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TRADE IN ENVIRONMENTAL SERVICES: OPPORTUNITIES AND CONSTRAINTS

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Contents

List of Abbreviations

AMC	Ahmedabad Municipal Corporation
AusAID	Australian Agency for International Development
BHEL	Bharat Heavy Electricals Limited
BOO	build-operate-own
BOOT	build-operate-own-transfer
BOT	build-operate-transfer
CGEA	Compagnie Generale d'Entreprises Automobiles
CII	Confederation of Indian Industry
CNG	compressed natural gas
CPCB	Central Pollution Control Board
DFID	Department for International Development
EBI	Environmental Business International
EIA	environmental impact assessment
EMS	environmental management system
EC	European Communities
EU	European Union
FDI	Foreign direct investment
FEMA	Foreign Exchange Management Act
FIPB	Foreign Investment Promotion Bureau
FTC	foreign technology case
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GPA	Agreement on Government Procurement
HACCP	Hazard Analysis Critical Control Point
HS	Harmonized System
ILD	International Long Distance
ISO	International Organization for Standardization
MEA	multilateral environmental agreement
MNC	multinational corporation
NGO	non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
RBI	Reserve Bank of India
tpd	tons per day
UK	United Kingdom
ULBs	urban local bodies
UNCPC	UN Central Product Classification
UNCTAD	United Nations Conference on Trade and development
US	United States
US–AEP	United States–Asia Environmental Partnership
WTO	World Trade Organisation

List of Tables

List of Boxes

Foreword

ICRIER's objective is to foster improved understanding of policy choices for India in an era of growing international economic integration and interdependence. ICRIER undertakes research in areas of international economic relations of current and future interest.

The commencement of the new round of multilateral trade negotiations at Doha in November 2001 has brought to the fore a number of issues that impinge on the trade and economic prospects of India as well as its trading partners. In this context, ICRIER has undertaken a programme of research to study from India's perspective the approaches being suggested for further liberalisation of trade, the proposals for improvement and clarification of existing rules, and the initiatives for developing multilateral disciplines in new areas. The objective is to equip stakeholders and policymakers with full analytical information so as to enable them to take a view on where India's interests lie on each issue and to decide on the positions that India must adopt at the negotiations. The studies would also serve the purpose of enlightening the public at large on various facets of the subjects being negotiated.

This paper, 'Trade in Environmental Services: Opportunities and Constraints', by Dr Aparna Sawhney, Consultant, ICRIER and Assistant Professor, Indian Institute of Management, Bangalore, and Dr Rupa Chanda, Consultant, ICRIER and Associate Professor, Indian Institute of Management, Bangalore, is part of a series of studies under this programme. The study was funded by the Ministry of Commerce and Industry, Government of India.

The environmental services sector has been growing rapidly during the last two decades. Moreover, privatisation and increasing outward-orientation of environmental services during the 1990s has made this sector an important service sector for negotiations under the new round of the General Agreement on Trade in Services (GATS). This study explores the nature and structure of the environmental services sector, both globally and in India, with particular focus on recent trends such as privatisation and foreign investment in this sector. It also discusses issues of classification and definition which have occupied centre stage in the multilateral negotiations in this sector. The study assesses the implications of liberalising environmental services in India, taking into account the country's strengths, weaknesses, and interests in this sector. Based on this assessment, it suggests a negotiating strategy for India in environmental services in the ongoing GATS negotiations in the DOHA round. Given the special features of this sector, the study also suggests domestic reforms and regulations to ensure equity and sustainability along with economic efficiency in the provision of environmental services in India.

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Trade In Environmental Services: Opportunities and Constraints

1 Introduction *

The environment industry has witnessed rapid growth over the last two decades. Industry surveys in the mid-1990s had estimated that the global environment industry revenue would increase from US$ 469 billion in 1997 to US$ 600 billion by 2010, representing an average annual rate of growth of 5 per cent.[1] In 2000, the global environment industry was estimated to have revenue of US$ 522 billion, of which the environmental services market was valued at about US$ 280 billion.

The global environment industry is dominated by developed countries, with the US accounting for the largest share of this industry at about 50 per cent of the world market, followed by the European Union (EU) and Japan. During the 1980s, the environment industry (equipment and services) experienced rapid growth in the developed countries, due to increased enforcement of environmental regulations (command and control as well as economic instruments). More recently, however, the industry has shown signs of maturity and stagnation in these countries, with growth rates dropping sharply during the 1990s.[2] In contrast, during the 1990s, the market for environmental goods and services in developing countries has been growing rapidly, with double-digit annual growth.

The major factors responsible for the expansion of the global environment industry include the growing awareness of environmental problems and greater enforcement of environmental regulations, besides rapid population growth and urbanisation that have put increased pressure on natural resources. Moreover, technological changes have also made possible new and innovative ways of dealing with environmental challenges, and increased global competition in this sector.

* We have gained useful insights from discussions with several people. In particular, we would like to thank Professor Anwarul Hoda and Dr Arvind Virmani (ICRIER), Professor B. K. Guha (Indian Institute of Technology, Delhi), Dr Veena Jha (UNCTAD India), Dr D. K. Biswas (Central Pollution Control Board), Mr T. K. Bhowmick, and Ms Seema Arora (Confederation of Indian Industry), Mr Ajay Mehrotra (Bharat Heavy Electricals Limited), and Mr Sumanta Chaudhuri and Mr P. K. Srivastava (Ministry of Commerce). We are grateful to Mr I. Srinivas and Mr Dave of the Foreign Investment Promotion Bureau for providing the foreign investment data. We would also like to thank the participants at the seminar held at ICRIER on April 2003 for helpful suggestions. Finally, we would like to thank Ms Sukanya Ghosh and Mr Abhijit Sengupta who provided competent research assistance at ICRIER.

1 WTO (1998b).

2 For instance, in the US the annual growth rate of the industry that was in the range of 10–15 per cent during 1985–90 dropped to 2–5 per cent during 1991–5 and further to a low of 1.2 per cent in 1996.

1.1 Definition of Environmental Services

The environmental industry consists of two main segments, namely, the service segment and equipment segment.[3] This also reflects the legal framework of the industry's global trade, in that the General Agreement on Tariffs and Trade (GATT) covers all environmental goods and the General Agreement on Trade in Services (GATS) covers environmental services. The focus of this study is the environmental services segment.

The distinction between environmental services and goods, though seemingly clear at first glance, may not always be so. There are significant overlaps in activities and often the two segments are provided on an integrated basis. For instance, technology, designing, and engineering of waste treatment system fall under environmental services, but the provision of these environmental services are often integrated with the provision of the associated equipment.[4] Firms providing environmental goods also provide environmental services as varied as project design and management, engineering, construction, equipment operation, and maintenance of utility facilities. Moreover, the provision of environmental services can be embodied in another product, such as a computer programme for environment-related activities contained in a computer diskette or a video film containing instructions regarding environmental safety. Thus, it is difficult to neatly distinguish between the equipment and services segments in this sector.

The OECD/Eurostat definition, environmental services sector considers all activities that measure, prevent, limit, and correct environmental damage to air, water, soil, and problems relating to waste, noise, and ecosystems. Alternatively, the US environment industry defines environmental services as all revenue generating service activities which are related to compliance with environmental regulations, environmental assessment, analysis, and protection, pollution control, waste management, remediation, provision and delivery of environmental resources like water, recovered materials, and energy, and activities for improving energy and resource efficiency, increasing productivity, and enabling sustainable economic growth. Thus, broadly speaking, environmental services can be defined as those service activities that reduce environmental risk, minimise pollution, and enable efficient resource use.

The OECD definition of environmental services describes the coverage of environmental services in terms of groups of activities and in terms of core and non-core

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[3] The Environmental Business International Inc. (San Diego, CA) distinguishes three sectors in the environment market: *services*, *equipment,* and *resources*, based on the US Standard Industry Classification system. This is worth noting, since the sizes of the environment market and components as estimated by this agency are widely quoted in the literature. The *services* revenue pertain to fees paid for services like waste treatment, waste management, remedial services, consulting, engineering, testing, and analytical services. *Equipment* revenues are sales of hardware, and *resources* are sales of material, water, or energy. The OECD/Eurostat classification, discussed later in this paper, includes 'resources' under the services sector.

[4] Of course there are environmental services that do not involve any complementary use of any other product, like advice on environmental standards/environmental law, or environmental information and data analysis.

areas of activity within each of these groups. The three broad groups of activities in this sector are as follows.[5]

The first is the *pollution management group* which consists of activities such as air pollution control, wastewater management, solid waste management, remediation, clean-up of soil and water, noise and vibration abatement, environmental monitoring, analysis, assessment, environmental research and development, and environmental construction and engineering. For instance, waste management services include core activities such as collection, transport and landfill operations, waste to energy conversion services, recycling, industrial resource recovery, and waste reduction services. In addition, there are non-core activities such as ecological consulting, legal, land use advisory, and analytical services, which are also relevant to this group.

The second set of activities falls under the *cleaner technology group*. These activities are aimed at eliminating or reducing the impact of technologies, processes, and products. These include activities such as the design of new processes and products, environmental research and development, and environmental monitoring and impact assessment. Again, non-core areas such as consulting, engineering, technical analysis, and testing are relevant to this group of activities.

The third set of activities falls under the *resource management group*. This group includes activities that enable efficient and sustainable use of resources, for instance, solid waste recycling and resource recovery relating to disposal, management, and recycling services.

The importance of the cleaner technology and resource management groups of activities is on the rise, due to the recent shift in focus from end-of-pipe solutions towards prevention and control of environmental pollution. This paradigm shift has contributed to the increasing importance of the environmental services sector. The growing significance of the environmental services industry can also be traced to the privatisation of certain traditional environmental services like water, wastewater treatment, and municipal solid waste management services.

There is also an increasing role of service activities beyond the traditional core environmental services. Although traditional activities such as waste management, water treatment, refuse disposal, and pollution abatement activities dominate the sector, other non-core services have also gained importance. These new services include those relating to compliance with environmental legislation and remediation, support services like environmental lab testing, monitoring, legal, consulting, auditing, research and development, strategic environmental management services, and consulting and engineering support services for building of environmental infrastructure. The inclusion of these non-traditional or non-core environmental services has led to an expansion of the environmental services sector.

1.2 Characteristics of Environmental Services

The environmental services sector has three important characteristics. The first important characteristic is that it overlaps with activities in just about all other sectors of the

[5] Based on Note by Secretariat WT/CTE/W/67/Add.1 (WTO 1998b).

economy. For instance, the sector overlaps with activities in sectors as diverse as architecture services, construction and related engineering services, technical analysis services, auditing and risk assessment, research and development, and consulting services. As a result, the range of establishments and occupations that are relevant to the environmental services sector is quite large and diverse. The range of occupations includes, for instance, environmental impact assessors, environmental consultants, ecological advisors, landscape consultants and urban planners, environmental management consultants, environmental law counsellors, and ecological marketing advisers. This overlap is due to the fact that activities within the environmental services sector, unlike those in other sectors, are meant to internalise the environmental costs of economic activities into the economic system.

A second important characteristic of this sector is that the consumption of several environmental services has similar properties to that of public goods, and this makes pricing based on consumer use difficult.[6] Hence, considerations of equity, universal provision, and affordable access are very important in this sector.

The third important characteristic is that the provision of several environmental services typically requires large investment to ensure that collection and distribution networks reach the entire population (e.g. sewerage system network). This feature supports the emergence of natural monopoly for efficiency in the provision of environmental services requiring large capital investment (i.e. to minimise the cost of per unit provision of the service).

The public good nature of environmental services, coupled with its characteristic of natural monopoly means that the public sector is the primary provider of these services. Thus several environmental services, including sewage and refuse disposal, collection of garbage, cleaning of roads, parks and lakes, provision of (tapped) drinking water, have been traditionally provided by local government bodies. These are all services which are essential for ensuring a basic quality of life to the public.

Given the public monopoly characteristic of many environmental services, opportunities for trade and foreign investment in this sector have traditionally been limited. However, in the last decade, the sector has undergone significant changes, with deregulation and privatisation of many activities and an increasing role for private sector participation. Increasingly, across developed and developing countries, regulated private ownership is being preferred to public monopoly in many environmental service activities. For instance, there is a trend towards the privatisation of environmental infrastructure segments such as solid waste management, water treatment, and water utilities. The mode of operations and delivery is also undergoing change, as firms are increasingly providing integrated packages, which include elements such as designing, building, managing, and

[6] It may be noted, however, that environmental services are not pure public goods. The classical definition of 'pure public goods' is based on certain properties as opposed to those of private goods. These include, non-rivalry in consumption (consumption by one individual does not affect the consumption of others), non-excludability (once provided, it is hard to exclude others from consuming the good), and non-divisibility (the good can be provided to an additional person at no extra cost). Excludability in the provision of environmental services, however, could be introduced (e.g. disconnecting water supply to an individual household for non-payment), and rivalry in consumption also exists (due to congestion in use).

even ownership of the infrastructure.[7] As a result, there is growing scope for competition, and foreign provision via commercial presence and via movement of persons is likely to become increasingly important in future.

The increased outward orientation of the environmental services industry in the 1990s is indicated by the fact that export revenues of the environment industry as a whole constitute about 15–20 per cent of the total output produced in Japan and Western Europe and about 10 per cent for the US industry.

The market for environmental services in developing countries like India has been growing due to increased environmental regulations, urbanisation, and industrialisation. In 2001, about 28 per cent of the billion plus Indian population (about 285 million) were living in cities and the proportion of urban population is expected to further increase to 40 per cent by 2021. Moreover, enhancement in the set of domestic environmental regulations, liberalisation, and increased private participation in municipal activities during the last decade have increased opportunities for trade in environmental services.

Overall, given the growing trade orientation of the global environment industry (especially in the last decade), and the cross-cutting nature of the sector, environmental services are set to become one of the fastest growing service sectors in the near future.[8] Developing countries are emerging as important markets for environmental services. Firms in OECD countries are increasingly exporting environmental services to developing countries as their domestic environment markets reach saturation.

1.3 GATS Classification and Coverage of Environmental Services

Environmental services are one of 12 classified service sectors under the GATS framework. Classification and definitional issues are important in this area given the overlapping nature of environmental activities. The scope and coverage of environmental services in the original GATS classification (contained in WTO 1991) was limited and it is now pertinent to adopt a broader definition of the sector.

The GATS W/120 classification of environmental services followed the provisional UN Central Product Classification system (UNCPC). Environmental services under the GATS are defined to include: (a) sewage services (CPC 9401); (b) refuse disposal services (CPC 9402); (c) sanitation and similar services (CPC 9403); and (d) other environmental services. The 'other environmental services' category has been expanded to include the remaining elements of the CPC environmental services category, namely, cleaning services of exhaust gases (CPC 9404), noise abatement services (CPC 9405), nature and landscape protection services (CPC 9406), and other environmental protection services (CPC 9409). Some CPC activities are, however, excluded from these sub-sectors under the GATS. Table 1 provides the definitions and scope of these four sub-sectors under the GATS.

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[7] For instance, this is happening in the case of water treatment around the world, including in developing countries like Brazil, Malaysia, and Taiwan.

[8] During the last two decades, the growth in trade of commercial services outstripped that of merchandise trade. In 2001, the export value of commercial services stood at US$ 1460 billion. For details, see WTO (2003).

There is partial correspondence between the GATS classification and the OECD/Eurostat classification. The latter includes services water for human use (under water management services), recycling services (under solid and hazardous waste management services) and protection of biodiversity, as opposed to the GATS classification. Table 2 highlights the environmental services segments under the OECD/Eurostat classification that overlap with the GATS definition and those that are excluded under GATS, and the corresponding UNCPC version 1 classification.

Table 1: The GATS Classification List of Environmental Services

Environmental services	Provisional CPC	CPC version 1
1. Sewage services Excludes: collection, purification, and distribution services of water (CPC 18000) and construction repair and alteration of sewers (CPC 51330)	9401	9411, 9412
2. Refuse disposal services Excludes: dealing and wholesale in waste and scrap (CPC 62118 & 62278), R&D services on environmental issues (CPC 85)	9402	9421, 9422
3. Sanitation and similar services Excludes: disinfecting/exterminating services for buildings (CPC 87401), pest control for agriculture (CPC 88110)	9403	9431, 9439
4. Other services		94900
• Cleaning of exhaust gases	9404	
• Noise abatement services	9405	
• Nature and landscape protection services Excludes: forest and damage assessment and abatement services (CPC 881, GATS 1F(f)	9406	
• Others not included elsewhere	9409	

Source: Compiled from WTO documents *Services Sectoral Classification List* MTN.GNS/W/120, 10 July 1991 and Table 1 in *Environmental Services* S/C/W/46, July 1998.

Table 2: OECD, UNCPC Version 1, and GATS Classification of Environmental Services

OECD/Eurostat	CPC version 1.0	GATS
A. Water and wastewater management sector with sub-sectors: • Sewage services • *Water for human use*	941 Sewage services 94110 Sewage treatment services 94120 Tank emptying and cleaning services	1. Sewage services *Excludes collection, purification, and distribution services of water, and construction repair and alteration of sewers.*
B. Solid and hazardous waste management sector with sub-sectors: • Refuse disposal and treatment services • Sanitation services • *Recycling services*	942 Refuse disposal services 94211 Non-hazardous waste collection services 94212 Non-hazardous waste treatment and disposal services 94221 Hazardous waste collection services 94222 Hazardous waste treatment and disposal services 943 Sanitation and similar services 94310 Sweeping and snow removal services 94390 Other sanitation service	i. Refuse disposal services *Excludes dealing and wholesale in waste and scrap, and R&D services on environmental issues*. 3. Sanitation and similar services
C. Protection of ambient air and climate	94900 Other environmental services	4. Other services
D. Noise and vibration abatement	94900 Other environmental services	4. Other services
E. Remediation and clean-up of soil, surface water and groundwater.	94900 Other environmental services	4. Other services
F. Protection of biodiversity and landscape services	94900 Other environmental protection services	4. Other services *Excludes forest and damage assessment and abatement services*
G. Other environmental/ancillary services: • Design consulting and engineering. • Preparation of sites, construction, installation, assembly, repair, and maintenance • Environmental research and development • Analytical services, data collection, testing, analysis, assessment • Environmental education, training, and information	94900 Other environmental protection services	4. Other services

Source: Classification based on Table 4 of OECD (2000), GATS 2000 EC Submission S/CSS/W/38, and Table 1 of WTO (1998a).

At the time of the initial GATS commitment negotiations, due attention was not paid to the classification of environmental services, as compared to other segments like financial services that had elaborate classification of the industry segments. The scope and coverage of environmental services under the GATS and its relationship with the OECD/Eurostat classification system, as outlined in Tables 1 and 2 warrants some discussion.

Firstly, the GATS classification has a focus on traditional end-of-pipe approaches and not on prevention, thereby failing to reflect the emerging trend in this sector, which is for instance, reflected in the OECD/Eurostat classification. The latter includes services relating to pollution management (including construction and installation of facilities), services relating to cleaner technologies and products, and products reducing environmental risk and minimising pollution, and services for improving resource use. In contrast, the GATS W/120 classification mainly focuses on pollution control and waste management activities. The last category of 'other services', however, allows for an expansion in the definition to some extent—for example, it can encompass services to protect the ambient air and climate, and nature resources (including biodiversity) under the OECD definition.

Secondly, the GATS environmental services classification is somewhat narrow. Under environmental services, the segments cover services that are uniquely environmental and does not include services such as design, construction, architecture, engineering, investigation and survey, research and development, technical testing and analysis, consulting, and distribution, which could have an environmental component or application but which have dual uses. As noted earlier, environmental services encompass components of several other sectors (which explains the call for a *cluster* negotiation approach). These related services are present in other parts of the W/120 list so as to keep the self-contained and mutually exclusive nature of sectoral classification under the GATS.

A third shortcoming of the GATS classification is in terms of its organisation. Although it covers all environmental media, including air, water, soil, etc., it does not organise the activities by the provision of services for specific environmental media.

In contrast, the OECD classification not only gives the overall boundaries of this sector but also the boundaries relating to specific environmental media. The GATS classification also does not differentiate between resource management versus pollution management services. Thus, the existing WTO classification system for environmental services does not reflect the evolving and integrated nature of environmental services and the wide scope of this sector.

It may be noted here that the two segments excluded under the GATS environmental services (WTO 1998a) also happen to be services that are sensitive in nature, including social equity issues and environmental risk respectively. For instance, the GATS classification of environmental services categorically excludes the provision of water for human use, while this segment is included in the OECD classification. Privatisation and liberalisation of the water sector (treatment and purification) is partial across the globe, since water is a basic requirement for sustaining life, and only in certain Western European countries is the water sector privatised completely. While privatisation and liberalisation of the water sector may be able to provide drinking water in an efficient manner, public intervention is bound to remain significant to ensure that the provision of essential services like drinking water remains socially equitable and environmentally

sustainable as well (e.g. the private firm does not indulge in unsustainable withdrawal of underground water in providing the service).

Similarly, recycling services of solid wastes are excluded under GATS but are included under the OECD definition (under solid and hazardous waste management). The international trade in hazardous waste is currently regulated under the Basel Convention on the Control of Tranboundary Movements of Hazardous Wastes and their Disposal (adopted in 1989, entered into force in 1992). The guiding principle of the Basel Convention is to minimise the threat to human health and environment by encouraging the treatment and disposal of hazardous wastes close to where they are produced. The Basel Convention aims to control the transboundary movement of hazardous wastes, monitor and prevent illegal traffic, provide assistance for the environmentally sound management of hazardous wastes, promote co-operation between Parties in this field, and develop Technical Guidelines for the management of hazardous wastes. There is a ban on exports from OECD to non-OECD countries of hazardous wastes intended for final disposal, effective 1994. An amendment to the Basel Convention in 1997 also prohibits export of hazardous wastes intended for recovery and recycling from Annex VII countries (including the EU, OECD, and Liechtenstein) to non-Annex VII countries (all other parties to the Convention).[9] Notably the US, one of the largest exporters of scraps, has not yet ratified the 1989 Basel Convention nor the amendment to the Basel Convention on the ban of export of hazardous wastes for recycling services.

For a developing country like India, where the focus so far has been on end-of-pipe pollution management, it would be beneficial to embrace a wider definition of environmental services, if only to emphasise the importance of efficient and optimal resource utilisation.[10]

In conclusion, it is observed that India should adopt the broad classification of environmental services with seven sub-sectors (contained in WTO 1998 Secretariat Note, as opposed to the 1991 GATS classification in W/120). The sensitive segments of water for human use (under A. Water and wastewater management) and recycling services (under B. Solid and hazardous waste management) should be excluded or not liberalised.[11]

1.4 Objective and Outline of the Study

This study discusses what India's negotiating strategy should be in environmental services in the ongoing GATS negotiations in the DOHA round, keeping in mind the country's interests and strengths in this sector. There are eight sections to this study.

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[9] The Amendment to the Basel Convention has not yet entered into force since it needs ratification by two-thirds of the parties to become effective.

[10] The intent of optimal resource utilisation is reflected in some of the domestic environmental policies, although instruments to ensure efficiency are still lacking. The domestic environmental legislations are listed in Table A1 in the Annex and discussed briefly under Section 4.1.

[11] The United States in its initial offer on GATS services, while accepting the broader classification of environmental services, has excluded 'water from human use' in the sector specific commitments. The 'recycling services' have also not been explicitly tabled under solid/hazardous waste management (TN/S/O/USA dated 9 April 2003).

Section 2 provides an overview of the global environmental services sector. Section 3 provides an overview of the Indian environmental services sector, in terms of market size and potential, the status and deficiencies in environmental services by seven sub-sectors, the extent of privatisation and foreign participation in the provision of domestic environmental services, and India's trade and investment prospects in this area. Section 4 outlines the main domestic and external barriers impeding trade and investment in environmental services in India. Against this background discussion, Section 5 examines the state of negotiations and liberalisation in environmental services under the GATS framework. It analyses the commitments that have been made thus far in this sector, the country proposals under GATS 2000, and the requests received by India in this sector. Section 6 outlines what India's negotiating position should be in this sector at a broad level and for specific sub-segments within environmental services and in specific modes of interest. Section 7 discusses the domestic reforms and measures, which would be required to support India's negotiating strategy in the GATS. The discussion touches on issues such as regulation, legislation, privatisation, and foreign direct investment, and suggests areas where the Indian government would need to introduce reforms or modify existing regulations and practices to further its interests and support its negotiating strategy at the GATS. Section 8 concludes with a discussion of issues concerning liberalisation of environmental services.

It is important to note at the outset that the discussion in this paper follows the broader classification including the seven categories of environmental services (as outlined in Appendix II of WTO 1998b). The discussion, however, often clubs the sub-sectors on sewage, refuse disposal, and sanitation services as environmental infrastructure services. These three infrastructure environmental services are largely in the realm of the public sector, as distinct from other environmental support services that include air pollution/ noise abatement, environmental analysis/consulting services, where private players are common. While adopting the basic resource management approach of the OECD/Eurostat definition, the analysis here excludes the segments on water services for human use and trade in scrap since these are sensitive areas and not advisable for liberalisation. It must also be noted that while the focus of this study is on the environmental services sector, for the sake of completeness the study also refers to the aggregate environment market involving environmental equipment.

2 Overview of the Global Environmental Services Sector

The environmental services sector constitutes about half the total environment industry, since the activities of firms operating in the environment industry are equally distributed between the manufacturing and services sectors. In 2000, the value of the environmental services sector was approximately US$ 280 billion.[12] In 1996, the environmental services segment was valued at about US$ 229 billion.[13]

[12] One estimate of the global environment industry in 2000 suggests a value of US$ 522 billion (Butkeviciene et al. 2002).

[13] WTO (1998a), p. 4.

The industrialised countries, namely the US, Western European countries and Japan, dominate the global environment industry (including sales of equipment, services, and natural resources). These countries together accounted for about 85 per cent of the global market. The environment markets in these industrialised countries exhibited robust growth in the 1980s. However, more recently, the aggregate market in these countries seems to be stagnating, with a growth rate of only 2 to 3 per cent per annum. In particular, the growth of the environment market in the US, which commands the largest share of the global market, dipped in the 1990s. The American environment market registered a growth of 28 per cent during the 1990s, which was almost half of the growth during the 1970s and 1980s.[14] The median profit margins of US environmental firms exceeded 10 per cent in the late 1980s, but dipped to between 2 to 3 per cent in the 1990s in the service segments.[15]

The environment market in the developed countries is considered to be mature, and with the saturation of the environment market, the growth rates have declined.[16] A study of the US environment industry noted that maturity of the sector was heavily dependent on the demand by regulations, and thus in the 1990s the industry suffered from 'waning regulation-induced market growth'.[17]

On the other hand, the environment market in the developing countries of Africa, Asia, and Latin America is expected to grow at a rate of 10 to 15 per cent per annum. These countries together account for less than 10 per cent of the worldwide market (in 1996 they accounted for 7 per cent of the market), but are expected to register double-digit annual growth. Among the factors supporting this trend are increasing stringency of domestic environmental regulations in these countries, enforcement of international environmental standards and pressure from consumers/ communities.

In terms of sub-sectors within the environmental services industry, water and wastewater management is the largest segment followed by waste management and air pollution control in the OECD countries (WTO 1998a: 5). These segments, however, are not equally significant across the different OECD countries. Water treatment is by far the most capital-intensive segment, and firms in France and UK have a lead in water and wastewater treatment, following privatisation in the water segment more than a decade ago. In the US, solid waste management is the most significant environmental services segment followed by wastewater treatment works. In Japan, on the other hand, air pollution control is the most important segment in environmental services.

In terms of competitiveness, firms from different countries have emerged as leaders in the different segments of environmental services during the 1990s. The US firms were the most competitive in the air pollution control services, largely due to the fact that the first comprehensive air quality legislation, the Clean Air Act, was passed in 1970. Subsequently, Western Europe and Japan emerged as leaders following the introduction of

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[14] Ferrier (2000).

[15] Berg and Ferrier (1998).

[16] Maturity in an industry is characterised by decelerating growth, heightened competition, reduced profitability, growing customer sophistication, pricing pressure, emphasis on marketing (by firms), consolidation of market share by larger players, and heightened merger and acquisition activities.

[17] Ferrier (2000).

more stringent air quality regulations in these countries (UNCTAD 1998). The US firms also had an edge in remediation environmental services due to the strict legislation and enforcement under the 1986 Superfund Amendments and Reauthorization Act.

2.1 Trade Orientation of the Industry

The expected growth of the environment market in developing countries, coupled with the saturation of environment markets in the developed countries, prompted mature environmental firms (of the latter) towards seeking export opportunities in the developing countries. The developing countries are net importers of environmental services (as also equipment). In particular, privatisation and deregulation of utilities adopted in developing countries is expected to increase the opportunities for foreign participation. Thus the share of trade in environmental services, though small in worldwide services trade today, is set to increase significantly in the future.

In 1999, worldwide environmental exports were approximately US$ 122 billion.[18] The leading country exporters included the US with 26 per cent share of the global environmental exports (export value of US$ 32 billion), followed by Germany with a share of 19 per cent, and Japan with 15 per cent share. These three countries also enjoy the largest trade surplus in this sector.[19] In contrast, European nations like Italy, UK, and France had smaller shares of 8 per cent, 7 per cent, and 6 per cent, respectively, of total global environmental exports. Notably, while Finland and Norway are extremely export-oriented, with almost half their production being exported, they do not have a large share of the global market. Table A4 in the Annex gives the details of global environmental exports by country for the years 1995 and 1999.

In the Asian environment market, Japan is the leading exporter. In 1999, Japan accounted for a share of about 40 per cent of the total environmental imports of 11 Asian countries, followed by the US with a share of 29 per cent, Germany with a share close to 8 per cent, and Taiwan with a share of 5.5 per cent.[20] It should be noted here that even though Taiwan's annual environmental exports have been close to US$ 3 billion during 1995–9, it remains a net importer in the environment sector.

In particular, the US environment industry's export revenues doubled between 1993 and 1997, amounting to about 10 per cent of industry revenues.[21] The annual growth of US environmental exports, however, has slowed down. Until 1997, the annual growth

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[18] The sectors covered include air pollution control equipment, heat/energy management and renewable energy plants, monitoring and analysis equipment, solid/hazardous waste, other recycling systems and remediation and clean-up, and wastewater management equipment. The estimate was based on OECD trade statistics (actual sales by HS codes) (US–AEP 2001: 10).

[19] WTO (1998a).

[20] US–AEP (2001), p. 13.

[21] Ferrier (2000). Note that environmental exports reported in the previous paragraph and in the Annex are taken from the US-AEP study, and do not match the estimates of the Environmental Business International (EBI) quoted elsewhere in the paper. For instance, the export value reported for 1997 of the US environment industry is only US$ 18.8 billion from EBI (Ferrier 2000), but US$ 29.7 billion by US–AEP (2001).

rate was between 10 to 28 per cent, but dropped to single digits in 1998 and 1999. In 1997 the growth rate of US environmental exports was 4 per cent, compared to the compound annual average growth of 18 per cent during the previous four years.[22] Within the environment industry in the US, the highest growth in 1998 was experienced in environmental energy sources (predominantly in solar and wind system that constitute more than half the market).

Several Asian countries, including India, have been the focus of the US environment industry under the United States–Asia Environmental Partnership (US–AEP), given the growth prospects of the environment sectors in these industrialising countries. The imports of environmental goods and services of the 11 US–AEP countries, however, fell from US$ 24.16 billion in 1995 to US$ 22.41 billion in 1999, with a sharp decline experienced in 1997 due to the Asian crisis. The total imports of environmental goods and services during 1995–9 by these Asian countries amounted to US$ 116.74 billion. Korea had the largest share of the total imports (22.8 per cent), followed by Taiwan (19.5 per cent), Hong Kong (14 per cent), Singapore (11.9 per cent), Malaysia (8.2 per cent), Thailand (7.6 per cent), Philippines (5.3 per cent), Indonesia (4.7 per cent), India (4.7 per cent), Vietnam (1.1 per cent), and Sri Lanka (0.3 per cent).[23] Table A5 gives details of the imports by US–AEP countries for 1995 and 1999. It is important to note that imports declined sharply in Korea during 1995–8, while strong overall growth was evident in the Philippines and Taiwan during 1995–9.

In terms of environmental segments significant for Asian country imports, solid/hazardous waste and other recycling systems/remediation constituted the largest share during 1995–9, followed by monitoring and analysis equipment, and potable water treatment/wastewater management.

2.2 Privatisation and Liberalisation of Environmental Services

Privatisation in environmental services has great significance for international trade opportunities, since basic infrastructure services that constitute the largest segments of the environmental services sector have traditionally been in the public sector. Local government bodies have typically provided environmental services like water and sanitation, sewage and refuse disposal, cleaning of roads, parks, and lakes. However, private participation in the provision of these basic services has been increasing globally, driven by the need for cost reduction and private sector capital.

The trend in privatisation of public utilities has included most significantly that of water supply and wastewater management. This is because, among the public infrastructure services, water purification and wastewater treatment systems require the largest investment, and more than a third of the public sector capital expenditures in developed and developing countries is spent on the latter.[24] Wastewater treatment is completely privatised in United Kingdom, and in France more than two-thirds of the

[22] Berg and Ferrier (1998).

[23] For details, see US–AEP (2001).

[24] WTO (1998b).

market is in the private sector.[25] Privatisation has also been extensive in the US, though not uniform across all environmental service sub-sectors.

Developing countries have also encouraged private participation in environmental service provision, including water, sewage, and sanitation services. It is estimated that during 1990–7 the cumulative private sector capital expenditure on water and sanitation projects in developing countries was about $25 billion (compared to $297 million during 1984–90).[26] Among the Asian developing countries, in particular Malaysia, Indonesia, Thailand, and the Philippines have encouraged private participation in these infrastructure environmental services. In the Philippines, contracts for water and sewerage services for the city of Manila were awarded to two private consortia, and in Indonesia a 25-year build-and-operate contract for drinking water treatment plant in the city of Medan, Sumatra, was awarded to a French company.[27]

Private participation in environmental infrastructure services has taken various forms across the world. The major types of contracts are briefly discussed below.[28]

2.2.1 Management Service Contracts

Under management service contracts, the government remains the primary provider of the service and the private operator is hired to carry out designated tasks (e.g. operation of water/wastewater treatment plant, or distribution, or meter reading/billing/collection, or maintenance operations) for a certain period of time, typically 5 to 7 years. This is a low risk option of service contracts, but does not optimise the efficiency of the entire service system. Such contracts are appropriate when only operation efficiency is required without significant new investment. In Mexico City, the government awarded four 10-year water service contracts to different companies for four zones of the city in 1993. Since the existing drinking water network reached 98 per cent of the city population and sewage network covered 94 per cent of the population, privatisation was initiated to improve the drinking water distribution (that had major leakage), make the billing system more effective, and install water meters.

2.2.2 Build-Operate-Transfer (BOT) and Build-Operate-Own (BOO)

Under BOT, private investment is invited in construction and operation of new facilities for a certain period of time, typically 10 to 20 years to allow for the private company to recover cost and earn profit. Government retains ownership of the infrastructure facility, and takes the role of both a customer and a regulator. The city of Chengdu in the Chinese province of Sichuan awarded a 18-year contract to Chengdu Generale des Eaux Marubeni Waterworks Co. Ltd., a company owned by a consortium of Vivendi (France) and Marubeni (Japan). The contract included building and operating a modern water supply plant, water intake works, and transmission line to improve water supply.

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[25] WTO (1998a), p. 5.

[26] Johnstone et al. (1999), p. 2.

[27] UNCTAD (1998), p. 17.

[28] Based on Lovei and Gentry (2002), pp. 73–7.

A BOO [or build-operate-own-transfer (BOOT)] is a long-term concession contract, usually for a period more than 25 years, the government gives the full responsibility of the delivery of services in an area to the private party, including construction, operation, maintenance, collection, and management activities. The infrastructure assets entrusted to the private party remains government property, and the government remains the regulator. In 1995, Tucuman Province of Argentina awarded a 30-year concession to Vivendi in 1995 for the province's water and sewerage system. Eventually, however, a new provincial government accused the company of inadequate service and failure to fulfil guarantees, meet quality standards, and cut tariffs on schedule and in 1998 Vivendi was allowed to withdraw.

2.2.3 Joint Ventures

Under joint venture, the private and public sectors together assume co-ownership of assets and co-responsibility for the delivery of services, by forming a new company or share ownership of an existing company. Joint ventures involve the creation of a new entity for implementing the environmental service, under a contract, BOT or otherwise. In Malaysia, two such joint ventures failed: In 1995, a joint venture Kelantan Water, between Kelantan state agency of Malaysia and the UK firm Thames Water, failed to carry out the infrastructure work as the latter had serious debt problems. Eventually Thames Water agreed to sell its entire 70 per cent equity to the state government. In 1993, another Malaysian joint venture, Indah Water Konsortium, failed to provide the sewage services (under a concession contract) due to financial hardships. In Thailand, however, public stock offerings by East Water, a subsidiary of the Provincial Waterworks Authority, in 1997 achieved 51 per cent private ownership and helped finance water treatment and supply projects.

2.2.4 Full Privatisation

Under full privatisation, the government grants the responsibility of providing the service and ownership of the underlying infrastructure assets to the private party. The government only functions as the regulator of quality and price of the environmental service provided by the firm. Full privatisation has been tried in England and Wales, France, and the United States. In 1989, England and Wales privatised the water and sewage sector through the new Water Act. Ten regional water and sewage companies and 26 water supply firms were allowed to run geographic monopolies. While privatisation is said to have improved drinking water supply and wastewater treatment, concerns remain about the increases in user fees and the companies' use of the revenues.

Privatisation of infrastructure environmental segments like water utilities does seem to increase efficiency, and provides the capital for building networks to extend services to millions of new customers (considering the government agencies can be bureaucratic, inefficient, corrupt, and also strapped for finances). Yet there are serious concerns with private entities operating in the public services sector, since profit-seeking behaviour in the market may not take care of the public interest, especially as some of the

environmental services support the emergence of monopolies.[29] This raises the argument for public intervention to restrict monopolistic practices in the market, while private participation remains desirable on grounds of efficiency gains.

The major concerns in full privatisation of environmental infrastructure services arise from the disparity in information between the government and private firms, opportunities for regulatory capture or corruption, and inadequacy of regulatory capacity. It is important to note that full privatisation has been experienced only in select environmental service segments in a handful of industrialised countries, which have the most mature institutional and regulatory structures. Developing countries so far have encouraged more of service and concessional contracts, and also joint ventures, in this sector.

While privatisation in environmental infrastructure services has been witnessed in various forms across the world, on the whole the public sector continues to play an important role as the provider of these environmental services. The public sector capital expenditures on pollution control and water and waste management are increasing in both developed and developing countries. Government procurement and government provisions of environmental services continue to play a large role despite large-scale privatisation in utilities.

In the United States, where privatisation of utilities has been the most extensive in the overall environment services sector, the extent of privatisation is different across the segments. For instance, in 1994 the wastewater treatment segment was virtually controlled by the government with 95 per cent ownership.[30] In other words, even in a country like the US, 'generally regarded as a country which has gone furthest in terms of privatisation of utilities, most of the revenue in wastewater is generated by the public sector'.[31] Privatisation, however, is still progressing in this sector. In other segments, including solid waste management, hazardous waste management and environmental testing/analytical services, the US government has a more limited role with an ownership of 33 per cent, 10 per cent, and 8 per cent, respectively. Full privatisation exists in the two segments of remediation/industrial environmental services and environmental consulting/ engineering.[32]

2.3 Structure of the Environmental Services Industry

The environmental services industry consists of both public sector environmental utilities/infrastructure as well as private sector environmental support services. Even with

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[29] A World Bank survey of water projects indicates that the water supply is subsidised and the price charged for in developing countries is only a fraction of the cost of providing the utility. Optimal resource utilisation and conservation of water would require raising this price, which is likely to take place with privatisation. On the other hand, a hike in water price would adversely affect basic cleaning habits of the poor, leading to increased risk of diseases. UNCTAD (1998), p. 17.

[30] Based on data reported in Table 4, WTO (1998a).

[31] WTO (1998a), p. 5.

[32] Considering the entire environment market, however, the stake of the public sector in the US has reduced over the years, and constituted only 34 per cent of the industry revenues at the end of the 1990s (Ferrier 2000).

privatisation in the infrastructure services, the public sector plays a large role (as both producer and consumer) of the most significant environmental services (by value), including sewage treatment, refuse disposal, sanitation, and drinking water.

The structure of the industry that has emerged is not uniform across its sub-sectors. The environmental services that require large scale investment for economies of scale (and support the emergence of natural monopoly) have a few large firms. For instance, sewage services need collection and distribution network investment of a size that would be economical only for a single large operator. Considering the scale benefits due to large capital investments and technological development, there has been a tendency towards increasing concentration in the environmental industry. Moreover municipalities have been seen to use few large environmental service suppliers due to the ease in monitoring and tracing liability.[33] In the US the number of mergers and acquisitions in the environment industry increased during 1987 through 1991 to reach 223 transactions in 1991. Ten companies were estimated to control about half the private market.

On the other hand, specialised environmental services, including analytical services and consulting, support the emergence of several small/medium scale operators. Thus these services are provided widely by both medium-sized and small firms, who are often sub-contractors for large projects.

This industry structure is reflected in the global market with the emergence of large multinational corporations dominating a few market segments in water and wastewater treatment. The larger multinationals provide integrated products and services required for environmental systems management. The large integrated multinationals account for about 50 per cent of the total environment market, and the other half is accounted by the smaller firms.[34]

In 1995, the top 50 environment companies represented 20 per cent of the market, with American and French firms being in the lead. Among the two largest corporations in the environment industry worldwide are The Waste Management of the US and Vivendi of France (renamed in 1998, formerly La Generale des EAUX CGE, meaning Company of Water). The big players are becoming bigger through transnational acquisitions, and the industry is getting to be more complex. For instance, after Vivendi acquired US Filter in 1999, the Environmental Business International noted that the US water industry was getting more complicated and more global with each passing year due to enhanced global partnership, acquisition, and direct sales activities of the big players.

The country tags of large multinational corporations (MNCs) in environmental services are thus losing significance. Large MNCs also offer a gamut of services (that fit into the argument of liberalisation of a cluster of services). In particular, Vivendi, which is considered to be leading in environmental services worldwide, has four business divisions: water, waste, energy services, and transportation. Vivendi Environment operates in more than 100 countries and provides multi-service global offers.

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[33] WTO (1998a), p. 5.

[34] UNCTAD (1998), p. 8.

3 Overview of the Indian Environmental Services Sector

The Indian environment industry has grown rapidly in recent years. The following discussion highlights the size and market potential of the Indian environment sector, including the services segment, the factors contributing to the growth of this sector, the status of environmental services in the country, and the domestic industry's strengths and weaknesses.

3.1 Size and Nature of the Indian Environment Industry

The environmental infrastructure services segment is in the realm of urban local bodies (ULBs) while environmental support services have traditionally been part of integrated engineering consulting services. The first comprehensive estimate of the Indian environment market including equipment and services was made for the year 1994 and valued at US$ 1.9 billion.[35] The summary estimates are given in Table 3.

A more recent estimate, in 2002, valued the Indian environment market at US$ 4.36 billion, with an annual growth rate of 15 per cent. In 2000, the market was estimated at US$ 3.29 billion, and in 2001 at US$ 3.79 billion. The market estimate included environmental management technology, equipment and services, including clean and renewable energy.[36]

Table 3: Market Potential in Indian Environment Sector, 1994

(in US$ million)

Environment segment	Net capital investment potential*
A. Wastewater treatment	
Industrial	700.2
Municipal	660.0
B. Solid waste management	
Municipal (composting)	90.0
Industrial hazardous	46.0
Industrial non-hazardous	n.a.
D. Other services	
• Air pollution	
Industrial	313.9
Mobile	40.0
• Environmental consultancy	38.0
• Water and air monitoring/ testing equipment and services	17.7
Total	1905.8

* Total estimated capital investment required in 1994 less of the capital investment incurred.
n.a. = no information was available.

Source: Data from Table 4.1.1 in CII (1996).

[35] CII (1996). Note however that the estimate was conservative since it did not cover segments like industrial non-hazardous solid waste treatment or sanitation. The estimates were based on secondary data collected from government agencies, industry suppliers, and multilateral and bilateral assistance agencies.

[36] USDOC (2002a).

The Indian environmental services industry consists of two sets of firms: first, large engineering firms offering environmental services as part of their equipment or technology package for pollution treatment; and second, smaller firms specialising in environmental consulting services. In 1999, the Confederation of Indian Industry (CII) reported a total of 216 environmental enterprises operating in India.

The first type of environmental services has been popular through large turnkey consulting projects involving equipment or technology for pollution treatment, in that the environmental firms typically provide environmental services (related to environmental goods) as part of an integrated package to address an environmental problem. This includes comprehensive and specifically targeted project design and management through the provision of engineering, construction, equipment, and operation and maintenance of general utility facilities, such as water, pollution, and waste management systems. For example, a firm may offer engineering consulting services along with the specification, design, installation, and commissioning of treatment systems to an industry. These Indian firms are typically well developed and large in terms of staff strength and scale of operations.[37] While the Indian environment industry is nascent, it has made progress in conventional and advanced technologies both on its own and through joint ventures with foreign manufacturers. The most common pollution abatement products are systems for treating water and controlling air pollution as required by the domestic regulations. The sector has begun to expand to include conservation, resource recovery, and waste utilisation technologies. The new as well as upgraded environmental regulations pertaining to the disposal of industrial wastes, municipal solid wastes, noise pollution, etc. at the end of the 1990s is likely to help in the growth of this sector. For instance, some domestic firms have emerged in refuse treatment and disposal service, especially in composting of municipal solid wastes, like Excel Industries.

The second type of firms is limited in number. They provide environmental study-type services in terms of audit reports, environmental impact assessment (EIA), environmental management system (EMS), auditing, training, etc. Environmental consulting firms from Australia, Denmark, Canada, UK, US, France, and Japan have performed EIA studies or pollution prevention studies sponsored by the donor agency of their respective countries.

3.2 Potential Growth Factors in Environmental Services

Thought the environmental services sector in India is small, the emergence of several factors can support rapid growth in this sector. These include, notably, rapid population growth and urbanisation, industrialisation, enhanced domestic environmental regulation, and increasing demand for environmental attributes in merchandise exports to OECD countries. According to estimates reported in Table 3, the environmental segments requiring the largest investment include wastewater treatment, followed by industrial air pollution. There is also an urgent need for remediation and clean-up services of contaminated surface and ground water that have been polluted through indiscriminate

[37] CII (1999).

dumping of untreated municipal wastes and wastewater, as well as industrial effluents, over the years. Each of these demand factors is discussed briefly here.

Among the more significant government policy approaches that potentially affect the growth of the environment market in India was the 1992 Policy Statement for Abatement of Pollution. The government formally recognised the merits of using economic/market-based instruments in controlling pollution and identified four critical issues including, heavily polluted areas and river stretches, pollution prevention at source, recognition of the polluter-pay-principle, and development of the best available technical solutions for environmental management.

3.2.1 Increasing Population and Urbanisation

As noted earlier, environmental services in sewage, refuse disposal, and sanitation comprise the most significant (by value) segments of the sector, and in India there are severe deficiencies in the provision of basic environmental services to the growing population. In 2001, of the 1 billion odd population, more than 28 per cent was classified as urban (Census 2001). The infrastructure environmental services in the cities have been unable to keep up with the rapid increase in population. This is particularly critical since the urban population is growing faster than the total population. During 1991–2001, the urban population increased by 32.26 per cent while the total country population increased by 21.34 per cent during the same period.[38]

The demand for some of the essential environmental services from the domestic sector is evident from the increase in defensive expenditure of Indians, and the growth of markets for bottled water, household water purification kits, and air purification equipment during the last decade. This clearly indicates that communities in urban India (except for the urban poor) are willing and do pay for improvement in environmental quality of the basic consumption goods and services. Thus, while the majority of Indians can ill-afford the cost of full market price of basic resources like water and sanitation, a certain section of the Indian population, notably in the urban areas, can pay more for enhancing these services that follow from privatisation and liberalisation.

Government initiatives in this segment include the Accelerated Urban Water Supply Programme, which supplements the state governments' Basic Minimum Services Programme of 1996 to provide safe drinking water to the entire urban population in India by 2000. In the Tenth Five-Year Plan, the government released a revised draft Water Policy aimed at providing safe drinking water to all. In 2000, the Municipal Solid Wastes (Management and Handling) Rules issued the guidelines and made local bodies the nodal agencies in solid waste collection, transportation, and disposal. This legislation set deadlines for cities to establish suitable waste processing, disposal facilities, and sanitary landfill sites. The set of environmental regulations is listed in Table A1 in the Annex.

[38] Based on Census 1991 and 2001 figures, the total population increased from 846 million in 1991 to 1,027 million in 2001, while the urban population increased from 215.7 million to 285.3 million during the same period. The urban population has been increasing due to natural population increase, reclassification of new towns, and rural–urban migration.

3.2.2 Industrial Demand for Environmental Services

A second significant potential demand for environmental services comes from the industrial sector, particularly for industrial wastewater treatment and disposal, hazardous waste management, environmental analysis, consulting, testing, and certification. The increase in the demand for environmental services in the industrial sector in India during the 1990s stems from three major factors, namely, enhanced domestic environmental regulations and government initiatives, increasing demand for environmental attributes in products and processes by importers (e.g. ISO 14001 certification), and civil society pressure as well as environmental legal activism.

3.2.2.1 Upgradation in domestic environmental legislation and other initiatives

There has been an expansion of domestic environmental regulations in recent years to incorporate environmental management guidelines. The nature of environmental regulations in India while mainly focused on installation of end-of-pipe pollution control equipment has changed somewhat towards a more holistic environmental management approach. For instance, mandatory EIA (for 30 categories of activities) and environmental safety audit have encouraged the growth of environmental services. Similarly, the Bio-medical Waste Rules (1998) and Hazardous Waste (Management and Handling) Rules (amended 2000) have helped to attract more equipment manufacturers along with consulting services in the Indian environment sector.

The upgradation of certain domestic environmental legislation has followed from the implementation of commitments under the Multilateral Environmental Agreements (MEAs), to which India is a signatory. For instance, the Ozone Depleting Substances (Regulation) Rules (2000) followed the Montreal Protocol, and the New Biodiversity Act (2002) followed the Biodiversity Convention.

3.2.2.2 Increased demand for environmental attributes of products and processes by OECD importers

There has been an increase in demand for environmental attributes of products as well as production processes (justified under the environmental provisions of the Agreements on Technical Barriers to Trade and Application of Sanitary and Phytosanitary Measures) from importers in the OECD countries. Indian exporters have faced consignment rejections in OECD markets, and there has been a move towards upgrading environmental management systems (like the voluntary ISO 14001) or processing (like Hazard Analysis Critical Control Point [HACCP] in food processing plants), as well as obtaining environmental certification and labels. The government too has set up environmental testing and certification laboratories, and helped in environmental training.

3.2.2.3 Community pressure and legal environmental activism

Civil society (individuals and environmental non-governmental organisations (NGOs)) in India have been active in bringing polluters to court with environmental public interest litigation given that a good environment is a constitutional right of the Indian citizen (under the Right to Life, Article 21 of the Indian Constitution). Notably, the Supreme

Court of India rulings have become a significant factor behind the change in firm behaviour. Some of the rulings from the environmental public interest litigation have also resulted in major regulatory initiatives.

3.2.3 Degraded State of the Environment

The third potential source of demand for environmental services (for remedial services) stems from the need to clean up the present degraded state of the environment in the country. The indiscriminate disposal of untreated wastes and effluents into waterways and land has led to severe surface and ground water pollution. During the last five years in particular, the Ministry of Environment and Forests has more than doubled its expenditure on environment to US$ 180 million in 2001–2, the largest outlay of $58 million being for cleaning up the rivers.[39] Under the 1995 National River Conservation Directorate, remedial and pollution control works were undertaken for 18 major rivers in India.

3.3 Status and Deficiencies in Environmental Services by GATS Sub-sectors

The Indian environmental services sector has been growing, and given the acute shortfall in the provision of infrastructure environmental services and potential demand induced by new/enhanced environmental regulations, the growth prospects of the environmental services sector are good. This section gives a brief review of the status and current deficiencies in environmental services by seven sub-sectors (as per the broader GATS classification) to indicate the need and scope of growth in these services in India.

3.3.1 Wastewater and Sewage Services (excluding Water for Human Use)[40]

Water pollution is considered to be India's worst environmental problem. This segment is estimated to account for almost half of the country's environmental market, with an expected growth rate of 10–12 per cent per annum. A number of publicly owned water/wastewater treatment utilities and urban authorities have begun to privatise such infrastructure and raise funds from the capital market to meet their financial needs. The foreign investors expect 'the *real boom* in the municipal water and wastewater treatment over the medium term (3 to 6 years) when the Central and State governments take adequate measures towards privatisation'.[41] The industrial water and wastewater treatment market is expected to continue to grow, especially in the highly water polluting sectors such as chemicals, petrochemicals, metal processing, ferrous and non-ferrous metals processing, and food processing sectors.

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[39] For details, see Table A2 in the Annex.

[40] Discussion in this section is based on the data published in CPCB (1999a, d). It may be noted here that 78 per cent of the urban population have access to safe drinking water, while in the villages barely 35 per cent have access to water supply. In Class I cities, the provision of water supply is above the urban average, with 88 per cent of the municipal population covered by organised water supply (CPCB 1999b).

[41] USDOC (2002a).

The domestic sector, however, is the largest generator of wastewater (by volume) in Indian cities. The Ministry of Environment and Forests noted that municipal wastewater accounts for about three-fourths of the total wastewater generation by volume, and almost half the total pollution load. In Class I cities, in particular, about 97.65 per cent of the total wastewater generated by volume comes from the domestic sector, and the rest from the industrial sector. Thus the deficiency in treatment of municipal wastewater is the single largest source of surface and ground water pollution in India.

A large section of the Indian urban population is not even provided with sewerage facility. In Class I cities, about 70 per cent of the municipal population is provided with sewerage facility, whereas in Class II cities about 66 per cent of the municipal population is covered by sewerage facility. The sewerage facility includes open, closed, and piped systems. Of the total wastewater generated, about 72 per cent is collected in the Class I cities and 66 per cent in the Class II cities. Among the Class I cities, metropolitan cities (with population above 1 million) contribute to the bulk of the wastewater generated, the maximum contribution being made by Delhi. The collection rate of wastewater in Delhi city at only 59 per cent of the wastewater generated was lower than the average across all Class I cities.

The deficiency in the provision and collection of wastewater is accompanied by gross undercapacity to treat wastewater generated in the cities. In Class I cities, the total available treatment capacity was only 24 per cent of the total volume of wastewater generated. The situation in Class II cities is still worse, with barely 4 per cent of the total wastewater generated being treated, and the rest being disposed off untreated.

3.3.2 Solid Waste Management (excluding Recycling Services) [42]

3.3.2.1 Refuse disposal services

The disposal of industrial (hazardous and non-hazardous), municipal solid wastes and bio-medical wastes has become a serious concern due to the land pollution and ground water pollution caused by leaching from the land disposal sites. Municipal solid waste includes residential, commercial, institutional, and industrial (but not hazardous) wastes. The majority of the municipal solid waste is generated in the metro cities with more than 62 per cent of the waste from Class I cities. In the industrial sector, thermal power stations are a major source of solid waste, especially coal ash, while hazardous wastes are generated mostly from petrochemical, pharmaceutical, chemical, pesticides, fertiliser, and metal finishing industries.

Among the most severe infrastructure deficiencies in municipal waste disposal services are the absence of any transfer stations and legally notified landfill sites for dumping solid wastes. This is significant since virtually all cities simply dump the wastes collected without treatment: about 94 per cent of the total waste collected being dumped in Class I cities. On an average, only about 6 per cent of the total municipal solid waste generated in the Class I cities is treated. Some cities in states like Gujarat, Kerala, Maharashtra, Rajasthan, and Delhi, however, do encourage composting but the national average for Class I cities show 94 per cent of the municipal solid waste is disposed off

[42] Data in this section is taken from CPCB (1999c).

through dumping, and only 5 per cent is composted. Under Schedule I of the Municipal Solid Waste Management and Handling Rules 2000 this is set to change, landfill sites as per specifications were to be ready for operation by December 2002, and waste processing and disposal facilities are to be established by December 2003. This implies a large potential demand for waste processing, disposal, as well as construction of sanitary landfills across cities in India.

Following the 1998 legislation on mandatory treatment of biomedical wastes, the market for biomedical waste treatment is estimated at US$ 200 million, and is expected to double over the next 3 years prompted by the domestic regulation.[43] Domestic legislation has made the treatment of biomedical waste mandatory, and hospitals with 500 beds are required to install adequate treatment and disposal facilities. By the end of 1999, only a few facilities had abided by the rules. Technology needs in this sub-sector include microwave, autoclave, and hydroclave and advanced incineration systems.

3.3.2.2 Sanitation services

Outdoor sweeping and cleaning of streets is in the purview of ULBs. In urban India, about 38 per cent of the population have access to sanitation services, while in rural areas barely 12 per cent have access to such services.[44] Although the urban population has greater access to sanitation services compared to the rural population, the deficiency is acute in the slums of urban India, where the population may not have adequate purchasing power to pay for private services.

3.3.3 Protection of Ambient Air and Climate Services

Air pollution is perhaps the most serious environmental concern in urban India. The largest source of air pollution is the transport sector, followed by the industrial sector (including coal based thermal power stations). The air pollution equipment and services market is expected to have a growth rate of 15 per cent per annum.[45] In 2001, the value of imports was about US$ 80 million, with the US being the single largest import source (40 per cent of the import market). Growth in the sector is led by the transportation sector (due to enforcement of stringent vehicular emission standards), followed by planned capacity additions in the thermal/liquid fuel/gas-based power sector, and retrofitting opportunities in the existing polluting industries like steel and petroleum refinery.

The key needs within this sub-sector include: pollution control equipment like filters and precipitators; energy efficient boilers and furnaces; ambient air and stack air quality monitoring equipment; process control and instrumentation for industries; industrial hygiene and safety monitoring equipment; and vehicular emission control products like catalytic converters, CNG kits, and consulting services.

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[43] USDOC (2002a).

[44] CPCB (1999a).

[45] USDOC (2002a).

3.3.4 Remediation Services and Clean Up of Soils and Water

As mentioned in the previous section, the degraded state of the environment in the country, especially in terms of water and land, need remediation services. Surface water quality, especially of the major Indian rivers (e.g. Ganga, Yamuna), is poor due to the dumping of municipal wastes and industrial effluents, as well as chemical run-off from the agricultural fields. While efforts have been devoted to target river cleaning (e.g. under National River Conservation Directorate), remediation services need to be enhanced.

3.3.5 Noise Abatement Services

Noise abatement regulations are fairly recent in India (dated 2000, and amended 2002), and specify standards on ambient noise by area (residential, commercial, industrial, and silent zones) differentiated by time of day and night. There are also specific standards for noise limits from vehicles. The market in this segment is equipment oriented towards noise suppression devices. Import needs are particularly in engineering and design services.

3.3.6 Nature and Landscape Protection Services

For the conservation of total biological diversity (including forests), the 1988 National Forest Policy recommended that the network of national parks, sanctuaries, biosphere reserves, and other protected areas should be strengthened and extended adequately. The strategy goal includes achieving a forest area cover of at least one-third of the total land area of the country. The participation of local communities is important in natural resource management (as initiated under the Joint Forest Management), since these resources provide sustenance to a large Indian rural population. The forest management services to that extent seem largely informal.

3.3.7 Other Environmental and Ancillary Services: Data Collection, Analysis/Assessment, Environmental R&D, Education, Training, and Information

The Indian industry has responded with a robust growth in environmental consulting firms (though the quality of services from these firms varies). Air pollution monitoring services have also been growing in the country, with air pollution being monitored across various cities. While training in environmental management systems like ISO 14001 seems to have become a forte of the industry, environmental R&D is virtually absent. Thus, technological know-how seems to be the main deficiency in the Indian environment industry. The CII[46] notes that the Indian environment industry really needs affordable cutting edge technology in pollution prevention and abatement.

[46] CII (1996) and Seema Arora, CII (discussion).

3.4 Private Participation in Infrastructure Environmental Services

The inadequacies in the provision of basic environmental amenities in urban India, as discussed above, are often due to paucity of funds (and also due to the growth of unplanned/illegal urban colonies). While infrastructure for environmental services is quite adequate in the developed countries, in a developing country like India, capital investment to enhance the infrastructure for providing the environmental services is important. This implies that among the various options of privatisation available (as listed in Section 2.2 above), BOT and BOO has greater significance for India than just management service contracts.

The most significant reform affecting the provision of urban environmental services in India is the 74th Amendment Act of the Indian Constitution in 1992. This amendment recognised the principle of local self-governance and empowered the ULBs, including municipal corporations, municipal councils, and nagar panchayats. Schedule XII of the Constitution lists the functions of ULBs, which include environmental services like:

- water supply for domestic, industrial, and commercial purposes
- public health, sanitation, conservancy, and solid waste management
- urban forestry, protection of the environment, and promotion of ecological aspects
- provision of urban amenities and facilities such as parks, gardens, playgrounds.

In other words, among the functions of ULBs listed in Schedule XII, several as listed above coincide with the environmental services listed under the GATS. Wastewater collection and treatment corresponds to 'sewage services' (under A. Wastewater management); municipal solid waste collection, and disposal corresponds to 'refuse disposal services'; sanitation, including sweeping of streets, corresponds to 'sanitation and similar services' (under B. Solid waste management), and urban forestry, protection of environment, promotion of ecological aspects, parks, and gardens corresponds to 'nature and landscape services' (classification F).

Since financial constraints of ULBs have been a major problem towards the adequate provision of services, the new legislation provided the framework for decentralisation of governance and local participation, and for ULBs to tap financial resources through Central Finance Commission as well as the State Finance Commissions. In 1996, the Central government also sent guidelines to all state governments on innovative approaches for resource mobilisation and suggesting urban development plans/projects be placed on commercial format by designing commercially viable urban infrastructure services and area development projects. A state is supposed to assign ULBs with specific taxes, duties, tolls, and levies, and authorises them to impose, collect, and appropriate the same.

All state governments of India have either enacted new municipal laws or amended the existing laws to conform to the changes under the 74th Amendment. This is considered to be the first generation reforms in the urban sector. Second generation reforms would include policies to protect consumers with privatisation of financing and delivery of municipal environmental services, including water and sanitation.

In 1999, the state of Gujarat passed a law (Gujarat Act No. 11 of 1999) that provides a clear framework for private participation in financing, construction,

maintenance, and operation of infrastructure projects. In particular, Schedule I on types of projects covered under this Act included water storage, water supply, sewerage system, solid waste management, as well as tourism projects. The scope for private participation in local government functions in the Gujarat Act was the first of its kind in India. Schedule II of the Act elaborated on the nature of concession agreements that can be offered to private parties, including BOOT, BOT, build and transfer, build-lease-and-transfer, lease management, rehabilitate-operate-and-transfer, service contract, or joint venture.

In June 2001, the state of Maharashtra also issued guidelines for private sector participation to increase performance and investments for water supply and sewerage.[47] This was adopted to help cities improve the provision of these services by tapping external funds and increasing efficiency in operations. Besides maintenance and repair, other operations requiring improvements included metering, billing, and collection of charges. The guidelines recommended ULBs to invite competitive bids during the selection of private firms, and the state guidelines detailed the procedure for such competitive bids.

Privatisation of infrastructure services has also been witnessed in the Indian transport sector, where similar issues were involved. The sector is analogous to the environmental sector in terms of the existence of externalities, large investment requirements, and long gestation period in investment returns. Here too, BOT and BOOT type of concessions have been used in India. For example, the Bangalore–Mysore Infrastructure Corridor Project is the largest BOOT highway project in India. The project, estimated to cost Rs 836 crores, was awarded to the Nandi Infrastructure Corridor Enterprises Ltd. (part of Kalyani Group of Industries) in 1995. The contract includes the grant of government land for the highway construction as well as adjacent land to the entrepreneur for a lease period of 40 years (10 years for construction and 30 years after construction). Private lands falling in the area are to be purchased by the entrepreneur. The entrepreneur is expected to recoup the investment through sale of the land to be developed (for 5 proposed townships) and the highway is to be maintained through the tolls charged from users.

3.4.1 Experience with Privatisation in India

Apart from financial constraints, the management of environmental services of ULBs has also been poor. For instance, in 1999 the report on solid waste management in Class I cities from the Supreme Court constituted Committee noted that, *inefficient management and indiscipline among the workforce* has led to the unsatisfactory municipal services (besides the paucity of funds due to inadequate taxation).

During the 1990s, municipalities, especially in Class I cities, have encouraged private participation in infrastructure environmental services that fall under their purview. These have taken the form of service contracts in refuse collection and disposal, cleaning of streets, composting, etc. Long-term concession contracts under BOO (and BOOT) have also been awarded in the refuse disposal segment. These cover composting projects notably in the states of Maharashtra, Tamil Nadu, Andhra Pradesh, and Kerala. The private firms recoup their investment by selling compost derived from waste processing. The quality of compost, however, needs close monitoring, since without proper waste

[47] FIRE(D) (2002).

segregation at source, compost may be contaminated. The capital investment in these facilities [with capacity 100 to 700 tons per day (tpd)] has been in the range of Rs 30–70 million, and has been driven primarily by promoter equity.[48] For example, in the city of Delhi, two waste-to-compost plants of 600 tpd and 300 tpd have been set up under BOO with domestic private firms from Khurana Group and Excel Industries.

Private capital has also been used in landscape services in India, notably in the city of Ahmedabad. The Ahmedabad Municipal Corporation (AMC) initiated a 'green partnership' where private firms share the cost of urban environmental management efforts in parks, gardens, and roadsides. In parks and gardens, private companies pay for the saplings and tree guards, while the AMC undertakes actual plantation and maintenance: under such partnership 200,000 saplings have been planted. In roadside tree plantation, private companies pay the expenses for tree plantation on specific stretches and in return for this can put a discreet logo on the tree guard. According to the AMC, in 1995–6, 17 private companies came forward to sponsor a total of 7150 tree guards at the cost of Rs 7.15 million.[49]

The above anecdote illustrates how the Indian private sector capital can be successfully tapped in municipal environmental services, to overcome financial constraints of the ULBs and improve the quality of life for the citizens at the same time. As for the firms, the participation in urban environmental services offered economic benefits through the opportunity to advertise and help build a green and socially responsible corporate image.

3.5 Foreign Investment in the Indian Environment Sector

For the year 2003, the US Department of Commerce ranked the Indian environment sector as the second most attractive sector after computer software services for American exporters and investors.[50] The estimate of the Indian environment market, domestic production, and imports are reproduced in Table A6 in the Annex.

Liberalisation through the 1990s has witnessed the significant opening up of sectors for foreign investment, especially through the automatic route of the Reserve Bank of India.[51] The foreign direct investment (FDI) in environment equipment and services (i.e. manufacture of pollution control equipment, sewage, refuse, and consultancy services) are allowed under the automatic route with up to 100 per cent foreign equity holding.

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[48] FIRE(D) (2001), pp. 2–3.

[49] Ahmedabad Municipal Corporation website: www.ahmedabadcity.org

[50] The prospects in this sector seem to have been improving for the year 2002, the environment sector had been ranked sixth after sectors like computer software and services, telecommunication services, telecommunication equipment, computers and peripherals, and education.

[51] Only certain sectors require separate approval: The list of economic activities not available for the automatic route includes 'investing companies in infrastructure and service sector', which can route their investment in India through the Foreign Investment Promotion Bureau (Annexure A of RBI Exchange Control Department Notification No. FEMA 20/2000-RB, dated 3 May 2000). These infrastructure services typically include that of telecommunications, power, etc., and not the environmental infrastructure services referred to in this paper.

However, foreign investment has been largely routed through the Foreign Investment Promotion Bureau (FIPB) in India, since it comes with a written approval of the Government of India. Thus while the automatic route is open for foreign investment in environmental services, the FIPB has been approving several of these projects.

During 1993 through 2002 the total foreign direct investment in the environment sector approved by the FIPB amounted to US$ 32.7 million (for details, see Table A3 in the Annex). The largest share of this foreign investment came from the US (31.86 per cent), followed by the Netherlands (23.33 per cent), Singapore (18.65 per cent), UK (8.65 per cent) and Germany (6.45 per cent). In 1991–2 there was no FDI or foreign technology cases (FTCs) in the environment sector approved by the FIPB in India.

Countries like the US consider the prospects for investment in India to be good given the increasing privatisation in environmental services and enhancement of domestic regulations. Since local capacity in India will not be able to meet demand, imports will register higher growth. Private sector implementation of projects on a BOOT and BOO basis (some facilitated through financial participation of multilateral and bilateral agencies in large urban environmental infrastructure projects) has encouraged foreign investment in the sector. Among the Indian environmental segments with significant foreign investment are: water/wastewater treatment; recycling and sanitation; industrial and vehicular air pollution control; hazardous waste management, treatment, and disposal; biomedical waste management; municipal solid waste management; pollution testing and monitoring equipment/services; clean and renewable energy equipment; and environmental consulting/engineering services.

Joint ventures have also been prominent in the Indian environment industry, and over 100 companies have associations with international companies in the form of joint ventures and technology transfer agreements for various types of pollution control equipment (instances given in Table A7 in the Annex). While there are many joint ventures and collaborative arrangements in the environmental goods sector (between 100 to 150) there are fewer such arrangements in the environmental consultancy services sector.

Some of the Indian environmental services firms have established long term strategic partnerships with foreign firms to enhance their skills in selected niche areas: for example, in 1997, Technofab Engg. (India) formed Tetra Tech India Ltd. under a joint venture with Tetra Tech EMI (US) to offer consultancy and engineering services in environment, energy, and infrastructure.[52] Similarly, Tata Risk Management Services is a joint venture (50–50) between Tata Sons Ltd. and American International Group Inc. (US) that provides safety audits, risk assessment, as well as environment related services in EIA, environmental audit, biomedical waste management, environmental training, etc.

[52] In 2001, however, Tetra Tech sought to increase its foreign equity from 50 per cent to 100 per cent. In February 2002, Tetra Tech India became a wholly owned American subsidiary after the FIPB approval. It should be noted here that all cases involving transfer of shares need the FIPB approval, even though the sector *per se* allows FDI under the automatic route.

3.6 A Case of Liberalisation in Municipal Environmental Service

During the last few years, liberalisation in the environmental service sector has been witnessed in several Indian cities. The city municipalities in Chennai, Hyderabad, Navi Mumbai, Rajkot, and Surat have experimented with partial privatisation and liberalisation in solid waste management to increase efficiency. Other city municipalities have imported engineering and design consulting services (e.g. in Greater Bombay), or even to construct and operate water systems (e.g. in New Delhi).

In 1995, the Municipal Corporation of Greater Bombay awarded a 32-month feasibility study to R. V. Anderson and Mott MacDonald under a joint venture team with Indian firms PHE Consultants Ltd. and Mahindra Acres Consulting Engineers Ltd. The contract was worth $3 million and was meant to upgrade the sewerage operation system of Bombay's Water Supply and Sewerage System. In 2000, a contract to design, build, and operate drinking water provision in Sonia Vihar, New Delhi was given to Suez-Degremont. The project is expected to cover 3 million citizens at a cost of Euro 50 million.

In 2000, the Municipal Corporation of Chennai partially privatised the collection of solid waste to Chennai Environmental Services Onyx (CES Onyx), a subsidiary of the French company, Onyx, through its Asian operations set-up in Singapore. Onyx operates in 11 Asian countries, including Hong Kong, Guanzhou in Mainland China, and Taiwan, and is a leader in the Asian market for waste management. In Chennai, Onyx is responsible for collecting and disposing household and commercial wastes in 3 zones of the municipal area.

CES Onyx was expected to make an investment of Rs 40 crores, which the Compagnie Générale d'Entreprises Automobiles (CGEA) was to bring in as foreign funds. The existing Corporation workers were to be redeployed to other departments such that *no worker lost his/her job*. Under the contract (signed November 1999, effective March 2000), CES Onyx is responsible for sweeping, collecting, storing, and transporting municipal solid waste. The company is committed to use more than 1800 workers, 31 compactor trucks, 30–5 hook lift trucks, 180 auto rickshaws, 800 modified bicycles, etc. The quantity of waste to be removed is about 1000 metric tons/day for 7 years. The Municipal Corporation agreed to pay Rs 648/per metric ton in the first year, and a 5 per cent annually escalated rate in subsequent years (i.e. about Rs 1200/per ton in the seventh year). The Corporation estimated that this would *save Rs 10–12 crores per year* (comparing with the cost of providing the same service in-house at Rs 1050 to Rs 1365/per metric ton) for disposal of garbage.

In 2002, the activities of CES Onyx came under attack, when the Tamil Nadu Pollution Control Board issued a notice to Onyx for indiscriminate dumping of wastes in Perungudi/Pallikaranai wetlands. Onyx maintained that its services were as per the contract, including choice of dumping grounds in the sensitive wetland area. Box 1 provides an account of this recent partial liberalisation of municipal operations.

Box 1: Liberalisation of Municipal Solid Waste Management in Chennai

The Municipal Corporation in Chennai is the oldest Corporation of India and was formed in 1688. In the year 2000, the Municipal Corporation privatised solid waste collection and transportation in 3 out of the 10 city zones, namely Ice House, Mylapore, and Kodam-bakkam, in an effort to modernise municipal services. The private services cover about 35 per cent of the corporation area. The Corporation is estimated to generate about 2500 metric tons of solid waste per day. The Corporation is also planning to privatise waste treatment, and invite bids to set up a compost plant to treat municipal solid waste under a long-term build-operate-transfer contract.

The Chennai Municipal Corporation, together with Tamil Nadu Industrial Development Corporation, awarded a 7-year service contract to CGEA Asia Holdings. The arrangement required CGEA to operate through a subsidiary under the name of Chennai Environmental Services Onyx (CES Onyx). Onyx is an affiliate of the French multinational Vivendi Environment, and is a market leader in waste management in Europe with diversified operations in all sectors of waste management: including waste collection, sorting, treatment, and landfill.

Two years into the operation, CES Onyx came under attack. While the residents of Chennai seem satisfied with clean streets, the disposal of the waste after collection remains *medieval* rather than state-of-the-art, according to CorpWatch India. After collecting the wastes from the three zones, the company dumps the waste in a low-lying wetland area of Perungudi everyday. The dumping ground has no landfill or liner, and is adjacent to Pallikaranai, which is a rainwater harvesting area recharging groundwater as well as lakes in the south of Chennai.

The haphazard disposal of wastes in and around the wetlands has generated leachates that threaten to pollute the ground water and indeed the entire ecosystem supported by the adjacent wetlands. In 2000, the Tamil Nadu Pollution Board issued a notice to Onyx for 'dumping indiscriminately on wetlands'. The Board took exception to the fact that the company had failed to demarcate the area allotted for dumping, and threatening the wetlands. Onyx has maintained that the dumping area is as per the contract with the Municipal Corporation.

The fact remains that the Chennai Municipal Corporation earlier used the wetlands of Perugudi and Pallikaranai for dumping wastes, and Onyx continues the practice. Even Chennai Metro Water Supply and Sewerage Board, which manages the city's sewage (and has appointed Vivendi as consultant in its water supply management), discharges 'treated' sewage water directly into the wetlands.

Source: *Business Line*, 27 November 1999, Jayaraman (2002), and websites of the Ministry of Urban Development, Government of India and Vivendi Universal.

The crux of the problem seems to be the lack of an integrated approach to waste management. The Chennai Municipal Corporation privatised the waste collection and disposal while the treatment of the collected waste was excluded. While privatisation of waste treatment also seems to be in the Municipal Corporation's planning agenda, such a piecemeal approach (or perhaps cautious phased privatisation) has proved to be inefficient and costly. Chennai now has additional service requirements of soil and water remedial for the wetlands.

There are other instances of liberalisation in environmental services that are directly related to projects under multilateral and bilateral agencies. For example, in the year 2000, a five-year pilot project for the Bangalore Water Supply and Sewerage Board

was given jointly to Vivendi Water and Northumbrian Water Group, each covering 1 million people [under the AusAID (Australian Agency for International Development) assistance programme from the Australian government to privatise water supply on BOO and BOOT basis].[53]

3.7 India's Trade and Investment Prospects in Environmental Services

The privatisation and liberalisation of environmental markets promise the standard free trade benefits to countries based on individual comparative and competitive advantage of providing environmental services: Expansion and export of services that can be produced more efficiently at home and importing services that cannot be provided as efficiently. The industrialised countries have a comparative advantage in the export of resource saving and clean technologies, and technical expertise in the design and engineering of treatment and purification facilities, given that the environment industry is mature in these countries. On the other hand, developing countries like India have the scope of specialising in labour-intensive environmental services, including skilled segments like environmental consulting, auditing, analysis, and training.

3.7.1 India's Export Potential

The Indian environmental service providers have emerged most significantly in two areas: first, environmental services in turnkey projects (e.g. integrated engineering services in energy equipment); and second, environmental support services like consulting, environmental impact assessment, auditing, and training (including ISO 14001). There are also a few companies, which have been specialising in composting of solid waste and waste to energy services.

3.7.1.1 Export of integrated environmental equipment and services

Large Indian environmental equipment firms offering accompanying environmental services have been exporting equipment in Asian, Middle Eastern, and African markets. They have also begun to explore niche markets in the environment sector within industrialised countries, to boost exports as also to nurture future partnership and alliances for technology solutions. For instance, Thermax Ltd., a multinational energy equipment, chemicals, and services company, opened its second overseas subsidiary, Thermax Inc., in Detroit, US in 2001 (the first one being ME Engineering based in the UK). The overseas subsidiary offers resins for water treatment and specialty applications, process cooling, cogeneration solutions, biomass fired boilers for niche markets, heat recovery units, and engineering/consultancy services. The new export strategy being to target major global players by offering quality solutions in energy and environment projects worldwide: in its first year of operation, Thermax's UK subsidiary ME Engineering obtained orders worth US$ 7.5 million.

[53] B. Ramakrishna, 'Water Supply to go private in Bangalore', *Times of India*, 11 April 2001.

Similarly, Reva Enviro Systems (P) Ltd., providing both environmental equipment and services in industrial effluent treatment, sewage treatment for municipal and industrial township, water supply schemes, and operation and maintenance of treatment plants, has also won projects abroad. This has ben mainly in South Asian countries like Indonesia (biomethanization plant) and Vietnam (effluent treatment plant for sugar distillery).

3.7.1.2 Export of environmental consulting, training services

The environmental support services segment constitutes a relatively small share in the global environmental services industry, and is declining in developed countries. In the developing countries, however, the demand for these services is on the rise as witnessed within India. Since the environment markets in the OECD countries are quite mature and saturated, India's export potential in this sector is primarily in the developing countries, where the demand for environmental services is growing. The Indian environmental service providers could specialise in services in regions where there are similarities in ecological and economic conditions. Thus India has opportunities in this segment in some developing countries in South Asia, Africa, and the Middle East, where environmental support services are increasingly in demand. For example, in Sri Lanka environmental support services in analysis and consulting are growing (EIAs being compulsory for new and expanding projects) and under the Indo-Sri Lanka Free Trade Agreement effective March 2000, trade opportunities have been enhanced. The Central Environmental Authority of Sri Lanka and the industry associations encourage the use of better environmental management systems including ISO 14000. Indeed, India has exported environmental consulting services, including training in ISO 14000 and auditing, to countries, such as Nepal, Sri Lanka, Nigeria, Egypt, and Qatar.[54]

However, much like India, most developing countries (where the environmental services sector is expected to grow rapidly) require establishment of infrastructure facilities including sewage treatment facilities, water purification and distribution, waste treatment facilities which are technology driven and where countries like the US, France, UK, Germany, Japan, etc. have been exporting. In the OECD countries, India has no opportunity in the upper-end technology trade that takes place in the environment sector.

3.7.2 India's Import Needs

As noted earlier, the Indian firms offering environmental services do so as part of the equipment supply, especially for air pollution management solutions in power plants and vehicular pollution abatement. However, the Indian environment industry needs the technology (not equipment *per se*) and state of the art design for pollution management equipment, since the industry is capable of manufacturing the hardware domestically. [55]

Environmental services in R&D, design, and technology, which are an integral part of the environment equipment sector, are relatively poor in India. For instance, companies like Bharat Heavy Electricals Limited (BHEL) focus mostly on product-application

[54] Seema Arora, Environment Management Division, CII, interview.

[55] Seema Arora, Environment Management Division, CII, interview.

research rather than basic research, and thus basic technology for equipment manufacture like gasifier and fuel cell need to be imported.[56] Technological foreign collaborations are already evident in this sector; for example, BHEL has had technological collaborators in manufacturing steam/gas turbines and boilers with GE (US) and, Siemens and Babcock Borsig Power (Germany). Thus openness in this segment has encouraged the flow of state of the art techniques and design for pollution management.

The analysis of deficiency in environmental infrastructure services clearly indicates that capital is a major constraint in the provision of these services in India, followed by poor management systems (e.g. the problem of attitude noted by the Supreme Court Committee on Municipal Waste Management in India). Thus foreign investment could be attracted (along with domestic private capital) in this sector to ensure the provision of the required infrastructure and efficient collection and management. In particular, the building of septic disposal sites and waste treatment plants needs capital investment, which the ULBs find hard to finance with the funds available. To ensure efficiency in environmental services, the contracts should be for waste management, not merely for collection or dumping that fails to correct the basic pollution problem (as evident from the CES Onyx case).

As in any capital-intensive project, the payoff would come typically after a long gestation period. Thus, to recoup investment private firms would require ownership and operations control for that period. Liberalisation (and privatisation) in the environmental services sector would then imply that to enhance infrastructure investment India should allow long-term contracts of the form BOT and BOO.

It is important to note, however, that environmental problems are region-specific. Thus, when importing technological solutions local conditions need to be kept in mind. Domestic firms may have an edge over firms from developed countries in addressing environmental problems specific to India. For instance, an incineration plant under a waste to energy technology project set up in Timarpur, Delhi in 1987 using Danish technology failed to operate properly because the waste fed into the plant did not have sufficient calorific value. Similarly pelletisation facilities under waste to energy projects in Vijaywada, Baroda, Bangalore, Mumbai, and Kalyan did not work properly due to poor pellet quality.[57]

4 Domestic and External Constraints

Some of the most significant barriers to trade in environmental services pertain to restrictions in the establishment of commercial presence and movement or employment of nationals of the operating company (GATS supply Mode 3 and 4 respectively). The provision of environmental services like sewage services, sanitation, and refuse disposal are capital intensive; thus conditions on commercial presence and foreign investment are crucial in these cases. Thus, among the different modes of supply of services, conditions and restrictions on commercial presence (Mode 3) can become significant barriers to trade in this sector. Restrictions under Mode 3 can take various forms: limits on foreign

[56] Mr Ajay Mehrotra, BHEL, interview.

[57] FIRE(D) (2001).

ownership of specific assets (e.g. landfill, sewage system), the number and location of foreign companies, type of legal entity (e.g. requirement to incorporate locally), application of economic needs test. Trade in environmental services is also affected by market access barriers in other sectors, including environmental equipment, and services sectors like engineering, consulting, and analytical services.

Restrictions on movement of natural persons (Mode 4) are also important barriers to environmental services trade services. Professionals including environmental engineers, consultants and auditors may face barriers to cross-border movement and temporary presence resulting from different qualifications or licensing requirements. Although commitments under Mode 3 for commercial presence are important, the commitments in Mode 4 have by far the greatest significance for India, since environmental consulting services has been the most robust segment in India.

The cross-border mode of supply (Mode 1) can also be used for some environmental support services that can be delivered as IT-enabled services. The scope, however, is limited, since the significant segments of sewage treatment, waste management, and sanitation services require the physical presence of the service providers.

4.1 Domestic Constraints

There are certain financial regulations that can affect the import of environmental services in India, if the remittances involved are large. In September 2002, prior approval of the Reserve Bank of India (RBI) was made mandatory for remittance exceeding US$ 100,000 per project for any consultancy services procured from outside India (even if such remittances are made out of the funds held in Exchange Earners' Foreign Currency accounts).[58]

In the export of environmental services, Indian corporations are free to open, hold and maintain offices/branches abroad and hold a foreign currency account with a bank outside India. Remittances for the purpose of normal business operations abroad are subject to conditions (e.g. overseas office should not create any financial liabilities contingent or otherwise for Head Office in India).[59]

4.2 External Constraints

The external barriers that exist in countries experiencing rapid growth in the environmental service sector cover a gamut of domestic regulations on business operations by foreign companies, or employment of nationals. Since a large part of the environmental services

[58] A. P. (DIR Series) Circular No. 20, 12 September 2002.

[59] RBI notification, A. P. (DIR Series) Circular No. 54, June 2002.

sector is still in the realm of the public sector, public procurement policies affect market access for environmental services in these countries.[60]

Among the Asian developing countries, Sri Lanka seems to have a fairly non-discriminatory treatment towards foreign investors, and private entities are free to establish, acquire, and dispose of interests in business enterprises, without much limitations in access to markets, credit, or licences.

While China has a rapidly growing environmental services market, there is an effort to encourage the growth of the domestic Chinese enterprises. Traditionally China's service sector has been one of the most heavily regulated parts of the national economy—and one of the most protected—where foreign service providers are largely restricted with licensed operations that have limits on entry, and restrictions on the geographic scope of activities.[61] Similarly Korea and Thailand, who have good growth prospects in the environment sector, have not committed to full liberalisation since they want to encourage domestic entrepreneurs.

Hong Kong too has good growth prospects in the environmental services sector, especially in consulting and training in environmental management systems like ISO 14001, and environmental impact assessments (a 1998 Ordinance made EIAs mandatory for all major infrastructure projects). However, large environmental companies may offer some of these environmental support services as part of the integrated project in infrastructure building. Similarly, Egypt gives priority to solid waste disposal, garbage collection and recycling (tenders on BOT basis had been issued during 2000 and 2001), although environmental support services are also growing.

Thus, there are several promising markets for Indian environmental service providers, particularly in consulting and support services. These markets are mostly in South Asia, the Asia Pacific region, Middle East, and Africa. There is little export potential in the OECD markets. The main barriers are in the form of investment restrictions, restrictions on cross border mobility of labour, and government procurement and approval related policies.

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[60] In this regard, the GATS multilateral negotiations on government procurement in services will have an impact on market access of environmental services. First there is the plurilateral Agreement on Government Procurement, GPA, (involving 26 WTO Members) that includes commitments by government departments, public entities, and state-owned enterprises in each Party to the GPA to procure goods and services in accordance with the disciplines established in the GPA. Second, there is the mandate of the Working Group on Transparency in Government Procurement established at the 1996 Ministerial Conference (involving all WTO Members) to study the transparency in government procurement practices taking into account national policies, and to develop elements for inclusion in an eventual agreement. Third, Article XIII of the GATS provides for multilateral negotiations on government procurement in services (conducted within the Working Party on GATS Rules). The purpose of these negotiations is to explore the possibility of applying multilateral disciplines to government procurement covering all sectors of services (WTO 1998b).

[61] USDOC (2002b).

5 Commitments and GATS 2000 Discussions on Environmental Services

This section analyses the commitments that have been made in environmental services and outlines developments in this area, in the context of country requests and discussions on environmental services, since the Uruguay Round.

5.1 Analysis of GATS Commitments in Environmental Services

This sector has received relatively few commitments under the Uruguay Round. Only one-third of countries have made commitments in this sector, although this includes all the major players, including the US, EU, Canada, Australia, and other important developed countries. The commitments are mostly by the developed countries and by the Eastern European countries. There are only two commitments by Asian countries, two by Latin American countries, and the rest are by African countries. Many developing countries, including India, have not filed commitments in this sector.

Although there are significant differences in the extent of binding and restrictiveness of the scheduled commitments in this sector, there are several common features across the sub-sectors and across the four modes. An analysis of the commitments shows that they are quite uniform across sub-sectors. There are 38 WTO Member countries that have made a commitment in at least one sub-sector of environmental services. The number of commitments in individual sub-sectors is roughly equal, with 29 commitments on sewage services, 30 in refuse disposal services and in sanitation services, and 28 in other environmental services. Slightly fewer commitments have been made in individual segments of other environmental services.

The commitments are also quite uniform across the modes, within each of these sub-sectors. For instance, there are few full commitments across Modes 1, 3, and 4, Mode 2 being the exception. More than 60 per cent of the entries under Mode 1 are unbound, while about 30–5 per cent are partial commitments and only about 5 per cent are full commitments. In Mode 2, more than 60 per cent of the commitments are full commitments and about 30 per cent are partial commitments. On the rest there are no commitments. The exception in this mode is the sub-sector of sewage services where only 28 per cent are full commitments and the remaining 72 per cent of the commitments are limited/partial. The restricted nature of commitments in sewage services probably reflects the government monopoly nature of this sub-sector. In Mode 3, there are very few full commitments and over 90 per cent of the commitments are restricted. There are virtually no sectoral commitments in Mode 4 and reference is made to the horizontal commitments in this mode, as is the case in other GATS sectors as well.

As regards the nature of these limitations, they are mostly sector specific in the case of Modes 1 and 2 while they are mostly horizontal in the case of Modes 3 and 4. Between 30 to 70 per cent of the limitations in Mode 3 are horizontal in nature and mostly on market access rather than on national treatment. There are only horizontal limitations for Mode 4. Overall, taking into account the nature of commitments across the modes, sectoral coverage is limited for Modes 1 to 3, at around 30–5 per cent, while almost all the sectoral entries under Mode 4 are unbound.

The sector-specific and horizontal limitations are similar across the different sub-sectors for each of the modes. There are no commitments in Mode 1 for reasons of

technical unfeasibility. There are few restrictions on Mode 2. The main sector-specific restrictions on Mode 3 pertain to exclusions from sectoral coverage for public service functions, for services that are owned, operated, and contracted out at any government level, and for services provided in the exercise of government authority.[62] In addition, sector-specific restrictions on Mode 3 also include limits on the number of foreign companies allowed and on the value of their services, foreign equity restrictions, and jurisdictional limitations, among others. Most of the limitations in Mode 3 are, however, horizontal. The key ones include limits on foreign equity participation, approval, and authorisation requirements, quotas on the number of operating licenses, conditions relating to government monopoly, economic needs tests, limitation on purchase or rental of real estate, restrictions on the form of legal entity, residency requirements for directors, and differential treatment of foreign service providers in the case of taxes and subsidies.

Mode 4 is mainly affected by horizontal restrictions. The key horizontal limitations in this mode include quotas on entry by foreign service providers, limitations on the duration of their stay, limited coverage of service provider categories (restricted to only business visitors, certain categories of intracompany transferees, managers, executives, and specialists), quality and licensing requirements for professional environmental service providers, domicile requirements in some sub-sectors like refuse collection, and requirement of a local representative body (or commercial presence) to allow entry by foreign service providers. There are no commitments on lower level staff under Mode 4. In addition to the above-mentioned limitations, conditions relating to government procurement and environmental regulations and standards affect all modes of supply.

Given the significant overlap of this sector with other services, liberalisation commitments and limitations inscribed in the commitment schedules for related areas are also relevant to the environmental services sector. For instance, in the case of Mode 1 market access in environmental services is affected by conditions such as limited internet and network access, restrictions on capital transfer and payment, and requirement of commercial presence for Mode 1 based delivery which are often present in the commitment schedules for related services. In the case of Mode 3, market access and conditions of competition in environmental services are affected by authorisation and ownership restrictions, monopoly conditions, reservation of activities, restrictions on the form of legal entity, and nationality and residency conditions in related service sector schedules. Similarly in the case of Mode 4, limitations in the form of licensing and authorisation requirements, nationality and residency conditions, and other barriers to labour mobility in related professional services such as consulting, engineering, legal, accounting, auditing, and bookkeeping services are relevant for the environmental services sector. Thus, one needs to examine the commitment schedules for environmental services along with those in related service sectors to assess the true extent and nature of liberalisation that has been realised under the GATS.

A description of the commitments made by some of the main developed and developing countries that have scheduled environmental services supports the above

[62] For example, in the EU schedule, public utilities include environmental services at a national or local level, and are subject to public monopoly and exclusive rights given to private operators. In some of the schedules, provision of public utility services is restricted to public monopolies that are closed to private investment.

characterisation of the commitments in this area. Most of the major developed countries, including Australia, the EC, US, and Canada have made full commitments in Modes 2 and 3 and have either given a full commitment in Mode 1 or left the latter mode unbound. A few developed countries such as Norway, Sweden, and Switzerland have made partial commitments in Mode 3 with limitations such as retaining government monopoly in certain areas within the sector or carving out of the commitments, all public works functions owned and operated by municipalities, state or federal governments, or contracted out by these governments. Some developed countries like Japan have subjected their Mode 3 commitment to any applicable horizontal limitations. The Mode 4 entries are unbound as usual, except as stated in the horizontal commitments. In addition, Switzerland has imposed a sector-specific limitation by linking Mode 4 to the requirement of commercial presence.

Among the few developing countries that have scheduled environmental services, the approach varies between being relatively liberal to being quite conservative. For instance, South Africa has made full commitments in Modes 1 to 3 and Turkey has made full commitments in Modes 2, 3, and even 4, while leaving Mode 1 unbound. However, important markets such as Korea and Thailand have been much more cautious in their commitments, especially with regard to commercial presence. They have included restrictions on foreign equity participation, requirements of economic needs test for establishing commercial presence, and restrictions on the number of service suppliers under Mode 3 and have also referred to their horizontal limitations in the case of Modes 3 and 4.

Overall, given the fact that developing countries are the main markets for exporting environmental services and that most have either not scheduled this sector or have made restrictive commitments in Mode 3, the mode most relevant for market access in their countries, the extent of liberalisation has been quite limited. Horizontal limitations further limit the significance of whatever sector-specific commitments have been made in Mode 3. Developing country export interests in terms of environmental support and consulting services have also not been addressed due to the limited and horizontal nature of commitments in Mode 4. Liberalisation in Mode 1 is also quite limited due to largely unbound commitments and thus there is little opening up of trade in supporting services via internet-based delivery and other traditional means of delivery. The relatively liberal commitments in Mode 2 are not so significant given that Mode 2 is not an important mode of delivery for environmental services or in the supporting service sectors of interest.

5.2 GATS 2000 Discussions on Environmental Services

Under the GATS 2000 discussions, which commenced in early 2001, some common issues have been raised by a number of countries in the environmental services negotiations. The central issue under debate in this sector is that of classification and definition as most countries feel that the existing classification does not really reflect the way in which business operates in this sector and because it deals with end-of-pipe cleaning solutions rather than services for pollution prevention. Several OECD countries have pointed out the above-mentioned limitations of the existing GATS W/120 classification in their proposals and have called for broadening the coverage and definition of environmental services. The reclassification requested is in terms of core activities such as air and water pollution and

solid waste management, distinct from related services such as technical testing and analysis, consulting, and engineering and construction services, which are important for delivering environmental services. Different approaches have been suggested, including a cluster approach, and a core cum cluster approach (which focuses on core environmental services separately from auxiliary services and keeps the mutually exclusive nature of the GATS W/120 classification). There are also requests for adding more activities within the sector.

Some of the communications received from key countries are discussed here to provide an idea of the kinds of issues that have taken centrestage in the ongoing GATS negotiations in the DOHA round in environmental services. These proposals also indicate the overlapping interests with a variety of business services, the numerous cross-cutting issues that need to be addressed in future negotiations, and therefore the likely difficulties in obtaining liberalisation commitments in this sector.

In its communication proposal, Canada has stressed the need for transparency in regulations and practices. It has also pointed to the importance of related services elsewhere in GATS W/120 which are important for delivering environmental services. It has asked for liberalisation in core and related services and has pushed for broader commitments in related services so as to enable meaningful market access in environmental services.

Australia has likewise asked for a broader definition, going beyond pollution control and clean-up activities into a broad range of pollution management, cleaner technology, and resource management activities, and a separation between core and auxiliary services. It has also asked for scheduling commitments with respect to the revised classification, while retaining the mutually exclusive nature of W/120. Some of the restrictions raised by Australia include limitations on the type of legal entity, nontransparency in licensing and other procedures, restrictive business practices, discretionary use of environmental laws and regulations and differential treatment in taxes, and limits on foreign equity participation and on ownership of specific assets by foreign service establishments.

The EU communication on environmental services proposes to schedule commitments according to a revised classification which keeps the mutually exclusive nature of GATS W/120 while addressing some of its recognised problems. The proposed classification consists of ‘core’ environmental services, classified along the lines of environmental media like air, water, and soil and one which is more diversified and reflects current realities in this sector. The communication also proposes an amended classification, including ‘water collection, purification, and distribution services through mains’ and clarifying the contents of other sub-sectors like recycling services and ancillary environmental services.

The US proposal calls for a core cum cluster approach to the negotiations on environmental services whereby, the focus would be on liberalisation in core environmental services, but attention would also be paid to liberalisation commitments in related auxiliary services in the current GATS W/120 classification. The proposal also notes the need to focus specifically on Modes 3 and 4, including barriers to professional and business services relevant to the provision of environmental services, and the need for transparency guidelines in this sector.

Thus, the bulk of proposals deal with the classification problem in this sector under the present GATS W/120 list. Transparency issues and removal of limitations on commercial presence are also raised in several proposals.

5.3 Country Requests to India in Environmental Services

The requests that India has received in environmental services are quite extensive. All the major OECD countries, including the US, EU, Australia, Japan, and Canada, which are important players in this sector, have made requests to India.

The requests are similar across countries. All the developed countries, barring Canada, have requested commitments on the basis of a new classification of environmental services (notwithstanding ongoing negotiations on classification). According to this classification, the categories and sub-sectors within this sector include:

(1) Water for human use and wastewater management which consists of water collection, purification, and distribution services through mains, except steam and hot water, and also wastewater services (9401)

(2) Solid/hazardous waste management which consists of refuse disposal services (CPC 94020) and sanitation and similar services (CPC 94030)

(3) Protection of ambient air and climate which consists of services to reduce exhaust gases and other emissions and improve air quality (CPC 94040)

(4) Remediation and clean-up of soil and water which consists of treatment, remediation of contaminated/polluted soil and water (CPC 94060)

(5) Noise and vibration abatement services (CPC 94050)

(6) Protection of biodiversity and landscape which consists of nature and landscape protection services (CPC 94060)

(7) Other environmental and ancillary services not classified elsewhere (CPC 94090)

Thus the number of categories and sub-sectors is more disaggregated and diverse than in the original GATS classification of this sector.

All the requests ask India to firstly schedule this sector, and secondly to commit fully in Modes 2 and 3, and also in Mode 1 if technically feasible. The requests call for unbound commitments in Mode 4 except as indicated in the horizontal commitments. In addition, there are requests in related business support and other service sectors, in particular, construction services (with reference to sub-sectors of installation and civil engineering works), integrated engineering services, urban planning and architecture, and consulting services. Again, in these related services, the requests largely call for full market access commitments in Modes 1, 2, and 3 and unbound commitments in Mode 4 except as indicated in the horizontal schedule. Thus, the overall thrust is on entering the Indian market through commercial presence (Modes 1 and 2 being far less important for this sector) and for removal of limitations such as foreign equity ceilings and form of legal entity that are present in India's Mode 3 commitments in the scheduled sectors.

6 Strategy for the Current Negotiations

It is apparent from the background discussion in this paper that India needs capital, technology, and expertise in this sector. There are deficiencies in all these respects, particularly, in infrastructure environment services. The sector has been completely open and foreign players have been entering this budding sector in recent years.[63] On the export side, India's interests are rather limited to labour-intensive activities and to developing countries in selected regions such as South Asia, Africa, and the Middle East.

Hence, in terms of negotiating strategy, the focus has to be on India's own commitments in this sector, stemming from its import requirements in this sector and the potential benefits from liberalisation. However, at the same time, the negotiating strategy must take into account domestic political economy constraints to committing under the GATS. On the export side, while the issue of obtaining market access for Indian service personnel providing environmental support services is relevant, it is part of the broader negotiations on Mode 4 as a cross-cutting issue and not directly a part of India's negotiating strategy in this particular sector.

The following discussion starts by outlining the issues that need to be kept in mind when committing environmental services under the GATS. It highlights the potential gains from opening up the environmental services sector and the objectives that should be served when committing this sector along with the political economy type concerns that need to be kept in mind in framing the commitments. This is followed by a discussion of the specific negotiating strategy India should adopt in this sector, in terms of specific sub-sectors and activities where it could take commitments, the nature of these commitments, and areas which should be excluded from the commitment process.

6.1 Issues to Consider in Liberalising Environmental Services

The potential direct and indirect gains from liberalisation of the environmental services sector are considerable. Liberalisation can provide much needed capital and technological expertise in environmental management, since the domestic sector has poor investment in clean R&D. For a labour-abundant country like India the growth of the environmental services sector would also mean increased employment generation. The expansion in the environmental services sector can provide employment opportunities to unskilled as well as skilled labour in the country, as some of the environmental segments are labour intensive, as for example waste management, sanitation, consulting, training, etc. Moreover, given that environmental services are typically provided in conjunction with other products or services, expansion of the environmental services sector would generate demand in other sectors including engineering and design, construction, research and development, training, and consulting. There would also be additional external benefits in terms of improvement in environmental quality, more cost-effective and environmentally-sound approaches to resource use in a whole gamut of industrial activities that can conceivably reduce costs and prices in associated commodity markets, and greater resource efficiency for the economy at large. There could also be positive spillover effects in

[63] Overall the sector remains largely in the realm of the public sector (local and municipal bodies).

export-oriented sectors like tourism. Liberalisation can also promote competition and improve managerial operations in sectors that have been traditionally public in nature. As mentioned earlier, India has autonomously opened up this sector to 100 per cent foreign equity participation on automatic basis. Hence, the FDI policy is already in line with the import needs in this sector.

While the potential benefits from liberalising environmental services and the autonomous liberalisation already undertaken in this sector would argue for unrestricted opening up of the sector under the GATS, such an approach may not be feasible from a negotiating strategy and domestic political economy perspective. A selective approach may be more acceptable in terms of the sub-sectors that are committed under the GATS and in terms of the limitations and exclusions that are maintained in this sector. This approach is justified on several grounds. Firstly, given that the sector had not even been scheduled in the Uruguay Round, it may be difficult to undertake complete opening up under the GATS in this round. A more gradual opening up may thus be more palatable as a negotiating strategy. Secondly, given the nascent domestic environmental services sector which may require time to develop expertise, consolidate, and be prepared to face foreign competition, a gradual approach to multilateral liberalisation of this sector may be in the interest of domestic industry and would be less likely to encounter opposition. Thirdly, the relationship between trade and the environment is not yet well understood and is still under discussion at the WTO. As thinking is still evolving on the subject of environment and trade, to ensure harmony in the country's overall position on this matter, a gradual approach to environmental services is justified. And finally, since there is limited experience with private participation in the environmental services sector, the state of knowledge about the likely impact of opening up and the cost–benefit tradeoff is poor, and hence a gradual approach under the GATS is justified.

6.2 Specific Commitment Strategy

India needs to first take a position on whether it will schedule environmental services in this round of negotiations. In view of the likely gains from FDI and associated technology and expertise in this sector, and the fact that this sector appears in the request list of all the major developed countries, it is in India's interests to schedule the sector from an economic and negotiating perspective. But, for the reasons outlined above, commitments need to be judiciously taken, in select areas within the sector, with necessary restrictions, and with necessary exclusions.

It is proposed that all environmental services that are under government monopoly should be excluded from the commitments. However, government services which have been contracted out or privatised (as is the case with some municipal services like cleaning and refuse disposal in India) can be included in the commitments. This approach mirrors that taken by developed countries such as the US and Sweden. For instance, the Swedish commitment on environmental services states that public works functions, whether owned and operated by municipalities, local bodies, state, or federal governments, would not be covered. Likewise, the recent US offer covers activities like wastewater management services and solid/hazardous waste management services that have been contracted out to private industry and excludes services provided under government monopoly. In addition to the latter exclusion, services relating to potable water supply should also be excluded

from India's commitments, in view of equity concerns that liberalisation of water supply could result in higher prices of drinking water and affect the poor sections adversely.

It is further proposed that sectoral commitments only be considered for activities where there has been at least a few years of experience with private participation, including foreign participation. This approach is again suggested not so much from the point of view of the likely gains but from the point of view of what is acceptable domestically to undertake under the GATS and what is practically feasible to commit. As mentioned earlier, foreign participation has taken place in recycling, industrial and vehicular pollution, industrial waste management, biomedical waste management, pollution testing and monitoring, and consulting and engineering services. Among these activities, commitments could be taken as per the new classification that has been proposed for this sector, in the following areas:

(i) Industrial wastewater services;

(ii) Industrial solid waste management services, including collection, segregation, and recycling of solid waste;

(iii) Services to control air pollution and improve air quality;

(iv) Services to control noise pollution and related testing and monitoring services;

(v) Remediation services;

(vi) Environmental consulting, design, and engineering services.

In areas (i) to (v) above, commitments in Mode 1 can be full if technically feasible or no commitment may be taken (unbound entry inscribed) if Mode 1 based supply is not feasible. Commitments in Mode 2 can be full as this is not an important mode for trade in this sector and there are no major issues or concerns that arise in this mode for this sector.

Commitments in Mode 3 could be partial. The limitations could take the form of foreign equity ceilings with majority participation allowed, so as to afford some protection to the domestic players in these segments while also creating some competition to improve standards and efficiency, and promote consolidation in market structure. Joint ventures could also be required under Mode 3 in those segments in particular where transfer of technology and foreign managerial and technical expertise is desired. It would not be advisable to impose national treatment limitations such as economic needs tests or local staffing requirements if the aim is to attract foreign capital and technology. Such limitations are likely to discourage FDI. If required, conditions such as reinvestment of proportion of profits in infrastructure or capacity building and regulations to ensure appropriateness of technology for local conditions, could be imposed on foreign environmental service firms. To the extent that regulations such as jurisdictional restrictions and local government approval are applicable to both domestic and foreign firms, they would not constitute national treatment limitations and would not need to be inscribed, unless there is some discriminatory element in their application.

No sectoral commitments need be taken in Mode 4 except as indicated in India’s horizontal commitments, with the proviso that required managerial and consulting expertise in this sector are appropriately covered in the horizontal schedule.

Where it is difficult to commit multilaterally at present but where the intentions for liberalisation are clear and the benefits well recognised, a more gradual approach could be

taken by pre-committing to open up five years from now [as was done in the telecommunications sector for International Long Distance (ILD) telephony services]. This would allow time to undertake the necessary steps to strengthen such segments domestically, to introduce necessary domestic regulations, and to build on recent privatisation trends and learn from the experience.

In the case of environmental consulting, design, and engineering services (item 6 above), a full commitment can be taken on Mode 1 if technically feasible. Otherwise, this mode can be left unbound if it is not technically feasible to provide such services cross-border. Full commitments can be taken in Mode 2 as there is little concern in liberalising this mode. A full commitment can be allowed under Mode 3 for this segment, with 100 per cent foreign equity participation allowed, or a partial commitment can be made by putting a foreign equity ceiling but allowing majority participation. In addition, there could be restrictions in terms of licensing requirements to ensure the quality of the service provider and measures to ensure that the technology is suitable to Indian conditions. Mode 4 can remain unbound except as specified in the horizontal schedule, with possible limitations in the form of licensing and/or economic needs test requirements, and with the proviso that the required skills and occupational categories are appropriately covered in the horizontal schedule.

Thus, broadly speaking, some of the sub-sectors in the proposed new classification can be committed by India. Modes 1 and 2 can be liberally committed. Commercial presence should be committed, but subject to conditions that protect consumer interests and which prevent wiping out of the nascent domestic industry in many of these areas. Alternatively, a pre-commitment strategy could also be considered if a more gradual approach is desired, with privatisation being encouraged in the interim period. For now, services that are exclusively in the government domain, whether at the Central, state, municipal, or local levels, should not be committed. Privatisation and contracting out of such services to private parties should be encouraged before these are committed multilaterally.

It is worthwhile to note here that important markets like Korea have opened only the industrial sewage and industrial solid waste (refuse) disposal services, i.e., the commitment does not infringe upon public sector operations. Korea has also imposed an economic needs test under Mode 3 for market access, and refuse collection and transport services are to operate within the jurisdiction and with approval of the Regional Environment Office. Such a strategy is aimed at giving impetus to the domestic environment industry, while opening the sector for foreign technology imports, capital, and management skills. Similarly, Thailand has committed to restricted market access under Mode 3 with a 49 per cent equity limitation. Even countries such as Sweden have excluded public sector operations from their commitments. There is thus merit to studying the commitments made by other developing countries and even some of the developed countries in this sector, to identify what the scope of India's commitments should be and the kinds of limitations that may be warranted. Overall, the commitments need to be selective in terms of the choice of sub-sectors, activities within these sub-sectors, and modes, and in terms of the choice of regulatory measures for safeguarding public interests, ensuring equity with efficiency, and providing a supportive environment to domestic private players.

It is also important to note that India's commitments in several related sectors are relevant to its liberalisation strategy in environmental services. Hence, there is a need to ensure that commitments in those areas are consistent with the approach outlined above for this sector. For instance, commitments for construction of facilities and civil works, integrated engineering services, architecture and design services, and business services like consulting and auditing need to be consistent with the commitments in this sector, particularly under Modes 3 and 4 and to some extent in Mode 1, where technically feasible. Therefore, if a commitment is made to allow commercial presence for environmental consulting and support service firms, the schedule for consulting services should explicitly mention this commitment under Mode 3, with the corresponding limitations. The same holds for the accountancy services sector, where the commitments under audit services for instance, should reflect the commitments made for environmental audit services. Any exclusions must be similarly reflected in the related service sector schedules. An alternative approach would be to explicitly exclude environment related aspects from the related service sector schedules and to deal with these activities only in the environmental service schedule, thus keeping the mutual exclusivity of the commitments in different sectors. Overall, the commitment strategies for these related areas, as outlined in the specific sectoral reports, must be kept in mind to ensure that all interests are taken into account when scheduling environmental services, and that commitments in one area do not undermine commitments in the other.

7 Domestic Reforms and Measures

The public good nature of this sector gives rise to certain considerations and challenges, which need to be factored into the process of liberalisation. Privatisation and liberalisation in environmental services needs to ensure a balance between three broad objectives, namely economic efficiency, social equity, and environmental sustainability. For instance, equity issues are important in segments like provision of drinking water and sanitation, especially since the majority of the Indian population does not have the economic means of purchasing these essential services at market price. Regulations on pricing and business practices are required to ensure affordability, access, and quality of services. The GATS provisions pertinent to the prevention of anti-competitive business practices or to ensure quality and equitable distribution of services are important for dealing with such challenges posed in liberalising this sector. Some degree of government monopoly in the provision of environmental services such as water supply and distribution may thus be warranted on equity grounds.

While encouraging the efficient development of the environmental services sector through privatisation and liberalisation, India needs to ensure that there are no potential conflicts in environmental sustainability either. The presence of environmental externalities in trade in certain cases may have adverse environmental effects. For instance, the cost of recycling and disposal of hazardous wastes is relatively cheaper in India, typically since all of the environmental and health safety costs in processing and disposal are not internalised. Thus liberalisation in recycling services (under hazardous waste management services) may lead to an increase in imports of untreated hazardous wastes as this segment expands (unless prohibited under The Hazardous Waste

Management Rules of 1989 or the Basel Convention).[64] In other words, the *scale effect* of free trade in this segment (and trade in the related good) can lead to an increase in the risk of contamination from hazardous pollutants in the developing countries. Since the pollution from hazardous pollutants can lead to irreparable damages to both the ecosystem and human health, such an expansion may not be efficient or desirable, in that the increased risk involved would make the optimal level of services (here processing toxic/hazardous waste) much lower than that dictated by usual comparative advantage arguments.

Similarly with liberalisation in nature protection and landscaping service, local ecosystem characteristics have to be factored in while expertise from abroad is imported. Also if the tourist flow increases due to better environmental infrastructure services and nature protection services, caution may need to be exercised in nature tourism to protect certain fragile ecosystems (where the increased flow of people can disturb the delicate balance of the ecosystem). So accompanying regulations may be necessary to minimise damage to the environment.

Economic efficiency in this sector would require not only private participation in the provision of services, but changes in the domestic environmental regulations as well. These reforms are important to boost the demand for environmental services from the manufacturing sector and also to ensure the development of domestic enterprises.

It is important to note that the nascent Indian environment industry has been responding fairly well to end-of-pipe pollution control legislation, and to support services of environmental consulting. Thus to stimulate the growth of the Indian environmental services industry, a change towards a more holistic resource and pollution management regime is required. Privatisation and liberalisation is important to instill the growth of a competitive environmental services industry and to enhance the resource productivity. A holistic approach to environmental management in India would help ensure environmental sustainability with privatisation and liberalisation in the sector. To ensure social equity the government needs to give guidelines for contracts in this sector and also closely monitor business activities in infrastructure environmental services.

7.1 Economic Instruments in Pollution Management

The development of the environment industry (equipment and services) in industrialised countries was induced by stringent environmental policies and regulations and their enforcement, as well as increasing public environmental awareness, corporate liability, and recognition of the financial and quality gains from environment-related investments. The environmental regulation regimes included command and control instruments like pollution standards, as well as economic instruments (like pollution taxes, fees, and liability) to prevent pollution and increase resource productivity. In India, while the environmental legislation is comprehensive enough, it lacks built-in economic incentives to prevent and reduce pollution.

[64] While India ratified the Basel Convention in 1992, the amendment on scrap trade for recycling and reuse has not been ratified. Illegal import of hazardous wastes have also been reported at the Indian ports, even though the Supreme Court has banned the import and auction of hazardous wastes in ports and container depots.

The set of environmental regulations is quite extensive, but the focus is still on the initial compliance of installing pollution abatement equipment, and environmental clearance (and EIAs for some projects). As is evident this has supported the growth of the environment equipment segment, and the requirement of environmental impact assessment has encouraged the growth of environmental consulting services. The dynamic efficiency to reduce pollution and support growth of the environment industry, however, is completely missing. Thus a change in the regulatory approach is needed to encourage innovation in pollution and waste prevention strategies over conventional end-of-pipe pollution and waste control by introducing pollution taxes. This will immediately boost the demand for environmental services from the manufacturing industry, especially for wastewater treatment, and for air pollution abatement.

7.2 Encouraging Private Investment in Infrastructure Environmental Services

Private sector participation in the infrastructure environmental services has been partial and limited in India. Of course, the full implementation of the 74th Amendment is expected to take some time and municipal bodies probably will encourage more private participation then. Privatisation is important with liberalisation in the environmental services, since it will give an impetus to domestic entrepreneurs to develop.

Full privatisation in environmental services, however, may not be desirable, considering the issues related to distribution of basic services to the poor. Public–private partnerships may be more appropriate, since a government (whether national or local) agreement with a private sector operator is expected to safeguard the interest of the poor: including provision of potable water or sewage services for the poorer population.[65]

7.3 Ensuring Equity with Efficiency

Liberalisation and privatisation in the provision of environmental services is certainly a good viable option to enhance productivity and efficiency, but it needs regulation and monitoring to ensure that monopolistic pricing is not practised. The government needs to reinforce equity with efficiency in the environmental services sector, since some of the most significant environmental services are part of the basic public services to support a healthy human existence.

The measures to ensure equity could include qualifications for private service providers in terms of maximum prices for consumers, percentage of profits that should be reinvested in the infrastructure, etc. The equity issue is important in the light of present pricing and business structure of some of the leading environmental corporations with various affiliated divisions, where cross-subsidisation across markets may be practised. Consider the case of Vivendi Environment,[66] which is a part of Vivendi Universal in France. Vivendi France is a broad-based company with two seemingly different unconnected divisions, one in environmental services (namely Vivendi Environment), and

[65] DFID (2002), p. 28.

[66] Vivendi Environment is ranked "Number 1 worldwide in environmental services" has four arms: Vivendi Water, Dalkia (in energy), Onyx (in waste management) and Connex (in transportation business).

the other in communications, audio-visual, and entertainment (including Universal Studios, Universal Music, and USA Networks). The corporate profile of the company suggests that Vivendi Environment, and especially Vivendi Water, is often called Vivendi Universal's 'cash cow' as water utilities privatisation contracts are the key source of funds for Vivendi's extremely expensive foray into the communications field! During 2002, Vivendi Universal ran into serious financial difficulties, and had to write off bad debts, as many believed that the company had overstretched itself.

In the process of liberalising of environmental services, the contracting details have to be carefully drafted and monitored so as to eliminate the risk of Indian operations being part of the 'cash cow' water utilities department for such large multinational corporations. To ensure equity in the provision of basic environmental services in developing countries like India, the government needs to have an appropriate framework while promoting efficiency.

7.4 Monitoring Firm Behaviour

The global environmental services industry consists of several large corporations, since the most significant environmental services support the emergence of natural monopoly. On efficiency grounds such large corporations need to exist, and their operations need to be monitored closely. While liberalisation in the Indian environmental sector would bring in state of the art technology with mature multinational environmental service providers from the OECD countries, some of these firms do not have a proven environmental track record. For example, some of the UK multinational water corporations have been hauled up by UK's Environment Agency as the country's most polluting companies, as is evident from the number of their appearances in court and prosecutions during 2000.

Moreover, mature environmental firms with deep pockets (or with cross-subsidisation across affiliated markets) could indulge in anti-competitive practices.[67] This is important for the Indian environmental services industry, which is still to develop into a full-fledged industry. It is important that the Indian environmental service providers are exposed to global competitive forces to grow into an efficient industry, but it is equally important to ensure that restrictive business practices of large incumbent firms do not stifle their growth.[68]

8 Conclusion

The privatisation and liberalisation of environmental services promises gains for India in terms of access to capital, technology, and competition from global firms that emphasise

[67] This would imply the reverse of the point made earlier on equity issues, where the fear is that of overcharging. Here the reference is being made to short-term lowering of prices to out-bid newer firms in competitive environmental projects, where the lower price quote is not based on cost efficiency but predatory pricing strategy.

[68] In this regard, GATS Articles VIII and IX on *Monopoly Practices* and *Other Restrictive Business Practices*, respectively, provide a framework for gaining information on foreign environmental service firms, and ensuring that large firms do not engage in any anti-competitive practices or abuse their market positions, as discussed earlier in Section 5.

resource efficiency. Moreover, given the deficiencies in the Indian environmental infrastructure services and basic amenities, including sewage, refuse, and sanitation services, it is essential to bring about radical changes in these services. The process started in 1992 with the 74th Amendment of the Constitution, and several Indian cities are encouraging liberalisation in these services to increase productivity and efficiency. Moreover, the domestic environmental legislation affecting infrastructure environmental services like refuse disposal is fairly new (e.g. the Municipal Solid Waste Management & Handling Rules of 2000), such that the municipalities across the country and the domestic environment industry have only just begun to respond to the legal requirements.

The emerging domestic environment industry needs to be given the opportunity to respond to environmental regulations, and more of such demand boosting environmental reforms need to be in place before mature global environment service providers start operating in the Indian market. It is also important to take a holistic view of environmental management, rather than a piece-meal approach, hence BOT and BOOT options may be more appropriate rather than just management contracts. This would also help to bring in state of the art technology besides much needed capital in the waste management and environmental remedial services.

Moreover, the privatisation and liberalisation in environmental services require a strong institutional and regulatory structure to monitor the activities of large environmental service providers to prevent anti-competitive and restrictive practices (especially with regard to equity issues in certain basic environmental services like drinking water and sanitation). Thus the privatisation and commitment to liberalisation needs to be supported by a strong institutional framework.

At present the environment services sector is open autonomously, with upto 100 per cent foreign equity participation. Hence, the FDI policy is already in line with the import needs in this sector. Yet the authors feel that unrestricted opening up of the sector under the GATS is neither advisable from a negotiating strategy viewpoint nor from the domestic political economy perspective. A selective commitment approach in terms of the sub-sectors has been suggested along with limitations and exclusions. India should exclude all environmental services under government monopoly from the commitments (even industrialised Member countries including the US and Sweden have done so in their initial offers). However, government services which have been contracted out or privatised (as is the case with some municipal services like cleaning and refuse disposal in India) can be included in the commitments.

This cautious approach is justified on several grounds. First, given that the sector had not even been scheduled in the Uruguay Round, a more gradual opening up may be more attractive as a negotiating strategy. Second, given that the nascent domestic environmental services sector requires time to develop expertise, consolidate, and be prepared to face foreign competition, a gradual approach to multilateral liberalisation of this sector may be in the interest of domestic industry. Also, since there is limited experience with private participation in the environmental services sector, the state of knowledge about the likely impact of full commitment and the cost–benefit trade-off is poor, and thus a gradual approach under the GATS is preferable.

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ANNEX

Table A 1: Salient Indian Environmental Legislation, Rules, and Notifications

Year	Environmental Act/ Notification/ Rule
1927 :	The Indian Forest Act
1960 :	The Prevention of Cruelty to Animals Act
1972 :	Wildlife Protection Act (amended 1993)
1973 :	The Wildlife (Stock Declaration) Central Rules
1974 :	Water (Prevention and Control of Pollution)Act (amended 1988)
1975 :	The Water (Prevention and Control of Pollution) Rules
1977 :	The Water (Prevention and Control of Pollution) Cess Act (amended 1992)
1978 :	The Water (Prevention and Control of Pollution) Cess Rules
1980 :	The Forest Conservation Act (amended 1988)
1981 :	The Air (Prevention and Control of Pollution) Act (amended 1987)
1982 :	The Air (Prevention and Control of Pollution) Rules
1986 :	The Environment (Protection) Act (amended 1991)
1986 :	The Environment (Protection) Rules (amended 1999, 2002)
1988 :	National Forest Policy
1989 :	The Rules for Manufacture, Use, Import and Storage of Hazardous Microorganisms, Genetically Engineered Organisms or Cells Rules
1989 :	The Hazardous Wastes (Management and Handling) Rules (amended 2000)
1989 :	Manufacture, Storage, and Import of Hazardous Chemical Rules (amended 2000)
1991 :	The Public Liability Insurance Act (amended 1992)
1991 :	The Public Liability Insurance Rules (amended 1993)
1991 :	The Scheme on Labeling Environment Friendly Products
1991 :	The Coastal Regulation Zone Notification (amended 2001)
1992 :	The Environmental Audit Notification
1992 :	The Criteria for Labeling Cosmetics as Environment Friendly Products
1993 :	The Environmental Standards Notification
1994 :	Environmental Clearance: Restrictions & Prohibitions on the Expansion & Modernization of any activity or new projects (amended 2002)
1994 :	National Ambient Air Quality Standards
1995 :	The National Environment Tribunal Act
1995 :	The Wildlife Protection Rules
1995 :	The Wildlife (Specified Plant Stock declaration) Central Rules
1995 :	The Wildlife (Specified Plants - Conditions for Possession by Licensee) Rules
1997 :	Prohibition on the handling of Azodyes
1997 :	The National Environment Appellate Authority Act
1998 :	Bio-Medical Waste (Management and Handling) Rules
1998 :	Order Constituting the Taj Trapezium Zone Pollution (Prevention and Control) Authority
1998 :	Ambient Air Quality Standards for Ammonia
1998 :	The Breeding of and Experiments on Animals (Control and Supervision) Rules (amended 2001)
1999 :	Environment (Siting for Industrial Projects) Rules
1999 :	Dumping and Disposal of Fly Ash Discharged from Coal or Lignite based Thermal Power Plants
1999 :	Recycled Plastic Manufacture and Usage Rules
1999 :	Emission Standards for New Generator Sets
2000 :	Municipal Solid Waste (Management & Handling) Rules
2000 :	Noise Pollution (Regulation and Control) Rules (amended 2002)
2000 :	Notification on Laboratories Use of Pathogenic Micro-organism or Genetically Engineered Organisms or Cells for the Purpose of Research
2000 :	Ozone Depleting Substances (Regulation) Rules
2001 :	Batteries (Management and Handling) Rules
2001 :	The Prevention of Cruelty to Animals (Slaughter House) Rules
2001 :	The Eco-sensitive Zone: Mahabaleshwar Panchgani Region
2002:	New Biodiversity Act
2003:	Forest Conservation Rules

Source: Ministry of Environment and Forests, Government of India.

Table A 2: Annual Environmental Expenditure by Ministry of Environment

(in US$ million)

Sector	1997–8	1998–9	1999–2000	2000–01	2001–02*
Environment	23.07	28.80	23.62	32.48	42.93
National River Conservation Directorate	19.89	21.50	31.45	24.32	58.19
Forests and Wildlife	24.54	34.85	35.62	34.11	51.44
National Afforestation	13.84	14.41	17.29	18.61	27.44
Total	81.34	99.55	107.98	121.51	180.00

* planned expenditure

Source: Based on Table 16 in MOEF, *Annual Report 2001–02.*

Table A 3: Approved FDI and FTCs in Environment Sector in India, 1993–2002

(in US$ million)

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002*	Total
Australia				0.02							0.02
British Virginia					0.14						0.14
Canada		0.16	0.04		0.05			0.03			0.28
Denmark						0.06			0.02	0.04	0.12
France		0.15									0.15
Germany		0.04		0.40	1.56		0.05		0.05	0.01	2.11
Italy					0.10	1.27					1.37
Japan						0.15					0.15
Mauritius						0.03	1.50				1.53
Netherlands			7.01	0.45	0.11	0.01	0	0.05			7.63
Singapore							0.12	5.81			5.93
Sweden											0.00
UK	1.03	0.25	0.16	1.12	0.06	0.20			0.01		2.83
USA	0.08		9.87	0.32		0.06	0.05			0.04	10.42
Total	1.11	0.6	17.08	2.31	2.02	1.78	1.72	5.89	0.08	0.09	32.68

*For the year 2002, the period covered is January through August. For all other years, the data pertains to FDI approvals during the 12 calendar months.

Source: Foreign Investment Promotion Bureau, the data was generated based on a keyword search for 'environment' in 'Item of Manufacture' of foreign direct investment (FDI) and foreign technology cases (FTCs) during the period 1991 through 2002.

Table A 4: Environmental Exports (Goods and Services) by Country, 1995 and 1999
(in US$ billion)

Country	1995	1999	Share in Global Exports, 1999
8.1.1 US	24.15	31.64	26%
8.1.2 Germany	20.97	22.75	19%
Japan	20.42	18.47	15%
Italy	9.58	9.38	8%
UK	7.70	8.83	7%
France	6.91	7.42	6%
8.1.3 Netherlands	4.08	3.83	3%
Canada	2.17	3.37	3%
Sweden	2.85	2.97	2%
China	2.29	2.88	2%
Taiwan	2.73	2.80	2%
Denmark	2.72	2.77	2%
Austria	1.94	2.08	2%
Korea	1.86	2.05	2%
Australia	0.67	0.69	1%
8.1.3.1 Total	111.06	121.94	100%

Source: Data reported in US–AEP (2001), Figures 2.1 and 2.2.

Table A 5: Asian Environmental Imports (Goods and Services), 1995 and 1999
(in US$ billion)

Country	1995	1999	Share in Asian Import Market, 1999
8.1.4 Hong Kong	3.14	3.27	14.6%
8.1.5 Indonesia	1.18	0.59	2.6%
India	1.21	0.89	4.0%
Korea	6.78	3.99	17.8%
Sri Lanka	0.06	0.06	0.3%
Malaysia	2.28	1.67	7.5%
8.1.6 Philippines	0.87	1.44	6.4%
Singapore	2.72	2.81	12.5%
Thailand	2.22	1.30	5.8%
Taiwan	3.49	6.10	27.2%
Vietnam	0.20	0.28	1.3%
8.1.6.1 Total	24.15	22.40	100.0%

Source: US–AEP (2001), Figure 2.3 given.

Table A 6: Imports in Indian Environment Market 2000–02

(in US$ million)

8.1.6.2 Year	2000	2001	2002
Total Market Size	3294	3788	4166
Local Production	2061	2272	2499
Total Imports	1233	1516	1667
Imports from the US	431	530	583

Source: US Country Commercial Guide FY2003: *India*, Chapter 5: 'Leading Sectors for US Exports and Investment'. The market estimates include basic water treatment and sanitation projects.

Table A 7: Foreign Affiliation in the Indian Environment Industry

Indian Company	Foreign Partner
General Electric Company of India, Ltd	American Air Filter International SA
Paramount Pollution Control Pvt. Ltd.	Anderson
Flakt India	ABB Environmental Services
Hindustan Development Corporation Ltd.	C-E Air Preheater Combustion Eng.
Thermax Limited	Babcock & Wilcox, USA, General Electric Environmental Services, Inc.
Saraswato Omdistroa; Sumdocate	Smith & Loveless
Humphreys & Glasgow Ltd.	Jacobs Engineering Ltd.

Source: CII (1996).