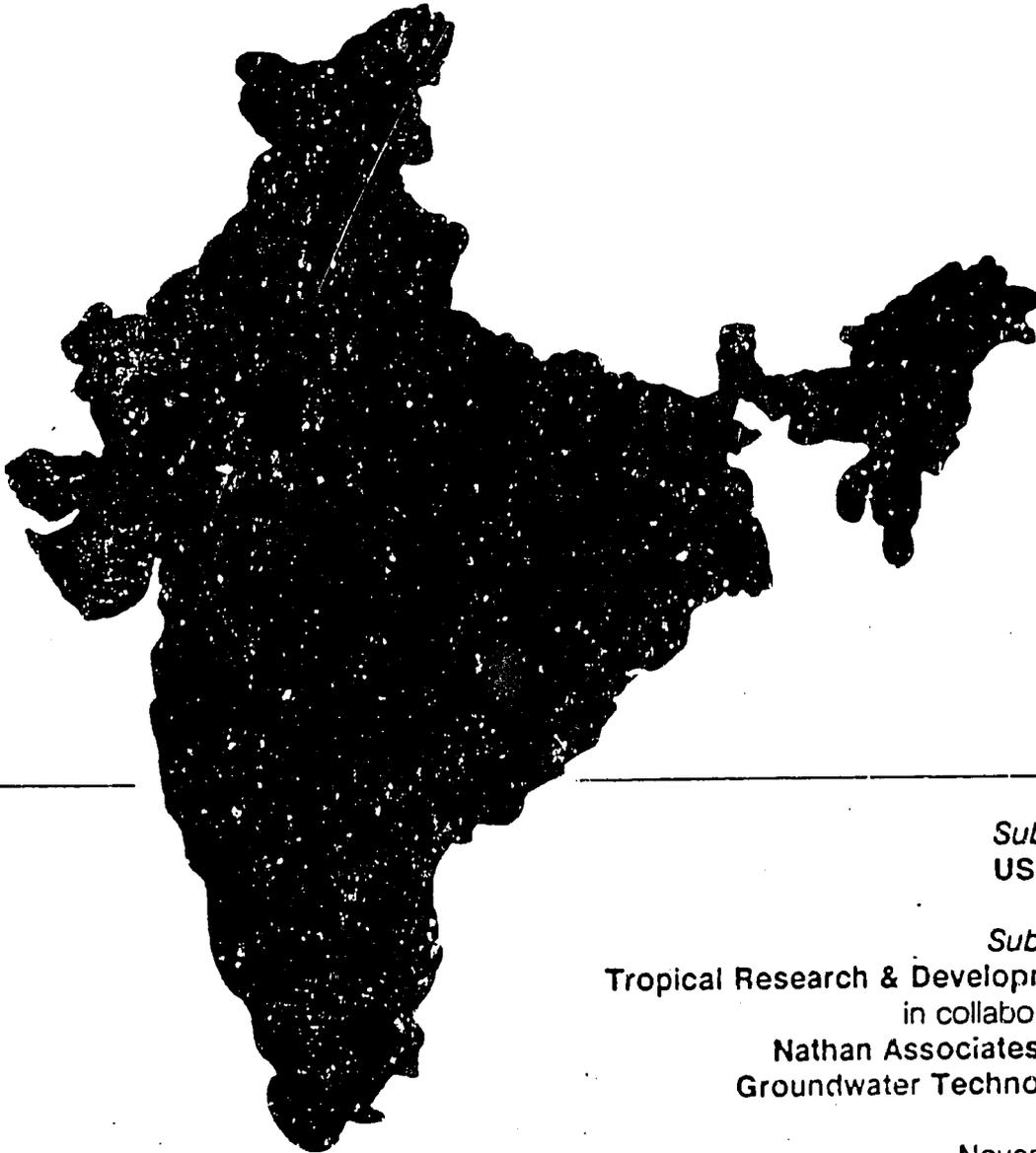


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**Market Survey of Proposed
Trade in Environmental Services and
Technology Project in India**

Final Report



Submitted to:
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Submitted by:
Tropical Research & Development, Inc.
in collaboration with
**Nathan Associates, Inc. and
Groundwater Technology, Inc.**

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ACRONYMS

3P	Pollution Prevention Pays
ACE	Agricultural Commercialization and Enterprise
A.I.D.	United States Agency for International Development, Washington
ASEAN	Association of Southeastern Asian Nations
BOD	Biological Oxygen Demand
CETP	Common Effluent Treatment Plants
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
EST	Environmental Services and Technologies
FY	Fiscal Year
FICCI	Federation of Indian Chambers of Commerce and Industry
ICICI	Industry Credit and Investment Corporation of India
IDBI	Industrial Development Bank of India
IIT	Indian Institute of Technology
IL&FSVC	Industrial Leasing & Financial Service Venture Capital
LPG	Liquified Petroleum Gas
MEK	Methyl Ethyl Ketone
MINAS	Minimum National Standards
NEERI	National Environmental Engineering Research Institute
NPC	National Productivity Council
NRI	Non-resident Indian
PACER	Program for the Acceleration of Commercial Energy Research
PACT	Program for the Advancement of Commercial Technology
PCB	Pollution Control Board
PCP	Phenochloronol
PVO	Private Voluntary Organization
QA	Quality Assurance
QBEL	Water Quality Base Effluent Limit
QC	Quality Control
Rs	Rupees
RBI	Reserve Bank of India
TBEL	Technical-Based Effluent Limit
TEST	Trade in Environmental Services and Technologies
UNDP	United Nations Development Programme
USAID	United States Agency for International Development Field Mission
WHO	World Health Organization

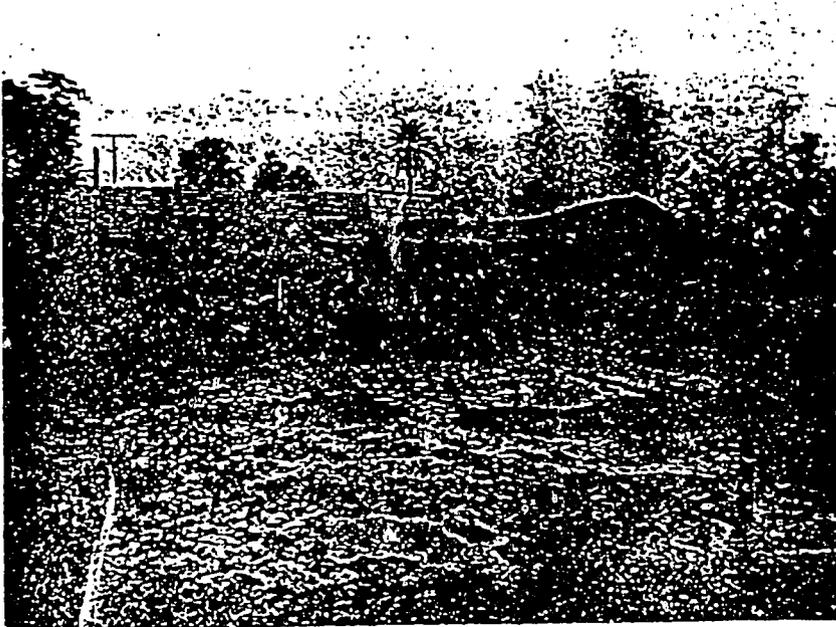
PREFACE

This study was carried out by Tropical Research & Development, Inc. under assistance from the U.S. Agency for International Development. Dr. Thomas A. Timberg, Nathan Associates, Inc., led the study team, assisted by Mr. Thomas T. Ankersen, Esq., an attorney in private practice; Mr. S.P. Chandok, Deputy Director of Pollution Control, and Mr. K. P. Nyati, Director of Pollution Control and Secretary, National Productivity Council, New Delhi; Mr. Paritosh C. Tyagi, former chairman of the Central Pollution Control Board, New Delhi; and Dr. Satya V. Yalvigi, Groundwater Technologies, Inc.

INDIA'S ENVIRONMENTAL RISKS

These photos show a tannery in the Kodugonda industrial area, one of 14 tanneries of its kind in the suburbs of Bangalore. The tannery is part of a network owned by a company that produces 50 to 60 crores (more than \$20 million) of leather garment exports a year, mostly to Germany. Some workers in the chrome unit work barefoot on floors containing spills of chromium solutions and even sulfuric acid (*right*). Effluent flows behind the tannery next to several drinking water wells (*bottom*) that, until recently, supplied water to houses that have sprung up around the tannery.

An effluent treatment plant is under construction that will receive the effluent through pipes and subject it to primary treatment before mixing it with other Bangalore city waste. Even this treatment will not make the water potable or deal with the large area with already contaminated water sources that surrounds the tannery.



The plant poses a health threat to many people who live near it, but because of tight foreign exchange, India may not be able to afford to abandon a \$20 million project. The costs of eliminating this health threat and "remediating" the contaminated groundwater produced by the plant are immense.

EXECUTIVE SUMMARY

India is facing an environmental crisis that could have serious implications not only for its own people but also for the rest of the world. India does not want to be an environmental outlaw; however, the technical and financial challenges to remedying industrial pollution alone are daunting. India needs good regulation, technological progress, and responsive industrial entrepreneurs to meet these challenges.

This report presents a market analysis of the demand for American environmental services and technologies (EST) in India, as part of the proposed Trade in Environmental Services and Technologies (TEST) project of the U.S. Agency for International Development (USAID). The purpose of the TEST project is to assist Indian private firms in acquiring EST in order to meet the country's priority environmental needs and enhance the competitiveness of its industries.

Demand for EST and resolution of the country's pollution problems depend on

1. The form and effectiveness of the regulatory system applied, including the role of private voluntary organizations (PVO) in enforcement;
2. The technological capabilities of the environmental service industry to assist industry in improving its environmental performance; and
3. The financial and commercial circumstances in which India's industries find themselves.

India's large, dense population and industrial growth have led to severe environmental strains that only recently have begun to be addressed. Industrial pollution is a major cause of environmental problems. American technologies can develop cost-effective remedies to pollution, particularly through environmental audits as a management technique leading to effective management of hazardous waste. Environmental audits are still new to India, but there is consensus that as a management tool their uses are not largely understood.

On the basis of the team's review of available literature and discussions with users and industry leaders, the present status of water and air pollution control technologies and processes in India was assessed. Improved environmental performance will ultimately enhance India's competitive edge in four ways:

1. Other countries will increasingly require imports to meet their environmental standards. To remain an exporter India may have to install pollution control devices for producing its exported products.

2. Despite lack of data, high pollution levels in India impose heavy social and economic costs, reducing the country's overall efficiency.
3. Waste minimization is an essential component of an overall technological package required to make the country more competitive. The newest generation of so-called "clean technologies" is usually financially attractive and needs to be adopted.
4. No country, including India, will tolerate high levels of pollution. If Indian industry is to continue to operate at all it may have to change its operations to be more environmentally sound in order to satisfy its own people as well as other countries.

The demands for American technology are already high, as indicated by machinery imports and joint venture activity, and are likely to grow rapidly. The present size of the pollution control market is relatively easy to estimate. Machinery purchases are estimated at US\$135 million by the Commercial Section of the U.S. Embassy, US\$6 million of which are U.S. imports.

Indications of the potential size of the Indian market given the present state of technological knowledge and regulatory system may come from various sources. One source, the Industrial Credit and Investment Corporation of India (ICICI), lists about US\$58 million of pollution control projects. This list can be used to project the credit demand from all financial institutions. Another source estimates the cost of the steps required by industrial units to bring them into compliance with present emission standards. Either source indicates the potential size of the market in several billion dollars.

Regulation and technology, however, will change. In the United States, attention to abandoned hazardous waste sites and remediation of polluted groundwater have proved the most costly elements in pollution control. In India, regulation is just beginning to address these activities. Conversely, the introduction of new technologies is equally likely to reduce as increase pollution abatement costs.

The most comprehensive environmental program will operate on three levels:

1. **The policy level**, to ensure effective enforcement of environmental regulations in order to promote demand, as well as changes to trade and investment policies that will enable private firms to conform to the regulations;
2. **The technological level**, by assisting in the creation of an environmental service industry with direct links to American private counterparts based on joint venture arrangements; and
3. **The enterprise level**, by a careful mix of promotion, provision of technical information, and limited subsidization of technologies new to India.

The team believes that a dollar facility of about US\$25 million, financed over 5 years, could be used even if the dollars and credit terms are at normal market rates. The facility may have to be subsidized, however, to encourage the introduction of new technologies. Cost sharing through matching or conditional grants is a desirable form of subsidization.

A brief introduction to the purpose of the project is given in Chapter 1. Chapter 2 provides background on India's environmental problems and on A.I.D. and other donor programs. Chapter 3 identifies specific environmental problems. In Chapter 4 the limitations of existing Indian production technologies in combatting pollution, as well as potential volumes of demand, are discussed. Problems caused by underdevelopment of India's environmental services industry are described in Chapter 5, while Chapter 6 reviews the policy and regulatory framework in India. Chapter 7 presents tentative recommendations for carrying out the proposed TEST project and improving the Indian environment.

This report also contains 11 appendixes. Appendix A is the terms of reference. A summary of the USAID program in India is given in Appendix B. Appendix C is a table explaining typical pollution control problems in industrial sectors that pollute. Appendix D lists Indian industries in terms of the seriousness of pollution problems they cause. Financial incentives and disincentives in acquiring EST are presented in Appendix E. A list of U.S. interviewees for this report is given in Appendix F. Appendix G provides a bibliography of both legal and technical references. Appendix H contains the schedule of team meetings in India. Appendix I is a list of solvent recycling suppliers. Finally, statements on trade and industrial policy are found in Appendixes J and K, respectively.

1.0 INTRODUCTION

India is facing an environmental crisis. Whether the challenge be the risk of rejection by German consumers of Indian hides treated with phenochloronol (PCP) or pressure from other countries over the depletion of the ozone layer, India does not want to be an environmental outlaw. The Indian people, like voters of most democracies, are angry about pollution. However, the technical and financial challenges of remedying industrial pollution are daunting. India needs good regulations, technological progress, and responsive industrial entrepreneurs to meet these challenges.

This report presents a market analysis of the demand for American environmental services and technologies (EST) in India, as part of the proposed Trade in Environmental Services and Technology (TEST) project by the U.S. Agency for International Development (A.I.D.). The purpose of the TEST project is to assist Indian private firms in acquiring EST in order to meet the country's priority environmental needs and enhance the competitiveness of its industries.

Improved environmental performance will ultimately enhance India's competitive edge in four ways:

1. **Other countries will increasingly require imports to meet their environmental standards.** Reports indicate that Germany may ban Indian garment and leather imports because of the use of PCP.¹ U.S. Senator David Boren (D-OK) introduced a bill in the U.S. Senate that would regard as export subsidies foreign environmental regulatory systems that fail to meet American environmental standards and impose countervailing duties half of which would be imposed on imports to the United States. Some commentators think that foreign competitors are able to unfairly avoid the costs of complying with strict environmental regulation like that of the United States, and these cost savings constitute a subsidy. To remain an exporter, India may be required to install pollution control devices for producing its exported products.
2. Although few data exist, high pollution levels in India likely impose heavy social and economic costs, thereby reducing the country's overall efficiency. The World Bank emphasizes the heavy costs imposed by labor morbidity (the level of sickness in the workforce) in developing countries (World Bank World Development Report, pp. 53-55).
3. Waste minimization, one of the most effective means of pollution control, is an essential component of an overall technological package to make the country more competitive. The newest generation of so-called "clean technologies" is usually

¹ *Financial Express*, October 18, 1991, p. 1.

more competitive. For example, a study conducted on chemical recovery systems showed that for a typical small pulp and paper mill (30 tons a day of unbleached pulp) in India, the cost of simple effluent treatment is roughly 2.8 million rupees (Rs.) a year compared with 18.8 million Rs. for chemical recovery, which will yield 33.8 million Rs. in recovered chemicals.

4. No country, including India, will tolerate high levels of pollution. If Indian industry is to continue to operate at all it may have to change its operations to be more environmentally sound in order to satisfy its own people as well as other countries.

The following chapters respond to the terms of reference (see Appendix A).

2.0 BACKGROUND

2.1 India and the Environment

With a population of 850 million inhabiting a land mass one-fifth the size of the United States, India is the world's second most populous country. Although its economy has not reached levels or achieved growth that might have been desired, India is a major industrial power and has achieved a respectable rate of industrial growth over the last decade, higher than the 3 percent growth in GNP that has characterized its modern history. This growth has occurred under highly protectionist and ultimately unsustainable circumstances. As India progressively opens its economy, by necessity it must improve its overall efficiency and competitiveness.

India's population and industrial growth have led to severe environmental strains. Indian society, business, and government have only recently begun to systematically address these strains, impelled by international events such as the 1972 United Nations Stockholm Conference on the Environment and the mishap at Bhopal in 1984 (in which more than 2,000 people were killed by poisonous gas from a pesticide factory).

In the wake of the incident at Bhopal and as part of increasing global environmental activism, a growing number of voluntary organizations have emerged that are committed to improving the environment. Private businesses, reacting partly to pressures from the voluntary organizations and partly to the enforcement of new legislation, began to install pollution control devices and realign their production to be more environmentally sound. Multinational corporations were apprehensive that their poor environmental performance might impair their competitiveness by undercutting their image or subjecting them to global sanctions by concerned consumers. However, private business response was limited because of outmoded production technologies, lack of technological knowledge in pollution control, and a lack of capital to implement the needed measures.

Under legislation in India, new and existing industrial units in many industries are required to secure licenses, report regularly, and allow periodic inspection of their methods of discharging waste into bodies of water or the atmosphere. It has been reported, however, that the state boards that enforce this legislation are overloaded, and lack of technical and organizational capacity often inhibits their response. Most affected units, particularly in small-scale enterprises, still do not comply with regulations; in fact, only 50 percent of chemical industries are estimated to comply (World Bank Staff Appraisal Report, p. 7). This general situation was confirmed by state pollution control boards (PCB) visited by the team in Andhra, Karnataka, and Maharashtra.

A more optimistic survey by the Federation of Indian Chambers of Commerce and Industry (FICCI) reports that more than 90 percent of the larger units surveyed had taken some pollution control measures. More than half of the units had appointed consultants,

installed instruments, trained personnel, and used wastewater facilities; 18 percent retained foreign consultants. Only 44 percent reported a 96 percent or greater conformity with pollution control standards. Some 40 to 55 percent reported having a recycling control system, but many fail to meet minimum legal standards.

The Center for Environmental Science and Engineering of the Indian Institute of Technology (IIT) in Bombay recently conducted a survey of industrial units in the Bombay-Gujarat-Goa area. Although the response rate was low enough to raise some questions about the accuracy of the survey, the results indicate wide-scale compliance with existing regulations. As many as 20 percent of the firms had some type of treatment for their liquid waste disposal.

Furthermore, the results show that Indian firms have not institutionalized environmental compliance through the hiring of corporate environmental managers, as is typical in large U.S. firms. The lack of in-house capability is partly compensated for by the emergence of a service industry of environmental consultants and "turnkey" pollution control equipment manufacturers. Twenty-three of 100 such service industry firms approached responded to the IIT survey, most of them small professional services firms. Almost half of the responding firms, mostly equipment manufacturers, had some foreign, often U.S., affiliation.

In a climate in which other forms of regulation (e.g., regulation of capital investment, foreign exchange use) are being rapidly dismantled worldwide, environmental regulation is an increasingly important factor in industrial decisions and often imposes its own considerable costs on the economy.

In 1989-1990, India purchased pollution control equipment costing US\$135 million, approximately US\$6 million of which was from American sources, and roughly US\$6 million was spent on consultancy in pollution control. These figures omit government expenditure, estimated at US\$10 million. Overall expenditures are increasing rapidly. Equipment imports alone are estimated to grow 16 percent a year.

2.2 Donor Programs in India

2.2.1 USAID

USAID has operated programs in India for more than 30 years, contributing billions of dollars to the country's overall development. The agency played a critical role in the country's agricultural development and achievement of grain self-sufficiency in the 1960s. After severe reductions in the early 1970s, USAID increased funding again in 1977 and continued to work especially in the agricultural development, natural resources, and health sectors. A list of current projects is contained in Appendix B.

Since the mid-1980s the program has been redirected to reflect India's successes in development. The current program focuses, among other things, on enterprise development and technology transfer in order to facilitate increased economic competitiveness and a transition to a fully self-dependent economic pattern. Several projects under way are particularly relevant to this report and parallel the activities proposed for the TEST project. The Program for the Advancement of Commercial Technology (PACT), Program for the Acceleration of Commercial Energy Research (PACER), and Agricultural Commercialization and Enterprise (ACE) projects all provide grants and credit to various institutions and firms for technology acquisition and development in their respective fields (agro-technology, energy, etc.). Loan funds, guarantees, and risk sharing are provided for private firms through the apex financial institutions servicing private sector firms such as ICI and the Industrial Development Bank of India (IDBI).

According to Indian government figures, between 1979-1980 and 1986-1987 Rs. 160 billion of foreign aid was received, including Rs. 345 million from USAID, Rs. 143 million from other U.S. bilateral sources (such as Eximbank), and Rs. 90 billion from the World Bank group. As noted in Appendix B, the USAID program should provide about US\$63 million in development assistance in 1991 and more than US\$80 million in Title II programs through CARE and Church Relief Services. Authorized development assistance funds on uncompleted projects total \$567 million, of which \$447 million were obligated through FY 1991. USAID funds provided to India are just one part of a larger stream of foreign aid, in recent years totaling more than US\$2 billion a year.

2.2.2 Other Donors

Other donors have assisted India on a wide range of projects, including those involving the environment. The World Bank, for example, recently approved an industrial pollution control project, as well as urban development projects. The industrial pollution control project will provide US\$260 million from 1992 to 1998. The World Bank group will fund US\$155.6 million, participants' equity will supply US\$62 million, and the Government of India and nationalized financial institutions will furnish the rest. The project includes funds for institutional strengthening of state and central PCBs, investment in common and individual plant treatment facilities and demonstration projects, and support for technical assistance.

The Dutch are assisting with the Clean Ganges project. The Danish Foreign Ministry (1989) recently published a report on its pollution control efforts in India. German and Japanese teams are also involved in various projects.

The purpose in mentioning other donor programs stems from the team's concern that neither time nor effort be expended in needless duplication of projects under way. Conversely, other projects define certain gaps that the TEST project might be able to help

fill. For example, the World Bank project concentrates on institutional development for the public sector as well as on provision of assistance to private sector units in controlling their effluent. The project does not, however, address assistance to a service industry to meet the technological needs of both, a need that the TEST project could fill.

3.0 ENVIRONMENTAL PROBLEMS

3.1 Major Problems

India's natural environment is seriously threatened. Particularly in urban and industrial areas, important portions of the country's water, land, and air are growing less and less usable. Mortality and morbidity increase. The intelligence and growth of children are threatened by the level of pollutants. Plant and equipment, as well as great historical monuments such as the Taj Mahal, are threatened with destruction.

The World Health Organization (WHO) reports adverse health effects when the amount of suspended particulate matter exceeds an annual average of 60 to 90 g/m³. In the early 1980s, Delhi had a level of about 400, making its particulate level the fourth highest in the world. Levels in Delhi have since climbed to between 550 and 650, and even 1,000 in areas where stone crushing is undertaken.²

The beaches of Bombay are largely unsavimmable because of dumped industrial wastes. Potable water drawn for Delhi's use from the Yamuna River is often more polluted when it reaches Delhi, because of the dumping of effluents upstream, than post-use effluent standards for Delhi industry, which industry must meet when it is finished with the water. Hundreds of square kilometers of potable water aquifer in Karnataka and Rajasthan alone are polluted and have been the subjects of major lawsuits.

The environmental problems of India can be linked to four processes: (1) pollution of water, air, and land; (2) deforestation and land degradation; (3) mismanagement of water resources; and (3) incompatible land use patterns. The team identified air and water pollution as the principal concern to the TEST project. The other problems, though significant, are already being tackled with or without international assistance and are not the focus of the proposed project.

The pollution problem is in turn due to four main causes: (1) domestic waste; (2) vehicular pollution; (3) agricultural pollution (pesticides and fertilizers); and (4) industrial pollution.

3.1.1 **Domestic Waste**

Domestic waste is estimated to account for more than 60 percent of water pollution. Handling domestic waste is normally a municipal responsibility, and Indian cities have limited resources for handling them. Even in Delhi, only 60 percent of homes are connected to sewers, and only 70 percent of sewer water is treated at all. The situation elsewhere is far worse. Much of the treatment is totally inadequate. More than half of the

²Hindustan Times, Sept. 27, 1991, p. 5.

country's cities have no sewers. There has been little discussion to date of using private contractors to handle this waste.

Innovative treatment of domestic waste is limited to efforts such as the following:

- In some cities, liquid waste or sludge after treatment is sold as agricultural manure.
- In Delhi the municipal corporation operates a plant that generates methane gas, which is piped for domestic use.
- In cities such as Bombay, where water tariffs are relatively high (18 Rs./kiloliter), there is some incentive to reprocess water for industrial use.
- Domestic solid waste is efficiently sorted by various informal sector operators, but one or more private formal sector processing operations have been proposed, such as a pelletization plant in Bangalore. Some possibilities for electricity cogeneration may also exist.
- The entrepreneurial Sulabh Shuchalaya has been promoting a large-scale private sector solution to domestic waste problems in the form of pay toilets, but does not have an obvious need for foreign technological collaboration.

Private solutions are certainly feasible but would require considerably more preparatory work than has been performed to date.

3.1.2 Vehicular Pollution

Vehicular pollution is estimated to account for more than 60 percent of urban atmospheric pollution. It is quite likely that the government or certain states will find themselves forced to take measures requiring the installation of devices such as catalytic converters or sets equipped for liquefied petroleum gas (LPG), which would be facilitated by collaboration with other firms to manufacture the required devices to install in motor vehicles to correct vehicular pollution. Even without regulatory pressure, the rising number of exports by the Indian motor vehicle industry may require some collaboration to ensure their conformity to overseas standards. Many manufacturers will collaborate on pollution control with the sources of their other technology for manufacturing motor vehicles—Maruti from Suzuki, for example. A few firms have seen their collaborations expire and might be interested in tying up with American firms.

3.1.3 Agricultural Pollution

Agricultural pollution, from fertilizer runoff and other phenomena, has not been seriously addressed. The need to meet rapidly growing food demands has resulted in

insufficient attention to the environmental impact of agricultural practices and in widespread environmental degradation and depletion through soil erosion, deforestation, drought, and desertification; loss of and deterioration in the quality of surface and groundwater; reduction in genetic diversity; waterlogging and siltation; and eutrophication caused by excessive use of fertilizers. High-technology agriculture has resulted in extensive use of chemicals in the form of pesticides and fertilizers. India uses 100,000 tons of pesticides a year, much of which contains compounds banned in countries such as the United States (Khanna and Kulkarni).

3.1.4 Industrial Pollution

Although not as serious as domestic waste and vehicular pollution, industrial pollution is more easily controlled than other types. Industrial pollution is the result of discharges of "chemically impacted" liquid, solid, and gaseous wastes, especially those classified as toxic and hazardous as distinguished from simply noxious.

The primary causes of industrial pollution are as follows:

- Prevalence of inefficient production processes and technologies that generate a large amount of waste.
- Large, unplanned industrial conglomerations that have been encroached upon by expanding residential areas severely pollute their environs.
- The existence of a large number of small-scale industries, which escape land use and environmental regulations.
- The relative weakness of regulatory organizations, in budget and skills.

The regulatory organizations must enhance their strength and increase their enforcement activity. The first World Bank industrial pollution project and the Indian government are addressing this problem. The enhanced regulatory organizations will create pressure for industries to use the new processes and technologies that will be made available through the TEST project.

3.2 Media Focus

For some years, water pollution from industrial sources was regarded as the country's principal environmental problem. Accordingly, the Water Pollution Act was passed in 1974, shortly after the 1972 United Nations Stockholm Conference on the Human Environment. Water pollution is of two types: pollution of surface waters and pollution of the subsurface aquifer through soil contamination. In 1981 the Air Pollution Act was passed, and interest in combatting air pollution grew. In both cases, interest was limited to a small number of

pollutants – in air, for example, particulate matter, carbon monoxide, nitrogen oxides, and sulfur dioxide. Only in the last 2 to 3 years, as a delayed reaction to the 1984 Bhopal disaster, has the problem of hazardous waste received the attention of the Indian government. Rules and guidelines in this emerging field of regulation were first published in 1989 and are still being framed.

3.3 Large- vs. Small-Scale Units

Environmental management and pollution control measures have primarily been directed toward larger-scale industrial units. These units are more likely than smaller units to conform to other regulations and have the greatest technical ability to respond (World Bank Appraisal Report, FICCI). Regulatory pressure and response appear to have been far greater in private sector units than in public sector units. Any serious attempt to deal with the country's environmental problems must address the large public sector as well as the small-scale private sector, which accounts for much of the country's production. Of a manufacturing employment force of roughly 26 million in 1984-1985, only 4.4 million worked in private sector plants of more than 10 employees and only 1.8 million in the public sector (*Handbook* 1989, pp. 203-206).

3.4 Primary Sectors Affected

The Indian government has identified 17 heavily polluting industrial subsectors, 14 critically polluted industrial areas and river stretches, as listed below, and critical pollutants (Appendix C).

Polluting Industrial Subsectors

Cement
Thermal power plants
Iron and steel
Fertilizer
Zinc smelters
Copper smelters
Aluminum smelters
Oil refineries
Distilleries
Pulp and paper
Pharmaceuticals
Dyes and dye intermediaries
Pesticides
Petrochemicals

Tanneries
Sugar
Basic drugs

Critically Polluted Areas

Vapi (Gujarat)	Dhanbad (Bihar)
Chembur (Maharashtra)	Gobindgarh (Punjab)
Vishakhapatnam (Andhra Pradesh)	Korba (Madhya Pradesh)
Talcher (Orissa)	Singrauli (Uttar Pradesh)
Manali (North Arcot, Tamil Nadu)	Digboi (Assam)
Udyogmandal (Kerala)	Mangalore (Karnataka)
Pali (Rajasthan)	Durgapur (West Bengal)

Many of the polluted subsectors that contain primarily large-scale units have made some progress in addressing their environmental problems. Small-scale industries tend to have particular problems because of:

1. Obsolete and wasteful technologies,
2. Lack of finance for modernization,
3. Employment of inadequately trained personnel and few training opportunities to upgrade their personnel, and
4. Lack of knowledge of technological alternatives.

Some small- and medium-scale industry sectors, including those from the list above, have special environmental problems, paralleling to some extent the industries listed above, such as the following:

Chemical processing (organic and inorganic)	Lime kilns
Dyes, pigments, and dye intermediates	Metal finishing
Textile dyeing and printing	Tanneries
Foundries using cupolas	Combustion equipment, boilers, and furnaces
Rice milling	Stone crushers
Food and fruit processing	Pulp and paper
Brick kilns	Sugar (<i>khandsari</i>)
	Pharmaceuticals

The following chapters will concentrate on these subsectors as well as on the broader sectors identified by the Indian government and listed above. Environmental problems in the 17 key sectors are given in Appendix C. Tables 1 and 2 indicate the level of compliance of selected industrial subsectors.

Table 1. Status of Water Pollution Control In Selected Subsectors

Subsector	Effluent Treatment Plant					
	Number of Industries	Meeting Standard	Under Construction or Design	Partial	Defaulter	Unit Closed
Distillery	178	8	53	101	11	2
Sugar	363	65	73	110	107	88
Pulp and paper	330	41	67	124	74	24
Fertilizer	108	57	5	8	35	3
Alkali	27	23	-	-	-	4
Manmade fibers and semisynthetics	20	-	-	4	10	-
Oil refinery	12	3	6	3	-	-

Source: Meeting proceedings, Federation of Indian Chambers of Commerce and Industry, Sept. 30, 1991.

Table 2. Status of Air Pollution Control In Selected Subsectors

Subsector	Emission Control Plant					
	Number of Industries	Meeting Standard	Under Construction or Design	Partial	Defaulter	Unit Closed
Cement	994	60	23	-	5	6
Thermal power plants	68	23	19	-	23	3
Fertilizer	108	34	4	26	41	3
Oil refinery	12	6	6	-	-	-

Source: Meeting proceedings, Federation of Indian Chambers of Commerce and Industry, Sept. 30, 1991.

To determine which industries have the most pollution potential, the Indian government has classified industries into red, orange, and green, ranging from most to least polluting (see Appendix D). The team has some reservations, based on available field studies, about this classification.

4.0 DEMAND FOR AMERICAN ENVIRONMENTAL SERVICES AND TECHNOLOGIES

4.1 Limitations of Existing Indian Environmental Services and Technologies

4.1.1 Major Limitations of Technologies and Their Causes

The limitations faced by industry in combatting its pollution problems are best illustrated in Tables 1 and 2 (Chapter 3), which show the extent of compliance with environmental regulation in various industries. Three main factors inhibit compliance: lack of enforcement, use of unclean technologies, and lack of pollution abatement technologies.

4.1.1.1 Lack of Enforcement

Enforcement is lacking because of understaffed and underfunded state PCBs in India, a problem that was addressed in the World Bank's industrial pollution control project. However, another severe constraint is the lack of knowledge of available technologies, including many for which the United States is the logical source.

There is little expertise in the field of pollution prevention. A few institutions play some role - National Productivity Council (NPC), National Environmental Engineering Research Institute (NEERI), and a small center at IIT in Bombay. Institutions such as the Central Leather Technology Research Institute in Madras have sector-specific knowledge. A nascent consulting industry contains several hundred firms, but fewer than 10 have any volume of business.

4.1.1.2 Use of Unclean Technologies

Small-scale industrial units are often marginal and lack the ability to assimilate new technology. They have neither the profits nor the access to capital to buy new process technology. Neither do they have, or have available to them, the knowledge about such processes or the ability and trained staff to implement them. These units are protected enough from competition, foreign and domestic, that they can often survive with obsolete technologies even though they may otherwise be unsustainable.

Use of obsolete technologies leads to generation of a large amount of waste, which, apart from increasing production costs, also calls for higher expenditure in "end-of-pipe" control. Typically, for example, the specific waste generation in a small dye manufacturing industry in India is 100 to 300 percent higher than that of a comparable unit in the United States.

Indian industry, in order to modernize and increase competitiveness required by the challenges of its liberalizing economy, needs to adapt "clean" technologies. Clean technologies are typically more efficient in their use of materials and energy as well as less taxing on the environment. The steps toward adoption of clean technologies or processes are process modification, recycling or reuse, equipment redesign, and product reformulation. Examples of clean technologies and their availability in India are given in Table 3.

4.1.1.3 Lack of Pollution Abatement Technologies

In some cases, commercially viable pollution control technologies are not available domestically. The pollution control industry in India cannot provide the cost-effective technological options required to meet the stipulated regulatory requirements. A certain level of capability has been achieved through commonly used conventional technologies, such as biological wastewater treatment and electrostatic precipitators; however, a wide gap must still be filled in order to effectively tackle industrial pollution control.

Indian industry lacks knowledge of, and the ability to, assimilate state-of-the-art pollution control technologies, many of which are available in the United States. However, even if industry were ready to adopt these technologies, several obstacles hinder their use:

- Certain raw materials (e.g., membranes, virgin carbon for activated carbon) and critical components and apparatus are neither locally manufactured nor easy to import.
- Limited servicing capability exists for designing, installing, and servicing such technologies. A survey conducted by one company found that of a total of 200 of a particular type of monitoring device that had been imported to India, 90 percent were out of service because of servicing and spare parts. The service industry is so accustomed to handling conventional technologies that it has difficulty handling other types. Design technologies, for example, are mechanically copied from foreign sources, and insufficient adaptation means that they are ineffective.
- Knowledge of available technologies in the international market is limited.

Table 3. Clean Technologies of Production

Industry	Process Modification	Recycle or Reuse	Status and Limitations of Technology
Pulp and paper	Removal of silica before evaporation process	In Whitewater recycling for washing of pulp	Not available
	Cooking of rice straw	In	
	Substitution of chlorine dioxide or hydrogen peroxide bleaching of pulp	In Recovery of sodium sulfide and sodium carbonate in cooking	Available but cost prohibitive for small-scale industry Not available
		Separation of lignin in bleaching process for use as adhesive agent and raw material for dyestuffs	
Textile	Use of thermal printing process for cotton cloth	Recovery of caustic soda in mercerizing	Not available
	Replacement of starch by CMC/PVA in sizing	Separate solid cotton waste to use for stuffing cushions and dolls	Available
	Countercurrent washing		Available
Tannery	Replacement of chromium salts by aluminum salts in pretanning	Use of cuttings and trimmings as raw material for leather boards	Use of drums and mixers instead of pits
	Batch washing instead of continuous washing of hides	Use of green scrappings from sawing for glue production	Available
	Use of enzymes to replace sulphate in unhairing	Use of tail and body hair for carpet industry	Available
Metal and electroplating	Countercurrent washing for rinsing	Recovery of chromium and cyanide through reverse osmosis	Technology is not fully developed because components are not available, such as specific membranes
	Use of noncyanide salts for nitriding	Recovery of noble metal through electrolysis	Technology is not fully developed because components are not available
Chlor-alkali	Ion-exchange and electrolysis for production of chlorine and caustic soda		Technology is not fully developed because components are not available
Iron and steel	Mechanical cleaning to replace acid pickling Natural electrolytic process for pickling	Use of blast furnace slag as construction material Recovery of hydrochloric acid from pickling process	Material handling and collection problems NA

(continued)

Table 3 (continued)

Industry	Process Modification	Recycle or Reuse	Status and Limitations of Technology
Fertilizer	Use of nitrophosphate process for NPK complex production	Recovery of nitric acid in ammonia fertilizer plant	NA
Chemical processing industries	Solvent recovery from vapor	Recovery of expensive solvents	NA
Painting industries	To reduce wasteful emissions	Recovery of volatile organics	NA
Audio- and videotape industry	To reduce wasteful emissions	Recovery of MEK	NA

Source: "Development of Clean Technologies," National Environmental Engineering Research Institute, Aug. 1991.

From the team's review of available literature, as well as discussions with users and industry leaders, the present status of water and air pollution control technologies and processes in India was assessed. Tables 4 and 5 present the team's findings, including the industrial sectors where these technologies could be used and the areas in which imports may be needed.

Table 4 lists the major processes for water pollution control, the "parameters" or sources of pollution to which they apply, and the industries in which such processes would be appropriate. The table also indicates the present status of process technology in India and whether imported technology, hardware, or critical software components would be suitable.

Table 5 presents a similar assessment for air pollution, for emissions discharged into the atmosphere, based on work by the National Productivity Council. Other solid wastes are not yet being addressed systematically in India.

4.1.2 Pollution Monitoring and Analysis Technologies

Monitoring instruments and control facilities are often unavailable in India, and foreign technologies are often both unknown and difficult to import. The lack of reliable monitoring facilities, both in terms of instruments and services, has resulted in a poor and often incomplete characterization of the nature and extent of pollution problems. This lack of facilities also constrains optimization of control system design. Most of the existing laboratories conduct routine tests only as required by regulatory bodies; even then the accuracy of the results is often poor. There are several reasons why monitoring technology in India is poor.

- General indifference toward process instrumentation and continued preference for manual controls, especially in the small-scale sector.
- Poor reliability and servicing of indigenously manufactured instruments and lack of standardization.
- High cost and unavailability of spare parts and specialized maintenance services for imported instruments.
- Lack of awareness or demands for quality control.
- Continued use of obsolete technology that is not amenable to monitoring and control.
- Lack of technical education of operators, especially in the small- and medium-scale sectors.

Table 4. Liquid Effluent and Sludge Treatment System Matrix

Process	Control Parameter	Industries	Present Status In India	Techno-logy	Assessment of Import Needs		Note
					Total	Hardware	
						Critical Components	
Adsorption	BOD, COD, toxic compounds, color	Dyes and intermediates, textile, paper, pharmaceutical, pesticides, fruit canning, petrochemicals, rubber chemicals, manmade fibers	Limited product range	Yes	No	-	Import of knowhow for technology of activated carbon manufacture and regeneration. Import of technology for synthetic adsorbents. Initial import of special adsorbents including activated carbon.
Air Stripping and Steam Stripping	Volatile organics	Dyes and intermediates, textile, paper, pharmaceutical, pesticides, fruit canning, petrochemicals, rubber chemicals, manmade fibers	Underdeveloped	Yes	No	Yes	Packing material such as Jaeger tripecks are needed.
Biotechnology, Conventional	BOD, COD	For all industries biodegradable and difficult to biodegrade	-	-	-	-	-
Aerobic							
General	-	-	Developed	No	No	No	-
Rotating biological contactors	-	-	Underdeveloped	Yes	No	Yes	Import of process knowhow and hardware; initial imports of disc segments only.
Diffused aeration			Limited range	Yes	No	Yes	Import of knowhow for manufacture of diffusers and initial import of porous diffusers of various materials.
Anaerobic			Developed	Yes	No	No	Import of knowhow for design of reactors, including anaerobic activated sludge, eff-shaped digesters, etc.
Advanced Microbial cultures and enzymes	BOD, COD	-	Research stage	Yes	No	Yes	Initial import of know-how and cultures and enzymes especially for recovery of single products.

(continued)

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Table 4 (continued)

Process	Control Parameter	Industries	Present Status In India	Assessment of Import Needs			Note
				Technology	Hardware		
					Total	Critical Components	
Fixed film bio-reactor package units for small industries	-	-	Under	Yes	No	Yes	Import of knowhow for design of aerobic and anaerobic reactors, such as shaft, tower, loop, upflow and down-flow, fixed film, and fluidized bed. Also initial import of critical components if necessary.
Disinfection Conventional Ozonation	Pathogens See "Ozonation and other chemical oxidation reduction processes"		Developed	No	No	No	-
Ultraviolet	Pathogens		Nil	Yes	No	Yes	Import of knowhow and critical components.
Dissolved Air Flotation	Suspended solids and oil and grease	Metal processing and finishing, petroleum refining and petrochemicals, dairy, edible oil, textile processing, dyestuff, tanneries, food and fruit processing	Limited product range	Yes	No	Yes	Import of knowhow and critical components.
Electrodialysis	Heavy metals	Metal processing and finishing, caustic soda	Nil	Yes	No	Yes	Import of knowhow and critical components, especially membranes.
Evaporation and Crystallization	Toxic organic and inorganic	Pulp and paper, distillery, metal processing and finishing, textiles, organic chemicals, and petrochemicals	Underdeveloped	Yes	No	Yes	Import of knowhow for vacuum evaporators and critical components.
Incineration (Thermal Treatment)	BOD, COD Toxic organics	Paper, distillery, tannery, pharmaceuticals, pesticides, petrochemicals, petroleum, dyestuff intermediates	Underdeveloped	Yes	No	No	Import of knowhow especially for effective combustion system

(continued)

Table 4 (continued)

Process	Control Parameter	Industries	Present Status in India	Assessment of Import Needs			Note
				Techno-logy	Hardware		
					Total	Critical Components	
Ion Exchange	Heavy metals, NH ₃ , cyanides, fluorides	Caustic soda, fertilizer, manmade fibers, rayon, pulp and paper, distillery, pharmaceuticals, metal processing and finishing, electronics, ferrous and nonferrous	Limited product range	Yes	No	No	Import of knowhow for the manufacture of macromolecular resins and selective ion exchange resins. Initial import of macromolecular resins and selective ion exchange resins.
Ozonation and Other Chemical Oxidation Reduction Processes	BOD, color, odor, refractory organics, toxic chemicals, pathogens	Iron and steel manufacturing, dyes and intermediates, pharmaceuticals, paper, pesticides	Nil	Yes	No	Yes	Import of knowhow and initial import of ozonators.
Reverse Osmosis	Dissolved inorganics	For all industries for reclamation of water	No	Yes	No	Yes	Import of knowhow and import of membranes.
Sedimentation	Suspended solids, oil, grease	-	-	-	-	-	-
Conventional Tube and plate settlers	Suspended solids, oil, grease	-	Developed Underdeveloped	No Yes	No No	No No	Import of knowhow
Sludge Handling Treatment and Disposal Handling	-	All Industries	Limited product range	Yes	No	No	Import of knowhow for the manufacture of screw pumps for high consistency sludges and air lift pumps
Treatment Thickening	-	-	Developed	No	No	No	-
Dewatering	-	-	Underdeveloped	Yes	No	Yes	Import of knowhow for manufacture of centrifuges, belt filters, and so on. Also, import of critical components.
Digestion	Organic sludge	-	Underdeveloped	Yes	-	-	Import of knowhow for reactor design as per section 2.
Composting Thermal de-watering	Organic sludge Organic and inorganic sludge	-	Developed Underdeveloped	No Yes	No No	No No	Import of knowhow

(continued)

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Table 4 (continued)

Process	Control Parameter	Industries	Present Status In India	Assessment of Import Needs			Note
				Techno-logy	Hardware		
					Total	Critical Components*	
Ultimate disposal Smelting	Organic and Inorganic sludge	-	Developed	No	No	No	-
Inclineration	Organic sludge	-	Underdeveloped	Yes	No	No	Import of knowhow
Stabilization and solidification	Toxic and hazardous sludges	-	Nil	Yes	No	No	Import of knowhow
Solvent extraction	Toxic and hazardous sludges	-	Nil	Yes	No	Yes	Import of technology
Ultrafiltration	COD, dissolved polymer and colloids	Dairy, oil refinery, wood industry, breweries, paper, paints	Underdeveloped	Yes	No	Yes	Import of knowhow and critical components, especially membranes
Control and Monitoring	Various parameters	All Industries	Limited range	Yes	No	Yes	Import of knowhow for instruments for continuous monitoring and sampling systems, specific ion electrodes, flow measurement and recording. Also, import of critical components and initial import of instruments.

Note: Dashes indicate not applicable.

- * Refers to the actual fabrication of treatment units. Indian industries can develop this if process design drawings and specifications are provided.
- Include specialized materials as well as fabricated components.

Source: "Report on Identification of Import Component of Waste Treatment Technology and Knowhow," prepared for the Central Pollution Control Board by committee chaired by Dr. D. Kantawala.

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Table 5. Air Pollution Control Matrix

Process	Control Parameter	Industries	Present Status in India	Assessment of Import Needs			Note
				Techno-logy	Hardware		
					Total	Critical Components	
Mechanical	Particulate matter in small and medium industries	Boilers, dryers, kilns	Developed	Partial	No	Yes	Import of knowhow for high-efficiency systems and for some components required
Bag filters	Particulate matter and some gases by dry scrubbers	Cement, boilers, chemical, flour mills	Underdeveloped	Partial	No	Yes	Bag material available in limited range. Lacunae in components.
Scrubbers	Particulates, gases	Glass, ceramic cupolas, foundries, cement, rayons, mining, quarrying, steel	Underdeveloped	Yes	Yes	Yes	Specialty material not available. Present availability only in simple types. Lacunae in adsorption and absorption type scrubbers.
Electrostatic precipitators (ESP)	Particulates, limited gases	Power boilers, kilns, dryers, coal mills, coolers, pulp and papers, chemical	Developed	Partial	No	Yes	Hot and wet ESPs need to be developed
Incinerators	Particulates	Distilleries	Very limited	Yes	Yes	Yes	Infancy stage in India

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4.1.3 Major Areas of Limitation

Indian industry, service organizations, and regulatory agencies are especially limited in three technical areas: hazardous waste management, groundwater remediation, and advanced common effluent treatment plant technology. These are all areas in which the United States has a tremendous comparative advantage because of the expertise developed in enforcing Superfund-related provisions.

4.1.3.1 Hazardous Waste Management

Indian industry, regulatory bodies, and professionals have all expressed great interest in American EST as means to remedy hazardous waste management. Despite recent legislation by the Indian government (see Chapter 6), little practical guidance is available. Nonetheless, problems exist and need to be confronted.

The first problem is the definition of hazardous waste. The government has prepared only a brief list of critical pollutants. These pollutants are often discharged into the atmosphere or water untreated or dumped around factories. The resulting land and water contamination is already a major environmental problem. Even the largest and most sophisticated plants provide hardly any protective equipment to their employees who handle these materials. The team observed barefoot workers exposed to sulfuric acid and chromium-bearing effluents. To combat these conditions, three major categories of assistance are needed that could be provided by U.S. environmental services firms:

1. Training of workers and management in handling hazardous materials,
2. Technology for the safe handling and management of such materials, and
3. Treatment and disposal technologies.

4.1.3.2 Groundwater Remediation

Lack of adequate pollution control and uncontrolled dumping of hazardous wastes have led to deterioration of valuable groundwater resources. In some cases, people continue to use polluted water without realizing its impact on their health. In other cases, use of water was stopped and emergency measures were taken. In one lawsuit before the Supreme Court, it is contended that 200 km² of potable groundwater aquifer was contaminated by a small cluster of chemical industries.

Despite widespread awareness of the problem, little is being done to remedy it. Two of the three state PCBs (Andhra Pradesh and Karnataka) with whom the team met expressed urgent interest in technologies in groundwater remediation. The lack of expertise extends even to the characterization of the problem and the delineation of its

extent. Similar opportunities to those noted for hazardous waste management clearly exist for environmental service organizations with the requisite technology.

4.1.3.3 Common Effluent Treatment Plants

Since 1989 the Government of India has vigorously promoted development of common effluent treatment plants (CETP), particularly to address the pollution problems posed by large clusters of small-scale enterprises. Table 6 lists the plants suggested for funding under a World Bank program, totaling more than US\$50 million. Most of the proposed units plan to use conventional technologies such as neutralization, aerobic bioreactions, and clarification, followed by extended aeration for liquid effluents and incineration for solid and other hazardous wastes. No treatment or disposal is proposed for sludge and residue generation from the liquid effluent that is applied to land or dumped. The ultimate effluent is often released in primary or secondary treated form into surface water bodies.

The proposed treatments may produce no appreciable reduction in chemical oxygen demand (COD) levels; this is the case with the two operating units observed by the team. Typically the effluent is very concentrated, contains "mother liquor," and is not pretreated. Although incineration will completely destroy materials, the resulting gaseous emissions may contain toxic substances. Ash and other residues also contain highly toxic chemicals. Even the most prominent incinerator manufacturer and installation company admits that a severe technology gap exists in the safe handling of toxic ash.

Great care must be taken in the design and implementation of CETPs in order to prevent them too from becoming one of the country's most heavily polluting industries. Needed assistance to the plants includes

- Collaboration on instituting good materials handling practices;
- Provision of technology to segregate and recover valuable solvents that would considerably reduce treatment costs;
- Provision of library, laboratory, workshop, and training facilities to meet the technical services needs of the participating units;
- Affiliation of fire stations and health units with the CETP.

These technological problems are likely to be exacerbated by the characteristic complications of managing joint facilities, where responsibility is shared, and a strong parastatal element is present. Numerous industrialists expressed anxiety to the team about these complications. Government and regulators are monitoring the situation closely.

Table 6. CETP Proposals

State	Total Cost (lakh ^a)	Name of Proposal
Andhra Pradesh	507	Collection, Treatment, and Disposal of Industrial Wastewaters at Pattacheru, A.P.
	600	CETP for Pashaayaram, A.P.
	200	CETP for Mallapur, A.P.
	300	CETP for Nacharam Industrial Area
	108	CETP for Pyranagar, Medak, A.P.
	300	CETP for Bollaram, A.P.
	250	CETP for Jeedimetla Run by JETL
Total	2,157	
Delhi	200	CETP at Wazirabad
	Total	200
Gujarat	395	Treatment of Combined Wastewater of Ankleshwar Estate
	600	CETP at Ankleshwar
	600	Combined Wastewater Treatment Plant for Vapi Industrial Estate
	969	CETP at Sachin
	1,615	CETP at Sarigaor
	1,292	CETP at Panoli
485	Pandesara CETP	
Total	5,550	
Karnataka	122	CETP for Cluster of Tanneries at Kadungondana, Bangalore
	Total	122
Madhya	140	CETP at Industrial Area, Urla, Shanpuri Pradesh, Raipur, M.P.
	117	CETP at Industrial Area, Govindpur, M.P.
	70	CETP at Pologround, Indore, M.P.
	76	CETP at Industrial Area, Maharajur, Gwalior
	Total	403
Maharashtra	188	CETP at Trans-Thane Creek Area
	400	CETP at Tarapur
	33.65	CETP at Jaisingpur
	1,100	CETP at Dombivili
Total	1,633.65	
Punjab	63	CETP for Cluster of Dyeing Industries in Textile Colony Industrial Area at Ludhiana
	278	CETP for Cluster of Textile of Mills at Satala Road, Amritsar
	183	CETP for Cluster of Dyeing Industries along Nachin Road and Buddha Nallar, Ludhiana City
	32	CETP for Cluster of Electroplating Industries along Gill Road, Ludhiana
	Total	475
Tamil Nadu	335	CETP for Cluster of Tanneries at Pannal and Pallawara
	335	CETP for Cluster of Tanneries at Erode
	1,132	CETP for Dyeing Units at Karur, Tiruppur, Periyasaru, Erode, and Bhavani
Total	2,165	
Uttar Pradesh	28	CETP Schemas for Leather Complex, U.P.
	60	CETP for Industrial Area, Mathura
	43	CETP for Ram Nagar Industrial Estates, Varanasi
	38	Dyeing and Printing Industries, Farukabad
	Total	169
Grand total	12,752.65	

Note: Proposals listed have been approved for financial assistance by the Ministry of Environment and Forests.
^a 1 lakh = 100,000 Rs.

4.2 Sectors and Potential Volumes

4.2.1 Overall Volume and Costs

The present size of the pollution control market is relatively easy to estimate. Machinery purchases are estimated at US\$135 million by the Commercial Section of the U.S. Embassy, US\$6 million of which are U.S. source imports. A considerable amount of the remaining purchases are produced by U.S. joint ventures (see Tables 7 and 8 and Exhibit 1). The consultancy and testing market appears to be about US\$6 million, as estimated by one large firm. On that basis, the value of construction associated with pollution control, including some machinery, can be estimated at US\$60 million, given that the norm for consultancy is set at about 10 percent of project size.³

IL and FSVC	<ol style="list-style-type: none">1. Liquefied petroleum gas (LPG) kits that will permit motor vehicles to use both gasoline and natural gas. Estimated US\$2 million.2. Service collaboration with Chicago-based Wheeling Company. Estimated US\$5 million.3. Catalytic converter. Estimated US\$10 million, US\$3.3 million foreign exchange.
Thermax	Zum (Alabama)
RPG	<ol style="list-style-type: none">1. Wastewater treatment center near Bombay, Lansing. US\$20 million project, with possible need for US\$2 million foreign exchange.2. Service representative in United States seeking collaboration. Estimated 50 crores turnover.
Kirloskar	Discussing tie-in with CDM

Exhibit 1. Potential American Joint Ventures in Pollution Control

³How much of this is real is often difficult to determine. Government rules usually limit consultancy in construction contracts to 10 percent for public sector units. This percentage is also the norm for income-tax authorities, to which private units tend to conform. Consultants are often the contractors who implement the projects, so they may sometimes receive payment indirectly or in cash to avoid taxes.

Table 7. Status of Waste and Wastewater Treatment Equipment Manufacturers

Company	Product	Production Turnover	Collaboration	Expansion Technologies
Voltas Ltd., Bombay	Treatment plants	1,200 units/yr	20 percent previously with Amescrosta, U.K. 10 percent none	-
Hydraulics General Engineering Ltd., Bombay	Aerators (3-50 hp); clarifiers (55 mm); mechanical screens; digesters	NA	10 percent none	-
Pennwalt India	Chlorination plant	7 crores	20 percent	Ultraviolet technologies; ozonizers
Purva Water Treatment Systems	Softener (100 l/hr); D.M. plants; filters; dosers	0.60 crores	15 percent none	-
Imal Industries	Softener; filters; activated carbon filters; ultraviolet disinfection	0.50 crores	15 percent none	-
The Acme Industries, Bombay	Aerators; clarifiers; clariflocculators; agitators	0.80 crores	None	-
Hindustan Dorr Oliver, Bombay	Treatment plants; R.O. membranes; sludge dryers; high-rate clarifiers	10 crores	10 percent Dorr Oliver USA	-
IAC India Ltd.	D.M. plants; filters; dealkalyners	25 crores	15 percent previously with M/s Steinnuer, Germany 10 percent Paques Technology, Netherlands 10 percent	Further sophistication; automated systems
Western-Paques India	Wastewater treatment technology (UASB)	NA	10 percent Paques Technology, Netherlands	-
Samsuk Industries, Bombay	Under bed nozzles; resin traps for water treatment plants; microbubbler for aeration plants of effluent treatment plants	0.20 crores	10 percent	-
Star Industries and Textile Enterprises	Ultraviolet systems	1 crore	100 percent Ultra Dynamics Corporation, USA	Technology used is latest
Millipore (India) Pvt. Ltd.	R.O. systems; micro-porous filtration equipment; ultraviolet filtration equipment	0.15 crores	20 percent Millipore Intertech USA	Energy-saving membrane technology
Aquatreat Engineering Co. Pvt. Ltd., Bombay	R.O. desalination plants; aerators; softeners; D.M. plants; clariflocculators	0.60 crores	20 percent none	Indigenous membranes
Driplex Water Engineering, New Delhi	Ion exchange resins; R.O. membranes; filtration; chlorination equipment; aerators; gas digesters; plants for industrial waste treatment	8 crores	20 percent on project-to-project basis: Envirotech USA; B.S. Water, Holland; B.T. Water, U.K., for process knowhow	-
Dewan Kraft Systems Pvt. Ltd., Delhi	Tunnel reactor; fine bubble diffuser; UASB anaerobic reactor; flotation technology	NA	Advance Env. Control, Denmark; Bav Analagen, Germany (for technical advice only)	-

Table 7 (continued)

Company	Product	Production Turnover	Collaboration	Expansion Technologies
Geo. Miller & Co., Pvt. Ltd., New Delhi	Water treatment plants; sewage treatment plants; effluent treatment plants	8 crores	25 percent DHV Consulting Engineers, Netherlands	
The Trivent Engineering Works, New Delhi	Screening unit; sedimentation unit; grit removal unit; fluidized bed reactor; aeration systems; belt filter press; digestors; flocculators; gravity filter	4.5 crores	20 percent Envirex Inc. USA	Depending on extent of modernization and industrialization
Aqua Mech. Pvt. Ltd., Madras	Water and wastewater treatment plants	0.35 crores	-	-
Beardseil Satec Ltd., Bombay	Aerators; clarifier central drive and peripheral drive; clariflocculators	NA	Satec Ltd. U.K.	-
Inteca Colloids Pvt. Ltd., New Delhi	Water treatment plants	0.34 crores	Fluid Dynamics International Ltd., U.K.	-
Biotach Envirocare Systems Pvt. Ltd.	Equipment for wastewater treatment	-	-	-
Ion Exchange India Ltd.	Sedimentation tank; scraped clarifier; lamella clarifier; reactor clarifier; multidirectional flow clarifier; different types of filters; membrane filtration systems; water softeners	-	Graver Water International U.K.; Axel Johnson Engineering AB, Sweden	-
Thermax Ltd.	Water softeners and demineralizers; generators and degassers; electro-dialysis units; R.O. membranes; ion exchange resins	-	U.O.P. Fluid Systems USA	-
Kilin Plants & Equipments Ltd.	Gravity sand filters; screening equipment; oil skimmers	-	M/S OCS, Italy	-

Source: "Technology Status Report on Water Effluent Treatment Plants in India," prepared for Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India, n.d.

Table 8. Status of Manufacturers of Air Pollution Control Equipment

Indian Firm	Collaborator	Manufactured Items
Rathi Industrial Equipment Co. Pvt. Ltd., Poona	Apparatebau Rothemuhle, West Germany Micropole Duncan Ltd., U.K. Duncan Co. Inc., USA	Multicell dust collectors Fabric filters Cyclones, wet scrubbers, and odor control
Air Conditioning Corporation Ltd.	Ventilatorenfabrik Oelde GmbH, West Germany	Cyclones, filters, and fabric filters
Andrew Yule & Co. Ltd., Calcutta	DCE Group Ltd., U.K. Peabody Sturtevant Ltd., U.K. B.J. Deveaux Co. Ltd., U.K. Machien Fabrik Bathe, West Germany	Cyclones, filters, and fabric filters Cyclones, scrubbers, bag filters Wet suppression dust control products, plants, and systems Bag filters, filters with shaking mechanism, filters, wet/dry electrostatic precipitators, fan, cyclones, separators, and pneumatic control plants
Orient Paper & Inc. Ltd., Calcutta	Lodge Cottrell Ltd., U.K.	Electrostatic precipitators, gas filling and conditioning towers
GEC of India	American Air Filter International, S.A., Switzerland	Electrostatic precipitators
Hindustan Development Ltd., Calcutta	James Howden & Co. Ltd., U.K. C.E. Air Preheater, USA United McGill Corporation, USA	Industrial fans and dust collectors Bag filters and air preheaters Electrostatic precipitators
Flakt India Ltd., Calcutta	Flakt AB, Sweden	Electrostatic precipitators, fabric filters, other air treatment, air pollution control equipment (scrubbers, wet separators, etc.)
Voltas Ltd.	Bombay Research Cottrell, Inc., USA	Electrostatic precipitators; scrubbers, including mist eliminators and bag houses
Acc-Babcock Ltd. Bharat Heavy Electricals, Ranipet	Bombay Lurg-um-Weldt, West Germany Flakt Industries, Sweden C.E. Air Preheater, USA	Electrostatic precipitators Electrostatic precipitators, air preheaters
Battiboi & Co. Pvt. Ltd.	Peabody Holmes, London Whealaborator Air Pollution Control Systems, USA	Cyclones and multicyclones, bag house filters and scrubbers, fabric filters, electrostatic precipitators, flue gas scrubbers, and mechanical collectors
Thermax Ltd., Pune	Zum Industries, USA General Electric Environmental	Dust collectors, bag filters and scrubbers Bag filters and electrostatic precipitators
Paramount Pollution Control Pvt. Ltd., Baroda	Anderson 2000 Inc., USA	Cyclone separators, dry/wet scrubbers, high-efficiency filters, odor control system, sound control system
Structural & Machineries (Bokaro) Ltd. Bokaro, Steel City	Oshitari Laboratory Inc., Japan	Clean room equipment, for example, various types of air filters, air showers, and clean benches
IAEC India Ltd., Bhandup, Bombay	Intensive Filter GmbH & Co. KG, West Germany	Dedusting equipment, specifically, fabric filters

(continued)

Table 8 (continued)

Indian Firm	Collaborator	Manufactured Items
Kinetic Technology India Ltd., New Delhi	Apparatebau Rothermuhle, West Germany	Regenerative air preheater fans, electrostatic precipitators
Andhra Pradesh Heavy Machinery & Engineering Ltd., Vijayawada	Environmental Elements Corporation, USA	Air pollution control equipment, specifically, electrostatic precipitators, bag filters, and cyclones
Madras Industrial Linings Ltd., Madras	Environmental Corporation, USA	Scrubbers, cyclones, air washers, gas absorption and desorption towers and dehumidifiers, odor control equipment
Bharat Steel Tubes Ltd., New Delhi	Air Industrie Environment, France	Air pollution control equipment and systems
Primatex Machinery Pvt. Ltd., Bombay	Gesellschaft für Entstaubungstechnik AG, Switzerland	Fabric filter plants
Indabratx Ltd., Bombay	Wheelabrator Fry, Inc., USA	Mechanical collectors and fabric bag filters
Otto India Ltd. F. Harley & Co.	Manesman Demag, West Germany Dust Suppression International Ltd., U.K.	Gas cleaning and recovery systems Bag filters, scrubbers, cyclones, and fans
Hindustan Sheet Metal Ltd.	Otto Keller GmbH, West Germany	Humanized work stations, bag filters, cyclones, and Venturi scrubbers

Source: "Status Report on Air Pollution Control Equipment Industry," October 1991. Prepared by Directorate General of Technical Development, Ministry of Industry, Government of India, in cooperation with Confederation of Engineering Industry.

Indications of the size of the potential market, given the present state of knowledge and enforcement in the Indian market, may come from various sources. One source, the Industrial Credit and Investment Corporation of India (ICICI), reports a pipeline of US\$58 million of pollution control projects. (See Table 9.) ICICI accounts for roughly 10 percent of the disbursement of loans by financial institutions; on this basis, the total size of Indian loan demand for industrial pollution control projects might be estimated at US\$600 million. (It should be noted that this is a stock, a one-time figure, that will be incurred over several years.) However, while the ICICI portfolio may focus more on pollution control than that of other financial institutions, these loan demand figures exclude the considerable project finance by commercial banks, especially to small units, and self-financing, which in pollution control is particularly important to multinational companies.

Table 9. ICICI Pipeline

Industry	Project Cost		Likely Loan Amounts	
	Crores	\$US millions	Crores	\$US millions
Distilleries	102	39	61.2	24
Pulp and paper	95	37	67	22
Power	18	7	9	3.5
Dyes and dye intermediates	16.5	6	10	4
Others	28.75	11	13.78	5
Total	260.25	100	150.48	56.50

Another source is the estimates of the cost of the measures required to achieve compliance by industrial units with present emission standards, given the present state of regulation and knowledge of technology. One report prepared for the World Bank estimated a cost of US\$220 million (550 crores or Rs. 5.5 billion) for pesticides industry in four states alone, and a national figure of about US\$400million.⁴ The pesticide industry is small, but if it is typical of the more than 10 sectors studied, the market is potentially worth US\$4 billion. More accurate figures may be forthcoming as other World Bank reports become available. U.S. sources estimate that the American pollution control industry has annual sales of more than \$100 billion (see Tables 7 and 8 and Exhibit 1).

In the United States, attention to "abandoned hazardous waste sites" and remediation of polluted groundwater have proved the most costly elements in pollution

⁴The team was unable to consult similar reports prepared for the World Bank that are reportedly scheduled to be published shortly by the IDBI.

control. Hazardous waste consultancy alone is a \$2 billion market in the United States. Conversely, the introduction of new production technologies is at least as likely to reduce as increase pollution abatement costs.

4.2.2 Effective Demand for American Environmental Services Technologies

Within the larger demand, it is difficult to determine how much is for specifically American services. Exhibit 1 lists the potential American joint ventures of which the team was informed during the Mission. As indicated earlier, the United States is the preferred source of many of the most desired technologies in hazardous waste handling and groundwater treatment. There was consensus among interviewees about the superior techniques for conducting environmental audits available in the United States. There was also the usual apprehension about the cost of American services, which are significantly higher than domestic technology and services.

The costs of acquiring these technologies are hard to determine before specific negotiations take place. One price list for solvent technologies is given in Table 10. Partial price data are included in Exhibit 1.

4.2.3 Needs for Subsidy and Policy Support

The preceding section indicated a large number of sectors with demands for new technology, including several in which American technology is either clearly available or could be available. In a few cases, American technology vendors will not want to sell or the price may be noncompetitive. In other cases, American technology will require extensive adaptation to Indian conditions. In yet others, even the cheapest available technology may be difficult for India to afford. This may well be the case, for example, for cleaning extensive areas with polluted aquifers.

Purchasers will be more willing to buy American services and technologies if they are subsidized. However, as indicated, a considerable volume (US\$6 million of machinery, plus joint venture involvement) is already being purchased, and considerable subsidies are already extended by the Government of India to purchasers of environmental goods and services, mostly indirectly through public-sector-owned financial institutions (see Appendix E). The ceilings on the amounts of money provided in some cases more or less ensures that the government will not underwrite the purchase of foreign services. Several respondents indicated that foreign exchange was difficult to secure for such purchase of foreign services. As will be seen later, it is unclear whether liberalization under the New Economic Policy will include the environmental service sector.

In addition, there was some opinion that subsidies might be desirable to encourage new, high-potential types of technology, such as environmental audits. Initial subsidies like those provided for the United Nations Development Programme (UNDP) for energy audits might be appropriate in order to complement the present government subsidy for the rupee costs of such audits. Such subsidies would also play a promotional role for other environmental technology and products. Conditional grants could also encourage American firms decide to meet with Indian firms to test markets about which they are unsure, as indicated in the next section.

The three problem areas identified earlier—hazardous waste management, restoration of contaminated groundwater, and reclamation of abandoned or active hazardous waste dump sites—are the major ones in which American technology may have some advantage. Hazardous waste dump sites might be affected by the new Public Liability Act, which will force their cleanup and thus a search for appropriate, including American, technology. In all cases, the role of government policy enforcement is more important than subsidy. Government will play a critical role, both as a regulator forcing enterprises to search for technology and as a purchaser paying for needed technology.

Although optimism is high over the demand for American technology, any TEST project will be conditional on continuing government policy commitments to enforcement of environmental legislation. Only when those commitments are in place will it be possible to judge the overall size of markets in these three areas. These commitments would be for increased enforcement and measures to facilitate and encourage units and financial institutions to support the kind of hazardous waste treatment, groundwater treatment, and environmental audit required. In some cases, the government itself or public sector enterprises will be expected to be the prime customers.

4.3 Potential American Supply Response

4.3.1 Size and Shape of the American Industry

The United States was one of the first nations to attempt imposition of regulations to prevent pollution. Its regulations have become an international standard followed by the rest of the world. The pollution control industry is, observers agree, "regulation driven." Its growth is a direct function of the severity of the regulations and their enforcement, to such a degree that some slowing down of pollution enforcement in the early 1980s had immediate and negative effects on both the size of the industry and its international competitiveness (Schwartz et al.).

Pollution control is a relatively "unorganized" industry because of its representation by a large number of competing and poorly coordinated organizations. Sales are estimated to total US\$100 billion a year. The firms that handle each type of problem, for example, solid waste or water pollution, are different. More important, though, they are organized into separate and largely noncommunicating trade associations.

In addition, pollution control is primarily focused on a domestic market, reflecting both the rapid growth of a market with which it is very familiar and the development of a large portion of its technology in response to specifically U.S. regulatory and commercial pressures. This domestic orientation affects many of the firms' orientation and ability to compete in international markets. Most of the firms have a vague desire to tap overseas markets, especially in Europe and Eastern Europe, but have little idea of how to proceed.

Nonetheless, it is agreed that American ESTs are generally superior, and many of the larger firms in the industry have licensed or otherwise arranged to make their technology available abroad. One important subsector, larger engineering firms, has considerable international experience outside the environmental market. The firms bid actively on multilaterally funded overseas projects, but even the large firms surveyed are quite apprehensive about the prospects for profitable business in developing countries generally. A list of U.S. interviewees is given in Appendix F.

Other countries with technical specialties in EST compete vigorously with the United States or are rapidly overcoming its lead, and the United States certainly buys a considerable amount of foreign technology (Elkington and Shopley 1989). As part of a pattern observable in other industries and a legacy from the more inward-looking history of U.S. business, many firms still conduct their international marketing through European affiliates, particularly in the developing countries that were formerly European colonies.

4.3.2 Strategies of U.S. Environmental Services Firms

The U.S. environmental services industry has further progress to make in both developing appropriate technologies for current domestic problems and cleaning up so-called "abandoned hazardous waste sites." However, there is growing awareness of and interest in overseas opportunities, along with a lack of orientation to overseas markets and considerable apprehension, especially about Third World markets. The U.S. pollution control industry is generally recognized to have salable technologies, which have not been fully marketed (Elkington and Shopley 1989). Recent articles have highlighted the industry's interest in both western and eastern European markets, which has been becoming more active and is largely based on developing joint ventures with partners who know these markets (see bibliography in Appendix G). It is perhaps indicative that no articles were found on Third World markets in general or Indian markets in particular.

Nevertheless, awareness of U.S. technological potential has led to a concerted effort to market U.S. technology with a broader international approach to environmental problems through, for example, U.S. government-sponsored task forces and studies. A National Academy of Sciences study has been completed (Elkington and Shopley 1989), and several USAID projects are under way. An amendment was attached to a recent A.I.D. authorization bill to mandate US\$750 million in funds for U.S. contributions to capital projects, including environmental projects. A bill was introduced to impose compensatory duties on imports whose production fails to meet U.S. environmental standards and contribute half the proceeds to U.S.A.I.D. for distribution to developing countries to purchase U.S. pollution control equipment. The other half would be distributed by the Environmental Protection Agency to support U.S. research and development in the development of pollution control technology. A coalition of 85 U.S. universities and 35 trade associations has been formed and is attempting to secure government funding for environmental project promotion; it was recently granted an A.I.D. project for such promotion in Eastern Europe (see Appendix H). The U.S.-ASEAN Council for Business and Technology recently sponsored a trade mission for environmental services.

4.3.3 Advantages of U.S. Environmental Services and Technologies In Serving Indian Needs

As indicated elsewhere in this report, there are a number of areas, such as hazardous waste management, groundwater remediation, clean process technologies, and environmental audit, in which U.S. firms have technologies especially desired by Indian firms. At the same time, U.S. firms have already launched one or another variety of joint ventures in India, mostly, as indicated in Tables 7 and 8 and Exhibit 1, in apparatus manufacturing but also in service provisions.

4.3.4 Interest of U.S. Environmental Services Firms In Serving Indian Markets

Almost all of the 15 or so firms contacted (see Appendix F) indicated some interest in serving Indian markets, and several were already serving them. None of the firms indicated anxiety about intellectual property rights. Some businessmen, however, expressed anxiety that Indian partners would learn from them and become potent competitors in third markets. Some preferred wholly owned subsidiaries or other mechanisms as a way to prevent the "leaking" of their knowhow. Most had anxieties about recovering the money they would invest in India—because of currency control and restrictions on the remittance of profits and limits on royalties. The conditions offered were in several cases not as favorable as the firms generally expected.

This situation may change both as the new liberalized policies take effect and as U.S. businessmen become more familiar with the Indian market. Many believed that the

Government of India was hostile to their involvement in the Indian market. One businessman was told by high-ranking Indian officials. However, businessmen were interested in the prospects that could result from liberalization.

All the interviewees appeared to be quite enthusiastic about A.I.D. projects in India and thought that even a facility that permitted rupee purchase might be useful. Most were reluctant to invest heavily now in what they perceive to be high-risk business promotion in India but for precisely that reason were interested in conditional grants. Several indicated that the right kind of A.I.D. project would influence them to change their present stance.

The U.S. firms frequently believed that India was a low-return market, that is, low volume and low profitability, especially in repatriable profits. A number of the joint ventures appear to be operating unsatisfactorily from one viewpoint or another. One firm said that the terms of its joint venture were so disadvantageous that it "would not negotiate them again when they came up."

The complaints and apprehensions about profitability were different from those by U.S. firms in other technical areas interested in the Indian market. Although most of the other firms are reluctant to commit equity, they often believe that they receive a good overall return on their sale of technology to India and are well positioned to exploit the large Indian market if it opens up.

Besides the general issue of profitability, U.S. firms often had difficulties with current agency arrangements. Many of the firms were represented by Indian agents that Indian consumers sometimes found unsatisfactory because of the lack of a direct link to the United States. The agents were perceived as unfamiliar with the goods they sold and unable to service them. The team found a number of technologies with considerable potential not being vigorously promoted by agents, who often handled a large number of similar agencies among which they distributed their attention, as well as competitive technologies of their own. Several Indian respondents said that joint ventures with greater U.S. involvement would fare better in the Indian market.

The obverse of the perceived low return of Indian business was an Indian perception that U.S. services and technologies were sometimes too costly. Superficially this seems a peculiar complaint, because the services have a high wage component and U.S. professional salaries are often lower than those of their principal competitors. Possibly the lack of appropriate joint ventures in the services industry means that U.S. firms are less able to arrange a least-cost combination of American and Indian labor inputs and do not know how to structure their prices for Indian markets.

U.S. businessmen also reported being uncertain about which Indian partners to use. Many had contacts through people they knew or through nonresident Indians (NRI) on their staff, but they were uncertain whether the contacts were really the best channels to use or about what were perceived as the major alternatives – large, established Indian firms, including multinationals. They clearly believed that the Indian market required considerable familiarization for them to enter successfully. In this regard, the TEST project could clearly help.

One point requires further emphasis. NRI are very active in the pollution control industry in the United States. At least two members of the U.S. environmental services trade mission to the Association of Southeast Asian Nations (ASEAN) sponsored by the U.S.-ASEAN Council for Business and Technology were NRI. All firms expect them to be very active in any U.S.-Indian environmental services connection.

5.0 U.S. ENVIRONMENTAL SERVICES AND TECHNOLOGIES AS REMEDIES TO INDIA'S ENVIRONMENTAL PROBLEMS

5.1 Lack of Environmental Service Industries

The environmental service industry has two components: consulting organizations and testing laboratories. Consulting organizations typically provide environmental impact assessments, environmental auditing, problem analyses and solution development, and environmental monitoring. Testing laboratories analyze waste streams and quantify chemical concentrations.

5.1.1 Consulting Organizations

The role of consulting organizations in the environmental field in India is becoming more important as a result of (1) stringent government policies and regulations and (2) the complexity of the problems of pollution. Even industries with in-house capabilities use outside consulting organizations. The environmental consulting industry has not achieved its full potential, for two reasons: (1) limits on enforcement, which has generated limited response from the polluting industry, and (2) lack of technical expertise.

Very few consultants provide environmental services exclusively. Some research and development organizations have developed capabilities to use and test technologies on a bench or pilot scale; their prototype development for commercial application remains insufficient.

Almost all the Indian consultants contacted during the Mission expressed their inability under present conditions to deal with environmental auditing, hazardous waste management, and groundwater remediation. This inability has already constrained user industries to the extent that many large, multinational industries are using the services of their foreign collaborators and their consultants. Small- and medium-scale industries will start looking to Indian consulting groups as regulation and enforcement become stricter.

Many of the consulting organizations have recognized the need to develop comprehensive environmental service capabilities to address a wide range of pollution problems, including those just noted.

5.1.2 Testing Laboratories

Although the state pollution control boards recognize several laboratories, user industries believe that proper quality assurance (QA) and quality control (QC) procedures in the analyses are not followed, resulting in poor and erroneous characterization and

quantification. Unavailability of proper sampling containers and subsequent storing and shipping equipment has also constrained the user industry. One consultant observed that holding times before analyses are regularly exceeded, again leading to erroneous quantification and characterization. The user industry is also constrained by unavailability of mobile laboratory facilities, which would save time and effort when large-scale sampling and analyses must be completed in short periods of time.

5.2 Using U.S. Environmental Services and Technologies to Solve India's Environmental Problems

Previous chapters discussed the major environmental problems in Indian industries and the limitations they face in combatting problems. This section discusses the potential of U.S. EST to address those limitations and problems.

Two high-potential targets for U.S. ESTs are (1) cleaner process and pollution control technologies ("clean technologies") and (2) joint venture servicing firms, including specialized consultancy service for hazardous waste management and groundwater remediation.

5.2.1 Clean Process Technologies

The "pollution prevention pays" (3P) approach is becoming popular in India almost as rapidly as it has in the United States. The adoption of U.S. clean technologies will be quite difficult, as discussed in Chapter 4. However, large, multinational companies with joint ventures have standardized their operations worldwide. Most fabrication of components can be and is already cost-effectively carried out in India. The opening of the Indian economy is likely to lead to more fabrication, but to do so Indian industry must adopt state-of-the-art production technology.

The United States has well-developed technologies in recovery, recycle, and reuse technologies. Units ranging from small package units to large custom-designed are available. Many could be used in India with slight adaptation. A brief list of solvent recycling equipment suppliers is given in Appendix I.

5.2.2 Pollution Control Equipment Manufacture

Equipment manufacture is an area in which U.S. companies can effectively contribute to the development of innovative technologies for air, liquid, and solid treatment. Each of the technological gaps identified in Tables 4 and 5 can be filled by U.S. companies with few minor design modifications. In most contexts, U.S. products and units, especially package units, will be of particular interest to small-scale industries, which

produce small quantities of waste. Most of the technologies identified in Tables 4 and 5 have been subjected to extensive research, laboratory testing, and commercial application for various wastes and under various conditions. Exhibit 2 gives some examples of technologies in testing.

Exhibit 2. Treatments in Testing

Carbon adsorption	At least 25 companies in the United States supply units for total effluent and gaseous treatments. At least 10 companies have carbon regeneration units. The most recent development that would be particularly useful in India, is mobile regeneration units, which save transport transportation and handling cost.
Biotechnology	Biotechnology has experienced tremendous growth in recent years because of the simplicity of the processes involved. Many micro-organisms are being identified or genetically manufactured to break down the most resistant organic chemicals. Although U.S. biotechnology companies as a whole have marginal interests in India, particular areas of interest, such as fuel pump controllers and fixed film bioreactors, were identified by their industry association in a survey conducted in India.
Incineration	In the United States, incineration is now closely scrutinized by regulatory agencies and has consequently been changed to make it more environmentally sound. This will help Indian industries, which are constructing more and more common incineration facilities. A recent report compiled by a World Bank study group identified instrumentation as one aspect of incineration requiring needed attention. The lack of expertise in India in performing incineration may generate toxic compounds such as dioxins and furans. The expertise of U.S. companies in incineration could be useful.
Recovery	Solvent-to-solvent and solid-to-solvent recovery technologies can be used as they are in the United States. The processes are chemical specific and therefore require complete characterization of streams of waste before implementation.

5.2.3 Hazardous Waste Management Treatment Facilities

Hazardous waste management treatment facilities are an area in which India has the least expertise and U.S. companies have the most. The American hazardous waste management industry is perceived as the most advanced in the world. All segments of the U.S. hazardous waste industry can participate as technical consultants or joint venture partners with Indian counterparts. Typical involvement could include identification, classification, handling, transportation, treatment, and disposal of hazardous material and waste. These activities could start with training programs and developing infrastructure, such as laboratory and disposal facilities.

Another specialization of U.S. companies is characterization of abandoned hazardous waste sites in order to estimate the nature and extent of contamination in soil, groundwater, and other environments. Characterization can be coupled with risk assessment to finalize cleanup goals and levels as well as estimate health impacts.

5.2.4 Groundwater Remediation Services

The expertise of U.S. companies and institutions will be helpful in implementing a successful groundwater remediation program in India, particularly in characterizing the nature and extent of the problem by

- Installing monitoring wells and conducting regular sampling and analysis,
- Developing a data base for groundwater quality and using groundwater computer models to simulate the flow and contaminant fate and transport, and
- Evaluating and implementing cost-effective restoration alternatives.

Some of the recently developed restoration technologies, such as in situ biodegradation, in situ air and steam stripping, in situ vapor extraction, and air sparging, will be particularly useful in India. This list of treatment technologies is by no means exhaustive.

The two other supporting industries that can be launched, must be developed before a successful groundwater restoration program are testing facilities and drilling operations.

In conclusion, U.S. EST can be very easily adapted to Indian conditions, with few modifications. For pollution equipment, technology transfer either through joint venture or licensing will be particularly suitable in India, where the fabrication costs are much lower than in the United States. For the service industry side, joint venture arrangements will

also be feasible and exploit complementary economies. Several Indian organizations and firms have already expressed strong interest in such joint ventures.

6.0 POLICIES AND REGULATIONS

The demand for foreign EST in India is integrally related to the Indian government's rapidly developing environmental and economic policies. India is in the midst of a sweeping redirection of its industrial and foreign trade policies. In general, these new policies are designed to abandon India's protectionist past and move the country toward a sustainable economy that can compete in the international market. In fact, the success of the TEST project depends on the success of those policies.

In the environmental field, mounting public pressure is forcing the central and state governments to address the deterioration of the Indian environment. As a result, regulatory emphasis has been placed on pollution resulting from inadequate treatment of industrial effluent and, more recently, on the absence of appropriate safeguards in the management, storage, and disposal of hazardous waste. The extent to which these policies emphasize technological solutions to the environmental problems associated with industrialization, and encourage the liberal transfer of technology and services to address these problems, will largely dictate the actual demand for EST from abroad.

This report does not seek to systematically review Indian environmental law or economic policy. Rather, it is intended to focus on legal and policy aspects that directly impinge on the demand for foreign technology and services in the environmental sector. To provide context, however, this section includes a brief overview of India's environmental regulatory framework in a comparative law context, as well as a general description of the Government of India's New Economic Policy. To the extent that modifications in policy or law may be necessary to facilitate, or at least avoid deterring, the growth of an indigenous environmental service and technology sector, with foreign inputs, some tentative conclusions and recommendations are also provided.

6.1 Policies on Importation of Environmental Services and Technologies

After a period of sustained growth in the latter half of the 1980s, Indian export growth rates have begun to decline. In addition, the cost of Indian imports, particularly fuel, has soared as remittances fall. The consequent loss of foreign exchange restricted India's import capabilities and contributed to industrial stagnation. Faced with a mounting deficit in its balance of payments and depleted foreign exchange reserves, the Government of India announced on July 4, 1991, a package of sweeping reforms aimed at liberalizing the Indian economy by reducing government intervention in the industrial sector and facilitating free trade. The New Trade Policy focused on restoring the momentum in exports and linking imports to export performance.

6.1.1 Key Aspects of the New Trade Policy

A key feature of the new policy is replacement of the cumbersome replenishment licensing system – through which goods used in manufacturing were obtained – by a new, market-oriented system known as Eximscrip (see Appendix J, pp. 2-4). Eximscrips will be issued to exporters on the basis of 30 percent f.o.b. value of the export; for certain products, including advanced engineering goods, the Eximscrip rate will be 40 percent f.o.b. value.

In addition, the service industry, including consultants, has been expressly made eligible for Eximscrip at the 30 percent rate. Eximscrip may be freely traded and may be acquired by industries that are net importers. Goods that may be imported under the system are apparently restricted to items identified in the "limited permissible list," the "non-sensitive canalized list," and for "other general license items for actual users." It is important to note that the "supplementary license" system for the import of items has been retained for industries in the small-scale sector.

Other measures designed to reduce government intrusion in foreign trade include automatic licensing for importing capital goods for new or expanding units, regardless of the domestic availability of such goods and provided the import is fully covered by foreign equity or does not exceed 25 percent of the value of the plant and machinery up to a value of Rs. 20 million (US\$800,000). In addition, the list of so-called "canalized" items, which could only be imported or exported through public sector agencies, has been reduced. The policy also reactivates a board of trade to serve as facilitator for government, industry, and traders. The office of the Chief Controller of Imports and Exports was renamed the Directorate General of International Trade and is intended to serve a promotional function.

When the trade policy changes were announced, the Reserve Bank of India imposed measures to alleviate the country's foreign exchange crisis. One measure, in the context of the new industrial policy discussed later, restricts foreign exchange approvals to industries that can demonstrate foreign collaborations that will be "net foreign exchange positive," that is, produce a flow of foreign currency into India that exceeds the flow out of the country.

6.1.2 Effect of the New Trade Policy on TEST

To the extent there is an identifiable need for Indian industry to import pollution control technology in the form of equipment and services, the new trade policy may enhance the capability of Indian businessmen to access foreign markets. In the past, the Government of India has been reluctant to encourage trade in services. However, in the context of the new industrial policy, service industries have been declared eligible for a

number of concessions. Ordinarily, environmental consulting firms do not require large capital investments in plant and equipment. Hence, most of these firms will qualify for small-scale status (which is defined in terms of capital invested, not volume of business) and, therefore, the Government of India's continued protectionist policies toward small-scale firms.

The new trade policy preserves the Indian government's traditional preference for the small-scale sector by retaining the supplementary license system. As a result, small-scale units can obtain foreign currency at official rates (expected to be lower than Eximscip), rather than the premium rates established under the Eximscip system. Because the majority of environmental service firms are likely to be net foreign exchange negative, this concession represents a substantial cost savings over the Eximscip system.

The inexplicit policy responding to the present foreign exchange shortage – requiring industrial firms seeking to import goods to demonstrate a net positive foreign exchange ratio – may affect the demand for EST. In the service sector, most environmental consulting firms seeking foreign exchange for equipment or collaborations are unlikely to meet this requirement. Even manufacturers of pollution control equipment are, at least now, more likely to concentrate on meeting the demands of the domestic market. Over the long term, India may become an exporter of environmental apparatus and services.

The TEST program may be uniquely capable of addressing the Reserve Bank of India's (RBI) requirement for firms that are otherwise net foreign exchange negative. The precise contours of the program have not been fully defined, but at a minimum, it contemplates a tied-dollar grant to the Government of India. Because of the use of grant funding, the program itself is necessarily net positive. Accordingly, if RBI were to consider individual firms seeking funds under the TEST program within the ambit of the positive foreign exchange flow provided by the U.S. Government, the present domestic orientation of EST in India and the negative foreign exchange flow thus connected with them would not pose a hurdle to services and technology trade under TEST.

6.2 Policies on International Business Investment

Foreign investors have traditionally been chary about investment in India. India's historical policy of economic self-reliance and domestic market protection served to discourage foreign investment. For entrepreneurs still willing, negative reports abounded of investment projects interminably mired in layers of bureaucratic approvals, requiring continued and disproportionate attention. A new era of liberalization has been launched in which foreign investment and technology are officially welcomed, and Indian industry

must compete for its market share. Technology transfer, in particular, has been targeted as a priority area in the new economic policy.

According to recent press accounts, the foreign investment community has adopted a cautious approach toward Indian economic liberalization.³ Investment funds have for the moment been concentrated on the emerging markets of the Soviet Union and Eastern Europe. Nonetheless, most commentators think that the new economic policies will eventually take root and achieve their own momentum. Should this occur, domestic and foreign investment in EST will share in the new climate, provided governmental environmental regulation maintains its momentum as well (see Chapter 4).

6.2.1 Overview of the New Industrial Policy

The primary features of the New Industrial Policy as it is emerging include

1. Reduction to eight in the number of industries reserved solely to the public sector;
2. Abolition of industrial licensing for all but 18 of the industries listed, based on their strategic or fundamental importance to the Government of India;
3. Automatic approval of direct foreign equity investment of up to 51 percent in specified high priority industries requiring large capital investments and advanced technologies;
4. Automatic approval of foreign technology agreements for specific high priority industries and for all other industries that can demonstrate a net positive foreign exchange flow; and
5. When capital goods must be imported, automatic clearance will be provided if foreign exchange is ensured through equity investment or if the imported capital goods constitute less than 25 percent of the total value of plant and equipment up to a maximum of Rs. 20 million (US\$800,000).

In addition to these fundamental changes, a number of other aspects of the New Industrial Policy merit mention. The list of industries reserved to the small-scale sector is retained. Central government approval of industrial siting has been abolished, except in cities with more than 1 million people. Zoning, land use, and environmental regulations continue to apply in all instances of industrial startups. Exemption from licensing also applies to all substantial expansions of existing units. Appropriate incentives and the

³Asian Wall Street Journal Weekly, Nov. 18, 1991, p. 16.

design of investments in infrastructure will be used to promote the dispersal of industry to rural and "backward" areas. Of particular interest is the New Industrial Policy's liberalized provisions in technology transfer.

As noted before, automatic clearance will be given for foreign technology in the "high priority" industries identified in the new policy. With the granting of automatic clearance, lump sum payments are limited to Rs. 10 million (US\$400,000), and royalties are limited to 5 percent of domestic sales and 8 percent of export sales over a period of 10 years from the date of payment or 7 years from the commencement of production. The same guidelines apply to industries not listed that can demonstrate that free foreign exchange will not be required in order to secure the technology. The policy also removes the need to seek advance governmental approval to retain foreign technicians.

6.2.2 Effect of the New Industrial Policy on Environmental Services and Technologies

As with most industrial sectors, EST can be expected to share in the commercial advantages provided by the Government of India's economic liberalization program (see Appendix K). Environmental services, however, like most other service industries, are perhaps less affected by the new policies than are manufacturing industries. The list of industries granted automatic clearance for 51 percent equity investment and technology transfer includes only one from the service sector—the hotel and tourism industry. Presumably, then, environmental consultancies remain constrained by prior government limitations on foreign investment.

Manufacturers of pollution control equipment, a sector well positioned to receive TEST funds, does not appear on the list of "high priority" industries that derive the greatest benefit from the new foreign investment and technology transfer policies. In some instances, however, these manufacturers may be subsumed under certain generic industrial categories such as "electronic equipment" or "industrial instruments."

In addition, industries on the high priority list should be able to take full advantage of the new policies by installing pollution control equipment ancillary to their units. Both manufacturers and the environmental service sector can theoretically benefit from the New Industrial Policy's automatic approval for retention of foreign technicians. However, unrealistic caps on salaries for these technicians prevent this apparent advantage from being truly meaningful from the perspective of U.S. technicians.

6.3 Policies Affecting Transactions Costs

Transaction costs may simply be defined as "the cost of doing business" in India. Foreign investors have traditionally complained that these costs are excessive in India

because of overbureaucratization of the economy. The new liberalization policies described earlier are in part designed to reduce unnecessary transaction costs. The extent to which these policies are applicable to TEST projects will determine the extent to which transaction costs are minimized.

In addition, the New Economic Policy expressly notes that it does not alter environmental regulatory requirements. To the extent that these requirements grow, and to the extent of increased public participation in environmental regulation, environmental transaction costs may also be expected to rise.

The Government of India and certain state governments have periodically granted incentives to promote corporate initiative and responsiveness in controlling pollution. These are briefly summarized in Appendix J.

6.4 Intellectual Property Issues

The United States and India have been involved in a highly charged debate over intellectual property rights. The United States has demanded that India increase protections accorded such rights. This debate, however, has apparently focused on the pharmaceutical industry. None of the firms interviewed in the course of preparing this report has identified intellectual property rights as a significant issue affecting EST.

6.5 Environmental Law and Regulation

India has a well-established environmental law tradition that predates the contemporary world environmental movement. Indeed, the Indian Constitution contains specific provisions imposing duties on the Government of India and the Indian people alike to protect the environment. Like most nations, however, the legislative response to environmental concern in India began in the early 1970s. Preambles to India's principal environmental legislation routinely refer to the 1972 United Nations Stockholm Conference on the Human Environment as a galvanizing influence in national environmental policy.

In its actual administrative regulatory system, however, Indian environmental law has borrowed heavily from the U.S. model, which has been described as a complex "command and control" system that emphasizes "end-of-the-pipe," "technology forcing" solutions through a disincentive structure administered by the Environmental Protection Agency and its state and local counterparts. Fundamental distinctions in the comparative law of the two countries, as well as basic cultural and economic differences, have reduced the effectiveness of the American model in India. Nonetheless, considerable pressure exists to address India's pressing environmental problems, particularly in the wake of the 1984 disaster at Bhopal.

6.5.1 Statutory Framework

More than 200 statutes have been identified as having some bearing on environmental matters in India. The overarching framework of statutory environmental protection may be found, however, in the list of statutes that follows.

1. The 1974 Water (Prevention and Control of Pollution) Act, as amended.
2. The 1977 Water (Prevention and Control of Pollution) Cess Act.
3. The 1981 Air (Prevention and Control of Pollution) Act, as amended.
4. The 1986 Environment (Protection) Act.
5. The 1991 Public Liability Insurance Act.

6.5.2 Administrative Structure

India's environmental regulatory framework is based on a system of shared central and state government pollution control administration. Since passage of the Environment Act of 1986, the enforcement and oversight role of the central government, particularly the Ministry of Environment and Forests, has been strengthened considerably. At the national level, the Central Pollution Control Board (CPCB) administers air and water regulatory efforts. This board is responsible for coordination of activities and guidance in standard-setting for its state counterparts. The CPCB has promulgated minimum effluent standards known as Minimum National Standards (MINAS).

The state pollution control boards are charged with the responsibility of enforcing the MINAS and emissions regulations. Some idea of the activity of these boards is given in Table 10. The states may adopt standards that are more restrictive than those of the CPCB, but they may not relax them. With respect to the Union Territories, the CPCB functions as a state board within the territory. In the event a state board is inadequately administering its pollution control responsibilities, the CPCB may be directed by the central government to intervene and assume the state role. This circumstance has not yet arisen.

New sources of industrial pollution must first receive environmental clearances from either the central government or the states, or both, depending on the magnitude and location of the individual unit. These clearances take the form of a "Consent to Establish" and a "Consent to Operate." Depending on the nature of the unit, an environmental impact assessment may also be required. Annex 2.2 of the World Bank Staff Appraisal Report for the First Industrial Pollution Control Project describes the procedures for each of these regulatory mechanisms (World Bank Staff Appraisal Report 1991). It is worth noting that FICCI has reported significant delays in industrial unit construction resulting

from backlogs in the issuance of these clearances. Delays in industrial approvals resulting from environmental pressures may be expected to mitigate to some extent the New Economic Policy's efforts to streamline bureaucratic procedures by abolishing industrial licensing for most sectors.

Table 10. Cases Before State Pollution Control Boards in India
(as of June 30, 1991)

Name of Board	Total Cases Under		Total Decision Under Water Act				Total Decision Under Air Act				Total Decision Dismissed/Withdrawn	Total Decision	Total Conviction	No of Cases Pending	Date Information Received	
	Water Act	Air Act	No. of Both Acts	No. of Decision	In Favor of Board	Against Board	Conviction Secured	No. of Decision	In Favor of Board	Against Board						Conviction Secured
Assam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 2 91
Andhra Pradesh	15	1	16	8	5	3	1	1	1	-	-	7	9	1	-	15 4 91
Bihar	139	67	206	32	30	2	1	3	-	3	-	-	35	1	171	6 4 91
Goa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6 2 91
Gujarat	1218	287	1505	273	143	130	7	53	45	8	32	-	326	39	1179	16 1 91
Haryana	281	189	470	159	135	24	7	27	27	-	18	-	186	25	264	30 5 91
Himachal Pradesh	48	22	70	24	16	8	1	15	13	2	-	-	39	1	21	19 11 90
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9 4 91
Kerala	56	3	59	39	32	7	3	-	-	-	-	-	39	3	20	30 1 91
Karnataka	74	35	109	18	6	10	-	3	-	3	-	-	21	-	88	17 1 91
Maharashtra	264	125	389	110	50	50	13	99	81	18	81	-	209	94	172	15 4 91
Madhya Pradesh	85	28	113	4	1	3	1	3	2	1	2	-	7	3	106	18 12 90
Meghalaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 2 91
Manipur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4 2 91
Mizoram	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 2 91
Orissa	42	23	65	2	1	1	-	1	-	1	-	7	3	-	55	16 4 91
Punjab	372	36	408	103	37	66	37	6	-	6	-	112	109	37	187	22 1 91
Rajasthan	235	4	239	63	27	36	2	2	2	-	1	-	65	3	174	21 11 90
Tamil Nadu	300	120	420	80	50	30	50	91	68	23	68	2	171	118	247	20 11 90
Tripura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA
West Bengal	24	-	24	-	-	-	-	-	-	-	-	-	-	-	-	16 4 91
Union Territories																
Andaman & Nicobar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chandigarh	4	-	4	2	2	-	-	-	-	-	-	-	2	-	2	-
Dadra & Nagar Haveli	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Daman & Diu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lakshadweep	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pondicherry	6	-	6	5	5	-	-	-	-	-	-	-	5	-	1	-
Grand Total	3551	949	4500	1133	751	382	126	307	241	66	204	173	1440	330	2887	

6.5.3 Recent Changes In Hazardous Waste Regulation

The 1986 Environment Act introduced the regulation of hazardous substances into Indian law for the first time. Pursuant to the act, the Hazardous Waste (Management and Handling) Rules were promulgated in 1989. These rules codify categories of hazardous waste and establish quantities of wastes that bring individual generators within the purview of regulation. The state PCBs are charged with responsibility for implementing these rules. In addition, the Rules charge the states with responsibility for identifying potential sites for the disposal of hazardous wastes.

The recent passage of the Public Liability Insurance Act has added a new dimension to the regulation of hazardous substances in India. The act establishes strict liability for death, injury, or property damage resulting from the discharge of hazardous substances as defined under the Environment Act of 1986. This means that a company may be liable even though the environmental damage was not its "fault." The act also requires any person handling hazardous substances to secure liability insurance against claims brought under the act. Claims for relief under the act may be made by the central government or by any other person, provided the Central Government is given 60 days' notice. Depending on how it is judicially construed, this new legislation may greatly increase pressure on industry to identify and secure technologies for the proper storage and disposal of hazardous wastes. A statutory cap of Rs. 6,000 (US\$240) on property damage may, however, diminish the effectiveness of this act as a private enforcement tool.

6.5.4 Legal Trends Since 1984 That May Increase Compliance Pressures

More broadly, the 1984 Bhopal catastrophe added tremendous impetus to the regulation of industrial pollution in India, both in the passage of legislation and their implementing regulations, as well as increased judicial activism. Included among the notable trends since 1984 that have been identified as bearing on environmental compliance in industry are the following:

1. An increase in direct public interest litigation in the Supreme Court;
2. Emergence of a statutory framework for the regulation of hazardous substances;
3. Imposition of common law strict liability for accidents resulting from abnormally dangerous activities. See *M.C. Mehta v. Union of India*, AIR 1987 SC 1086 (1986).
4. Imposition of statutory strict liability for death, injury, or damage to real property resulting from discharge of hazardous substances and wastes;

5. Imposition of individual liability on corporate management for accidents resulting from violations of pollution control statutes;
6. Procedural changes in criminal prosecutions that ease prosecutorial burdens in environmental cases;
7. Power to issue directions to close down polluting units and halt their provision of services and increased use of the criminal nuisance statute; and
8. Enactment of "Citizen Suit" provisions in environmental statutes.

6.5.5 Proposed Legislation and Policy Changes That May Influence Environmental Protection

As in other countries, environmental law and regulation is a rapidly evolving field in India. New legislative proposals and initiatives are routinely floated in the press. Of particular interest to the TEST project is the Minister of Environment and Forest's recent proposal to impose environmental audits on industry. Although environmental auditing has become a "buzzword" in the Indian service sector, its definition has not been fully developed. It is worth noting that environmental auditing in the United States emerged in the early 1980s as the federal and state governments began to address the issue of improper hazardous waste disposal. It was driven, however, not by government intervention, but by lenders and insurance companies concerned with the tremendous liabilities associated with contaminated real property. (One estimate states that the average "Superfund" cleanup exceeds US\$12 million.)

Apart from direct government intervention, environmental auditing in India appears to be developing along somewhat different lines. India's environmental laws have yet to systematically address the problems associated with previously contaminated soil and groundwater, which is likely to be extensive. As a result, Indian consultants who are entering the field of environmental auditing are emphasizing its role in regulatory compliance and waste minimization. The latter area, in particular, implies advanced "clean technologies," many of which may be unavailable in India. However, as indicated earlier, Indian expertise in this area is limited.

Another proposal from the Ministry of the Environment and Forests would require industrial units to report the percentage of their gross revenue that is reinvested in pollution abatement technology. Presumably, this could be used as a "technology forcing" tool as data are developed industry by industry.

Finally, legislation has been proposed that would establish a separate environmental judiciary to deal with the complex technical issues that environmental cases necessarily imply. This would serve a function like that of the extensive administrative law system in the United States. In addition, the judiciary might serve to reduce the severe docketing backlog plaguing the Indian judiciary. Expedited case resolution would undoubtedly provide an additional deterrent to those seeking to "buy time."

The proposed environmental court legislation (which the team understands has been abandoned) also contained substantive liability provisions such as statutory imposition of strict and joint and several liability in environmental cases. Under the doctrine of joint and several liability, when there are multiple defendants and the harm is indivisible, one defendant may be held liable for all damages resulting from the harm, even when that defendant's contribution is relatively insignificant. Both of these legal doctrines are firmly embedded in U.S. environmental law. The United States, additionally, has recognized the retroactive application of its hazardous waste laws, and thus has required cleanup of previously contaminated sites, an issue not yet addressed by India.

6.5.6 Regulatory Gaps

Although India has a strong statutory environmental framework in place, there are a number of identifiable gaps (from a comparative law standpoint) that will influence the market for foreign technologies generally, and U.S. technologies particularly. Foremost among the gaps is the failure of the legal and regulatory system to address the problems associated with past contamination of soil and groundwater, the "cleanup technology" field in which the United States leads. In addition, pollution control equipment performance standards are not established in Indian law.

Currently there is little institutional impetus provided for the adoption of "clean-process technologies" and "waste minimization" techniques. Process technologies, however, have their own economic returns that mitigate the need for extensive regulatory interference. Management, storage, and disposal of solid and hazardous wastes remain in regulatory infancy as well, although recent legislation is directed toward these problems.

India has yet to address the issue of hazardous air emissions, particularly the generation of dioxins and other synergistic contaminants from incomplete combustion (an issue of current concern in the United States). This area is particularly important in India because of a strong move toward incineration as a primary method of hazardous waste disposal, as well as consideration of various cogeneration proposals for domestic solid waste. The synergistic contaminants issue is further complicated by the advanced level of detection technology required and its prohibitively costly nature.

Although India has to some extent adopted the U.S. model of environmental regulation, certain important components of that system remain relatively undeveloped. For example, even though India has established "water quality based effluent limitations" (QBEL) as the technology-forcing mechanism of pollution control, it has apparently not fully exploited the use of "technology-based effluent limitations" (TBEL) that are used in parallel in the United States. TBELs presume that a particular approved technology will meet water quality standards when installed, maintained, and operated properly. Thus, the use of the approved technology becomes prima facie evidence of regulatory compliance. In addition, India does have a "regulatory relief" mechanism to vary standards in appropriate cases, but it does not appear to have developed its use to the same extent technically as its U.S. counterparts.

Statutory violations of environmental laws are prosecuted under India's criminal code. Crowded criminal dockets and the greater procedural protections afforded criminal defendants may serve to reduce the effectiveness of enforcement under criminal law. In the United States, however, violations of environmental statutes incur civil penalties that accrue at a rate sufficient to produce substantial deterrence, whatever happens on the criminal side.⁶

In addition, U.S. environmental law provides for natural resources damages. India currently has no civil penalty or natural resource damage provisions to serve as an economic disincentive to continuing pollution. Fines may, however, be imposed under the Indian criminal code. Some commentators have stated that fines are not set sufficiently high or imposed promptly enough to have the desired deterrent effect.

⁶Penalties for violations of the Clean Water Act, for example, accrue at the rate of \$25,000 per day per violation.

7.0 RECOMMENDATIONS FOR TEST

7.1 Feasibility of the Project

The team concludes India is ready for the extensive purchase of American environmental technologies, some of them in the form of direct services.

It appears to the team, as noted in the beginning of this report, that an effective program could best operate on three levels:

1. **The policy level**, to ensure effective environmental enforcement to promote demand and trade and investment policies that will enable them to be met;
2. **The technological level**, by assisting in the creation of an environmental service industry with direct links to American private counterparts based on joint venture arrangements; and
3. **The enterprise level**, through a careful mix of promotion and provision of technical information and limited subsidization of technologies new to India.

However, lesser programs could also have a positive effect.

7.2 Areas of Project Concentration

In technological terms, this report contains a great many detailed suggestions about American services and technologies that may be appropriate for the Indian market. The greatest potential appears to be in environmental audit, hazardous waste management, clean production technologies, groundwater remediation, and technology for common effluent treatment plants. There is considerable interest in all these areas, and American technology is both excellent and well suited to India.

The team is reluctant to propose any specific allocation of funds to these areas, because it is essential that any program be market driven and respond to rather than guide entrepreneurs. The team is also reluctant to recommend any specific geographic concentration but suggests that it may naturally emerge in response to specific enforcement efforts by state PCBs and the availability of complementary funds for specific cleanup efforts.

7.3 Subsidization

The team believes that a dollar facility of the size proposed, roughly \$25 million over 5 years, would be used even if both the dollars and credit terms were at normal

market rates. However, subsidization may be appropriate beyond that implicit in the promotional activity. Subsidies could be provided for innovative and unfamiliar technologies, such as environmental audits as a management tool or specific hazardous waste treatment technologies. When subsidies are attempted they should be on a cost-sharing basis, such as a matching or conditional grant.⁷ Conditional grants might be used to encourage American firms to send their representatives to meet potential Indian partners.

There is generally no excuse for the provision of subsidized capital to private firms, because it serves to severely distort their own decision making as well as undermine the soundness of the financial system on which the entire economy depends. Subsidies are better if made directly, both from the point of view of targeting and so that all concerned can see their cost and assess their benefit.

Complementary support would be desirable through funds to support training and visits – and more important, commercial contacts – between private businessmen in the two countries and to familiarize regulators with the processes they propose to use. Training and visits could be provided on the usual selective basis or could be the result of a competitive grant process.

A small central project unit could manage and coordinate these processes of technical assistance and funding with a management information system that clearly targets the volume of commercial activity, the environmental impact, and the technological thrust of the environmental trade promoted.

Grants could be routed through Indian institutions, but if properly arranged, some of the conditional grants could be directed as well to American firms, provided that reflows are channeled back into an Indian fund.

7.4 Trade and Industrial Policy

1. The various lists of goods that may be traded in Eximscrip should be scrutinized and clarified to ensure that pollution abatement equipment is adequately addressed.
2. All participants in the TEST program should be covered under its dollar grant umbrella to ensure that they are not saddled with the independent requirement of demonstrating net positive foreign exchange under the New Industrial Policy.

⁷The success of using a conditional grant in the PACER project suggests its value.

3. The Government of India should consider including the environmental service and technology sector on the list of high priority industries accorded automatic clearance for 51 percent equity investment and technology transfer.
4. Consideration should be given to raising the cap for salaries of foreign technicians to more realistically reflect the norm for international consultants.
5. Spare parts and components imported in conjunction with the acquisition or installation of pollution abatement technology should be accorded the same concessional customs duties as the full equipment.
6. The Government of India should review its fiscal incentive program for procurement and installation of pollution abatement equipment to further encourage industrial participation in the national pollution abatement program.

7.5 Environmental Law and Policy

1. Protectionist industrial policies for the small-scale sector should be reviewed by the Government of India to ensure that small units operating with outmoded technology at suboptimal levels do not continue to contribute disproportionately to pollution loads.
2. If common effluent treatment plants will be encouraged in the small-scale sector, greater attention should be devoted to siting small-scale units to ensure waste stream compatibility. In addition, institutional accountability mechanisms must be reviewed and proper funding, operation, and maintenance provided.
3. Clusters of small-scale units should be treated as large-scale units for purposes of evaluating their cumulative impacts.
4. Financial and legal incentives should be established for "clean-technology" upgrades in existing units, installation of clean technologies in new plants, and adoption of waste minimization techniques. This might include regulatory recognition of "best available control technology," along with procedures to demonstrate alternative viable technologies.
5. Environmental auditing should continue to be encouraged through financial incentives.
6. Pollution control boards should be strengthened and provided with the authority to impose appropriate civil penalties.

7. Technical assistance should be provided to promote legal and regulatory information exchange so that India may consider developments in American environmental law and regulation.
8. Greater regulatory emphasis should be placed on cleanup of past pollution, particularly where potable water supplies may be threatened. This may require substantive amendments to existing legislation.
9. Environmental mediation and other forms of alternative dispute resolution may prove useful in avoiding costly and time-consuming litigation.

Appendix A

STATEMENT OF WORK

Statement of Work

Background

A protected market in India has permitted the adaptation and continuation of outdated production processes, both industrial and non-industrial, which excessively pollute air and water; encouraged the use of inefficient technologies which waste or degrade critical resources, and deterred the introduction and application of adequate methods of monitoring and evaluation of the ecological impacts of exploitative resource use.

In the U.S., environmentally positive services and technologies (ESTs) have emerged along with a trend toward positive government incentive systems for voluntary compliance by industry to find cost-effective solutions to problems. In India there is also growing awareness of the need to incorporate environmentally friendly options into the Indian marketplace. (An example is the recent GOI posting of an "Ecomark" label on "environmentally friendly" goods). However, at present the technology options to respond to such demands within India are extremely limited, as are the opportunities to take advantage due, among other reasons, to foreign exchange constraints, tariff restrictions on "non-essential" foreign goods and general lack of awareness of a growing array of commercially proven ESTs currently available in the U.S.

The purpose of Trade in Environmental Services and Technologies (TEST) would be to expand India's access to and utilization of commercially proven, environmentally positive services and technologies available in the U.S. which respond to the need for cost-effective, sustainable ways to achieve growth targets in the rapidly evolving sectors of the Indian economy.

Specific U.S. interest relates to increased Indo-U.S. trade in environmental services and technologies through liberalization of India's import policies and practices that in turn improves the country's environmental quality and negates the potential threat of significant domestic and global environmental repercussions.

For additional background, refer to the attached New Program Description.

Article I - Title

Program Development & Support: 499-0000; Market Survey for a proposed new program/project entitled "Trade in Environmental Services and Technologies (TEST).

Article II - Objective

To provide a five member study team comprising 3 U.S. and two Indian specialists to conduct a two-stage market analysis to determine the feasibility of designing the proposed \$30 m USAID TEST program.

Article III - Statement of Work

Generally, the first phase study will assess the state-of-the-art U.S. EST demand in India's primary problem areas and the impact of the existing environmental policies and practices on such demands. If sufficient demand exists, the second phase study will follow to determine the availability and interests of the U.S. EST suppliers to satisfy the specific demands of the EST users in India. A related issue will be to provide recommendations regarding policy liberalization for increased acquisition and use of U.S.-supplied ESTs.

A. Demand Analysis (In India)

Specifically the team will examine the following issues :

In relation to Environmental Technologies

- 1) Prioritize India's major environmental problem areas.
- 2) Identify the sectors and industries (also scale) involved in the highest ranking problem areas.
- 3) Describe the limitations of existing technologies within given sectors.
- 4) Identify private sectors willing to import U.S. state-of-the-art ESTs and if some form of economic incentive will be required without jeopardizing the commercial viability of the technology introduction.
- 5) Calculate the cost of some specific U.S. EST transfers to the target problem sectors.

In relation to Environmental Services

- (1) and (2) as in (A) above.
- 3) Determine to what extent does a lack of services (both discrete environmental services and environmental technology support services) constrain resolution of key environmental problems.
- 4) Assess entrepreneurs' willingness and ability to invest in environmental services.
- 5) Evaluate the opportunities for environmental services, such as those utilized in the U.S. by business, industry and government, to address specific aspects of key environmental problems in India; identify key industries or businesses that could benefit significantly.

Policies and Regulations

In relation to specific demands in the environmental problem area, the study will examine the implications and impact of:

- 1) policies concerning importation of ESTs (high tariff on importation of "non-essential" Ecotechnology).
- 2) Policies for international business investment (foreign currency transactions).
- 3) Policies affecting transaction costs (time, effort).
- 4) regulations to comply with environmental standards (incentive/disincentive structures).
- 5) Other policies and regulations that are relevant; and provide recommendations for specific policy liberalizations and reforms to expand India's access to U.S. ESTs and promote environmentally sustainable economic growth.

B. Supply Analysis (in U.S.)

In the event a positive determination is made following the first stage survey that sufficient demand exists in India (see Article IV below), the U.S. market place will be studied to assess:

- 1) The availability of specific ESTs consistent with the specific sectoral/industrial demand in India.
- 2) The interest and willingness of U.S. EST suppliers to enter India's market place given current policy and regulatory constraints that act as disincentive to U.S. private suppliers.

Article IV - Reporting Requirements

The contractor should submit a workplan to the USAID/India as to how they will proceed in the analysis before commencing field work. A draft report documenting findings with respect to EST demand in India will be required prior to the team's departure for review by USAID/India. If it is jointly agreed that sufficient demand exists, the team will conduct the second phase of market survey in U.S. to determine the supply situation and submit a comprehensive final report (15 copies) within 3 weeks of departure. In case, however, the review determines that sufficient demand does not exist to warrant a supply survey, the team will submit the final report to USAID/India within 1 week of departure. The language of all reports will be in English. The authority of the contractor to undertake any work related to the second phase is pursuant to the conditions of this contract under "Technical Directions". A determination by USAID not to undertake phase II shall not be considered as a termination of this contract.

Article V - Relationships and Responsibilities

The team will work under the technical direction of John Grayzel, Director, Office of Natural Resource Management (ONRM) and Amitabha Ray, TEST Initiative Technical Officer at the USAID mission in India pursuant to the clause of this contract, "Technical Direction". All coordination with the host country government institutions and agencies will be through the USAID India ONRM.

Article VI - Performance Period

Starting o/a September 16 and ending o/a October 27, 1991

Article VII - Categories of Specialists and Level of Efforts

The contractor will provide a mix of U.S. and Indian specialists to perform the technical services outlined in the SOW. To accommodate the range of skills required the team will comprise the following specialists:

U.S. Specialists

- 1) An Enterprise Specialist with background in economics, familiarity in international market behavior relating to product/service introductions and extensive Indian experience.
- 2) An Environmental Technology Specialist having up-to-date knowledge of U.S. environmental industry and experience of technology adoption by the target groups in LDCs.
- 3) An Environmental Law/Regulation Specialist with U.S. (and preferably LDC) experience in the formulation and actual implementation of environmental regulations.

Indian Specialists

- 1) Environmental Engineer having capacity to advise Indian entrepreneurs on adaptation of cost effective solutions to environmental problems and realities of Indian entrepreneur compliance with environmental standards.
- 2) Legal Specialist with familiarity of Indian environmental regulations (including process of law formulation and effectiveness of application and implementation) and capable of advising on acquisition of goods/services, meeting environmental standards and foreign currency transactions.

The U.S. Enterprise specialist will act as the Team Leader.

The contractor will perform these services over a six week period with a total level of effort of 138 person days as under:

In India: 130 person days (85 for U.S. and 45 for Indian Specialists) and
In US: 8 person days (for U.S. Specialists).

The contractor will propose to USAID, for its approval, how this total level of effort will be divided among the U.S. and Indian Specialists.

Article VIII - Special Provisions

A six-day work week is authorized.

Appendix B

PROGRAM OF USAID IN INDIA

Table B-1. Scheduled Expenditure for 1991 on Project of More Than US\$1 Million

Name of Project	Total Amount (US\$ millions)	1991 Expenditure (US\$ thousands)
Agricultural Research	20	4,671
Integrated Child Development Services	15.3	2,250
Madhya Pradesh Minor Irrigation	46	8,520
Irrigation Water Research, Management, and Training	51	9,680
Family Planning Communications and Marketing	23.7	3,324
Development and Management Training	9.5	1,574
Hill Areas Land and Water Development	42	6,028
Maharashtra Minor Irrigation	47	3,227
Biomedical Research Support	9.3	2,596
Program for Acceleration of Commercial Energy Research	20	1,079
National Social Forestry	59.4	1,510
Program for Advancement of Commercial Technology	17.7	3,199
Child Survival Health Support	55	9,746
Technical Assistance and Support	15	1,100
Total		63,300
Title II Programs		
CARE	65	
Church Relief Services	18	
Total	83	

Source: Annual budget submission, FY 1993, India. July 1991.

Appendix C

TYPICAL POLLUTION PROBLEMS ASSOCIATED WITH POLLUTING INDUSTRIAL SECTORS

TYPICAL POLLUTION PROBLEMS ASSOCIATED WITH POLLUTING INDUSTRIAL SECTORS

S.NO.	SECTOR	TYPICAL POLLUTION PROBLEMS	LIMITATIONS
1.	Chemical Process Industries	Pollution problems are product specific. Release of hazardous materials is often associated. Pollution control systems are generally non-existent.	<ol style="list-style-type: none"> 1. Lack of availability of modern efficient manufacturing technologies due to factors like skill of operation, information gap, lack of finance, lack of technical skill etc. 2. Cost effective control system technology and hardware indigenously not available. 3. Being a sellers market little or no emphasis on efficiency improvement/waste minimisation etc. 4. Lack of horizontal information transfer within the industry.
2.	Lime Stone	Mainly air pollution; comprising of emissions of particulates, SO ₂ and poly-aromatic hydrocarbons. The problem is technically difficult since the emissions take place from a very wide area (the top of the kiln of about 2 meters diameter is open).	<ol style="list-style-type: none"> 1. The units are mostly owned and run by poorly educated people in rural areas. 2. The entire operation being manual no power connection is available. 3. Very low investment industry hence the capability to invest in modernisation/pollution prevention and control is very low. 4. Although, fuel efficiency is very low but the savings on account of low investment & labour costs makes industry still profitable.
3.	Metal Finishing	Air Pollution consists of emissions of vapours and fumes from the baths. More serious problem is that of water pollution which comprises of effluents from rinsing operations. The effluents may contain heavy metals like zinc, nickel, chromium and toxic components like	<ol style="list-style-type: none"> 1. Very small industries with obsolete old technology. 2. Due to job order working difficult to standardise. 3. No control over process parameters since entire operation is manual. 4. End of pipe control systems very expensive.
4.	Textile Dyeing And Printing Industry	Principally, water pollution pollutants being heavy metals, COD, colour.	<ol style="list-style-type: none"> 1. The units range from cluster of small scale to medium scale. 2. The available technologies for treatment of wastewater very expensive.
5.	Dyes and Pigments Manufacturing Industries	Water pollution - the major pollutants being heavy metal, colour (COD) and organics.	<ol style="list-style-type: none"> 1. While the basic dye manufacturing is a large scale, there are a number of small scale units manufacturing formulations and intermediates. The sector comprises of about 3000 units with a total production of 28000 tons in 1987. Over 65% of the production comes from 4% of the production. 2. The details of process are closely guarded due to fear of leak of trade secrets.

			<ol style="list-style-type: none"> 3. Conventional treatment methods very expensive. 4. Poor financial condition of small scale industries. 5. Most of the small scale industries are not complying with regulations. Their location at industrial estates makes them a likely target for common treatment facilities. 6. Many of the existing treatment plants are inoperative due to insufficient monitoring and lack of commitment. 7. Toxic waste generated by the industry is often not properly disposed.
6.	Foundries using Cupolas	Air Pollution and Solid wastes problem. The air pollutants are particulates, CO, SO ₂ and hydrocarbons. Emissions from Cupolas as well as fugitive emissions from sand preparation, demolding, fettling etc. Solid wastes mainly of slag and reject sand.	<ol style="list-style-type: none"> 1. Cupolas have been phased out from other developed countries hence no experience available from abroad. 2. The units do not work continuously for example in Agra it works only once a week. 3. Lack of commitment to invest anything.
7.	Rice Milling Industries	In case of par boiled rice manufacturing units both air and water pollution problems exists. The effluent water principally consists of high BOD. The air emissions mostly comprise of particulates. In the units shelling unboiled rice only air pollution problems exists.	<ol style="list-style-type: none"> 1. Over 10000 units exclusively in small scale sector widely dispersed all over the country. 2. Little or no technical skill as it is principally a rural industry. 3. Lack of availability of power in most of the units. 4. Very poor investment capability.
8.	Food & Fruit Processing Industries	Mainly oil, suspended solids and high BOD as effluent water. No air pollution problems.	<ol style="list-style-type: none"> 1. Due to wide range of product and the production processes standardisation is not possible. 2. Many units have space/cost limitations. 3. Seasonal operation of the units hence operation of biological systems becomes difficult.
9.	Brick Kilns	The single largest problems is that of Air Pollution resulting from the chimney exhaust which contains particulates, smoke, SO ₂ CO and unburnt hydrocarbon. In addition the degradation of land from where the clay has been dug out also causes environmental problems.	<ol style="list-style-type: none"> 1. Highly unorganised industry with little or no control by the Government. 2. Fly by night operations hence difficult to implement any rules and regulations. 3. The industry operates without any power connection.

10.	Small Pulp and Paper Industries	<p>1. More than 98% of the total pulp and paper units are in small scale sector.</p> <p>2. The major pollution problem is that of water effluents from pulp making for units having a digester. Black liquor is generated as a waste which is highly polluting in terms of BOD, COD, suspended and dissolved solids & toxic compounds.</p> <p>3. Excessive water usage.</p>	<p>1. There is no cost effective technology available to treat black liquor in small quantities. Even the roaster technology becomes too expensive.</p> <p>2. Some of the units may have limitations on availability of power or space.</p>
11.	Combustion Equipment	<p>The major pollution problem is that of Air Pollution resulting from incomplete inefficient combustion. The emissions comprises of particulates CO, SO₂ and NO_x. Water effluents in terms of blow down water, water treatment plants effluents are also created.</p>	<p>1. A large number of small time operators who survive in the market because of the low cost of their products.</p> <p>2. Highly competitive market with little emphasis on quality and efficiency aspects specially in the smaller size range.</p> <p>3. The small scale users lack knowledge on efficient methods.</p>
17.	Leather tanning industries	<p>1. The sector is made up of a few large modern export oriented units and a large number of manual small scale units.</p> <p>2. Mainly liquid effluent problems : The main pollutants being heavy metals and organic load.</p> <p>3. Solids wastes disposal problem of hair and waste hydes.</p>	<p>1. Over 70% of the tanneries have some primary treatment facilities but most of them do not need the MINAS.</p> <p>2. Discharge of wastewater seriously affects the ground water quality.</p> <p>3. Large number of tanneries are concentrated in clusters and are, therefore, candidates for common treatment schemes but heavy metals and sulfides need to be pretreated.</p>
1.	Pharmaceutical Industries	<p>1. There are an estimated 16,000 plants in operation out of which over 96% are in the small scale sectors.</p> <p>2. The main environmental problems caused by discharge of partially treated liquid wastes including release of toxic materials.</p> <p>3. Organic solid wastes are being disposed in land fields without characterisation pre-treatment or adequate control.</p>	<p>1. A wide variety of products/processes hence typically to standardise treatment schemes.</p> <p>2. Existence of both clusters as well as disposed units.</p> <p>3. Advance technologies for treatment do not exists.</p>
14.	Pesticides industries	<p>1. The sector has an installed capacity of 90,000 tons/yr out of which 20% is in small scale industries.</p> <p>2. Release of toxic and hazardous materials in both air & water</p> <p>3. Serious problems of disposal of solid hazardous wastes.</p>	<p>1. Due to wide range of products and process under technical solutions to environmental problems are impossible to formulate.</p> <p>2. Inadequacy of process and control instrumentations to deal with release of contaminants.</p> <p>3. Limited technical and financial ability to properly handle toxic wastes and sludge.</p>

15. Sugar Mills and Distilleries

1. There are over 400 sugar mills and 200 distilleries in operation. The distilleries are wastes on-sugarcane molasses raw-materials.
2. The main environmental concerns are related to disposal of high BOD effluent from distilleries (spent wash) and from manufacture of sugar.
3. Air emissions principally contain particulates as pollutants.
1. Lack of experience in crucially proven technologies for treatment of distillery effluents.
2. High cost of treatment plant for the distillery effluent.
3. Seasonal operation of sugar industry.
4. Cost effective control systems for particulate emissions yet to be evolved.

Appendix D

LIST OF INDUSTRIES UNDER VARIOUS CATEGORIES FOR POLLUTION INSPECTION

List of Industries under various Categories for Pollution Inspection

LIST OF INDUSTRIES UNDER 'RED' CATEGORY

1. Tannery manufacture - pending decision on proven pollution control device and Supreme Court's decision on querying.
2. Ceramics
3. Sanitary ware.
4. Tyres and Tubes
5. Pulse micronation.
6. Large flour mills.
7. Vegetable oils including solvent extracted oils.
8. Soap without steam boiling process and synthetic detergent formulations.
9. Steam generating plants.
10. Manufacture of machineries and machine tools and equipment.
11. Manufacture of office and house-hold equipment and appliances involving use of fossil fuel combustion.
12. Industrial gases (only nitrogen, oxygen and CO_2).
13. Miscellaneous glassware without involving use of fossil-fuel combustion.
14. Optical glass.
15. Petroleum storage and transfer facilities.
16. Surgical and medical products including prophylactics and latex products.
17. Bakery products, biscuits and confectioners.
18. Instant tea/Coffee processing.
19. Malted food.
20. Manufacture of power driven pumps, compressors, refrigeration units, fire fighting equipment etc.
21. Acetylene (synthetic).
22. Glue and gelatine.
23. Metallic sodium.
24. Photographic films, papers and photographic chemicals.
25. Plant nutrients (manure).
26. Ferrous and non-ferrous metal extraction, refining, casting, forging, alloy making processing etc.
27. Dry coal processing/mineral processing industries like ore sintering, beneficiation pelletization etc.
28. Phosphate rock processing plants.
29. Cement plants with horizontal rotary kilns.
30. Cement plant with vertical shaft kiln technology -- pending certification of proven technology on pollution control.
31. Glass and glass products involving use of coal.
32. Petroleum refinery.
33. Petrochemical industries.
34. Manufacture of lubricating oil and greases.
35. Synthetic rubber manufacture.
36. Coal, oil nuclear and wood based thermal power plants.
37. Vannspati, hydrogenated vegetable oils for industrial purposes.
38. Sugar mills (white and khandasari).
39. Craft paper mills.
40. Coke oven by-products and coal-tar distillation products.
41. Alkalies.
42. Caustic soda.
43. Potash.
44. Electro-thermal products (artificial abrasives, calcium carbide etc.)
45. Phosphorous and its compounds.
46. Acids and their salts (organic and inorganic).
47. Nitrogen compounds (cyanides, cyanamides and other nitrogen compounds).
48. Explosives (including industrial explosive, detonators and fuses).
49. Phthalic anhydride.
50. Processes involving chlorinated hydrocarbon.
51. Chlorine, fluorine, bromine, iodine and their compounds.
52. Fertilizer industry.
53. Paper board and straw boards.
54. Synthetic fibres.
55. Insecticides, fungicides, herbicides and pesticides (basic manufacture and formulation).
56. Basic drugs.
57. Alcohol (industrial or potable).
58. Leather industry including tanning and processing.
59. Coke making, coal liquification and fuel gas making industries.
60. Fibre glass production and processing.
61. Refractories.
62. Manufacture of pulp-wood pulp, mechanical or chemical (including dissolving pulp).
63. Pigment dyes and their intermediates.
64. Industrial carbons (including graphite electrodes, anodes, midget electrodes, graphite blocks, graphite crucibles, gas carbons, activated carbons synthetic diamonds carbon black, channel black, lamp black etc.).
65. Electrochemicals (other than those covered under alkali group).
66. Paints, enamels and varnishes.
67. Poly propylene.
68. Poly vinyl chloride.
69. Chlorates, perchlorates and peroxides.
70. Polishes.
71. Synthetic resin and plastic products.

LIST OF INDUSTRIES UNDER 'ORANGE' CATEGORY

1. Electroplating.
2. Galvanizing.
3. Manufacture of mirror from sheet glass and photoframing.
4. Surgical gauges and bandages.
5. Cotton spinning and weaving.
6. Wires, pipes-extruded shapes from metals.
7. Automobile servicing and repair stations.
8. Restaurants.
9. Ice cream.
10. Mineralised water and soft drink bottling plants.
11. Formulations of pharmaceuticals.
12. Dying and printing (small units).
13. Laboratory ware.
14. Wire drawing (cold process) and bailing straps.
15. Steel furniture, fasteners etc.
16. Potassium permanganate.
17. Surface coating industries.
18. Fragrance, flavours and food additives.
19. Aerated water/soft drink.
20. Light engineering industry excluding fabrication.
21. Electroplating.
22. Small textile industry.
23. Dye industry.
24. Pharmaceuticals industry formulation.
25. Plastic industry.
26. Chemical industry.
27. Readymade garment industry.
28. Flour mills.
29. Bleaching.
30. Degreasing.
31. Phosphating
32. Dyeing.
33. Pickling, tanning.
34. Polishing.
35. Cooking of fibres, digesting.
36. Desizing of fabric.
37. Unhairing, soaking, delimiting and bating of hides.
38. Washing of fabric.
39. Trimming, cutting, juicing and blanching of fruits and vegetables.
40. Washing of equipment and regular floor washing; using considerable cooling water.
41. Separated milk and whey.
42. Steeping and processing of grain.
43. Distillation of alcohol, stillage evaporation.
44. Slaughtering of animals, rendering of bones, washing of meat.
45. Juicing of sugar cane, extraction of sugar.
46. Filtration, centrifugation, distillation.
47. Pulping and fermenting of coffee beans.
48. Processing of fish.
49. DM plant exceeding 20 kilo litres per day capacity.
50. Pulp making, pulp processing and paper making.
51. Coking of coal, washing of blast furnace fuel gases.

LIST OF INDUSTRIES UNDER 'GREEN' CATEGORY

1. Recycling of used sand by hydraulic discharge.
2. Air chackies.
3. Rice millers.
4. Iceboxes.
5. Dal mills.
6. Ground nut decortating (dry).
7. Chilling.
8. Tailoring and garment making.
9. Cotton and woollen hosiery.
10. Apparel making.
11. Handloom weaving.
12. Shoe lace manufacturing.
13. Gold and silver thread and zari work.
14. Gold and silver smithy.
15. Leather footwear and leather products excluding tanning and hide processing.
16. Musical instruments manufacturing.
17. Sports goods.
18. Bamboo and cane products (only dry operations).
19. Card board box and paper products (paper and pulp manufacture excluded).
20. Insulation and other coated papers (paper and pulp manufacture excluded).
21. Scientific and mathematical instruments.
22. Furniture (wooden and steel).
23. Assembly of domestic electrical appliances.
24. Radio assembling.
25. Fountain pens.
26. Polythene, plastic and P.V.C. goods through extrusion/moulding.
27. Rope (cotton and plastic).
28. Carpet weaving.
29. Assembly of air coolers, conditioners.
30. Assembly of bicycles, baby carriages and other small non-motorized vehicles.
31. Electronics equipment (assembly).
32. Toys.
33. Candles.
34. Carpentry-excluding saw mill.
35. Cold storages (small scale).
36. Oil ginning/expelling (no hydrogenation and no refining).
37. Jobbing and machining.
38. Manufacture of steel trunks and suitcases.
39. Paper pins and U clips.
40. Block making for printing.
41. Optical frames.
42. Tyre retreading.
43. Powerlooms and handlooms (without dyeing and bleaching).
44. Printing press.
45. Garments stitching, tailoring.
46. Thermometre making.
47. Footwear (rubber).
48. Plastic processed goods.
49. Medical and surgical instruments.
50. Electronic and electrical goods.
51. Rubber goods industry.

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Appendix E

FISCAL INCENTIVES AND DISINCENTIVES IN ACQUIRING EST

The Government of India and certain state governments have from time to time granted incentives to promote corporate initiative and responsiveness in controlling pollution. These are briefly enumerated below.

1. **Tax relief:** The amount paid by a taxpayer to any association or institution for programs of conservation of natural resources is allowed as deduction in the computation of taxable income.
2. **Depreciation:** A list of devices and systems that are installed by industrial units for minimising environmental pollution or for conservation of natural resources has been notified as eligible for a depreciation allowance of 50 percent.
3. **Investment allowance:** The new machinery and plants that would assist in controlling pollution or environmental protection are entitled to a higher rate of (35 percent as against the general rate of 25 percent) of their cost as investment allowance.
4. **Capital gains:** To encourage industrial units to shift from congested urban areas, capital gains arising from transfer of buildings, land, machinery and plant are exempt from being added to taxable income, provided the gains are used for establishing the business at a new place approved for the purpose.
5. **Rebate on water cess:** To augment the financial resources of the Central and State Pollution Control Boards, industrial units and local bodies pay a water cess assessed by the Boards on the consumption of water. The rate of cess depends on the purpose for which water is consumed. However, if a plant for treatment of trade effluent/sewage is installed, a rebate of 70 percent of the assessed water cess is allowed.
6. **Duty relief:** The excise duty (a charge on production) is reduced from 15 percent to 5 percent on the manufacture of certain pollution control

equipment that has been notified by the Central Government. Customs duties on importation of pollution control equipment has been reduced to 40 percent from 85 percent (as against 200 percent levied generally). The custom duty relief for import of pollution control equipment being not admissible for spare parts, that tends to render the equipment less productive and servicable.

7. **Subsidies:** Loans are made available through public sector funding institutions (IDBI, ICICI, IFCI) at a concessional rate of interest that is up to 2.5 percentage points lower for pollution control measures than the annual interest rate for financing industrial enterprises. Risk finance for research and development projects for innovative technologies is made available at subsidised rate under PACT (a USAID program) and TDICI. Consultants fees at a rate of 50 percent (not exceeding Rs. 5000) for consultancy only and at 75 percent (not exceeding consultancy and implementation) are subsidised by IFCI for small projects of pollution control. More generally the nationalized financial institutions have been encouraged to extend credit for pollution abatement.

The Delhi Administration and the States of Gujarat and Tamil Nadu are among the State governments that subsidize, in part and to a varying degree, the costs of preparation of a feasibility study, construction of civil works procurement and installation of plant and machinery and limited manpower needed for establishing and operating pollution control measures. A special dispensation for clusters of small scale industrial units provides 25 percent of cost as subsidy each from the Central and State governments and 40 percent as loan to and balance 10 percent as contribution from the beneficiary units.

Appendix F

LIST OF U.S. INTERVIEWEES

Organization	Contact Person	Address and Phone Number
ASEAN Council	Ernie Bauer	202-289-1911
Camp Dresser and McKean Inc.		One Cambridge Center Cambridge, MA 02142 617-621-8181
Chemical Waste Management Inc.		3001 Butterfield Rd. Oakbrook, IL 60521 708-218-1500
CH2M Hill	Dave Burack	655 15th St. N.W., Suite 444 Washington, D.C. 20005 202-393-2426
Coalition for International Environmental Research and Assistance ^a	Dr. George Allen	12529 White Drive Fairfax VA 22030 703-815-0245
Dames and Moore	Dana Younger	7101 Wisconsin Ave., Suite 700 Bethesda, MD 20814-4870 301-652-2215
Disposal Safety Incorporated	Ben Ross	1660 L St. N.W., Suite 314 Washington, D.C. 20036 202-293-3993
Ecology and Environment Inc.	Ambassador Armin Meyer (International Marketing)	1700 North Moore Street Arlington, VA 703-522-6065
Four Nines	Peter Williamson	713-621-0490
Groundwater Technologies	Satya Yalvigi	215-558-1730
Hazardous Material Control Research Institute	George Wetzel	301-982-9500

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Organization	Contact Person	Address and Phone Number
Labat Anderson	Richard Dreiman	703-525-5300, ext. 711
Morris Knudsen Corp.	Mac Hartley	P.O. Box 703 Boise, Idaho 83729 208-386-5695
University of Florida, Gainesville	Lamar Miller	904-392-7101
Weston International	Abe Thomas Susan Shriver	Weston Way West Chester, PA 19380 215-692-3030
World Bank	Thomas Blinkhorn	World Bank, 1818 H Street, N.W. Washington, D.C.
Zimpro/Passavant	Al Slatin	301 West Military Rd. Rothschild, WI 54474

Eighty-five university and research centers and 40 trade associations are associated with a network to provide resources. Has EPA and DOE contracts to manage their international outreach and reaching for USAID's. Tries to set up counterpart structure. Are already setting up Eastern European representative office which others can rent from.

Appendix G

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Appendix H

SCHEDULE OF PROJECT RELATED MEETINGS

Delhi

Friday-Sunday Sept. 20-22, 1991

Meeting and Organization with John Grayzel.

Monday, Sept. 23, 1991

Vinit Virmani, Nandy Flour Mills, Chairman, Energy Committee of PHD Chamber, 15 Golf Links, phone 611500

Dinesh Dixit, Hindustan Development Corporation, IC/17 New Rohtak Rd., phone 5712586

Ram K. Berry, John Grayzel, and India-based team members

Tuesday, Sept. 24, 1991

Work and Organization

Shyam Bang, VAM Organic, New Delhi, Executive Vice President
Skyline House, 85 Nehru Place, New Delhi, phone 6465772

Wednesday, Sept. 25, 1991

10:00 a.m. Ministry of Environment and Forests
Mukul Sanwal, Joint Secretary
Mr. Amitabha Bhattacharya, Chief Programme Section III, UNDP,
55 Lodi Estate, New Delhi 110003, phone 4628877, 4627702

2:00 p.m. Federation of Indian Chambers of Commerce and Industry
Dr. Uma Garud

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4:00 p.m. Confederation of Engineers India
Avininder Singh, Managing Director, INDFOS Industries Ltd., 706-707, Surya Kiran 19, Kasturba Gandhi Marg, New Delhi 110001, phone 3316196-97-98, fax 3325993, telex 031 66632

S.P.Mene, Divisional Manager, Enviro Division, Thermax Ltd., Chinchwad, Pune 411 019, phone 775941, fax 772049, telex 146234/146302.

6:00 p.m. Ashwani Kumar, Advocate
C-9, Friends Colony, New Delhi 110065, phone 6832102, 6842758, fax 6831146

Thursday, Sept. 26, 1991

10:00 a.m. Finance Corporation of India
S.K. Jain, General Manager, Indian Red Cross Bldg., 1, Red Cross Rd., New Delhi 110001

2:00 p.m. National Productivity Council
Siladitya Ghosh, Deputy Director General (Technological Services) Lodi Rd., New Delhi 110 003, phones 4626986, PBX 690331-3, Res. 6474734, fax 615002, telex 66059

4:00 p.m. Technology Advisory Point
Chairman, Dr. A.K. Tiwari

5:00 p.m. Shailendra Swarup, Advocate, Swarup John and Co. No. 2, Scindia House (2d Floor), Janpath, New Delhi 110 001.

Friday, Sept. 27, 1991

9:00 a.m. U.S. Embassy Commercial Office
Tapan Banerjee, First Secretary and Commercial Attaché
Victor D'Souza, Manager, Market Research, Foreign Commercial Service, U.S. Embassy

11:30 a.m. Credit Finance Corporation
Amit Mukherjee, Director, Executive Board, 62 Basant Lok, Vasant Vihar, New Delhi 110 057, phone 676554, res. 646 9997, Fax 687 7482, telex 72451
Adit Jain, Manager, Consulting Services

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- 2:00 p.m. Meeting with USAID Mission
Mr. William Bollinger, Steven P. Mintz, John Grayzel, Ram K. Berry, N.V. Seshadri, David Jhirad, and others.
- 6:00 p.m. Narinder Singh, Adviser, Nonconventional Energy Sources, Ministry of Energy

Saturday, Sept. 28, 1991

- 6:00 p.m. Ashok H. Desai, Barrister, 8 Golf Links (FF), New Delhi 110 003, phone 462 0948

Poona

Monday, Sept. 30, 1991

- 8:30 p.m. Thermax Pvt. Ltd.
Dr. N.D. Joshi, Director R & D
S.K. Kulkarni, Div. Mgr. Engineering
Basargarkar Basa, Mgr. Process Design
G.S. Guveja, Director
- 2:00 p.m. Sandvik Asia Ltd.
Mr. S.M. Pardesi, Director of Manufacturing

Tuesday, Oct. 1, 1991

- 9:30 a.m. Four Eyes Research Private Ltd.
T.P. Vartak
Brihan Maharashtra Sugar Syndicate
Agashe
Kirloskar Consultants
Dr. S. K. Tavgaongkar, Executive VP
RPG Industries
Dr. Anil Pandit
- 2:00 p.m. Tata Electric Power

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Bombay

Wednesday, Oct. 2, 1991

- 8:00 a.m. Kannan Srinivasan, Special Reporter, *Financial Express*
- 11:00 a.m. RPG Enterprises Ltd.
Sharad Kulkarni, Executive Director, Supervisory Head, CEAT Mahal, 463, Dr. Annie Besant Rd., Bombay 400 025, phone 4930621/4930740, fax 4948861, telex 011 71285
- 11:00 a.m. Colin Rodrigues, Attorney
- 1:00 p.m. Universal Ferro and Allied Chemicals Ltd.
Dr. Juri Vilms, Executive Director (R & D), S.V. Road, Manpada, Thane 400 607, phone 534 4107/534 3361, fax 287 0180, telex 011 72307.
A.J. D'Sa, DGM, NETEL Oil Field Instrumentation and Services, phone 5344107, 534 3279, 534 3361
F.R. Katila, DGM, Environment Division
Dr. V.R. Bhawe, Chief Executive, Netel Chromatographs, phone 508107, 508279, 593361
"Jimmy" (Jamshed) Neterwala
- 6:00 p.m. IL and FS Venture Corporation
N.K. Prasad, Managing Director, 81, Maker Chambers VI, Nariman Point, Bombay 400 021, phone 287 2981-82-83, 2872888-89-90, 2872111-12, fax 204 9676, telex 83606, 83640
Vinod Haritwal, Vice President, Venture Capital

Thursday, Oct. 3, 1991

- 10:00 a.m. Maharashtra Pollution Control Board
D.R. Rasal, Member Secretary, Shri Chhatrapati Shivaji Maharaj Municipal Market Building, 4th floor, Palton Rd., Bombay 400 001, phone 261 2345/ 261 4348, res. 534 1429, fax 261 2320
K.H. Mehta, Air Pollution Abatement Engineer, phone 261 4103
- 12:00 noon Industrial and Investment Credit Corporation of India
N.J. Jhaveri, Deputy Managing Director, 163, Backbay Reclamation, Bombay 400 020-25, phone 202 5115, fax 204 6582, telex 011 - 83062. ICIC IN
P.D. Shedde, Manager, Scindia House, Ballard Estate, Bombay 400

038-50, phone 261 8251, fax 204 6582, telex 011 71874
 A.J. Advani, Deputy General Manager, Scindia House, phone
 2618251
 A.T. Kusre, Manager, Technology Group, Scindia House, phone
 2622927

- 3:00 p.m. Bayer (India) Ltd.
 Arun C. Vakil, Public Relations Manager, Express Towers, Nariman
 Point, Bombay 400 021, phone 2024242, res. 2864529, telex
 1182559/83570
 Dr. J. A. Barve, General Manager, EPP/Safety, Kolshet Rd., Thane
 (Maharashtra) 400 067, phone 5342851/5340851, res.
 5011731/594482, telex 011-72136
- 4:30 p.m. BASF India Ltd.
 M. Tandon, Chief Executive, Finance and Personnel, Rhone-Poulenc
 House, Sudam Kalu Ahire Marg, Bombay 400 025, phone 493 0703,
 fax 494 1612, telex 011 - 71538/71223 BASF IN
- 6:00 p.m. Esvin Advanced Technologies Ltd.
 T.S. Venkataraman, Managing Director, Esvin House, Perungudi,
 Madras 600 096, phone 416056, fax 417625, telex 21058 ESVI IN.

Friday, Oct. 4, 1991

Environmental Engineering Consultants

Dipak Kantawala

Yogen Parikh, General Manager, 96/97 Mittal Chambers, Nariman Point,
 Bombay - 400 021, phones 2025329/2022176, telex 11 6784 MEEC IN

Thane Belapur Industries Association

K. V. Venkatesh, Chairman, Health, Safety and Environment Committee, phone
 215 692461, res. 692193, fax 215 692048, telex 011 824465

Environmental Manager with NOCIL, P.O. Box 73, Thane 400 601 Maharashtra
 P.J. Sathe, Additional Secretary, Thane Belapur Industries Association, P-4,
 MIDC Rabale, P.O. Ghanesoli, New Bombay 400 701., phone 7 692 165, 691 919
 A.K. Rohtagi, Manager, Environmental Control-Safety-Training, Standard Alkali
 (Chemicals Division) Standard Industries Ltd., Thane Belapur Rd., POB No. 23,
 Thane 400 061., phone 6922052/692208, fax 6922652, telex 11 74418 STDP IN,
 res. 612 8158

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Saturday, Oct. 5, 1991

11:00 a.m. Cyanamid India Ltd.
Dr. A. B. Talwadkar, Technology Development
Atul Post Valsad Gujarat, Bombay, phone 4935211
7:00 p.m. Associated Industrial Consultants (India) Private Ltd.
Soli Arceivala, Managing Director, Raheja Centre, 13th Floor,
Nariman Point, Bombay 400 021, phone 234052, 242076, 243220, fax
204 0398, telex 11 86841

Nagpur

Monday, Oct. 7, 1991

National Environmental Engineering Research Institute,
P.P. Khanna, Dir Nehru Marg, Nagpur 440 020 526071-5, fax 523893, telex 715
233 NERI IN
Dr. F.V.R. Subrahmanyam, Deputy Director, phone 525191
Dr. S.K. Gadkari, Assistant Director, Environmental Impact Assessment Div.,
phone 523893
Dr. A.L. Aggarwal, Deputy Director and Head, Air Pollution Control, Phone
530673
Dr. R. Sarin, Assistan Director, Scientist and Head, Basic Research and Training
Division, Phone 525640.
Dr. B.K. Handa, Deputy Director

Hyderabad

Tuesday, Oct. 8, 1991

10:00 a.m. Jeedimetla Effluent Treatment Plant Ltd.
G.K.B. Chowdary, Mg. Dir also Vasant Chemicals Pvt. Ltd., Plot
No. 267, Phase I, IDA, Jeedimetla, Hyderabad 500 855, Off. 842
288, Factory 895180, fax 847940, telex 2130 VCPL IN
G. Narayan Rao, 40/1 Sarojini Devi Rd. Secunderabad, 500 003
India, phone 820 047, 830282

2:00 p.m. Administrative Staff College of India
P.C. Bowender

Dinner with Jeedimetla Directors

Wednesday, Oct. 9, 1991

- 11:00 a.m. Vimta Labs Ltd.
Dr. S. P. Vasireddi, Managing Director, B-302, Mayfair, 1-8-303/34,
Sardar Patel Rd., Secunderabad 500 003, phone 843399, telex 6841
TEST IN
Dr. K.S.M. Rao, Jt. Dir. and Head of Environmental Division.
- 3:00 p.m. Andhra Pradesh Pollution Control Board
Mr. Diljeet Arora, Chm.
Dr. S.V. Rao, Member Secretary, HUDA Complex, Ameerpet,
Hyderabad 500 038, phone 223567/228206, res. 840307, telex 0425-
6581 APCB IN
- Evening Y.S. Murthy, Consultant (Environment), Res. 12-5-35/A/4, Street
No. 6, Tarnaka, Secunderabad 500 017, phone 830 563 (former
Member Secretary State Pollution Control Board)

Bangalore

Mysore Kirloskar Ltd.
Saibal K., Manager, Water Pollution Control
V.T. Jairaj, Divisional Manager, Air Pollution Control

Thursday, Oct. 10, 1991

- a.m. D.R. Murali, Partner Murali Sesh Environmental Engineers
Tannery Cluster at Kadugonda
- 2:00 p.m. Karnataka State Pollution Control Board
Prof. B. Shivalingaiah, 8th Floor, Public Utility Building, M. G. Rd.,
Bangalore 560 001, phone 576570, res. 574762, telex 845-8348
- 5:30 p.m. Meeting at the Institution of Engineers
M.V. Ramaswamy, Chief Engineer, Karnataka Urban Water Supply
and Drainage Board, 11th floor, Public Utility Buildings, M. G. Rd.,
Bangalore 560 001, res. 349341/262311
G. Nanjappa, Globe Consultants, 50 Nanjappa Rd., Shantinagar,
Bangalore 560 027, phone 239635/620536
B.P. Baliga, Consultant, phone 345990, Flat 401, Ullas Apartments,
32/7, 8th Mada(?) Rd., Malleswaram, Bangalore, 560 003
Dr. K. S. Ramegowda, Hrd. Dir. Centre for Symbiosis of
Technology, Environment, and Management, 5 Ganapathi Apts.,
Lakshmi Rd., 7th Cross, Shanthinagar, Bangalore 560 027, phone
220574, telex 845- 2335 RAVI IN

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H-8

Friday, Oct. 11, 1991

10:00 a.m. Technology Development and Information Company of India
K.S. Nadkarni, President, Leo Complex, 5th Floor, 44 and 45
Residency (Cross) Rd., Bangalore 560 025, phone 543681/544471-
73, fax 540741, telex 845-2947

4:00 p.m. CEDCO Technical Services Limited
S. Ranganathan, Managing Director, 1/1 Palace Road, Bangalore
560 001, phone 266753, 266073, 262963, telex 845 8828 CEDCO IN
G.H. (Jerry) Buote, Director Power Services

Monday, Oct. 14, 1991

2:00 p.m. PHD Chamber
D.K. Kapur, Sonali, Adviser, Shed no.1 28, Phase II, Scheme II,
Okhla Industrial Area, New Delhi 110020, phone 631313, 683993,
res. 631313, 632650, telex 31-75061, SON IN
J. P. Kapur, M-213 Greater Kailash Part II, New Delhi 110048,
phone 641622, 6416100

Vinit Virmani, Nandy Mill's
Deepak Pahwa, Bye Air, 20 Rajpura Rd., Delhi 110054, phone 252
2424

10:00 a.m. M.C. Mehta, Advocate, 5, Anand Lok, Khelgaon Marg, New Delhi
110 049, phone 6445214, 6446145, 6436512

Wednesday, Oct. 16, 1991

11:00 a.m. Final Mission Debriefing

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Appendix I

SUPPLIERS OF SOLVENT RECYCLING EQUIPMENT

(Source: "Solvent Waste Reduction Technologies," US EPA/625/4-89/021,
Environmental Protection Agency, Washington, D.C., 1989)

Suppliers of Solvent Recycling Equipment Suitable for On-Site Reclamation - Single-Plate Packaged Still

Supplier	Throughput ¹ (gal/hr)	Solvent Capacity (gals)	Heating Options	Cooling Options	Explosion Proof	Cost \$K	Solvent Types Designed for	Comments
Alternative Resource Management 7134 S. Yale (Suite 400) Tulsa, OK 74136 918-495-0535	1.5-100	5-100	Electric/ Steam	Refrig/ Water	Yes	2.5- 100-	All	Atmospheric & Vacuum Models Available
Baron Blakeslee 2001 N. Janice Ave. Melrose Park, IL 60160 312-450-3900	10-120	8-95	Electric/ Steam	Refrig/ Water	No	5-8	Halogen- ated	
Eranson Cleaning Equip. Corp. P.O. Box 768 Shelton, CT 06484 203-796-0400	12-60	10-60	Electric/ Steam	Refrig/ Water	No	4-10	Halogen- ated	
BR Instrument Corp. P.O. Box 7 Pasadena, MD 21122 301-647-2894	1-2	3-6	Electric	Water	Yes	9-12	All	For Lab Operations
DCI International 1229 Country Club Rd. Indianapolis, IN 46234 317-271-4011	250	250	Dir. Steam Injection	Water	Yes	No Available Data	All	For Removal of Solvents from Oils
Detroit Chemical Ind. Inc. P.O. Box 501 Detroit, MI 48232 313-355-5800	50-180	50-200	Electric/ Steam	Water	No	6-10	Halogen- ated	
Dust Inc. 131 Prince St. New York, NY 10012 212-505-0611	2-70	10-50	Steam/ Hot Oil	Water	Yes	8-54	All	
Finnish Eng. Co. (Extratec) 921 Greengarden Rd. Erie, PA 16501-1591 814-455-4478	15-380	5-50	Electric/ Steam	Water	Yes	5-80	All	Make a Wide Range of ATM. & VAC. Models
Finishing Equip. Inc. 3640 Kenosha Dr. St. Paul, MN 55722 612-452-1860	No Available Data	No Available Data	Electric/ Steam	Water	No	No Available Data	Halogen- ated	
Giant Distillation & Recovery Co. 3156 Bellevue Rd. Toledo, OH 43606	1.5-10	5-60	Electric/ Oil	Water	Yes	5-100	All	Atmospheric & Vacuum Models Available
Hoyt Corp. Forge Rd. Westport, MA 02997 617-636-8811	4-8	25-50	Oil	Water	No	No Available Data	Halogen- ated	Also Make Vapor Recovery Units
Lenape Equipment Co. P.O. Box 285 Manasquan, NJ 08736 201-581-2442	4-45	5-30	Electric	Refrig/ Water	No	3-20	Halogen- ated	
National Ultrasonic 11113 IL 60626 312-465-6790	No Available Data	No Available Data	No Available Data	No Available Data	No Available Data	No Available Data	Halogen- ated	

Continued

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Suppliers of Solvent Recycling Equipment Suitable for On-Site Reclamation -
Custom Builders of Fractional Distillation Units

Supplier	Type of Equipment Available			
	Throughput ¹ (gal/hr)	Solvent Capacity (gals)	Explosion Proof	Price \$K
Advanced Process Systems 10400 Linn Stabon Rd., Suite 310 Louisville, KY 40223	5-100	5-100	Yes	20-50 +
Artisan Ind. Inc. 73 Pond Rd. Waltham, MA 02154 617-893-6800	10-50	10-50	Yes	20-30 +
Chem-Pro Equip. Co. 27 Daniel Rd. Fairfield, NJ 07006 201-575-1924	5-50	10-50	Yes	20-30 +
Distillation Eng. Co. 105 Dorsa Ave. Livingston, NJ 07039 201-992-9620	5-50	10-50	Yes	20-30 +
Ferrison Ind. Inc. 1900 W. Northwest Hwy. Dallas, TX 75220 214-556-0010	N/A ²	N/A	Yes	20-30 +
Finish Eng. Co. Ene, PA 16501 814-455-4478	5-50	10-50	Yes	20-30 +
Progressive Recovery Inc. 1976 Congressional Dr. St. Louis, MO 63146 314-567-7963	3-30	10-50	Yes	20-40 +

¹ For the lowest volatility solvent.
² N/A = No data available.

Suppliers of Solvent Recycling Equipment Suitable for On-Site Reclamation - Thin-Film Evaporation

Supplier	Throughput (gal/hr)	Solvent Capacity (gals)	Heating Options	Cooling Options	Price Range \$K
Alpha Laval Inc. 2115 Linwood Ave. Fl. Lee, NJ 07024 201-592-7800	-	-	Hot oil	Refring/Water	50 -
Artisan Ind. Inc. 73 Pond Rd. Waltham, MA 02154 617-893-6800	5-50	5-50	Steam/Oil	Refring/Water	50-130 -
Brighton Corp. 11861 Mosteller Rd. Cincinnati, OH 45241 513-771-2300	7.5-200	5-200	Steam/Hot oil	Water	18-43
Luwa Corp. P.O. Box 16348 Charlotte, NC 28216 704-394-8341	50-1200	Cont.	Steam/Hot oil	Water	25-50 -
Progressive Recy. Inc. 1976 Congressional Dr. St. Louis, MO 63146 314-567-7963	15-300	15-300	Steam/Hot oil	Water	40-120

¹ For the lowest volatility solvent.

(Continued)

Supplier	Throughput (g/hr)	Solvent Capacity (gals)	Heating Options	Cooling Options	Electric Proof	Cost \$/hr	Solvent Types Described for	Comments
Phillips Mfg Co 7334 No. Clark St Chicago, IL 60626 312-338-6200	5-125	5-125	Electric/Steam	Water	No	7-15	Halogenated	
Progressive Recovery Inc 1976 Congressional Dr St. Louis, MO 63146 314-567-7963	5-35	5-25	Hot Oil	Water	Yes	3-30	All	
Ramco Equipment 32 Montgomery St Hillside, NJ 07205 201-687-6700	25-200	30-135	Electric/Steam	Water	No	7-20	Halogenated	Also Make Custom Designs
Recyclene 1910 Trade Zone Blvd San Jose, CA 95131 408-945-8600	2-20	15-35	Electric/Heated Oil	Water	Yes	4-21	All	
Vaco Solv Co. P.O. Box 26147 Cincinnati, OH 45226 513-321-9178	1.6-10	5-60	Electric	Air	Yes	10-3	All	No Cooling Needed
Westinghouse Electric Co. Box 300 Sykesville, MD 21784 301-795-2800	15-30	10-50	Electric	Retng/Water	No	7-10	Halogenated	

1 For the lowest volatility solvent.

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Appendix J

STATEMENT ON TRADE POLICY

**Statement on Trade Policy to be made by
Shri P Chidambaram, Minister of State for Commerce
in the Lok Sabha on 13 August, 1991.**

On 4th July, 1991, I announced major changes in the Trade Policy. Subsequently, in consultation with the Ministry of Finance, several decisions have been taken. It is considered appropriate to put together all these decisions in the form of a Statement on Trade Policy. The Statement on Trade Policy is annexed herewith.

Hon'ble Members will be pleased to know that the Statement on Trade Policy contains major reforms in the Eximscrip system and Advance Licensing. It also contains a new package for 100% Export Oriented Units and Units in the Export Processing Zone. The Statement also deals with other matters such as the policy towards canalisation and the role of the public sector state trading organisations.

The functions of Chief Controller of Imports and Exports are being reoriented. The office itself is being redesignated as Directorate General of International Trade.

The Statement on Trade Policy recognises the major role that State Governments have to play in export promotion.

The Board of Trade has been reconstituted and it will meet shortly.

The Government attaches high priority to trade policy reform as an essential element in restructuring our economy to increase productivity and competitiveness and to achieve a strong export performance in the years ahead.

**Government of India
Ministry of Commerce**

STATEMENT ON TRADE POLICY

International trade today, more than ever before, is the driving force of economic activity. It not only enables the exchange of goods and services among countries, but in today's world, it serves as the bedrock for the increasingly inter-dependent global network of technology, investment and production. No country can ignore these developments which pose both opportunities and challenges. India's trade policy must respond to these challenges.

2. The new Government took office at a time when the Balance of Payments position facing the country had become critical and foreign exchange reserves had been depleted to dangerously low levels. The export momentum built up during the period 1986-87 to 1989-90, when India's exports grew at an average annual rate of 17% in terms of US dollars, was lost in 1990-91 when export growth decelerated to only 9% in US dollars. Exports in April-May 1991 have actually shown a decline of 5.8 per cent in terms of US dollars compared with April-May 1990. Imports had to be severely contained in the course of 1990-91 because of the shortage of foreign exchange. This affected the availability of many essential items and also led to a distinct slow down in industrial growth.

3. Restoration of viability in our external payments situation was an urgent task requiring action on several fronts, including macro-economic stabilisation and reform of trade policy. Trade Policy reform has to aim at quick revival of the momentum of exports. It is only through rapid growth of exports that we can expect to overcome our persistent balance of payments problems, restore international confidence and achieve true self-reliance with an expanding economy. The reform also has to aim at creating strong incentives to economise on imports but without resorting to proliferation of licensing controls which promote delay and inefficiency, spawn arbitrariness and stifle enterprise. The world economy is changing rapidly and most countries, including developing countries and the countries of Eastern Europe, are gearing up to the challenges of competing in an increasingly integrated, highly global market place. India cannot afford to ignore these changes. India can grow faster only as part of the world economy and not in isolation. Our trade policy must therefore create an environment that will provide strong impetus to exports and render export activity more profitable. We must also create an environment free from bureaucratic control in which our exporters will be able to respond with speed and flexibility to changing international conditions.

4. To this end the Government announced an initial package of trade policy reforms on 4th July 1991. Several changes in trade policy were introduced aimed at strengthening export incentives, eliminating a substantial volume of

import licensing and optimal import compression in view of the Balance of Payments situation. Essential imports of sensitive items such as POL and fertilisers were fully protected, but other imports of raw materials and components were linked to export performance, through an enlargement and restructuring of the replenishment licensing system. The system of cash compensatory support for exports was abolished consequent upon the change in the exchange rate and other measures of reform which provided substantial incentives for exports across the board.

5. Following the initial announcement, extensive consultations were held with various sections of industry and several additional steps have already been taken in pursuit of Government's stated objectives. Some others are being separately notified today. All these initiatives in trade policy and procedures are summarised in this statement.

The new Eximscrip System

6. The replenishment system has been enlarged and restructured to provide greater incentive for all categories of exports. REP licences have been replaced by a new instrument named Eximscrips. Eximscrips will be the means of obtaining access to certain categories of imports of raw materials, components and spares. Eximscrips will be issued on the basis of FOB value of exports or Net Foreign Exchange (NFE) earnings from exports as indicated below. The main features of the new system are:

- i) The basic rate at which Eximscrips will be issued against exports will be 30% of FOB value. Exports to hard currency areas will be eligible for Eximscrips valid for hard currency imports while exports to rupee payment areas will be issued Eximscrips valid for imports from these areas only. However, as a measure of transition, exports to rupee payment areas may continue to avail of REP licences valid for hard currency imports at the rate prevailing prior to 4 July 1991. This transition facility will be available only for exports effected upto 31st December 1991.
- ii) Products such as gems and jewellery, handicrafts, newspapers, journals and periodicals and cinematographic films, which enjoyed higher rates of REP will receive Eximscrips at the same rates as before.
- iii) The basic rate of 30% is inadequate for exports of certain products such as value-added agricultural products, electronics, bulk drugs and marine products, formulations and certain categories of advanced engineering goods. These products, which are listed in Annexure I will be eligible for an additional Eximscrips entitlement of 10 percentage points, taking the total Eximscrips rate to 40% of FOB value.
- iv) For exports made on the basis of duty free imports obtained against Advance Licences, Eximscrips will be available at the general rate of 30%

but this will be applied to the net foreign exchange earnings. On the same principle, Eximscrips at 30% of NFE will also be available for all EOU and EPZ units.

- v) The 30% of NFE rate of Eximscrips is also applicable to service exports, including software exports which is a thrust area. The definition of services covered under this category is being rationalised and extended to include other services such as services of architects, textile designers, artistes, management consultants, lawyers etc. The benefit will be available to services exported by resident Indians for which remittances are made to India. The details are being notified separately.

7. Eximscrips issued to exporters will be tradeable and can be used to import any item in the limited permissible list (Appendix 3), the non-sensitive canalised list (Appendix 5A) and for all OGL items for actual users (Appendix 6, List 8, Part I and List 10). Eximscrips earned by exporters on their own exports can also be used to import non-OGL capital goods other than those on the restricted list (Appendix 1A). All REP licences issued against exports prior to 4th July 1991 will continue to be valid for the life of the licence and will have the same import entitlement as the new Eximscrips. Additional licences issued to export houses/trading houses, which were earlier valid for a more limited range of imports, will also be valid for the same range of imports as Eximscrips.

8. With the introduction of Eximscrips, the system of issuing supplementary licences for raw materials, components and spares listed in Appendix 3 will be discontinued except for small scale industries and for manufacturers of specified life saving drugs and equipment. In future, all import requirements of these items (with the exceptions indicated above) will be made through Eximscrips. Similarly items in Appendix 4 and Appendix 9, which were earlier importable against supplementary licences, will henceforth be importable only against Eximscrips. Import of items appearing in Appendix 2 Part B (List of Restricted Items) and Appendix 8 (List of Scientific and Measuring Instruments Restricted for Import) of the Import-Export Policy 1990-93 will continue to require licences. Such licences as well as licences required for small scale industries and manufacturers of life saving drugs/equipment will be called Special Licences as these will be limited and indeed special cases.

9. As a measure of import compression and to strengthen the linkage between import capability and exports, two further changes have been made. The category of unlisted OGL has been abolished and these items have been shifted to Appendix 3. They are now importable only against Eximscrips (except for SSI and manufacturers of life saving drugs and equipment). In the case of units subject to the Phased Manufacturing Programme (PMP), many of which benefit from concessional duty on their imports of OGL items, all such items will henceforth be importable only against Eximscrips.

10. Eximscrips will be issued only after export proceeds have been realised. The procedure for issue of Eximscrips has been streamlined and Government will ensure that Eximscrips are issued within 48 hours of the receipt of the application accompanied by a single document, namely, the bank certificate for the realisation of export proceeds.

Advance Licences

11. The system of advance licences is designed to provide exporters with duty free access to the inputs they need to produce competitively for world markets. This is an important instrument of trade policy especially in our situation where tariff levels are still high. The Government has taken the following steps to strengthen the system of Advance Licences as an instrument of export promotion:

- i) The procedures for considering Advance Licence applications have been simplified to ensure that Advance Licences will be issued within 15 days of application in all cases where input-output norms have been fixed. Where norms have not been fixed, the licence will be issued within 45 days.
- ii) The number of documents accompanying an Advance Licence application has been reduced from 9 to 3 where norms are prescribed and to 4 where they are not prescribed.
- iii) At present norms have been prescribed for 540 items. This will be increased to over 1000 items by 31st October 1991 and more items will be covered thereafter.
- iv) Substantial Manufacturing Activity as a necessary condition under the Advance Licence Scheme will no longer be applicable for exports to the general currency area. However, the value addition norms will remain in force. A larger number of exporters will benefit under this scheme.
- v) A new Scheme of Transferable Advance Licence has been introduced for GCA exports in selected thrust areas, namely textiles, leather goods and engineering industries. Under this scheme exporters can undertake exports based on duty paid inputs obtained from the market and subsequently obtain Advance Licences for replenishment of these inputs by duty free imports. These Advance Licences will be freely transferable. The coverage of the scheme will be extended on merits.
- vi) Advance licences will specify values in free foreign exchange both for the purposes of import and export. The currencies in which such values are denominated will be limited to those notified for this purpose by the RBI.
- vii) The existing procedure for obtaining Bank Guarantee (BG) and Legal Undertaking (LUT) from different categories of exporters is being streamlined and liberalised as follows:

- a) Export/Trading/Star Trading Houses and public sector undertakings will have the facility of obtaining Advance Licence against LUT only without any monetary limit.
 - b) All manufacturing units having an annual turnover of at least Rs. 5 crores (including both domestic and exports turnover) during the previous 3 years would also be able to avail of the LUT facility upto a value limit of 50% of their annual production.
 - c) A new unit without any production or export performance to its credit would also be allowed LUT facility provided it is promoted by an existing company with an annual production of Rs. 5 crores for more than three years. In such a case, both the new company and the promoting company would have to provide LUT.
 - d) Bank guarantee and/or LUT obligations will be concurrent to the fulfilment of export obligation.
- viii) Exporters would be allowed to dispose of the materials imported against Advance Licences by way of replenishment without seeking prior permission of the licensing authority in cases where no MODVAT facility has been availed of on the domestic material used in exports.
 - ix) Adjustment needed on account of fluctuation of prices of imported individual items would be permitted within the overall CIF value of Advance Licence.
 - x) The power of revalidation which presently vests in the Licensing Committee at the Headquarters has been delegated to the Licensing Authorities.
 - xi) In cases where applications for an Advance Licence are turned down, the exporter will be permitted to convert to the Duty Drawback regime by the Collectors of Customs so that shipments made in advance can be imported on payment of duty for subsequent claims of duty drawback.
 - xii) Exporters can obtain Advance release orders for domestic supply against Advance Licences under which the domestic supplier gets the benefit of deemed exports. Henceforth, release orders will be issued across the counter without requiring the name of the domestic supplier, which could be given later.
12. The adoption of these procedures would reduce discretionary controls and delays and afford much greater freedom to exporters in procuring essential duty free raw materials to maintain their competitiveness in the world market thereby promoting exports from the country.

Export Processing Zones and 100% EOUs

13. The Export Processing Zone scheme and the 100% EOU scheme were introduced to provide for duty-free enclaves, which would enable entrepreneurs to concentrate on production exclusively for exports. However, with increasing

liberalisation in the DTA, the duty advantages enjoyed by EPZs/EOUs have become less important, while the procedures of Customs Bonding are very onerous. The schemes have not therefore taken off as expected and they have also not attracted foreign investment aimed at tapping export markets to the extent that was expected. The working of these schemes has been reviewed and the following changes made:

- i) All EOUs/EPZ units will be eligible for Eximscrips at the basic rate of 30% applied to net foreign exchange earning.
- ii) The duty applicable on DTA sales from EOUs/EPZ units is being reduced to 50% of the normal customs duty subject to the duty payable not being less than the excise duty on the same product. The extent of DTA sales allowed will be in accordance with their entitlement. DTA sales will be permitted in the ratio of 25:75 in relation to export sales in case of units whose use of indigenous raw material is more than 30% of production. In all other cases the ratio of permissible DTA sales to export sales will be 15:85. The procedures for clearing goods from the EOUs/EPZ units for DTA sales are also being streamlined.
- iii) In order to encourage exporters to set up EOUs or EPZ units the net foreign exchange earned by EOUs or EPZ units can be clubbed with the earnings of their parent/associated companies in the DTA for the purpose of according Export House, Trading House or Star Trading House status for the latter.
- iv) The IPRS scheme for supply of steel to exporters will also be extended to EOUs and EPZ units. The Development Commissioners are being empowered to issue "payment authorities" in lieu of JCCI&Es.

14. Under the New Industrial Policy, most industries do not require an industrial licence except for a defined list. Clearances for imports of capital goods have also been made automatic where capital goods imports are covered by foreign equity or where they are 25% of the value of plant and investment subject to a limit of Rs. 2 crores. With a view to bringing about comparable streamlining in the procedure for EOU/EPZ approvals, a system of automatic approvals is being established for all proposals which fall within certain parameters. Capital goods imports will be allowed under the automatic approval procedure if they are fully covered by foreign equity or if they do not exceed 50% of the value of plant and equipment subject to a ceiling of Rs. 3 crores. All proposals within the automatic approval parameters will be cleared within two weeks. All other proposals will be submitted to the Board of Approvals for consideration and decisions including issue of licences will be taken within 45 days.

15. A large number of issues relating to the operation of EOUs/EPZ units requiring centralised clearance in the Ministries of Commerce and Industry, powers are being delegated to the Development Commissioners so that these

approvals can be given on a decentralised basis. The specific approval of the Development Commissioner would not be required in cases of broad banding by EPZ units, where value addition is being maintained. The unit concerned would need only to provide relevant information to the Development Commissioner.

16. The following specific concessions to EOUs/EPZ units have also been extended:

- i) allowing entry of imported raw material on "provisional assessment" basis, to expedite customs clearance;
- ii) permitting units under the EPZ and EOU schemes to supply/transfer finished goods among themselves;
- iii) replacement of multiple bond by a single bond, for obtaining import clearance;
- iv) increasing the list of items under the "Special Imprest Licence Scheme", on selective basis;
- v) Expediting supplies from the DTA, without payment of excise duty, by issuing pre-authenticated CT-3 form booklets to EOUs, which would obviate the necessity of approaching Central Excise offices each time such exemption is sought.
- vi) clarifying that containers stuffed in EPZs and EOUs are not to be re-inspected at other points, as long as seals are intact.

17. Government have also decided to allow private parties to establish bonded warehouses within EPZ for stocking and sale of duty free raw materials, components, consumables and spares to EPZ units and EOUs. This will cut down delay in obtaining supplies of duty free materials which are in constant and regular demand by exporters. The details of this scheme will be notified shortly.

Simplified Procedure for Import of Capital Goods

18. The procedure for import of capital goods has been simplified following the statement on Industrial Policy. New units and units undergoing substantial expansion will automatically be granted licences for import of capital goods other than those in Appendix I Part A (Restricted List) of the Import-Export Policy, without any clearance from the indigenous availability angle provided the import of capital goods is fully covered by foreign equity or the import requirement is upto 25% of the value of plant and machinery subject to a maximum of Rs. 2 crores.

19. Access to non-OGL capital goods other than those in Appendix I Part A has also been expanded for all exporters and export houses by the fact that the Eximscrip entitlement has been increased and exporters are allowed to use Eximscrips earned on their own exports for import of such capital goods.

Harmonising Trade and Customs Classification

20. The classification system used in the import-export policy and the system used by the customs are not identical and this has often created difficulties in determining the tariffs applicable to different items. The two codes are being harmonised and the harmonised classification will be released in September 1991. This will reduce the scope for discretionary decision making at lower levels and introduce greater transparency in the import policy including tariff structure.

Canalisation of Exports and Imports

21. Over the years a number of items of exports and imports have been canalised for export or import through specified public sector agencies. The Government has reviewed the list of items thus canalised and has decided that a number of items may be decanalised. In the case of exports 15 items are being decanalised immediately. In the case of imports 6 items are being decanalised and placed on OGL while 14 items are being decanalised and listed in Appendix 3 where they will be available for import against Eximscrips. The list of items is given in Annexure II. Notifications regarding these changes are being published separately.

22. There is a strong case for decanalising imports of more items of raw materials and placing them on OGL. However, in view of the present balance of payments position, a decision on these items is being deferred. The Government's policy is to progressively reduce the extent of canalisation. It is proposed to make a further review by March 1992 and take suitable decisions effective from 1st April 1992.

Objectives of Public Sector Trading Organisations

23. Public sector trading organisations like the STC and MMTC have traditionally depended heavily on canalised trade. They will now be reorientated to achieve the objectives of emerging as international Trading Houses capable of operating in a competitive global environment, of serving as effective instruments of public policy and of providing adequate support services to the small scale/cottage sectors.

Export Houses and Trading Houses

24. Government will continue to support the development of export houses and trading houses as instruments for promoting exports. To this end the following initiatives are being taken:

- i) Export houses, trading houses and star trading houses received additional licences at varying rates based on their Net Foreign Exchange earning in the previous year. For the year, 1991-92, it has been decided to widen the range of items which can be imported against additional licences. The range will now be the same as that of Eximscrips.

- ii) With effect from 1st April 1992, additional licences will stand abolished and export houses, trading houses and star trading houses will receive additional Eximscraps at the rate of 5% of the FOB value of exports. The details of the scheme and the list of export items excluded from it because of their special nature are being worked out.
- iii) Government has announced that permission will be given for setting up of Trading Houses with 51% foreign equity for the purpose of promoting exports. Such trading houses would be eligible for all the benefits available to domestic export and trading houses in accordance with the Import-Export Policy. Procedures for recognition of these companies as export/trading houses are being notified separately.

Foreign Currency Accounts for Exporters

25. Government has decided to allow established exporters to open foreign currency accounts in approved banks and allow exporters to raise external credits, pay for export related imports from such accounts, and credit export proceeds to such accounts. This will facilitate payments by exporters for their essential imports. The details of this scheme will be notified separately by the Reserve Bank of India.

Board of Trade

26. The Board of Trade has been reconstituted and will be activated once again. The Board of Trade will be an apex forum to facilitate close and frequent interaction between industry and trade on the one hand and Government on the other. Government will attach great importance to the advice and recommendations of the Board of Trade.

Re-orientation of the Office of CCI&E

27. The office of Chief Controller of Imports and Exports is being redesignated as the Directorate General of International Trade. The principal function of the Directorate will henceforth be promotion of exports and facilitation of imports to promote export trade. Government is of the view that the Imports and Exports (Control) Act, 1947 and the Orders thereunder would require review. Such a review will be made as soon as possible. Besides, the Manual of Office Procedure and the functions performed by various Port Offices will be comprehensively reviewed and a new charter of duties and functions will be drawn up to reflect the new role of the Directorate.

States' Role in Export Promotion

28. Exports can only take place if we generate adequate volumes of surpluses in exportable commodities. Government recognises that State Governments have a major role to play in achieving this objective. State Governments have

been requested to exempt exports from all fiscal levies in order to ensure that our exporters are able to compete effectively in world markets. Government has taken steps to strengthen the State's Cell in the Ministry of Commerce so that interface with the State Governments becomes more effective. At the same time, Government has requested, and will continue to persuade, State Governments to set up a separate Export Promotion Cell or a Directorate of Export Promotion in each State Secretariat.

Reduction in Import Licensing

29. The policy changes now being implemented imply a substantial reduction in the extent of licensing and in the number and types of licences. Supplementary licences for import of items in Appendices 3 (except for SSI and manufacturers of life saving drugs and equipment), 4 and 9 of the Import-Export Policy 1990-93 have been abolished. Additional Licences which were issued as an incentive to Export Houses and Trading Houses will stand abolished with effect from 1st April 1992 and the incentive will take the form of an additional Eximscrap entitlement.

30. To achieve optimal import containment in the context of the present Balance of Payments situation, several steps have been taken. One of these is the shift of many items which are now on OGL to the Limited Permissible List.

31. With these changes, the policy for import of raw materials, components and other inputs needed for production has been simplified. Most raw materials and other inputs (except for those on the Restricted List) can be freely imported either against Eximscraps or on OGL. Some raw materials continue to be canalised but in most of these cases requirements beyond those provided by the canalising agencies can be met through Eximscraps. It is the policy of the Government to move to a situation where imports of essential raw materials and components needed for industrial production are regulated through appropriate tariffs. However, in view of the Balance of Payments position which necessitates continued import containment, this cannot be done immediately. Many items must therefore remain on the limited permissible list, with imports permitted only against Eximscraps.

32. The medium term objective of the Government is to progressively eliminate licensing and quantitative restrictions on capital goods and raw materials/components so that all these items can be placed on OGL save for a small carefully defined negative list. This shift is proposed to be achieved over a 3 to 5 year period. The Government will appoint a High Level Committee to work out the modalities of achieving this transition keeping in mind the Balance of Payments position and the need to rationalise and reduce tariffs progressively to provide Indian Industry with an appropriate environment to develop international competitiveness.

Dated: August 13, 1991

**PRODUCTS ELIGIBLE FOR ADDITIONAL EXIMSCRIPS
ENTITLED TO 10 PERCENTAGE POINTS**

I. Fish and fish products

1. Individually quick frozen fish (excluding frog legs), canned marine products.

II. Agricultural Items

1. Cashew kernels roasted/salted in consumer packs of 1 kg or less.
2. Fresh fruits, vegetables, cut-flowers, plants and plant materials and spices going by air.
3. All types of canned, bottled and aseptically packed fruits, vegetable products and spices.
4. Pulverised/Treated guar gum.
5. Instant Tea, Quick brewing black tea, tea bags, Packed tea, Tea caddies and Tea chestlets.
6. Instant coffee in all forms.

III. Drugs and drug intermediates (as appearing at S. No. B. II (1) of Appendix 17 of IMPEX Policy)

IV. All Electronics products

V. High Technology Engineering Products (to be notified separately)

ANNEXURE II

LIST OF IMPORT ITEMS TO BE DECANALISED

- I. *List of Items to be decanalised and put under OGL*
 1. Silk Worm
 2. Sodium Borate
 3. Old Ships
 4. Fluorspar
 5. Platinum
 6. Palladium

- II. *List of import items to be decanalised and put under REP*
 1. Jute Pulp
 2. Manila Hemp
 3. Raw Sisal Fibre
 4. Raw Jute
 5. Alkyl Benzene
 6. Floppy Disketts
 7. Lauric Acid
 8. Oleic Acid
 9. Stearic Acid
 10. Palmitic Acid
 11. Palm Fatty Acid
 12. Palm Acid Oil
 13. Other fatty acids, pure or mixed including acid oils
 14. Soap Stocks

LIST OF EXPORT ITEMS TO BE DECANALISED*Item*

1. Castor Oil
2. Polythelene (LD)
3. Coal and Coke
4. Colour Picture Tubes and sub-assemblies of colour TV containing colour TV picture tubes
5. Ethyl Alcohol or rectified spirit of any proof degree whether denatured or not
6. Exposed Cinematographic Films and Video Tape Cinema Films
7. Khandsari Molasses
8. Molasses
9. Mill Scale Scrap
10. Bimetal Ore (Black iron ore) with manganese contents from 3% upto 10% of Goa origin
11. Railway Passenger Coaches and Locomotives
12. Raw Jute, Mesta & Jute cuttings
13. Sugar
14. Iron ore of Redi origin
15. Iron ore of Goa origin when exported to China or Europe in addition to Japan, South Korea and Taiwan
16. Low grade bauxite of West Coast origin

Appendix K

STATEMENT ON INDUSTRIAL POLICY

ECONOMIC INTELLIGENCE SERVICE

STATEMENT ON
INDUSTRIAL POLICY

24 JULY 1991

CENTRE FOR MONITORING INDIAN ECONOMY

110-120 Kallandas Udyog Bhavan, Near Century Bazar, Worli, Bombay 400 025.

STATEMENT ON INDUSTRIAL POLICY*

Policy Objectives

1. Pandit Jawaharlal Nehru laid the foundations of modern India. His vision and determination have left a lasting impression on every facet of national endeavour since Independence. It is due to his initiative that India now has a strong and diversified industrial base and is a major industrial nation of the world. The goals and objectives set out for the nation by Pandit Nehru on the eve of Independence, namely, the rapid agricultural and industrial development of our country, rapid expansion of opportunities for gainful employment, progressive reduction of social and economic disparities, removal of poverty and attainment of self-reliance remain as valid today as at the time Pandit Nehru first set them out before the nation. Any industrial policy must contribute to the realisation of these goals and objectives at an accelerated pace. The present statement of industrial policy is inspired by these very concerns, and represents a renewed initiative towards consolidating the gains of national reconstruction at this crucial stage.

2. In 1948, immediately after Independence, Government introduced the Industrial Policy Resolution. This outlined the approach to industrial growth and development. It emphasised the importance to the economy of securing a continuous increase in production and ensuring its equitable distribution. After the adoption of the Constitution and the socio-economic goals, the Industrial Policy was comprehensively revised and adopted in 1956. To meet new challenges, from time to time, it was modified through statements in 1973, 1977 and 1980.

3. The Industrial Policy Resolution of 1948 was followed by the Industrial Policy Resolution of 1956 which had as its objective the acceleration of the rate of economic growth and the speeding up of industrialisation as a means of achieving a socialist pattern of society. In 1956, capital was scarce and the base of entrepreneurship not strong enough. Hence, the 1956 Industrial Policy Resolution gave primacy to the role of the State to assume a predominant and direct responsibility for industrial development.

4. The Industrial Policy statement of 1973, inter alia, identified high-priority industries where investment from large industrial houses and foreign companies would be permitted.

*The "Statement on Industrial Policy" tabled in the Lok Sabha by Minister of State for Industry, Mr. P.J.Kurien on 24th July 1991.

5. The Industrial Policy Statement of 1977 laid emphasis on decentralisation and on the role of small-scale, tiny and cottage industries.

6. The Industrial Policy Statement of 1980 focussed attention on the need for promoting competition in the domestic market, technological upgradation and modernisation. The policy laid the foundation for an increasingly competitive export base and for encouraging foreign investment in high-technology areas. This found expression in the Sixth Five Year Plan which bore the distinct stamp of Smt. Indira Gandhi. It was Smt. Indira Gandhi who emphasised the need for productivity to be the central concern in all economic and production activities.

7. These policies created a climate for rapid industrial growth in the country. Thus on the eve of the Seventh Five Year Plan, a broad-based infrastructure had been built up. Basic industries had been established. A high degree of self-reliance in a large number of items - raw materials, intermediates, finished goods - had been achieved. New growth centres of industrial activity had emerged, as had a new generation of entrepreneurs. A large number of engineers, technicians and skilled workers had also been trained.

8. The Seventh Plan recognised the need to consolidate on these strengths and to take initiatives to prepare Indian industry to respond effectively to the emerging challenges. A number of policy and procedural changes were introduced in 1985 and 1986 under the leadership of Shri Rajiv Gandhi aimed at increasing productivity, reducing costs and improving quality. The accent was on opening the domestic market to increased competition and readying our industry to stand on its own in the face of international competition. The public sector was freed from a number of constraints and given a larger measure of autonomy. The technological and managerial modernisation of industry was pursued as the key instrument for increasing productivity and improving our competitiveness in the world. The net result of all these changes was that Indian industry grew by an impressive average annual growth rate of 8.5% in the Seventh Plan period.

9. Government is pledged to launching a reinvigorated struggle for social and economic justice, to end poverty and unemployment and to build a modern, democratic, socialist, prosperous and forward-looking India. Such a society can be built if India grows as part of the world economy and not in isolation.

10. While Government will continue to follow the policy of self-reliance, there would be greater emphasis placed on building up our ability to pay for imports through our own foreign exchange earnings. Government is also committed to development and utilisation of indigenous capabilities in technology and manufacturing as well as its upgradation to world standards.

11. Government will continue to pursue a sound policy framework encompassing encouragement of entrepreneurship, development of indigenous technology through investment in research and development, bringing in new technology, dismantling of the regulatory system, development of the capital markets and increasing competitiveness for the benefit of the common man. The spread of industrialisation to backward areas of the country will be actively promoted through appropriate incentives, institutions and infrastructure investments.

12. Government will provide enhanced support to the small-scale sector so that it flourishes in an environment of economic efficiency and continuous technological upgradation.

13. Foreign investment and technology collaboration will be welcomed to obtain higher technology, to increase exports and to expand the production base.

14. Government will endeavour to abolish the monopoly of any sector or any individual enterprise in any field of manufacture, except on strategic or military considerations and open all manufacturing activity to competition.

15. The Government will ensure that the public sector plays its rightful role in the evolving socio-economic scenario of the country. Government will ensure that the public sector is run on business lines as envisaged in the Industrial Policy Resolution of 1956 and would continue to innovate and lead in strategic areas of national importance. In the 1950s and 1960s, the principal instrument for controlling the commanding heights of the economy was investment in the capital of key industries. Today, the State has other instruments of intervention, particularly fiscal and monetary instruments. The State also commands the bulk of the nation's savings. Banks and financial institutions are under State control. Where State intervention is necessary, these instruments will prove more effective and decisive.

16. Government will fully protect the interests of labour, enhance their welfare and equip them in all respects to deal with the inevitability of technological change. Government believes that no small section of society can corner the gains of growth, leaving workers to bear its pains. Labour will be made an equal partner in progress and prosperity. Workers' participation in management will be promoted. Workers cooperatives will be encouraged to participate in packages designed to turn around sick companies. Intensive training, skill development and upgradation programmes will be launched.

17. Government will continue to visualise new horizons. The major objectives of the new industrial policy package will be to build on the gains already made, correct the distortions or weaknesses that may have crept in, maintain a sustained growth in

productivity and gainful employment and attain international competitiveness. The pursuit of these objectives will be tempered by the need to preserve the environment and ensure the efficient use of available resources. All sectors of industry whether small, medium or large, belonging to the public, private or cooperative sector will be encouraged to grow and improve on their past performance.

18. Government's policy will be continuity with change.

19. In pursuit of the above objectives, Government have decided to take a series of initiatives in respect of the policies relating to the following areas.

- A. Industrial Licensing
- B. Foreign Investment
- C. Foreign Technology Agreements
- D. Public Sector Policy
- E. MRTP Act

Small & Tiny Sector

A package for the Small and Tiny Sectors of industry is being announced separately.

A. Industrial Licensing Policy

20. Industrial Licensing is governed by the Industries (Development & Regulation) Act, 1951. The Industrial Policy Resolution of 1956 identified the following three categories of industries; those that would be reserved for development in the public sector, those that would be permitted for development through private enterprise with or without State participation, and those in which investment initiatives would ordinarily emanate from private entrepreneurs. Over the years, keeping in view the changing industrial scene in the country, the policy has undergone modifications. Industrial licensing policy and procedures have also been liberalised from time to time. A full realisation of the industrial potential of the country calls for a continuation of this process of change.

21. In order to achieve the objectives of the strategy for the industrial sector for the 1990s and beyond it is necessary to make a number of changes in the system of industrial approvals. Major policy initiatives and procedural reforms are called for in order to actively encourage and assist Indian entrepreneurs to exploit and meet the emerging domestic and global opportunities and challenges. The bedrock of any such package of measures must be to let the entrepreneurs make investment decisions on the basis of their own commercial judgement. The attainment of technological dynamism and international competitiveness requires that enterprises must be enabled to swiftly respond

to fast changing external conditions that have become characteristic of today's industrial world. Government policy and procedures must be geared to assisting entrepreneurs in their efforts. This can be done only if the role played by the Government were to be changed from that of only exercising control to one of providing help and guidance by making essential procedures fully transparent and by eliminating delays.

22. The winds of change have been with us for some time. The industrial licensing system has been gradually moving away from the concept of capacity licensing. The system of reservations for public sector undertakings has been evolving towards an ethos of greater flexibility and private sector enterprise has been gradually allowed to enter into many of these areas on a case by case basis. Further impetus must be provided to these changes which alone can push this country towards the attainment of its entrepreneurial and industrial potential. This calls for bold and imaginative decisions designed to remove restraints on capacity creation, while at the same time, ensuring that over-riding national interests are not jeopardised.

23. In the above context, industrial licensing will henceforth be abolished for all industries, except those specified, irrespective of levels of investment. These specified industries (Annex-II), will continue to be subject to compulsory licensing for reasons related to security and strategic concerns, social reasons, problems related to safety and over-riding environmental issues, manufacture of products of hazardous nature and articles of elitist consumption. The exemption from licensing will be particularly helpful to the many dynamic small and medium entrepreneurs who have been unnecessarily hampered by the licensing system. As a whole the Indian economy will benefit by becoming more competitive, more efficient and modern and will take its rightful place in the world of industrial progress.

B. Foreign Investment

24. While freeing Indian industry from official controls, opportunities for promoting foreign investments in India should also be fully exploited. In view of the significant development of India's industrial economy in the last 40 years, the general resilience, size and level of sophistication achieved, and the significant changes that have also taken place in the world industrial economy, the relationship between domestic and foreign industry needs to be much more dynamic than it has been in the past in terms of both technology and investment. Foreign investment would bring attendant advantages of technology transfer, marketing expertise, introduction of modern managerial techniques and new possibilities for promotion of exports. This is particularly necessary in the changing global scenario of industrial and economic cooperation marked by mobility of

capital. The government will therefore welcome foreign investment which is in the interest of the country's industrial development.

25. In order to invite foreign investment in high priority industries, requiring large investments and advanced technology, it has been decided to provide approval for direct foreign investment upto 51% foreign equity in such industries. There shall be no bottlenecks of any kind in this process. This group of industries has generally been known as the "Appendix I industries" and are areas in which FERA companies have already been allowed to invest on a discretionary basis. This change will go a long way in making Indian policy on foreign investment transparent. Such a framework will make it attractive for companies abroad to invest in India.

Exploration of World Markets

26. Promotion of exports of Indian products calls for a systematic exploration of world markets possible only through intensive and highly professional marketing activities. To the extent that expertise of this nature is not well developed so far in India. Government will encourage foreign trading companies to assist us in our export activities. Attraction of substantial investment and access to high technology, often closely held, and to world markets, involves interaction with some of the world's largest international manufacturing and marketing firms. The Government will appoint a special board to negotiate with such firms so that we can engage in purposive negotiation with such large firms, and provide the avenues for large investments in the development of industries and technology in the national interest.

C. Foreign Technology Agreements

27. There is a great need for promoting an industrial environment where the acquisition of technological capability receives priority. In the fast changing world of technology the relationship between the suppliers and users of technology must be a continuous one. Such a relationship becomes difficult to achieve when the approval process includes unnecessary governmental interference on a case to case basis involving endemic delays and fostering uncertainty. The Indian entrepreneur has now come of age so that he no longer needs such bureaucratic clearances of his commercial technology relationships with foreign technology suppliers. Indian industry can scarcely be competitive with the rest of the world if it is to operate within such a regulatory environment.

28. With a view to injecting the desired level of technological dynamism in Indian industry, Government will provide automatic approval for technology agreements related

to high priority industries within specified parameters. Similar facilities will be available for other industries as well if such agreements do not require the expenditure of free foreign exchange. Indian companies will be free to negotiate the terms of technology transfer with their foreign counterparts according to their own commercial judgement. The predictability and independence of action that this measure is providing to Indian industry will induce them to develop indigenous competence for the efficient absorption of foreign technology. Greater competitive pressure will also induce our industry to invest much more in research and development than they have been doing in the past. In order to help this process, the hiring of foreign technicians and foreign testing of indigenously developed technologies, will also not require prior clearance as prescribed so far, individually or as a part of industrial or investment approvals.

D. Public Sector Policy

29. The public sector has been central to our philosophy of development. In the pursuit of our development objectives, public ownership and control in critical sectors of the economy has played an important role in preventing the concentration of economic power, reducing regional disparities and ensuring that planned development serves the common good.

30. The Industrial Policy Resolution of 1956 gave the public sector a strategic role in the economy. Massive investments have been made over the past four decades to build a public sector which has a commanding role in the economy. Today key sectors of the economy are dominated by mature public enterprises that have successfully expanded production, opened up new areas of technology and built up a reserve of technical competence in a number of areas.

31. After the initial exuberance of the public sector entering new areas of industrial and technical competence, a number of problems have begun to manifest themselves in many of the public enterprises. Serious problems are observed in the insufficient growth in productivity, poor project management, over-manning, lack of continuous technological upgradation, and inadequate attention to R&D and human resource development. In addition, public enterprises have shown a very low rate of return on the capital invested. This has inhibited their ability to regenerate themselves in terms of new investments as well as in technology development. The result is that many of the public enterprises have become a burden rather than being an asset to the Government. The original concept of the public sector has also undergone considerable dilution. The most striking example is the take over of sick units from the private sector. This category of public sector units accounts for almost one third of the total losses of

central public enterprises. Another category of public enterprises, which does not fit into the original idea of the public sector being at the commanding heights of the economy, is the plethora of public enterprises which are in the consumer goods and services sectors:

32. It is time therefore that the Government adopt a new approach to public enterprises. There must be a greater commitment to the support of public enterprises which are essential for the operation of the industrial economy. Measures must be taken to make these enterprises more growth oriented and technically dynamic. Units which may be faltering at present but are potentially viable must be restructured and given a new lease of life. The priority areas for growth of public enterprises in the future will be the following:

- Essential infrastructure goods and services.
- Exploration and exploitation of oil and resources.
- Technology development and building of manufacturing capabilities in areas which are crucial in the long term development of the economy and where private sector investment is inadequate..
- Manufacture of products where strategic considerations predominate such as defence equipment. At the same time the public sector will not be barred from entering areas not specifically reserved for it.

33. In view of these considerations, Government will review the existing portfolio of public investments with greater realism. This review will be in respect of industries based on low technology, small scale and non-strategic areas, inefficient and unproductive areas, areas with low or nil social considerations or public purpose, and areas where the private sector has developed sufficient expertise and resources.

34. Government will strengthen those public enterprises which fall in the reserved areas of operation or are in high priority areas or are generating good or reasonable profits. Such enterprises will be provided a much greater degree of management autonomy through the system of memoranda of understanding. Competition will also be induced in these areas by inviting private sector participation. In the case of selected enterprises, part of Government holdings in the equity share capital of these enterprises will be disinvested in order to provide further market discipline to the performance of public enterprises. There are large number of chronically sick public enterprises incurring heavy losses, operating in a competitive market and serve little or no public purpose. These need to be attended to. The country must be proud of the public sector that it owns and it must operate in the public interest.

E. MONOPOLIES AND RESTRICTIVE TRADE PRACTICES (MRTP) ACT

35. The principal objectives sought to be achieved through the MRTP Act are as follows:

- i. Prevention of concentration of economic power to the common detriment, control of monopolies, and
- ii. Prohibition of monopolistic and restrictive and unfair trade practices.

36. The MRTP Act became effective in June 1970. With the emphasis placed on productivity in the Sixth Plan, major amendments to the MRTP Act were carried out in 1982 and 1984 in order to remove impediments to industrial growth and expansion. This process of change was given a new momentum in 1985 by an increase of threshold limit of assets.

37. With the growing complexity of industrial structure and the need for achieving economies of scale for ensuring higher productivity and competitive advantage in the international market, the interference of the Government through the MRTP Act in investment decisions of large companies has become deleterious in its effects on Indian industrial growth. The pre-entry scrutiny of investment decisions by so called MRTP companies will no longer be required. Instead, emphasis will be on controlling and regulating monopolistic, restrictive and unfair trade practices rather than making it necessary for the monopoly houses to obtain prior approval of Central Government for expansion, establishment of new undertakings, merger, amalgamation of takeover and appointment of certain directors. The thrust of policy will be more on controlling unfair or restrictive business practices. The MRTP Act will be restructured by eliminating the legal requirement for prior governmental approval for expansion of present undertakings and establishment of new undertakings. The provisions relating to merger, amalgamation, and takeover will also be repealed. Similarly, the provisions regarding restrictions on acquisition of and transfer of shares will be appropriately incorporated in the Companies Act.

38. Simultaneously, provisions of the MRTP Act will be strengthened in order to enable the MRTP Commission to take appropriate action in respect of the monopolistic, restrictive and unfair trade practices. The newly empowered MRTP Commission will be encouraged to initiate investigation suo moto or on complaints received from individual consumers or classes of consumers.

F. Decisions of Government

39. In view of the considerations outlined above Government have decided to take a series of measures to unshackle the Indian industrial economy from the cobwebs of

unnecessary bureaucratic control. These measures complement the other series of measures being taken by the Government in the areas of trade policy, Exchange Rate, Management, Fiscal Policy, Financial Sector reform and overall macro economic management.

A. Industrial Licensing Policy

- i) Industrial Licensing will be abolished for all projects except for a short list of industries related to security and strategic concerns, social reasons, hazardous chemicals and overriding environmental reasons, and items of elitist consumption (list attached at Annex II). Industries reserved for the small scale sector will continue to be so reserved.
- ii) Areas where security and strategic concerns predominate, will continue to be reserved for the public sector, (list attached as Annex I).
- iii) In projects where imported capital goods are required, automatic clearance will be given
 - a) in cases where foreign exchange availability is ensured through foreign equity; or
 - b) if the CIF value of imported capital goods required is less than 25% of total value (net of taxes) of plant and equipment, upto a maximum value of Rs.2 crore. In view of the current difficult foreign exchange situation, this scheme (i.e. (iii) b) will come into force from April, 1992. In other cases, imports of capital goods will require clearance from the Secretariat of Industrial Approvals (SIA) in the Department of Industrial Development according to availability of foreign exchange resources.

- iv) In locations other than cities of more than 1 million population, there will be no requirement of obtaining industrial approvals from the Central Government except for industries subject to compulsory licensing. In respect of cities with population greater than 1 million, industries other than those of a non polluting nature such as electronics, computer software and printing will be located outside 25 kms. of the periphery, except in prior designated industrial areas.

A flexible location policy would be adopted in respect of such cities (with population greater than 1 million) which require industrial re-generation. Zoning and Land Use Regulation and Environmental Legislation will continue to regulate industrial locations.

Appropriate incentives and the design of investments in infrastructure development will be used to promote the dispersal of industry particularly to rural and backward areas and to reduce congestion in cities.

- v) The system of phased manufacturing programmes run on an administrative case by case basis will not be applicable to new projects. Existing projects with such programmes will continue to be governed by them.
- vi) Existing units will be provided a new broad banding facility to enable them to produce any article without additional investment.
- vii) The exemption from licensing will apply to all substantial expansions of existing units.
- viii) The mandatory convertibility clause will no longer be applicable for term loans from the financial institutions for new projects.

Procedural Consequences

- ix) All existing registration schemes (Delicensed Registration, Exempted Industries Registration, DGTD registration) will be abolished.
- x) Entrepreneurs will henceforth only be required to file an information memorandum on new projects and substantial expansions.
- xi) The lists at Annex II and Annex III will be notified in the Indian Trade Classification (Harmonised System).

B. Foreign Investment

- i) Approval will be given for direct foreign investment upto 51 per cent foreign equity in high priority industries (Annex III). There shall be no bottlenecks of any kind in this process. Such clearance will be available if foreign equity

covers the foreign exchange requirement for imported capital goods. Consequential amendments to the Foreign Exchange Regulation Act (1973) shall be carried out.

- ii) While the import of components, raw materials and intermediate goods, and payment of knowhow fees and royalties will be governed by the general policy applicable to other domestic units, the payment of dividends would be monitored through the Reserve Bank of India so as to ensure that outflows on account of dividend payments are balanced by export earnings over a period time.
- iii) Other foreign equity proposals, including proposals involving 51% foreign equity which do not meet the criteria under (i) above, will continue to need prior clearance. Foreign equity proposals need not necessarily be accompanied by foreign technology agreements.
- iv) To provide access to international markets, majority foreign equity holding upto 51% equity will be allowed for trading companies primarily engaged in export activities. While the thrust would be on export activities, such trading houses shall be at par with domestic trading and export houses in accordance with the Import-Export Policy.
- v) A Special Empowered Board would be constituted to negotiate with a number of large international firms and approve direct foreign investment in select areas. This would be a special programme to attract substantial investment that would provide access to high technology and world markets. The investment programmes of such firms would be considered in totality, free from predetermined parameters or procedures.

C. FOREIGN TECHNOLOGY AGREEMENTS.

- i) Automatic permission will be given for foreign technology agreements in high priority industries (Annex III) upto a lumpsum payment of Rs.1 crore, 5% royalty for domestic sales and 8% for exports, subject to total payments of 8% for exports, subject to total payments of 8% of sales over a 10 year period from date of payment or 7 years from commencement of production. The prescribed royalty rates are net of taxes and will be calculated according to standard procedures.
- ii) In respect of industries other than those in Annex III, automatic permission will be given subject to the same guidelines as above if no free foreign exchange is required for any payments.

- iii) All other proposals will need specific approval under the general procedures in force.
- iv) No permission will be necessary for hiring of foreign technicians, foreign testing of indigenously developed technologies. Payment may be made from blanket permits or free foreign exchange according to RBI guidelines.

D. Public Sector

- i) Portfolio of public sector investments will be reviewed with a view to focus the public sector on strategic, high-tech and essential infrastructure. Whereas some reservation for the public sector is being retained there would be no bar for areas of exclusivity to be opened upto the private sector selectively. Similarly the public sector will also be allowed entry in areas not reserved for it.
- ii) Public enterprises which are chronically sick and which are unlikely to be turned around will, for the formulation of revival/rehabilitation schemes, be referred to the Board for Industrial and Financial Reconstruction (BIFR), or other similar high level institutions created for the purpose. A social security mechanism will be created to protect the interests of workers likely to be affected by such rehabilitation packages.
- iii) In order to raise resources and encourage wider public participation, a part of the government's shareholding in the public sector would be offered to mutual funds, financial institutions, general public and workers.
- iv) Boards of public sector companies would be made more professional and given greater powers.
- v) There will be greater thrust on performance improvement through the Memoranda of Understanding (MOU) system through which managements would be granted greater autonomy and will be held accountable. Technical expertise on the part of the Government would be upgraded to make the MOU negotiations and implementation more effective.
- vi) To facilitate a fuller discussion on performance, the MOU signed between Government and the public enterprises would be placed in Parliament. While focussing on major management issues, this would also help place matters on day to day operations of public enterprises in their correct perspective.

E. MRTP Act

- i) The MRTP Act will be amended to remove the threshold limits of assets in respect of MRTP companies and dominant undertakings. This eliminates the requirement of prior approval of Central Government for establishment of new undertakings, expansion of undertakings, merger, amalgamation and takeover and appointment of Directors under certain circumstances.
- ii) Emphasis will be placed on controlling and regulating monopolistic, restrictive and unfair trade practices, Simultaneously, the newly empowered MRTP Commission will be authorised to initiate investigations suo moto or on complaints received from individual consumers or classes of consumers in regard to monopolistic, restrictive and unfair trade practices.
- iii) Necessary comprehensive amendments will be made in the MRTP Act in this regard and for enabling the MRTP Commission to exercise punitive and compensatory powers.

PROPOSED LIST OF INDUSTRIES TO BE RESERVED FOR THE PUBLIC SECTOR

1. Arms and ammunition and allied items of defence equipment, Defence aircraft and warships.
2. Atomic Energy
3. Coal and lignite
4. Mineral oils
5. Mining of iron ore, manganese ore, chrome ore, gypsum, sulphur, gold and diamond.
6. Mining of copper, lead, zinc, tin, molybdenum and wolfram.
7. Minerals specified in the Schedule to the Atomic Energy (Control of Production and Use) Order, 1953.
8. Railway transport.

**LIST OF INDUSTRIES IN RESPECT OF WHICH INDUSTRIAL LICENSING
WILL BE COMPULSORY**

1. Coal and Lignite
2. Petroleum (other than crude) and its distillation products
3. Distillation and brewing of alcoholic drinks.
4. Sugar
5. Animal fats and oils
6. Cigars and cigarettes of tobacco and manufactured tobacco substitutes.
7. Asbestos and asbestos-based products.
8. Plywood, decorative veneers, and other wood based products such as particle board, medium density fibre board, block board.
9. Raw hides and skins, leather, chamois leather and patent leather.
10. Tanned or dressed furskins
11. Motor cars
12. Paper and Newsprint except bagasse-based units
13. Electronic aerospace and defence equipment; All types
14. Industrial explosives, including detonating fuse, safety fuse, gun-powder, nitrocellulose and matches
15. Hazardous chemicals
16. Drugs and Pharmaceuticals (according to Drug Policy)
17. Entertainment Electronics (VCRs, Colour TVs, C.D. players, Tape Recorders)
18. White Goods (Domestic Refrigerators, Domestic Dishwashing machines, Programmable Domestic Washing Machines, Microwave ovens, Airconditioners)

Note: The compulsory licensing provisions would not apply in respect of the small-scale unit taking up the manufacture of any of the above items reserved for exclusive manufacture in small-scale sector.

LIST OF INDUSTRIES FOR AUTOMATIC APPROVAL OF FOREIGN TECHNOLOGY AGREEMENTS AND FOR 51% FOREIGN EQUITY APPROVALS

1. Metallurgical Industries
 - i) Ferro alloys
 - ii) Castings and forgings
 - iii) Non-ferrous metals and their alloys
 - iv) Sponge iron and pelletisation
 - v) Large diameter steel welded pipes of over 300 mm diameter and stainless steel pipes
 - vi) Pig iron
2. Boilers and steam generating plants
3. Prime movers (other than electrical generators)
 - i) Industrial turbines
 - ii) Internal combustion engines
 - iii) Alternate energy systems like solar wind etc. and equipment therefor
 - iv) Gas/hydro/steam turbines upto 60 MW
4. Electrical Equipment
 - i) Equipment for transmission and distribution of electricity including power and distribution transformers, power relays, HT-switch gear synchronous condensers
 - ii) Electrical motors
 - iii) Electrical furnaces, industrial furnaces and induction heating equipment
 - iv) X-ray equipment
 - v) Electronic equipment, components including subscriber's end telecom equps.
 - vi) Component wires for manufacture of lead-in wires
 - vii) Hydro/steam/gas generators/generating sets upto 60 MW
 - viii) Generating sets and pumping sets based on internal combustion engines
 - ix) Jelly-filled telecommunication cables
 - x) Optic fibre
 - xi) Energy efficient lamps and
 - xii) Midget carbon electrodes

5. Transportation
 - i) Mechanised sailing vessels upto 10,000 DWT including fishing trawlers
 - ii) Ship ancillaries.
 - iii) a) Commercial vehicles, public transport vehicles including automotive commercial three wheeler jeep type vehicles, industrial locomotives
b) Automotive two wheelers and three wheelers.
c) Automotive components/spares and ancillaries.
 - iv) Shock absorbers for railway equipment and
 - v) Brake system for railway stock and locomotives
6. Industrial Machinery
 - i) Industrial machinery and equipment
 - 7.i) Machine tools and industrial robots and their controls and accessories
 - ii) Jigs, fixtures, tools and dies of specialised types and cross land tooling, and
 - iii) Engineering production aids such as cutting and forming tools, patterns and dies and tools
8. Agricultural Machinery
 - i) Tractors
 - ii) Self-propelled Harvester Combines
 - iii) Rice transplanters
9. Earth Moving Machinery
 - i) Earth moving machinery and construction machinery and components thereof
10. Industrial Instruments
 - i) Indicating, recording and regulating devices for pressure, temperature, rate of flow weights levels and the like
11. Scientific and Electromedical Instruments and Laboratory Equipment
12. Nitrogenous & Phosphatic Fertilizers falling under
 - i) Inorganic fertilizers under '18-Fertilizers' in the First Schedule to IDR Act, 1951
13. Chemicals (other than fertilizers)
 - i) Heavy organic chemicals including petrochemicals.
 - ii) Heavy inorganic chemicals
 - iii) Organic fine chemicals
 - iv) Synthetic resins and plastics
 - v) Man made fibres

- vi) Synthetic rubber
- vii) Industrial explosives
- viii) Technical grade insecticides, fungicides, weedicides and the like
- ix) Synthetic detergents
- x) Miscellaneous chemicals (for industrial use only)
 - a) Catalysts and catalyst supports
 - b) Photographic chemicals
 - c) Rubber chemicals
 - d) Polyols
 - e) Isocyanates, urethanes, etc.
 - f) Speciality chemicals for enhanced oil recovery
 - g) Heating fluids
 - h) Coal tar distillation and products therefrom
 - i) Tonnage plants for the manufacture of industrial gases
 - j) High altitude breathing oxygen/medical oxygen
 - k) Nitrous oxide
 - l) Refrigerant gases like liquid nitrogen, carbondioxide etc. In large volumes
 - m) Argon and other rare gases
 - n) Alkali/acid resisting cement compound
 - o) Leather chemicals and auxiliaries
- 14. Drugs and Pharmaceuticals according to Drug Policy
- 15. i) Paper and pulp including paper products
 - ii) Industrial laminates
- 16.i) Automobile tyres and tubes
 - ii) Rubberised heavy duty industrial beltings of all types
 - iii) Rubberised conveyor beltings
 - iv) Rubber reinforced and lined fire fighting hose pipes
 - v) High pressure braided hoses
 - vi) Engineering and industrial plastic products
- 17. Plate Glass
 - i) Glass shells for television tubes
 - ii) Float glass and plate glass
 - iii) H.T. insulators
 - iv) Glass fibres of all types

18. Ceramics
 - i) Ceramics for industrial uses
19. Cement Products
 - i) Portland cement
 - ii) Gypsum boards, wall boards and the like
20. High Technology Reproduction and Multiplication Equipment.
21. Carbon and Carbon Products
 - i) Graphite electrodes and anodes
 - ii) Impervious graphite blocks and sheets
22. Pretensioned High Pressure RCC Pipes
23. Rubber Machinery
24. Printing Machinery
 - i) Web-fed speed off-set rotary printing machine having output of 30,000 or more impressions per hour
 - ii) Photo composing/type setting machines.
 - iii) Multi-colour sheet-fed off-set printing machines of sizes of 18"x25" and above.
 - iv) High speed rotograture printing machines having output of 30,000 or more impressions per hour.
25. Welding Electrodes other than those for welding mild Steel
26. Industrial synthetic diamonds
- 27.i) Photosynthesis improvers
 - ii) Genetically modified free living symbiotics nitrogen fixer
 - iii) Pheromones
 - iv) Bio-insecticides
28. Extraction and upgrading of minor oils
29. Pre-fabricated building material
30. Soya Products
 - i) Soya texture proteins
 - ii) Soya protein isolates
 - iii) Soya protein concentrates
 - iv) Other specialised products of soyabean
 - v) Winterised and deodourised refined soyabean oil
- 31.a) Certified high yielding hybrid seeds and synthetic seed and
 - b) Certified high yielding plantlets developed through plant tissue culture

32. All food processing industries other than milk food, malted foods, and flour, but excluding the items re-served for small-scale sector
33. All items of packging for food processing Industries excluding the Items reserved for small-scale sector
34. Hotels and tourism-related industry

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The following is the list of industries in respect of which industrial licensing is compulsory (In ITC (HS) Classification):

This list is based on the Indian Trade Classification, which follows the Harmonised Commodity Description and Coding System, Government of India, Ministry of Commerce, Directorate General of Commercial Intelligence and Statistics, Calcutta. The code specified for the item description relates to this classification.

Other items in respect of which industrial licensing is not exempted are:

- (A) For large and medium industries
The Items reserved for the small scale sector listed in Schedule III.
- (B) For all industries
 - (i) All items of electronic aerospace and defence equipment, whether specifically mentioned or not, in this list.
 - (ii) All items related to the production or use of atomic energy including the carrying out of any process, preparatory or ancillary to such production or use, under the Atomic Energy Act, 1962.

The authentic description will be treated as specified in the item description given below

Coal and Lignite

- 27.01 Coal
- 27.02 Lignite

Petroleum (other than crude) and its distillation products 27.10 Petroleum oils, other than crude

- 27.11 Petroleum gases and other gaseous hydrocarbons
- 27.12 Petroleum waxes and other similar products obtained through distillation of petroleum
- 27.13 Petroleum coke and other residues of petroleum oils

Distillation and brewing of alcoholic drinks

- 22.03 Beer made from malt
- 22.04 Wine of fresh grapes, including fortified wines
- 22.05 Vermouth and other wine of fresh grapes flavoured with plants or aromatic substances
- 22.06 Other fermented beverages (for example, cider, perry, mead)
- 22.08 Undenatured ethyl alcohol of an alcoholic strength by volume of less than 80% vol; spirits, liqueurs and other spirituous beverages;

compound alcoholic preparations of a kind used for the manufacture of beverages

Sugar

- 170199.02 Cane sugar, refined
- 170199.09 Other sugar, including centrifugal sugar

Animal Fats and Oils

- 151610.00 Animal fats and oils, partly or wholly hydrogenated
- 15.17 Edible mixtures or preparations of animal fats and oils
- 151800.11 Inedible mixtures or preparations of animal fats and oils

Cigar and cigarettes of tobacco and manufactured tobacco substitutes

- 24.02 Cigars, cheroots, cigarettes of tobacco or tobacco substitutes

Asbestos and asbestos-based products

- 68.11 Articles of asbestos-cement of cellulose fibre-cement or the like
- 68.12 Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate; articles thereof
- 681390.01 Asbestos friction materials

Plywood, decorative veneers, and other wood-based products such as particle board, medium density fibre board, and block board

- 44.08 Veneer sheets, plywood and other wood sawn lengthwise of a thickness not exceeding 6 mm
- 44.10 Particle board and other similar board of wood or other ligneous materials
- 44.11 Fibre board of wood or other ligneous materials
- 44.12 Plywood, veneered panels and similar laminated wood
- 44.13 Densified wood, in blocks, plates strips and other profile shapes

Raw hides and skins, leather, chamois leather and patent leather

- 41.04 Leather of ovine or equine animals, without hair on, other than leather of heading No 41.08 or 41.09
- 41.05 Sheet or lambskin leather, without wool on, other than leather of heading No 41.08 or 41.09
- 41.06 Goat or kid skin leather, without hair on, other than leather of heading No 41.08 or 41.09

- 41.07 Leather of other animals, without hair on, other than leather of heading No 41.08 or 41.09
- 41.08 Chamois (including combination chamois) leather
- 41.09 Patent leather and patent laminated leather, and metallised leather

Tanned or dressed fur skins

- 43.02 Tanned or dressed fur skins

Motor cars

- 87.03 Motor cars

Paper and newsprint except bagasse based units (except units based on minimum 75 per cent pulp from agricultural residues, bagasse and other non-conventional raw materials)

- 47.01 Mechanical wood pulp
- 47.02 Chemical wood pulp, dissolving grades
- 47.03 Chemical wood pulp, soda or sulphate, other than dissolving grades
- 47.04 Chemical wood pulp, sulphite, other than dissolving grades
- 47.05 Semi-chemical wood pulp
- 48.01 Newsprint, in rolls or sheets
- 48.02 Uncoated paper of a kind used for writing, printing or other graphic purposes, in rolls or sheets
- 48.03 Paper of a kind used for household or sanitary purposes, in rolls or sheets
- 48.04 Uncoated kraft paper, in rolls or sheets
- 48.05 Other uncoated paper, in rolls or sheets
- 48.06 Vegetable parchment, grease-proof papers, tracing papers and the like, in rolls or sheets
- 48.07 Composite paper, in rolls or sheets
- 48.08 Paper, corrugated, creped, crinkled, embossed or perforated, in rolls or sheets
- 48.09 Carbon paper, self-copy paper and other copying or transfer papers in rolls or sheets
- 48.10 Paper, coated with Kaolin or other inorganic substances, in rolls or sheets
- 48.11 Other coated or impregnated paper, in rolls or sheets
- 48.12 Filter blocks, slabs and plates, of paper pulp
- 48.13 Cigarette paper

Electronic aerospace and defence equipment: all types

- 87.10 Tanks and other armoured fighting vehicles
- 88.01 - 88.05 Defence aircraft, spacecraft, and parts thereof
- 8906.01 Warships -- all kinds
- 93.01 - 93.07 Arms and ammunition; parts and accessories thereof

Industrial explosives, including detonating fuses, safety fuses, gun powder, nitrocellulose and matches

- 36.01 - 36.06 Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations

Hazardous chemicals

- 22.07 Undenatured ethyl alcohol of an alcoholic strength by volume of 80% vol or higher, ethyl alcohol and other spirits, denatured, of any strength (industrial alcohol)
- 280110.00 Chlorine
- 281119.01 Hydrocyanic acid and its derivatives
- 281210.01 Phosgene and its derivatives
- 2815.11 Sodium Hydroxide (Caustic soda): Solid
- 2815.12 Sodium Hydroxide (Caustic soda): In aqueous solution
- 290121.00 Ethylene
- 290122.00 Propene (propylene)
- 290124.01 Butadienes
- 290220.00 Benzene
- 290230.00 Toluene
- 290241.00 O-xylene
- 290242.00 M-xylene
- 290243.00 P-xylene
- 290244.00 Mixed xylene isomers
- 290531.00 Ethylene glycol (ethanediol)/ethylene oxide
- 29.05 Industrial alcohol
- 292220.02 Meta amino phenol
- 292910.00 Isocyanates and di-isocyanates of hydrocarbon, not elsewhere specified (example, Methyl isocyanate)
- 380110.02 Aluminium Phosphide
- 380810.16 Dimethoate
- 380810.21 'Quinalphos'

- 380810.29 Carbaryl, Phorate and Fenitrothion
 390110.00 Polyethylene having a specific gravity of less than 0.94

Drugs and Pharmaceuticals (according to Drug Policy)

- 29.36 Pro-vitamins and vitamins, natural or reproduced by synthesis (including natural concentrates), derivatives thereof used primarily as vitamins, and inter-mixtures of the foregoing (Subject to the Drug Policy)
- 29.37 Hormones, natural or reproduced by synthesis; derivatives thereof, used primarily as hormones; other steroids used primarily as hormones (Subject to the Drug Policy)
- 29.33 Glycosides, natural or reproduced and synthesis, and their salts, ethers, esters and other derivatives (Subject to the Drug Policy)
- 29.39 Vegetable alkaloids, natural or reproduced by synthesis, and their salts, ethers, esters and other derivatives (Subject to the Drug Policy)
- 29.41 Antibiotics (Subject to the Drug Policy)
- 29.42 Other synthetic drugs, not elsewhere specified or included (Subject to the Drug Policy)
- 30.01 - 30.06 Pharmaceutical products (Subject to the Drug Policy)

Entertainment electronics (VCRs, colour TVs, CD players, tape recorders)

- 85.19 Compact disc players
- 852031.00 Tape recorders, cassette-type
- 8520.39 Tape recorders, other than cassette-type
- 85.21 Video recording or reproducing apparatus
- 8528.10 Colour television receivers

White goods (Domestic refrigerators, domestic dish washing machines, programmable domestic washing machines, microwave ovens, airconditioners)

- 84.15 Air conditioning machines
- 84.18 Refrigerators and other freezing equipment, of the household type
- 842211.00 Dish washing machines of the household type
- 84.50 Household washing machines, of the programmable type
- 851650.00 Microwave ovens

Source : Observer (India) Ltd., Business and Political Observer
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