenities/services</p>	
<p>5. Loss of standing crops/trees (i) With valid title (ii) Tenant/lessee (iii) Encroachers/Squatters</p>	<p>(i) Household (ii) Household (iii) Household</p>	<p>Compensation for standing crops, fuelwood and timber trees equal to the market value of the harvested crop/trees calculated as the average value for the past 3 years. Compensation for fruit and fodder trees is equal to the average market value of five years' production based on the average value of the five preceding years.</p>	<p>Sponsor</p>
<p>6. Losses during transition of displaced persons/establishments (i) Shifting/Transport (ii) Maintenance (iii) Construction</p>	<p>(i)Household/Unit (ii)Household/Unit (iii)Household/Unit</p>	<p>(i) provision of transport or cash equivalent (ii) cash payment for 3 months</p>	<p>Govt/ Sponsor</p>
<p>7. Losses to Host communities (i) Amenities/Services</p>	<p>(i) Community</p>	<p>(i) Restore losses as a result of re-settlement or amenities/services equivalent to those provided to PAPs</p>	<p>Govt/ Sponsor</p>

Generic Resettlement Performance Indicators

Activities/ dimensions	Indicators	Means of verification	Year 1/2/3/etc	
			Target	Actual
Impact				
	Incomes restored	Ext. monitoring		
	Living standards restored	Ext. monitoring		
Outputs				
Rehabilitation	Jobs/businesses/incomes provided	Int. & Ext. Monitoring		
Relocation of PAPs	Relocation completed & grants paid	Same		
Compensation	Relocation site prepared & community assets replaced	Same		
Asset acquisition	Assets acquired	Same		
Compensation	Compensation paid for assets to be acquired	Same		
Process				
Consultation and participation	Meetings held and committees formed	Same		
Capacity building	Training of PAPs	Same		
Information	Information disseminated	Same		
Inputs				
Establishment	Finance on deposit	Int. monitoring		
Establishment	Equipment available	Same		
Establishment	Qualified staff in place	Same		

Annex 6-4
Suggested Tools for Public Information and
Consultation

Suggested Tools for Public Information and Consultation

Rationale

A variety of tools are available for information dissemination and consultation offered below should be seen as a range of options. From which, the most appropriate tools can be chosen best reflecting the needs of the facility and the locality at hand. It is recommended that, in all instances, the consultation process start with the stakeholder analysis; to identify key stakeholders who will need to be involved in order to assure project success; and to plan the timing and level of intensity of their involvement.

The tools are based on the understanding that *information dissemination* will take place first followed by *consultation*. Information dissemination refers to one way communication; consultation is understood to go further, and involves two way communication/listening. This would ensure that information of the project attributes and issues are shared with the community and project affected people; and their opinions and feedback received and considered in project design.

The outline of this document is as follows:

- 1) Section 1 discusses *Stakeholder Analysis* as a preliminary necessary first step to executing a consultation process;
- 2) Section 2 describes *tools* to be used for *public information dissemination*, and approaches recommended;
- 3) Section 3 deals with *tools for social impact appraisal* to survey the potential social impact of HWM facility siting for communities in the environment of the site; and
- 4) Section 4 suggests *tools for direct consultation of potentially affected communities*.

(1) Stakeholder Analysis: a preliminary necessary step for any consultation strategy

As a basic step for initiating a consultation process, it is essential to undertake a stakeholder analysis of groups to be targeted by the public information and consultation strategy. This implies undertaking a systematic analysis of interests of each key stakeholder in the proposed project, the likely effect of the project on those interests (positive, negative, neutral), the potential influence that stakeholders can have on the success of the project, and planning of timing and level of involvement/consultation of key stakeholders.

(2) Tools for public information dissemination

The following tools for public information dissemination are suggested as ways to ensure full community awareness:

- a. use of public meetings, town meetings and hearing (which serve both the purpose of information dissemination, as well as consultation of affected groups - see below)
- b. use of media: radio, local newspapers and local television:
 - aim for newspaper articles and media programs on the technical and socio-political issues in the project;
 - it is advised to establish intensive interpersonal relations with the press.
- c. use of non-technical written materials, folders, posters and leaflets in the local language(s):
 - to be displayed at public locations, such as market places, community or town halls, police stations, public transport places, mosques, temples, etc.
- d. use of visual representations, videos, scale models (e.g. at public meetings)
- e. explore the option of organizing a study tour -- for the Proponent, local government officials, and possibly community leaders to projects of a similar nature in other localities/states, highlighting the consultation strategies used, involvement of media, NGOs and community organizations

Approaches suggested when using the tools

In using the public information tools above, the following approach is suggested:

- collaborate with environmental NGOs, press, community organizations, medical professionals and the school system, whenever possible, on the public information campaign
- work through local traditional decision making bodies and leaders, whenever possible
- the topics to be addressed in the public information campaign may include:
 - (a) how HWM is an integral part of the development process;
 - (b) how HWM disposal works, what local impacts can be expected and *which can not*;
 - (c) types of hazardous waste generated, and their impacts on health and welfare of population if incorrectly disposed of;

- (d) the role of the facility in mitigating such negative impacts;
- (e) the role of the proponent, government and WB respectively in the preparation and implementation of the project;
- (f) the process of site selection and EA, who will be involved and how the findings be will be disseminated and feedback; and
- (g) the range of feasible mitigation alternatives, if relevant (including when and how implemented).

(3) Tools for *social impact appraisal*

The socio-economic survey that normally is a part of EIAs lends itself particularly to tools for social impact appraisal. Two major tools, closely interlinked, stand out:

- a. socio-economic community profiles: these are profiles of communities in the vicinity of potential HWM sites and waste haulage roads, with a stake in the project.

The *objective* of a community profile is to document key population and land ownership uses, possible land acquisition (and resettlement) implications, proximity of site to residential, economic and socio-cultural locations, environmental sensitive zones, traffic routes and access and major drinking water sources. Often, community profiling makes use of Rapid Appraisal techniques, of which some components may be participatory, e.g. through Beneficiary Assessment techniques such as semi-structured interviews and focus group meetings, direct and participant observation and document review. Here it is recommended to explore the involvement of local NGOs and CBOs in the Appraisal.

- b. community/household opinion surveys: the *objective* obviously is to survey opinions at the household or community level on the proposed project, perceived positive and negative impacts, etc. Like in the case of community profiling, the approach is to make use of semi-structured interviews with individual households or community focus groups.

(4) Tools for *direct consultation* of potentially affected communities

A group convening the stakeholders will be the main vehicle for consultation in the EIA process and beyond by potentially affected communities and other stakeholders. In addition, there are additional means through which communities can be directly consulted.

- a. organizing *workshops* involving government officials, NGO and community representatives, local academics and professional interest group representatives:

e.g. on the scoping as well as drafting of ToR for an EIA, or the draft EIA report itself;

- b. holding *public meetings and hearings*, at which local government officials and the proponent explain the objectives of project, listen to and document community concerns, answer questions and request feedback from affected groups regarding e.g., draft ToR, draft EIA reports, mitigation plan formulation ('reality check' of options) -- public meetings generally require a strong but accommodating chair, somebody seen as more or less neutral, and able to deal with strong opinions. It is also recommended to use visual tools, such as video, photographs, slides and maps;
- c. establishing a *citizen liaison or advisory committee*, providing a two way communication between the Proponent and the community. Membership would represent a cross-section of community interests; the committee would have a certain level of access to the facility and members would be 'educated' by receiving tours around the facility as well as expert advice. The citizen committee may also be invited, among others, to play an important role in monitoring the operation of the facility once it has been constructed.

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