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Trade in environmental services: opportunities and constraints

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Working Paper No. 102

TRADE IN ENVIRONMENTAL SERVICES: OPPORTUNITIES AND CONSTRAINTS

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May 2003



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Foreword

The environmental services sector has been growing rapidly during the last two decades. Moreover, privatization 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 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 privatization 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 liberalizing 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 2000 negotiations. 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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May 2003

1. Introduction[#]

The environment industry has witnessed rapid growth over the last two decades. Industry surveys in the mid-1990s had estimated that the environment industry would increase from US\$469 billion in 1997 to US\$600 billion by 2010, representing an average annual rate of growth of 5%.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% of the world market, followed by the 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 urbanization 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 Hoda and Dr Arvind Virmani (ICRIER), Professor B.K. Guha (IIT Delhi), Dr. Veena Jha (UNCTAD India), Dr D.K. Biswas (CPCB), Mr. T.K. Bhowmick and Ms. Seema Arora (CII), Mr. Ajay Mehrotra (BHEL), 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 in ICRIER (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 ranged from 10-15% during 1985-1990, dropped to 2-5% during 1991-1995 and further to a low of 1.2% in 1996.

1.1 Definition of Environmental Services

The environment industry consists of two main segments, namely, the service segment and equipment segment.³ This also reflects the legal frameworks of the industry's global trade, in that the GATT covers all environmental goods and the GATS covers environmental services. The focus of this study is the environmental services segment.

The distinction between environmental services and goods, though clean on the outset, 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 is 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 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.

Considering the OECD/Eurostat definition, environmental services consist of those activities, which 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, which reduce environmental risk, minimize 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

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 is 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 follows⁵:

The first is the *pollution management group* which consists of activities such as air pollution control, waste water management, solid waste management, remediation, cleanup 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 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 group 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 privatization of certain traditional environmental services like water, wastewater treatment and municipal solid waste management services.

There is also a growing 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.

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

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 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 internalize 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 properties 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 minimize 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

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).

deregulation and privatization of many activities and a growing 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 privatization 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 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% of the total output produced in Japan and Western Europe and about 10% for the US industry. In the US, export revenue growth represented more than 50% of the growth of the U.S. environment industry during 1996-97.⁸

The market for environmental services in developing countries like India has been growing due to increased environmental regulations, urbanization, and industrialization. In 2001, about 28% 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% by 2021. Moreover, enhancement in the set of domestic environmental regulations, liberalization 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, environment services are set to become one of the fastest growing service sectors in the near future.⁹ 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.

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 Environmental Business International.

⁹ 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 *International Trade Statistics 2002*.

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 subsectors under the GATS. Table 1 provides the definitions and scope of these four subsectors under the GATS.

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 <i>Excludes:</i> 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 <i>Excludes:</i> 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 <i>Excludes:</i> disinfecting/ exterminating services for buildings (CPC 87401), pest control for agriculture (CPC 88110)	9403	9431, 9439
4. Other services <ul style="list-style-type: none"> • Cleaning of exhaust gases • Noise abatement services • Nature and landscape protection services <i>Excludes</i> forest and damage assessment and abatement services (CPC 881, GATS 1F(f)) <ul style="list-style-type: none"> • Others not included elsewhere 	9404 9405 9406 9409	94900

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, CPC ver. 1 & GATS Classification of Environmental Services

OECD/Eurostat	CPC version 1.0	GATS
A. Water and waste water management sector with sub-sectors: <ul style="list-style-type: none"> • Sewage services • <i>Water for human use</i> 	941 Sewage services 94110 Sewage treatment services 94120 Tank emptying and cleaning services	1. Sewage services <i>Excludes collection, purification & distribution services of water, and construction repair and alteration of sewers.</i>
B. Solid and hazardous waste management sector with sub-sectors: <ul style="list-style-type: none"> • Refuse disposal and treatment services • Sanitation services • <i>Recycling services</i> 	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	2. Refuse disposal services <i>Excludes dealing and wholesale in waste and scrap, and R&D services on environmental issues.</i> 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 <i>Excludes forest and damage assessment and abatement services</i>
G. Other environmental/ ancillary services: <ul style="list-style-type: none"> • Design consulting and engineering. • Preparation of sites, construction, installation, assembly, repair and maintenance • Environmental research & development • Analytical services, data collection, testing, analysis, assessment • Environmental education, training and information 	94900 Other environmental protection services	4. Other services

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 negotiations during the Uruguay Round, 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 Table 1 and 2 above, 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 minimizing 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 protection 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 organization. Although it covers all environmental media, including air, water, soil, etc., it does not organize 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 Secretariat Note 1998) 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. Privatization and liberalization of the water sector (treatment and purification) is partial across the globe, since it is a basic need for life and only in certain

West European countries, is the water sector privatized completely. While privatization and liberalization may be able to provide drinking water in an efficient manner, public intervention is bound to remain significant to ensure that provision of essential services like drinking water are 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 Transboundary Movements of Hazardous Wastes and their Disposal (adopted in 1989, entered into force in 1992). The guiding principle of the Basel Convention is to minimize 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 cooperation between Parties in this field, and develop Technical Guidelines for the management of hazardous wastes. There is an export ban 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 EU, OECD, Liechtenstein) to non-Annex VII countries (all other parties to the Convention).¹⁰ 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 hazardous wastes for recycling services.

For a developing country like India, where the focus so far has been on the end-of-pipe pollution management, it would be beneficial to embrace a wider definition of environmental services if only to emphasize the importance of efficient and optimal resource utilization.¹¹

Thus, India should adopt the broad classification of environmental services with 7 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. Waster and waste water management) and recycling services (under B. Solid and hazardous waste management) should be excluded or not liberalized.¹²

¹⁰ 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.

¹¹ The intent of optimal resource utilization is reflected in some of the domestic environmental policies, although instruments to ensure efficiency are still lacking. The domestic environmental legislation are listed in the annex, and discussed briefly under section 4.1.

¹² 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 April 9, 2003)

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, keeping in mind the country's interests and strengths in this sector. There are eight sections to this study.

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 environmental services by 7 sub-sectors, the extent of privatization 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 liberalization 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, privatization, 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 liberalization of environmental services.

It is important to note at the outset that the discussion in this paper follows the broader classification including the 7 categories of environmental services (as outlined in Appendix II of WTO 1998b). The discussion, however, often clubs the subsectors 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 liberalization. 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.¹³ In 1996, the environmental services segment was valued at about US\$229 billion.¹⁴

The industrialized 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 percent of the global market. The environment markets in these industrialized 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 percent 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 percent during the 1990s, which was almost half of the growth during 1970s and 1980s.¹⁵ The median profit margins of US environmental firms exceeded 10 percent in the late 1980s, but dipped between 2 to 3 percent in the 1990s in the service segments.¹⁶

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.¹⁷ 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”.¹⁸

On the other hand, the environment market in developing countries of Africa, Asia and Latin America is expected to grow at a rate of 10 to 15 percent per annum. These countries together account for less than 10 percent of the worldwide market (in 1996 they accounted for 7 percent 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 waste-water 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 privatization in the water segment more than a decade ago. In the US, solid waste management is the most significant environmental services

¹³ One estimate of the global environment industry in 2000 suggests a value of US\$ 522 billion (Butkeviciene et al 2002).

¹⁴ WTO (1998a: 4).

¹⁵ Ferrier (2000).

¹⁶ Berg and Ferrier (1998).

¹⁷ Maturity in an industry is characterized 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.

¹⁸ Ferrier (2000).

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 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 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, privatization 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.¹⁹ The leading country exporters included the US with 26% share of the global environmental exports (export value of \$32billion), followed by Germany with a share of 19%, and Japan with 15% share. These three countries also enjoy the largest trade surplus in this sector.²⁰ In contrast, European nations like Italy, U.K. and France had smaller shares of 8 percent, 7 percent, and 6 percent, 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 had a share of about 40 percent of the total environmental imports of 11 Asian countries, followed by the US with a share of 29 percent, Germany with a share close to 8 percent, and Taiwan with a share of 5.5 percent.²¹ It should be noted here that even though Taiwan's annual environmental exports have been close to US\$3 billion during 1995-99, it remains a net importer in the environment sector.

¹⁹ 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 cleanup, and wastewater management equipment. The estimate was based on OECD trade statistics (actual sales by HS codes). (US-AEP 2001:10).

²⁰ WTO (1998a).

²¹ US-AEP (2001), p. 13.

In particular, the US environment industry's export revenues doubled between 1993 and 1997, amounting to about 10 percent of industry revenues.²² The annual growth of US environmental exports however has slowed down. Until 1997, the annual growth rate was between 10 to 28 percent, but dropped to single digits in 1998 and 1999. In 1997 the growth rate of US environmental exports was 4 percent, compared to the compound annual average growth of 18 percent during the previous four years.²³ 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 industrializing 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 during 1995-99 by these Asian countries were US\$116.74 billion. Korea had the largest share of the total imports (22.8 percent), followed by Taiwan (19.5 percent), Hong Kong (14 percent), Singapore (11.9 percent), Malaysia (8.2 percent), Thailand (7.6 percent), Philippines (5.3 percent), Indonesia (4.7 percent), India (4.7 percent), Vietnam (1.1 percent), and Sri Lanka (0.3 percent).²⁴ 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 1995-98, while strong overall growth was evident in Philippines and Taiwan during 1995-99.

In terms of environmental segments significant for Asian country imports, solid/hazardous waste and other recycling systems/ remediation constituted the largest share during 1995-99, followed by monitoring and analysis equipment, and potable water treatment/wastewater management.

2.2 Privatization and Liberalization of Environmental Services

Privatization 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.

²² Ferrier (2000). Note that environmental exports reported in the previous paragraph and in the annex are taken from 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).

²³ Berg and Ferrier (1998).

²⁴ For details see US-AEP (2001).

The trend in privatization 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.²⁵ Wastewater treatment is completely privatized in United Kingdom, and in France more than two-thirds of the market is in the private sector.²⁶ Privatization 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 between 1990-97 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).²⁷ Among the Asian developing countries, in particular Malaysia, Indonesia, Thailand, Philippines have encouraged private participation in these infrastructure environmental services. In 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.²⁸

Private participation in environmental infrastructure services has taken various forms across the world. The major types of contracts are briefly discussed below:²⁹

(i) *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 optimize 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 percent of the city population and sewage network covered 94 percent of the population, privatization was initiated to improve the drinking water distribution (that had major leakage), make the billing system more effective, and install water meters.

²⁵ WTO (1998b).

²⁶ WTO (1998a), p.5.

²⁷ Johnstone et al (1999): 2.

²⁸ UNCTAD (1998), p. 17.

²⁹ Based on Lovei and Gentry (2002): 73-77.

(ii) *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.

A BOO (or 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 fulfill guarantees, meet quality standards and cut tariffs on schedule and in 1998 Vivendi was allowed to withdraw.

(iii) *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 UK firm Thames water, failed to do the infrastructure work as the latter had serious debt problems. Eventually Thames Water agreed to sell its entire 70 percent 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 percent private ownership and helped finance water treatment and supply projects.

(iv) *Full Privatization*

Under full privatization, 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 privatization has been tried in England and Wales, France and the United States. In 1989, England and Wales privatized 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 privatization 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.

Privatization of infrastructure environmental segments like water utilities does seem to increase efficiency, and provides the capital for building network to extend services to millions of new customers, (considering government agencies can be bureaucratic, inefficient, corrupt and also strapped for finances). Yet there are serious concerns with private entities operating in 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.³⁰ This raises the argument for public intervention to restrict monopolistic practices in the market, while the desirability of private participation remains on grounds of efficiency gains.

The major concerns in full privatization 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 remember to note that full privatization has been experienced only in select environmental service segments in a handful of industrialized 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 privatization 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 are increasing on pollution control and water and waste management in both developed and developing countries. Government procurement and government provisions of environmental services continue to play a large role despite large-scale privatization in utilities.

In the United States, where privatization of utilities has been the most extensive in the overall environment services sector, the extent of privatization is different across the segments. For instance, in 1994 the wastewater treatment segment was virtually controlled by the government with 95 percent ownership.³¹ In other words, even in a country like the US, "generally regarded as a country which has gone furthest in terms of privatization of utilities, most of the revenue in waste water is generated by the public sector".³² Privatization, however, is still progressing in this sector. In other segments, including solid

³⁰ A World Bank survey of water projects indicates that the water supply is subsidized and the price charged for in developing countries is only a fraction of the cost of providing the utility. Optimal resource utilization and conservation of water would require raising this price, which is likely to take place with privatization. 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.

³¹ Based on data reported in Table 4, WTO (1998a).

³² WTO (1998a) p. 5.

waste management, hazardous waste management and environmental testing/ analytical services, the US government has a more limited role with an ownership of 33 percent, 10 percent, and 8 percent, respectively. Full privatization exists in the two segments of remediation/industrial environmental services and environmental consulting/engineering.³³

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 privatization 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 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.³⁴ 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, specialized 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 percent of the total environment market, and the other half is accounted by the smaller firms.³⁵

In 1995, the top 50 environment companies represented 20 percent 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

³³ Considering the entire environment market, however, the stake of the public sector in the US has reduced over the years, and constituted only 34% of the industry revenues at the end of the 1990s (Ferrier 2000).

³⁴ WTO (1998a): p.5.

³⁵ UNCTAD (1998), p. 8.

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 in environmental services are thus losing significance. Large MNCs also offer a gamut of services (that fit into the argument of liberalization 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.

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.³⁶ The summary estimates are given in Table 3 below.

A more recent estimate, in 2002 valued the Indian environment market at US \$4.36 billion, with an annual growth rate of 15 percent. 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.³⁷

³⁶ 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.

³⁷ *US Country Commercial Guide for India* 2002, 2003.

Table 3. Market Potential in Indian Environment Sector, 1994

(in US\$ million)

Environment Segment	Net Capital Investment Potential*
A. Waste Water 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 & 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)

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 specializing in environmental consulting services. In 1999, the Confederation of Indian Industries 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.³⁸ 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 disposal of industrial wastes, municipal solid wastes, noise pollution etc, in the end of

³⁸ CII (1999).

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, U. K., U.S., 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*

The environmental services sector in India is small, but the emergence of several factors can support rapid growth in this sector. These include notably, rapid population growth and urbanization, industrialization, 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 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 most significant government policy approach that potentially affects the growth of the environment market in India was the 1992 Policy Statement for Abatement of Pollution. The government formally recognized 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 Urbanization*

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 percent 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 percent while the total country population increased by 21.34 percent during the same period.³⁹

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 privatization and liberalization.

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 10th 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.

3.2.2 Industrial Demand for Environmental Services

A second significant potential source of demand for environmental services is 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:

(i) 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-

³⁹ 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 215.7million 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.

medical Waste Rules (1998), and Hazardous Waste (Management and Handling) Rules (amended 2000) has helped to attract more equipment manufacturers with consulting services in the Indian environment sector.

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

(ii) *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 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.

(iii) *Community pressure and legal environmental activism*

Civil society (individuals and environmental 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 2001-02, the largest outlay of \$58 million being for cleaning up the rivers.⁴⁰ Under the 1995 National River Conservation Directorate, remedial and pollution control works were undertaken for 18 major rivers in India.

⁴⁰ See Table A2 in annex for details.

3.3 *Status and Deficiencies in Environmental Services by GATS Subsectors*

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 service sector are good. This section gives a quick review of the status and current deficiencies in environmental services by the 7 sub-sectors (as per the broader GATS classification) to indicate the need and scope of growth in these services in India.

3.3.A *Wastewater and sewage services (excluding water from human use)*⁴¹

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 percent per annum. A number of publicly owned water/wastewater treatment utilities and urban authorities have begun to privatize 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 privatization."⁴² 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.

The domestic sector, however, is the largest generator of wastewater (by volume) in Indian cities. The Ministry of Environment and Forest 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 percent 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 India urban population is not even provided with sewerage facility. In Class I cities, about 70 percent of the municipal population is provided with sewerage facility, whereas in Class II cities about 66 percent 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 percent is collected in the Class I cities and 66 percent 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 being by Delhi. The collection rate of wastewater in Delhi city was lower than the average across all Class I cities at only 59 percent of the wastewater generated.

⁴¹ Discussion in this section is based on the data published CPCB (1999) and (1999c). It may be noted here that 78 percent of the urban population have access to safe drinking water, while in the villages barely 35 percent have access to water supply. In Class I cities, the provision of water supply is above the urban average, with 88 percent of the municipal population been covered by organized water supply. (CPCB 1999)

⁴² US DOC (2003).

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

3.3.B Solid Waste Management (excluding recycling services) ⁴³

- *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) wastes. The majority of the municipal solid waste is generated in the metro cities with more than 62 percent 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, 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 percent of the total waste collected being dumped in Class I cities. On an average, only about 6 percent of the total municipal solid waste generated in the Class I cities is treated. Some cities in states like Gujarat, Kerala, Maharashtra, Rajasthan, Delhi, however, do encourage composting but the national average for Class I cities show 94 percent of the municipal solid waste is disposed off through dumping, and only 5 percent 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 bio-medical wastes, the market for biomedical waste treatment is estimated at US \$200 million, and expected to double over the next 3 years prompted by the domestic regulation.⁴⁴ Domestic legislation has made the treatment of bio-medical 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.

⁴³ Data in this section is taken on CPCB 1999b.

⁴⁴ US DOC (2003)

- *Sanitation services*

Outdoor sweeping and cleaning of streets is in the purview of ULBs. In urban India, about 38 percent of the population have access to sanitation services, while in rural areas barely 12 percent have access to sanitation services.⁴⁵ 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.C 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 percent per annum.⁴⁶ In 2001, the value of imports was about US \$80 million, with the U.S. being the single largest import source (40 percent 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; vehicular emission control products like catalytic converters, CNG kits, and consulting services.

3.3.D 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.E Noise abatement services

Noise abatement regulations are fairly recent in India (dated 2000, and amended 2002), which 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 seems equipment

⁴⁵ CPCB (1999).

⁴⁶ US DOC (2003).

oriented especially with noise suppression devices equipment with import needs in engineering and design services.

3.3.F Nature and Landscape protection Services

In the conservation of total biological diversity (including forests), the 1988 National Forest Policy observed that the network of national parks, sanctuaries, biosphere reserves and other protected areas should be strengthened and extended adequately. The strategy goal includes achieving forest area cover a minimum of 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.G 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, especially since air pollution is 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 notes that the Indian environment industry really needs affordable cutting edge technology in pollution prevention and abatement.

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 privatization available (as listed in section 2.2 above), BOT and BOO have 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 recognized the principle of local self-governance and empowered the urban local bodies (ULBs) including municipal corporations, municipal councils and nagar panchayats. The 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. Waste water 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 mobilization 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 authorizes 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 privatization 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, the 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 urban local bodies to invite competitive bids during the

⁴⁷ FIRE(D) (2002).

selection of private firms, and the state guidelines detailed the procedure for such competitive bids.

Privatization 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 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 privatization in India

Apart from financial constraints, the management of environmental services of urban local bodies 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 work force* 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 segregation at source, compost may be contaminated. The capital investment in these facilities (with capacity 100 to 700 tons per day, tpd) has ranged between RS. 30 to 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 “green partnership” where private firms share the cost of urban environmental management efforts in parks, gardens and roadside. In parks and gardens, private companies pay for the

⁴⁸ FIRE-D (2001) pp. 2-3.

saplings and tree guards, while 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 in exchange can put a discreet logo on the tree guard. According to the AMC, in 1995-96, 17 private companies came forward to sponsor a total of 7,150 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 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 estimates for the Indian environment market, domestic production and imports are reproduced in Table A6 in the annex.

Liberalization 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 in environment equipment and services (i.e. manufacture of pollution control equipment, sewage, refuse, and consultancy services) are allowed under the automatic route with upto 100 percent foreign equity holding. 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 (details given in Table A3 in the annex). The largest share of this foreign investment came from the US (31.86 percent), followed by Netherlands (23.33 percent), Singapore (18.65 percent), UK (8.65 percent) and Germany (6.45 percent). In 1991-92 there was no FDI or foreign technology cases (FTC) in the environment sector approved by the FIPB in India.

⁴⁹ Ahmedabad Municipal Corporation website: www.ahmedabadcity.org

⁵⁰ The prospects in this sector seem to have been improving because 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, 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 3rd May 2000). These infrastructure services typically include that of telecommunications, power, etc, not the environmental infrastructure services referred to in this paper.

Countries like the US consider the prospects for investment to be good given increasing privatization 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 Build Own Operate and Transfer (BOOT) and Build Own Operate (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 in the annex). While there are many joint venture 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, environmental due diligence, bio-medical waste management, environmental training, etc.

3.6 A Case of Liberalization in Municipal Environmental Service

During the last few years, liberalization 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 privatization and liberalization 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 32-month feasibility study to R.V.Anderson and Mott MacDonald under a joint venture team with

⁵² In 2001, however, Tetra Tech sought to increase its foreign equity from 50 percent to 100 percent. 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.

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, in New Delhi a contract to design, build and operate drinking water provision in Sonia Vihar, was given to Suez-Degremont. The project is expected to cover 3 million citizens at a cost of Euro 50 million.

In 2000, Municipal Corporation of Chennai partially privatized the collection of solid waste to Chennai Environmental Services Onyx (CES Onyx), subsidiary of the French company, Onyx, through its Asian operations setup 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 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, 30-35 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/ metric ton in the first year, and a 5% annually escalated rate in subsequent years (i.e. about RS. 1,200/ ton in the 7th 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. 1,050 to Rs1,365/ 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. The box below gives an account of this recent partial liberalization of municipal operations.

Box 1. Liberalization 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 privatized solid waste collection and transportation in 3 out of the 10 city zones, namely Ice House, Mylapore and Kodam-bakkam, in an effort to modernize municipal services. The private services cover about 35% of the corporation area. The Corporation is estimated to generate about 2,500 metric tons of solid waste per day. The Corporation is also planning to privatize 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 3 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 rainwater harvesting area recharging groundwater as well as lakes in 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 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 Municipal Corporation Chennai earlier used the wetlands of Perugundi 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* 27th November 1999, *CorpWatch India* article by 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 privatized the waste collection and disposal while the treatment of the collected waste was excluded. While privatization of waste treatment also seems to be in the Municipal Corporation’s planning agenda, such a piecemeal approach (or perhaps cautious phased privatization) 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 liberalization in environmental services that are directly related to projects under multilateral and bilateral agencies. For example, in year 2000, a five-year pilot project for Bangalore Water Supply and Sewerage Board, was given jointly to Vivendi Water and Northumbrian Water Group, each covering 1 million people

(under the AUS-AID assistance programme from the Australian government to privatize water supply on BOO and BOOT basis).⁵³

3.7 *India's Trade and Investment Prospects in Environmental Services*

The privatization and liberalization 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 industrialized 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 specializing 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 specializing in composting of solid waste and waste to energy services.

(i) *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 industrialized 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, bio-mass 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 \$ 7.5 million.

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, operation and maintenance of treatment plants, has also

⁵³ "Water Supply to go private in Bangalore" by B. Ramakrishna, *Times of India*, 11th April 2001.

won projects abroad. This has been mainly in South Asian countries like Indonesia (biomethanization plant) and Vietnam (effluent treatment plant for sugar distillery).

(ii) *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 specialize 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 the South Asia, Africa and 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, including Nepal, Sri Lanka, Nigeria, Egypt and Qatar.⁵⁴

However, much like India, most developing countries (where the environmental service 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 BHEL have focus mostly on product-application research rather than basic research, and thus basic technology for equipment manufacture like gasifier and fuel cell need to be

⁵⁴ Seema Arora, Environment Management Division, Confederation of Indian Industries.

⁵⁵ Seema Arora, CII.

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), 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 the deficiencies in India's environmental infrastructure services clearly indicates that capital is a major constraint in the provision of these services in India, followed by poor management systems (problem of attitude noted by 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 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. Liberalization (and privatization) in environmental services sector would then imply that India allows long-term contracts of the form BOT and BOO, to enhance infrastructure investment.

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, 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 pelletization facilities under waste to energy projects in Vijaywada, Baroda, Bangalore, Mumbai and Kalyan did not work out 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

⁵⁶ Mr Ajay Mehrotra, BHEL.

⁵⁷ FIRE(D) (2001).

in this sector. Restrictions under mode 3 can take various forms: limits on foreign 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 the 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 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 remittances involved are large. In September 2002, prior approval of the RBI was made mandatory for remittance exceeding USD 100,000 per project for any consultancy services procured from outside India (even if such remittance 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

⁵⁸ A.P. DIR Series Circular No.20, September 12, 2002.

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

environmental service 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 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 licenses.

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 liberalization 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 an 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.

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, a 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 *US Country Commercial Guide FY 2003: China.*

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, 2 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 subsectors and across the four modes. An analysis of the commitments shows that they are quite uniform across subsectors. There are 38 WTO member countries, which 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 subsectors. For instance, there are few full commitments across modes 1,3, and 4, mode 2 being the exception. More than 60 percent of the entries under mode 1 are unbound, while about 30-35 percent are partial commitments and only about 5 percent are full commitments. In mode 2, although more than 60 percent of the commitments are full commitments and about 30 percent are partial commitments. On the rest there are no commitments. The exception in this mode is the subsector of sewage services where only 28 percent are full commitments and the remaining 72 percent of the commitments are limited/partial. The restricted nature of commitments in sewage services probably reflects the government monopoly nature of this subsector. In mode 3, there are very few full commitments and over 90 percent 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 concerns 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 percent 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 30-35 percent while almost all the sectoral entries under mode 4 are unbound.

The sector-specific and horizontal limitations are similar across the different subsectors for each of the modes. There are no commitments in mode 1 for reasons of technical infeasibility. 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 authorization 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 subsectors 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 aforementioned 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, liberalization 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 authorization 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 authorization requirements, nationality and residency conditions, and other barriers to labour mobility in related professional services such as consulting, engineering, legal, accounting, auditing,

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, which are closed to private investment.

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 liberalization that has been realized 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 characterization 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 liberalization 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. Liberalization 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 how 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 aforementioned 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 centre stage in the ongoing GATS negotiations 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 liberalization commitments in this sector.

In its communication proposal, Canada has stressed the need for transparency in regulations, 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 liberalization in core and in 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 cleanup 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 recognized 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 subsectors 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 liberalization in core environmental services, but attention would also be paid to liberalization 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 highlighted 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 subsectors 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 waste water 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 cleanup 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 subsectors 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 subsectors 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 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 liberalization. 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 subsectors and activities where could take commitments, the nature of these commitments, and areas which should be excluded from the commitment process.

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

6.1 *Issues to Consider in Liberalizing Environmental Services*

The potential direct and indirect gains from liberalization of the environmental services sector are considerable. Liberalization 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 service 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 like 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 export-oriented sectors like tourism. Liberalization can also promote competition and improve managerial operations in sectors that have been traditional public in nature. As mentioned earlier, autonomously, India has opened up this sector to 100% 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 liberalizing environmental services and the autonomous liberalization 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 subsectors 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 liberalization 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, 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 privatized, (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 like 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 waste water 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. The latter is in view of equity concerns that liberalization 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:

- (1) Industrial waste water services
- (2) Industrial solid waste management services, including collection, segregation, and recycling of solid waste
- (3) Services to control air pollution and improve air quality
- (4) Services to control noise pollution and related testing and monitoring services
- (5) Remediation services
- (6) Environmental consulting, design, and engineering services

In areas (1) to (5) 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 liberalization are clear and the benefits well recognized, 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 ILD services). This would allow time to undertake necessary steps to strengthen such segments domestically, to introduce necessary domestic regulations, and to build on recent privatization 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 liberalizing this mode. A full commitment can be allowed under mode 3 for this segment, with 100% 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 subsectors 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 privatization being encouraged in the interim period. For now, services that are exclusively in the government domain, whether at the central, state, municipal, and local levels, should not be committed. Privatization 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 percent 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 choice of subsectors, activities within these subsector, 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 liberalization strategy in environmental services. Hence, there is 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 carve outs 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 liberalization. Privatization and liberalization 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 prevention of anticompetitive business practices or to ensure quality and equitable distribution of services are important for dealing with such challenges posed in liberalizing this sector. Some degree of government monopoly in provision of environmental services such as water supply and distribution, may thus be warranted on equity grounds.

While embracing the encouraging the efficient development of the environmental services sector through privatization and liberalization, 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 internalized. Thus liberalization 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 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 nor desirable. I.e. 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 liberalization in nature protection and landscaping service, local ecosystem characteristics have to be factored in while expertise from abroad is imported. Also if tourist flow increase due to better environmental infrastructure services and nature protection services, caution may need to be exercised in nature tourism to protect certain

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.

fragile ecosystems (where increased flow of people can disturb the delicate balance of the ecosystem). So accompanying regulations may be necessary to minimize damage to the environment.

Economic efficiency in this sector would require not only private participation in the provision of services, but changes in 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 observe 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, change towards a more holistic resource and pollution management regime is required. Privatization and liberalization 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 privatization and liberalization in the sector. To ensure social equity the government needs 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 industrialized 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.

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 Amendments are expected to take some time and municipal bodies probably will encourage more private participation then. Privatization is important with liberalization in the environmental services, since it will give an impetus to domestic entrepreneurs to develop.

Full privatization in environmental services, however may not be desirable, considering distribution issues 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*

Liberalization and privatization in 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 practiced. 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 global environmental: with various affiliated divisions, where cross subsidization across markets may be practiced. Consider the case of Vivendi Environment⁶⁶, 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 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 privatization 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 over-stretched itself.

In our process of liberalizing 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.

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).

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, their operations need to be monitored closely. While liberalization 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 UK multinational water corporations have been hauled up by UK's Environment Agency as the country's most polluting companies as evident from the number of appearances in court and prosecutions during 2000.

Moreover, mature environmental firms with deep pockets (or with cross-subsidization 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 competition in order to become efficient, but it is equally important to ensure that restrictive business practices of large incumbent firms do not stifle their growth.⁶⁸

8. Conclusion

The privatization and liberalization of environmental services promises gains for India in terms of access to capital, technology and competition from global firms that emphasize 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 liberalization 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

⁶⁷ This would imply the reverse of the point made earlier on equity issues, where the fear is that of over charging. 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.

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, so, BOT and BOOT options may be more appropriate rather than just management contracts. This would also help bring in state of the art technology besides much needed capital in the waste management and environmental remedial services.

Moreover, the privatization and liberalization 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 considering equity issues in certain basic environmental services like drinking water and sanitation). Thus the privatization and commitment to liberalization needs to be supported by a strong institutional framework.

At present the environment services sector is open autonomously, with upto 100% 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 nor from the domestic political economy perspective. A selective commitment approach in terms of the subsectors has been suggested along with limitations and exclusions. India should exclude all environmental services under government monopoly from the commitments (even industrialized member countries including the US and Sweden have done so in their initial offers). However, government services which have been contracted out or privatized, (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 the nascent domestic environmental services sector requires time to develop expertise, consolidate, and be prepared to face foreign competition, a gradual approach to multilateral liberalization 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 tradeoff is poor, thus a gradual approach under the GATS is preferable.

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Table A1. Salient Indian Environmental Legislation, Rules, and Notifications

Year	<u>Environmental Act/ Notification/ Rule</u>
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 Generation Sects.
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 Forest.

Table A2. Annual Environmental Expenditure by Ministry of Environment
(in US \$ million)

Sector	1997-98	1998-99	1999-00	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 & 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 Ministry of Environment and Forests *Annual Report 2001-02*

Table A3. 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

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.

*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.

Table A4. Environmental Exports (Goods and Services) by Country, 1995 and 1999
(\$ billions)

Country	1995	1999	Share in Global Exports, 1999
US	24.15	31.64	26%
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%
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%
Total	111.06	121.94	100%

Source: data reported in USAEP (2001): Figures 2.1 and 2.2

Table A5. Asian Environmental Imports (Goods and Services), 1995 and 1999
(US \$ billion)

Country	1995	1999	Share in Asian Import Market, 1999
Hong Kong	3.14	3.27	14.6%
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%
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%
Total	24.15	22.40	100.0%

Source: US-AEP (2001): Figure 2.3

Table A6. Imports in Indian Environment Market 2000-02
(in US \$millions)

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 A7. 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