

Environmental Goods and Services

**THE BENEFITS OF FURTHER
GLOBAL TRADE LIBERALISATION**

TRADE • ENVIRONMENT

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TRADE LIBERALISATION



ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

Work leading up to this volume got under way in 1998 in response to a request from the OECD Joint Working Party on Trade and Environment to develop a framework for future trade liberalisation efforts in the environmental goods and services (EGS) sector. The dynamic nature of the sector, together with its potential for strengthening environmental protection, made it an obvious candidate for a “win-win” sector, one in which environmental protection and trade liberalisation go hand in hand. While trade liberalisation can effectively address many supply-side factors that constrain the international diffusion of goods and services, it is widely recognised that demand or “market pull” factors, such as domestic environmental regulations and their enforcement, are relatively more important in the development of the global market for EGS. It was thus necessary to balance the analysis of trade barriers with attention to the complementary measures needed to ensure that the necessary environmental aspects were also taken into account.

This work benefited greatly from a joint OECD-Eurostat exercise which had just completed the first edition of *The Environmental Goods and Services Industry: Manual on Data Collection and Analysis*, which had not, however, taken up trade aspects. A number of coverage and classification issues could therefore be addressed using this state-of-the-art manual when undertaking the trade-related task of identifying the HS (Harmonised System) categories for environmental goods and the CPC (Central Product Classification)/GATS (General Agreement on Trade in Services) categories for environmental services, the range of which needed to be considerably broadened to reflect profound changes in the industry.

Following the preliminary phase of the work, the Joint Working Party on Trade and Environment asked that the analysis be extended to include a possible third “win” concerning the development dimension. In particular, interest was expressed in knowing whether concrete examples exist of “win-win” benefits accruing to developing countries from liberalisation of their environmental services markets to permit increased trade and private foreign investment. This further analysis, undertaken on water and waste water treatment, is recorded in Chapter 3, and an annex briefly summarises over 50 foreign investments in developing countries.

The report was drafted in the Trade Directorate by Dale Andrew and Rachel Thompson, with inputs from Rosemary Morris and Carole Pellegrino. Colleagues in the Environment Directorate regularly contributed comments over the three-year period covered by the study. The report is published on the responsibility of the Secretary-General.

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ACRONYMS

AGP	Agreement on Government Procurement (WTO)
APEC	Asia-Pacific Economic Cooperation
BAT	best available technology
BOO	build-operate-own
BOT	build-operate-transfer
BOTT	build-operate-train-transfer
CFCs	chlorofluorocarbons
CPC	Central Product Classification
DAC	Development Assistance Committee
ES	environmental services
EGS	environmental goods and services
FBC	fluidised bed combustion
GATS	General Agreement on Trade in Services
HS	Harmonised System
ISIC	International Standard Industrial Classification
ISO	International Organization for Standards
ISP	Internet service provider
ITC	International Trade Commission (United States)
MFN	most-favoured nation
MSW	management of solid waste
NACE	<i>Nomenclature générale des activités économiques dans les Communautés européennes</i>

NGO	non-governmental organisation
R&D	research and development
SDR	special drawing rights
SMEs	small and medium-sized enterprises
TBT	Agreement on Technical Barriers to Trade (WTO)
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organisation
UR	Uruguay Round
VOC	volatile organic compounds
W/120	GATS Services Sectoral Classification List
WTO	World Trade Organization

INTRODUCTION

At the start of the twenty-first century, one-half of the world's population lacks adequate sanitation and one person in five has no access to safe drinking water. Urban and suburban sprawl in developing and developed nations alike is putting pressure on air quality, water tables and biological diversity. Development of industrial and agricultural capacity – crucial for economic development and reduction of poverty in many countries – poses similar environmental challenges. In recent years, there has been an increasing trend towards technology-led responses to these environmental challenges, mostly, but not only, in developed countries. This has created new markets for environmental goods and services to remedy and prevent problems of water pollution, waste treatment, air pollution, habitat protection and sustainable resource use. Accordingly, a key issue for policy makers is the role that global trade liberalisation can play in building international markets for environmental goods and services to deliver these solutions.

Chapter 1 of this volume discusses the definitional issues and problems that arise in the environmental goods and services industry and analyses the potential value for trade negotiations of the classification developed in the OECD/Eurostat working group of national experts. This includes illustrative attempts to match industry activities with the Harmonised System (HS) and the Central Product Classification (CPC) used in trade negotiations for goods and for services, respectively. Chapter 2 categorises, in terms of supply- and demand-side considerations, the main factors conditioning the diffusion of environmental technologies, including the main trade-related measures that affect the international delivery of environmental goods and services. Building on the previous analysis, Chapter 3 examines the “win-win” proposition that trade liberalisation, particularly of a multilateral nature, can help to deliver mutually supportive and positive outcomes for improved and cost-effective environmental protection, improved economic efficiency and increased access to clean water and clean air – the development imperative. It explores the role of complementary policy measures in helping to ensure a potential “win-win” outcome from multilateral trade liberalisation in the environmental goods and services sectors and provides a view of the interaction of “win-win” elements via a set of case studies of international trade in the water and waste management areas.

A key conclusion of the research is the need for policy settings to address both supply- and demand-side factors. Indeed, supply-side factors, including a diverse and cumulative range of trade barriers, inhibit the deployment of technology and service-based solutions to global environmental challenges more than has been assumed. As a new round of services trade negotiations gathers momentum at the World Trade Organization (WTO), and efforts continue to launch a somewhat broader WTO Round encompassing tariff negotiations, this volume seeks to contribute to the debate on how trade liberalisation can help to achieve concrete results on the path to sustainable development.

Chapter 1

COVERAGE OF THE ENVIRONMENTAL GOODS AND SERVICES INDUSTRY

Mapping the environment industry

In the words of one analyst, “This is less a sector than an agglomeration of providers of many types of goods, services and technologies that are usually integrated into production processes and are often hard to tease out as separate items” (US Office of Technology Assessment, 1994, p. 149). A number of issues associated with the definition and separating out of individual items, particularly in order to measure them, are discussed below.

Table 1. Mapping environment activities

	Business activities	Production of equipment and specific materials	Provision of services	Construction and installation of facilities
Pollution management group				
Air pollution control				
Wastewater management				
Solid waste management				
Remediation/clean-up of soil and water				
Noise/vibration abatement				
Monitoring, analysis, assessment				
Cleaner technologies and products group				
Resource management group				

Note: This matrix is used to allocate business activities carried out by the environmental goods and services industry to environment classes. The environmental goods and services industry is assessed by filling the cells to indicate where satisfactory definitions and reliable data are available. This process can be repeated to adjust the classification to structural changes in the industry. The matrix is designed to allow comprehensive identification of environmental goods and services industry classes. Not all cells in the matrix can be satisfactorily filled owing to limitations in the current state of knowledge and data collection possibilities. In addition, not all the cells of the matrix are considered to be of sufficient quantitative importance to justify major investment in data collection and research.

The matrix combines environment industry business activities of different general kinds (columns) and the related environmental industry classes (rows). The rows correspond to the three large *groups* and the *categories*. These various groupings have also been used to structure the illustrative list of environmental goods in Annex 2, which also includes the *Manual's* further level of *sub-categories*.

Source: *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD and Eurostat, 1999.

Table 1 can service as background to the discussion of definitional and measurement issues. It is drawn from the OECD/Eurostat's *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis* (the *Manual*) and provides a flexible framework for mapping environment

industry activities. It is currently accurate and useful but it also can be adapted to future needs, as the industry is experiencing substantial structural changes, including concentration, privatisation, moving from end-of-pipe to integrated and cleaner technologies and shifts to totally new activities.

The global environment industry was estimated at USD 453 billion in 1996, USD 484 billion in 1998 and USD 518 billion in 2000 (Table 2). (While this estimate covers similar activities, it may include more recovery/recycling than would be included under the *Manual* definition). Markets in the OECD area represented over 90% of the total. Basic infrastructure services of waste treatment, water treatment and water supply comprised more than half, and equipment nearly another quarter, of that total.

Table 2. Global environmental market, 1996, 1998 and 2000

	USD billions							
	United States/ Canada	Western Europe	Japan Australia/ New Zealand	Asia/ Africa Latin America	Eastern Europe	World 1996	World 1998	World 2000 (est.)
Equipment	47.7	29	20.5	10.1	1.7	108.9	113.9	122.1
Water equipment & chemicals	17.2	10.5	6.3	4.3	0.8	39.1	41.8	45.2
Air pollution control	16	7.3	3.6	3.1	0.4	30.4	30.9	32.7
Instruments & information	2	1.6	1.1	0.5	0.1	5.3	6.1	6.7
Waste management	11.5	9.1	9	2	0.4	32.0	32.6	34.6
Process/prevention technology	1	0.5	0.5	0.2	0	2.2	2.5	2.8
Services	93	69.6	49.5	14	2.6	228.6	247.3	262.5
Solid waste management	34.9	29.5	31	5.8	1.1	102.3	105.8	111.8
Hazardous waste management	6.3	5.2	4	0.9	0.3	16.7	16.4	17.1
Consulting & engineering	15.1	8.4	1.7	1.4	0.3	26.9	27.2	29.2
Remediation & industrial	8.8	3.7	1.4	0.9	0.2	15.0	26.3	27.3
Analytical services	1.3	1	0.6	0.2	0.1	3.2	3.1	3.1
Water treatment services	26.6	21.8	10.8	4.8	0.6	64.6	68.5	74.1
Resources	42.8	34.8	24.1	11	2.9	115.6	123.2	133.6
Water utilities	29	19.7	13.5	8.6	2.4	73.2	75.3	80.8
Resource recovery	12.3	13.6	9.5	1.7	0.4	37.5	39.8	41.4
Environmental energy	1.5	1.5	1.1	0.7	0.1	4.9	8.2	11.4
Total 1996	183.4	133.5	93.9	35.3	7.1	453		
Total 1998	194.7	146.5	95.7	38.7	8.0		484	
Total 2000 (estimated)	208.1	156.0	99.2	45.5	9.4			518

N.B. Regional data by environmental market segment are for 1996.

Source: Environment Business International, Inc., San Diego, California.

The following two sections address particular problems in defining and measuring trade in environmental goods and in environmental services (ES) (see Box 1).

Box 1. Examples of environmental goods and services

Air pollution control: filters, catalytic converters and emissions scrubbers (products); turnkey contracts (services).

Water and wastewater treatment: membranes, chemical dosing, pipes and tanks (products); control systems, aerobic and anaerobic systems, trenchless boring and facilities management (services).

Waste management: landfill liners and composters (products); collection and disposal (services).

Remediation of contaminated land (including identification, assessment and remediation of contaminated sites): adsorbents and injection equipment (products); sampling/analysis (services).

Marine pollution control: booms and adsorbents (products); emergency response (services).

Noise and vibration control: acoustic enclosures and noise barriers (products); vibration measurement systems and noise and vibration measurement (services).

Environmental monitoring and instrumentation: monitors and instruments (products); installation and maintenance (services).

Energy management: electronic high-efficiency light bulbs and low-energy boilers (products); energy audits (services).

Source: Adapted from ten Brink and Haines, 1997.

Identifying environmental goods for international trade purposes

If defining the environmental industry is fraught with difficulties, measuring exports and imports in “environmental goods” is probably even more difficult. The OECD/Eurostat exercise concentrated on defining relevant industry activities, partly to develop coherent, comparable statistics for national surveys. Industry codes, such as NACE and ISIC, were not matched with trade codes for the various segments of the industry as it is difficult to find ISIC categories for all environment activities and because the CPC categorisation for services is not well developed.

However, a list of “environmental goods” is essential in order to analyse levels of tariff protection. In the absence of any internationally agreed list, an attempt was made to develop such a classification. The resulting preliminary and indicative list is presented in Annex 2. The list is structured according to the *Manual’s* groups, categories and sub-categories and matched with trade nomenclature product categories. Today, customs tariff schedules are based on the Harmonised System. However, there is no HS chapter for “environmental goods” as there is, for example, for cotton goods (52), steel products (73) or electrical equipment (85). As a first step, lists of goods produced and used by the environment industry must be assembled.

It is not strictly possible to find HS product categories for these goods on an internationally comparable basis. At the 6-digit level, the HS system is common to all WTO members. However, each national nomenclature can be developed to levels of eight, ten or more digits. Identifying environmental goods on the basis of 6-digit HS product category codes (as done here) involves capturing categories of goods at a higher level of aggregation than one that would generally allow environmental goods to have their own distinct code. For some products this is not serious, because the environmental good is identifiable within HS “national lines”, *i.e.* with a lower HS sub-category code within the higher level HS-6 category. For those for which sub-categories are more detailed (those beyond six digits), however, nations carve up the categories differently, resulting in differences

of definition. Agreeing on equivalent contents of detailed national HS categories (*i.e.* more than six digits) would involve a vast multilateral consultation exercise. In the first instance, therefore, the only practical way to compare tariff levels across markets is to limit “environmental goods” to 6-digit categories.

Problems in determining the contents of a list of “environmental goods” also abound. The most serious concerns *multiple use*. Many environmental products have a multiplicity of possible uses, many of which are not environmental. For example, separating harmful waste products from the output stream calls for a centrifuge. Yet centrifuges have a host of industrial uses, involving situations in which portions of a substance need to be separated for ordinary industrial reasons. One report estimates that 10% of centrifuge sales are for environmental purposes (Melling, 1996). Similar conditions hold for most environmental products, including pumps, filters, incinerators and chemicals that are used to “bind” polluting compounds into particular substances. This complicates the process of estimating industry size. One must either exclude certain products with clear environmental uses or run the risk of including some sales, production, trade, etc., in products that lack an environmental use. In preparing the illustrative list of products in Annex 2, a relatively wide “sweep” was taken, so that few products considered by expert evaluators to have more than negligible environmental use were excluded.

For *customs policy purposes* and trade nomenclature, a good is defined and assigned to a product code according to its physical characteristics: *e.g.* size, material, principal inputs. This is understandable since a customs official distinguishes a good on the basis of objective characteristics rather than purchasing industry or end use. For environmental goods, on the other hand, it is how the product is to be used that is of interest.

Identifying environmental goods that embody particular processes that have been defined as “cleaner” is also a serious problem. A piece of equipment using a cleaner technology will have *embedded technology*, which serves to “locate” the protection that justifies defining it as an environmental good. Cleaner technology, by definition, involves upstream changes in production and products as opposed to downstream add-ons or other end-of-pipe facilities for separating out harmful effluents after production. Under the second group on the illustrative list of environmental goods in Annex 2, a number of cleaner technologies are identified, generally without products which are integral to their function. For example, fluidised bed combustion (FBC) can reduce sulphur dioxide emissions from burning coal prior to the smokestack stage at which scrubbers are added on in traditional pollution control. But FBC does not depend on any particular product except the solvents used to fluidise the coal and the associated solvent recovery systems.

The *diversity* of the industry presents further challenges. Products and services are often classified by medium of pollution: air, water, solid waste and noise, along with sustainable energy and other natural resources. Distinctions and categories that are most useful in one case may not be appropriate in another. Recovery of pollutants from the air rarely offers the opportunity for re-use; the opposite is routinely the case for chemicals. Similarly, microbiological hazards are rarely a serious issue in air pollution. Thus, dispersal technology is appropriate for some problems (and some areas) but inappropriate for others.

The industry also divides according to the *maturity and sophistication* of the technology. As Table 2 shows, the bulk of industry value is in the routine services of water supply, water treatment and solid waste management, which feature mature and largely low-technology products similar to those for hauling, pumping and neutralisation that are widespread in other industries. This low-tech end of the industry shades quickly into the ordinary housekeeping functions that are common to many industries. As a result, it is difficult to draw a clear boundary around the industry.

In the case of cleaner technologies, some of these problems become particularly prominent. *Dual motivation* is intrinsic to many kinds of cleaner technologies, since pollution prevention is often accomplished primarily by better process control. One such example is more careful paint spraying to reduce emissions of volatile organic compounds (VOC). Examples from the chemical industry include the use of mixers to reduce sludge formation in storage vessels, leak detection, cleaning of heat exchange tubes and better reaction control to eliminate hot and cold spots or to speed reactions. As pollution prevention options can be more economical than end-of-pipe measures, and as pollution is managed as another kind of resource use, reducing the costs of (polluting) resources will be factored in along with costs of other resources. In such cases, it is difficult to distinguish environmentally motivated changes from those motivated by economic savings.

The definition of cleaner technologies also raises a problem of relativism. A technology that reduces resource use or pollution today may be relatively dirty in a few years, as more advanced technologies become available. Maintaining today's "cleaner" technologies for an inappropriate length of time on lists of favoured goods (*e.g.* through tax breaks, tariff preferences) could delay innovation or distort investment and trade decisions towards relatively less clean processes than those that become available with innovation and technological progress.

Identifying environmental services for purposes of international trade

Many of the factors identified above as complicating the task of defining environmental goods also apply to environmental services. Services are intrinsic to the delivery both of traditional pollution control and remediation/cleanup activities and of newer techniques of pollution management, installation of cleaner technologies and resource management activities. Increased privatisation of traditional environmental services, in particular water and waste treatment services, and a shift in regulatory emphasis and the behaviour of large firms from end-of-pipe pollution control to pollution prevention and cleaner production are having a number of important effects. These include expanding the relative importance of services in the environmental industry, stimulating private demand for and supply of environmental services and accentuating the need for and role of service activities beyond the traditional "core" environmental services.

Furthermore, environmental products, technologies and services are increasingly provided commercially on an integrated basis, whether "horizontally" by a firm or group of firms bringing together the range of materials and expertise required to undertake an entire project for a particular environmental medium (*e.g.* water, air, habitat) or "vertically", for example, by firms specialising in construction and engineering across several environmental media.

Specialist services are therefore important in their own right for the effective utilisation of environmental technologies and products in pollution and resource management projects. They are also increasingly integral to these technologies and products. This synergy suggests the desirability of pursuing liberalisation of international trade in environmental services in tandem with efforts to liberalise international trade in environmental products and clean technologies.

Traditionally, environmental services have been understood and defined quite narrowly in terms of facilities that provide water and waste treatment services, often by the public sector. However, over the past decade or so, a need has been felt to move beyond this stage, owing to a combination of new regulatory requirements for the management and control of pollution, growing public sensitivity to environmental problems and privatisation and liberalisation trends which have created private demand for environmental services and tied them more closely to the market.

Perhaps the leading factor has been the shift in regulatory approaches, particularly evident in OECD countries, from end-of-pipe pollution control to pollution prevention through adoption of technologies for cleaner production and products, with the active involvement of the private sector. This has made a broader range of services much more important, especially for the application of design, installation, managerial, environmental auditing and engineering know-how.

In many developing countries, the emphasis on basic environmental services remains, especially for water supply and wastewater treatment, but there is also a shift towards cleaner production in both development co-operation programmes and national initiatives. Cost-effectiveness mainly drives this trend, because of the gap between the environmental needs of developing countries and the financial resources available to satisfy them. UNCTAD has noted that developing countries have two main priorities: *i*) basic human needs relating to drinking and wastewater treatment, sanitation and waste management; and *ii*) coping with the problems of rapid industrialisation and urbanisation in relation to wastewater, urban air pollution and toxic and hazardous solid waste (UNCTAD, 1996, pp. 26-34).

Historically, the market played a limited role in environmental services (and hence in opportunities for international trade) because the major public infrastructure services, such as water treatment and waste disposal services, were largely provided by governments. This was mainly for two reasons. First, some environmental services may have the characteristics of public goods, *e.g.* sanitation and sweeping services for public spaces, which no single firm has an economic incentive to provide. Second, some environmental services may require comprehensive distribution or collection networks and equipment infrastructure, *e.g.* sewage collection systems, and the high level of investment required tends to create conditions of natural monopoly. Accordingly, governments provided such services until recently so as to control or subsidise the cost to consumers. These two factors tended to mean that the private sector either chose not to, or was not allowed to, enter the market to provide many of these services (WTO, 1998, p. 1).

However, over the past decade or so, domestic and international markets for environmental services have begun to emerge. One factor is the increased trade in environmental-related equipment and technology, along with associated services, to establish or upgrade industrial and public infrastructure plant, particularly for water treatment, waste management and abatement of air pollution. Another factor is the adoption of worldwide environmental standards, which can generate growth in international environmental goods and services markets, as demonstrated by the Montreal Protocol with respect to replacement strategies for CFCs (chlorofluorocarbons). A third factor has been the decision in many countries to commence domestic privatisation and demonopolisation of public utilities, which may generate foreign investment and competition in services. Internationalisation is also spurred by consolidation among providers and the global reach of large engineering firms.

Nevertheless, as with environmental goods, it is difficult to delineate the precise boundaries of the environmental services sector because of definitional problems arising from multiple use and from embedded environmental technologies and skills. This is because some services provided for environmental purposes are also provided in commercial contexts that do not relate directly to improved environmental protection or performance. Examples include architectural and design services, engineering, construction and installation services, land-use advisory services, R&D services and technical testing and analysis services. Industry groups, particularly those organised “horizontally”, also mention activities such as surveying services and land and water transportation services as relevant to their environmental project-delivery capacities; yet these services, too, obviously have non-environmental uses.

As a result, the development of a framework for further liberalisation of the environmental industry – as a means to stimulate deployment of urgently needed environmental technology and

know-how – requires a fresh look at the definition of environmental services. It is therefore essential to compare the classification system used in the Uruguay Round with the emerging industry profile, as classified in the *Manual*.

Shortcomings in the existing GATS classification of environmental services

The classification of environmental services provided by the OECD/Eurostat *Manual* and the GATS W/120 classification list (hereafter W/120) (GATT, 1991), which is used at the WTO, are very different. The *Manual* reflects an evolving, more integrated industry and identifies environmental services as those provided to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and ecosystems. It encompasses services relating to pollution management, including those relating to the construction and installation of facilities for such purposes, and services relating to the installation and utilisation of cleaner technologies and products and of technologies and products which reduce environmental risk and minimise pollution and resource use.

For its part, W/120, drawn up in 1990-91 and derived from the provisional UN CPC statistical classification (Provisional CPC), reflects a very traditional view of environmental services as largely public infrastructure services, *i.e.* services supplied to the general community, and focuses mainly on waste management and pollution control. This view persists in the recent revision of the CPC (CPC Version 1.0). The GATS and CPC classifications are set out in Table 3.

Table 3. GATS and CPC classifications of environmental services

GATS Sectoral classification 6	Provisional CPC Division 94	CPC Version 1.0 Division 94
Environmental services	Sewage and refuse disposal, sanitation and other environmental protection services	Sewage and refuse disposal, sanitation and other environmental protection services
A. Sewage services	9401 Sewage services	941 Sewage services 94110 Sewage treatment services 94120 Tank emptying and cleaning services
B. Refuse disposal services	9402 Refuse disposal services	942 Refuse disposal services 94211 Non-hazardous waste collection services 94212 Non-hazardous waste treatment and disposal services 94221 Hazardous waste collection services 94222 Hazardous waste treatment and disposal services
C. Sanitation and similar services	9403 Sanitation and similar services	943 Sanitation and similar services 94310 Sweeping and snow removal services 94390 Other sanitation services
D. Other	9404 Cleaning services of exhaust gases 9405 Noise abatement services 9406 Nature and landscape protection services 9409 Other environmental protection services n.e.c.	949 Other environmental protection services n.e.c.

The environmental services sector, as defined in W/120, was not a focus of the Uruguay Round services market access negotiations. This may account at least in part for the limited sectoral classification used: the main CPC headings were generally carried over to W/120. In some other sectors, such as financial services and telecommunications services, which received much greater attention, W/120 is much more closely related to how companies conduct their business and the services they provide.

Nevertheless, most OECD Members and some developing countries made at least some commitments under one or more of the four W/120 sub-sectors of sewage services, refuse disposal services, sanitation and similar services and “other” environmental services. An informal matrix showing the scope of existing GATS market access and national treatment commitments for each of the four GATS environmental services sub-classifications is included in Annex 4.

It should also be noted that the Uruguay Round services negotiators, in constructing the first multilateral trade framework for services in the early 1990s, sought guidance from Provisional CPC, which was, at the time, the best available tool. However, the CPC was not developed or intended as a basis for trade negotiations. The GATS negotiators were concerned that the GATS sectoral classification system should be a manageable and practical negotiating tool, readily linkable to national services statistics classifications, while covering commercially significant sectors in international services trade.

Therefore, and as with the CPC system, the GATS sectoral classifications are intended to be self-contained and, insofar as possible, mutually exclusive. A strong feature of current discussions on whether the GATS classification system should be updated for the mandated new round of GATS negotiations is the widespread view among WTO members, particularly developing countries, of the need for stability. Therefore, overhauling of the GATS sectoral classification needs to be justified by significant evolution in the sector concerned, including in the scope of services being traded internationally.

At first glance, this classification appears quite broad, encompassing the basic environmental media of water, waste, air and noise pollution and various unspecified “other environmental protection services” which could presumably encompass activities such as water and air quality monitoring, assessment and modelling, biological and ecosystem consultancy, environmental impact assessments and audits, site remediation, etc. However, a closer examination of the correlated CPC descriptions indicates that W/120’s classification of environmental services is unduly narrow for a number of reasons.

First, it is not clearly organised according to the provision of services for specific environmental media (water, solid waste, air, noise, soil, habitat, etc.). Yet many environmental services providers specialise in one or more environmental media and provide comprehensive service packages for those media. Thus, while there is some correlation between the primary environmental media and W/120’s main categories of sewage, refuse disposal, sanitation and “other” environmental services, it is only partial, especially in the case of water and solid waste management. For example, there is more to water management, water purification, wastewater treatment and water recycling than “sewage services”. Furthermore, the W/120 categories of refuse disposal and sanitation services are sub-sets of a missing broader category of solid waste management, in which recycling and sophisticated storage strategies should be core environmental service activities (instead, these services are partially covered elsewhere in W/120).

Second, the focus of the W/120 classification is on traditional “end-of-pipe” approaches, with little or no coverage of pollution prevention and sustainable resource management services. As a

result, some key services are not explicitly covered in W/120 (e.g. remediation of polluted or contaminated soils and water ecosystems, ecological research and consultancy, collection of paper, plastic, glass and metal waste for recycling, hazardous waste collection and storage).

Third, W/120 covers the services provided in the operation of certain facilities, plant and equipment, but not the design, engineering, R&D and consulting services that create and upgrade them, or the engineering, installation and construction services and technical testing and analytical services that make them operable. While these services are integral to environmental “value adding” and the international transfer of environmental technology, skills and know-how, they are classified elsewhere in W/120.

Fourth, the W/120 classification mainly focuses on utility/infrastructure services supplied to the general community and largely overlooks the provision of environmental services directly to industry.

The heterogeneous nature of the entities providing environmental services is also pertinent, insofar as they tend to cut across the “vertical” sectoral lines of the CPC/GATS classifications and involve both public and private sector actors, which may be either “vertical” functional specialists or “horizontal” service providers. For example:

- The water treatment sector tends to be dominated by large companies, in many instances formerly public water utilities which have been privatised.
- The waste management sector is more fragmented among small and medium-sized companies, particularly in the recycling segment.
- Engineering, consulting and project management services tend to be provided across functional segments by environmental divisions of big engineering firms, which enter into contract and partnership arrangements with smaller firms.
- Ecology consultancy and environmental education are often provided by smaller specialist firms, and R&D and testing services may be provided by publicly funded science consortia, specialist medium-sized private firms or specialist sub-divisions of large private firms.
- Pollution remediation and prevention activities in particular tend to involve the integrated provision of equipment, technology and services, with project managers and engineers calling in the required “medium” specialists (e.g. water, air, soil, habitat) on a contract basis.

These factors make it desirable to consider ways to modernise W/120 while preserving the “self-contained sectoral structure” of the GATS classification. As a first step in analysing how this could be done, Table 4 presents a comparative chart of the OECD/Eurostat classification and the W/120 sectoral list. The OECD/Eurostat classification helps to delineate the boundaries of the sector, in terms of covering services provided for environmental protection, pollution control, remediation or prevention activities and services provided for activities relating to specific environmental media. An effort was made to match practical descriptions/examples of such services to W/120 and the associated Provisional CPC and CPC Version 1.0 codes. This helps to reveal those services that are “uniquely” environmental in nature, as distinct from those services that have “dual” uses (i.e. that have both environmental and non-environmental uses and thus tend to be covered in W/120 under other sectoral headings). The most frequently occurring services in the latter group include (from W/120):

- Design, architectural and engineering services [W/120, item 1, Business Services, sub-item (A) Professional Services].
- Site investigation and surveying services [W/120, item 1, Business Services, sub-item (A) Professional Services; and item 3, Construction and Related Engineering Services].

- Research and development services [W/120, item 1, Business Services, sub-item (C)].
- Data monitoring and technical testing services [W/120, item 1, Business Services, sub-item (F) Other Business Services].
- Construction, installation and related engineering services [W/120, item 3 (A-C)].
- Distribution Services (regarding aspects of recycling) [W/120, item 4].
- Education and Training Services provided outside of the school and university systems [W/120, items 5(D) and (E)].

Table 4 gives a picture of environmental services provided directly to industry alongside those provided as “public infrastructure”, as well as the range of services that design, install, operate, maintain and upgrade the equipment and technologies involved, the “support” services involved in R&D, testing, analysis and monitoring, and the range of recycling and remediation services. It makes clearer how environmental services are actually provided. For example, it covers all of the services involved in Build-Operate-Transfer (BOT) projects for water supply and treatment or for solid waste management, a key means of delivering new environmental services in many parts of the world, particularly in developing countries.

The aim of Table 4 is to show the range of services involved in the environmental industry, not to suggest that this should be adopted as a new GATS classification for environmental services. Rather, it provides the necessary overview of the environmental services industry, to help trade policy makers make informed decisions about how to modernise the existing GATS classification.

In devising modernised GATS classifications, it is essential to maintain clear boundaries between the principal sectors in order to preserve the integrity of GATS specific commitments made under the existing classification system. This is a challenge because of the commercial scope of environmental services provision. As with environmental goods, “dual use” is a key issue for determining the boundaries of the environmental services sector. A number of services which, in commercial terms, are regarded as “environmental” in nature also have non-environmental uses, are provided as such by non-environmental service firms and are classified elsewhere in W/120. Examples include design and architectural services, engineering services, aspects of construction and installation services, education services, legal services, eco-tourism services and data monitoring, technical testing and analysis services.

From a commercial point of view, therefore, the question arises of the feasibility in the GATS context of constructing a new classification for environmental services that incorporates the “environmental elements” of these services, based on the circumstances in which they have an environmental end use. In practical terms, a service’s end use is defined by the customer’s purpose and requirements in commissioning a service. This also helps to shape a service’s characteristics in terms of the skills and technologies deployed. Thus, services with the same end use and similar characteristics are likely to be directly competitive or substitutable in the marketplace.

On the face of it, it should be possible to envisage a GATS classification for environmental services that makes possible the incorporation of specifically environmental end-use services, such as design and architecture services for the construction of waste management facilities, environmental education services for public awareness campaigns, computer modelling services and data-gathering and testing services for the monitoring and prevention of maritime pollution. Such an approach would involve providing clear descriptions of the specifically environmental aspect of the service under an Environmental Services sectoral classification and excluding these from any other “generic” classification in the GATS system.

**Table 4. Environmental services:
Comparison of OECD/Eurostat and GATS/CPC descriptions and classifications**

Service type	Examples/descriptions	GATS and Provisional CPC	CPC Version 1.0
<i>(I) Services provided for one or more environmental protection, pollution control, remediation or prevention activity¹</i>			
Design consulting and engineering	<p>Engineering services for environmental plant, equipment and facilities, including consulting services, e.g. feasibility studies, costing</p> <ul style="list-style-type: none"> ▪ Architecture and design services for environmental plant, equipment and facilities, including related urban planning and landscape architecture ▪ Environmental impact studies 	<p>GATS 1A (d), (e), (f), (g): architecture, engineering, urban planning, etc., services CPC 86711, 86712, 86721, 86722, 86724, 86725, 86726, 86732, 86733, 86741, 86742 GATS 6D: other ES CPC 9409</p>	<p>83131, 832, 833 94900</p>
Preparation of sites and construction, installation and assembly, repair and maintenance	<p>For environmental facilities, plant and equipment e.g. sewage and water management, solid and hazardous waste collection and treatment systems, landfill and incineration sites, etc.</p> <ul style="list-style-type: none"> ▪ Engineering services relating to site preparation; inspection during construction ▪ Surface and subsurface surveying ▪ Site investigation, formation and clearance ▪ Construction, installation and assembly of environmental utilities, plant and equipment (e.g. laying of sewers and water pipelines, construction of treatment plants, construction of landfills and other disposal sites) ▪ Installing septic systems and disposal fields ▪ Construction and installation work on buildings ▪ Repair and maintenance of machinery and equipment 	<p>Not fully covered by GATS 6A-D: operation of the facilities, etc. [see below]</p> <p>GATS 1A (e), (f): architecture, engineering CPC 86713, 86714, 86727, 86729 GATS 1A (e), (f) CPC 86752, 86753</p> <p>GATS 3E: other construction CPC 511, 515, 518 GATS 3B: construction work for civil engineering CPC 51340, 51350 GATS 3C: installation and assembly CPC 51620, 88590</p> <p>GATS 6A&D: sewage services and other ES CPC 9401, 9409 GATS 3A, D: building construction, completion and finishing CPC 512, 517 GATS 1F (n): maintenance & repair of equipment CPC 88620</p>	<p>83131, 832, 833 83520, 83530 54241, 54251, 541, 542, 543, 544, 545, 546, 547, 548 54342, 86590 94110, 94900 542, 547 87159</p>
Project management services	<ul style="list-style-type: none"> ▪ Supervision of design, engineering and construction and installation, as an integrated project 	GATS 1A (f): integrated engineering	83322, 83323, 83329
Environmental research and development	<ul style="list-style-type: none"> ▪ Scientific and technological activities to develop cleaner products, processes and technologies ▪ Scientific and technological activities to reduce or eliminate emissions and improve environmental quality <p>Research to improve knowledge of eco-systems and the impact of human activities on the environment</p>	<p>GATS 1C: R&D services CPC 85101, 85103, 85109, 85202, 85300, 8530</p> <p>GATS 6D: other ES CPC 9409</p>	<p>81110, 81130, 81190, 81220, 81300, 8130 94900</p>

1. Services for the operation of systems, plant and facilities for specific environmental media are covered in the second part of this table.

Table 4 (cont'd.)

Service type	Examples/descriptions	GATS and Provisional CPC	CPC Version 1.0
(I) Services for one or more environmental protection, pollution control, remediation or prevention activity (cont'd.)			
Analytical services, data collection, testing, analysis and assessment	<ul style="list-style-type: none"> ▪ Environmental monitoring, controlling and damage assessment services, e.g. acid rain, natural disaster assessment and abatement services 	GATS 6D: other ES CPC 9409	94900
	<ul style="list-style-type: none"> ▪ Composition and purity testing and laboratory analysis services (e.g. for health, safety, toxicology purposes) ▪ Computer modelling of pollution effects ▪ Sampling and monitoring of air and water quality 	GATS 1F (e): technical testing and analysis service CPC 86761 CPC 75440, 8672 GATS 1F (e) CPC 8672, 8676, 9409	83561 83139, 8339 8313, 8339, 8351
	<ul style="list-style-type: none"> ▪ Forestry assessment and damage abatement services 	GATS 1F(f): services incidental to agriculture, hunting, forestry CPC 881	
Remediation and cleanup of soil, surface water and groundwater	<p>Operation of systems or provision of other services to reduce the quantity of polluting materials in soil or water, including surface, groundwater and seawater:</p> <ul style="list-style-type: none"> ▪ Consultancy and engineering services for assessment ▪ Use of cleaning-up systems in situ or mobile, emergency response, spills cleanup; natural disaster assessment and abatement services. ▪ Treatment of water and dredging residues. 	GATS 6D: other ES CPC 94060	94900
	<ul style="list-style-type: none"> ▪ Specialised treatment of polluted soils: see solid waste management 	GATS 6B: refuse services CPC 9402	94222
Eco-system and landscape protection services	<ul style="list-style-type: none"> ▪ Consultancy and assessment services for ecological system, nature and landscape protection services, e.g. lakes, coastlines and coastal waters, wetlands, dry land, etc., including fauna, flora and habitats 	GATS 6D: other ES CPC 9406 and 9409	94900
Environmental education, training and information	<ul style="list-style-type: none"> ▪ Environmental education or training by specialised institutions or specialised suppliers provided outside the school/university system for the general public or specific workplaces, e.g. training courses on environmental protection or operation of environmental facilities 	GATS 6D: other ES CPC 9409	94900
	<ul style="list-style-type: none"> ▪ Adult education and specific-subject education courses not defined by level of pupil. 	GATS 5D, E: adult and other education CPC 924, 929	929
(II) Services provided for specific environmental media			
Water and wastewater management	Including "horizontal" services in section (I)		
(a) Sewage services	<ul style="list-style-type: none"> ▪ Operation and maintenance of facilities and equipment for sewage removal, sewage treatment and disposal, tank emptying, cleaning and servicing, transport of wastewater 	GATS 6A&D CPC 9401, 9409	94110, 94900
(b) Water for human use	<ul style="list-style-type: none"> ▪ Potable water collection, purification treatment and distribution through mains 	CPC 18000, 7139	69210

Table 4 (cont'd.)

Service type	Examples/descriptions	GATS and Provisional CPC	CPC Version 1.0
(II) Services provided for specific environmental media			
Solid and hazardous waste management	Including "horizontal" services in section (I)		
(a) Refuse disposal services	<ul style="list-style-type: none"> ▪ Collection and transport, treatment and disposal services of household, commercial and industrial trash, rubbish and waste (non-hazardous and hazardous). ▪ Treatment and disposal by incineration, dumping, composting, landfill or storage. Includes waste reduction services and specialised treatment of polluted soils <i>Excludes</i> dealing and wholesale services of waste and scrap – see below	GATS 6B CPC 9402	94211, 94212, 94221, 94222
(b) Recycling services	<ul style="list-style-type: none"> ▪ Metal waste and scrap recycling services, on a contract or fee basis, e.g. recycling of aluminium and steel ▪ Non-metal waste and scrap recycling services, on a contract or fee basis, e.g. recycling of paper, plastic and glass ▪ Dealing, wholesale and retail services of recycled waste, scrap and other material, e.g. sale of paper, cans or bottles for recycling 	GATS 1F(i): services incidental to manufacturing CPC 88493 CPC 88493	86931 86392
(c) Sanitation services	<ul style="list-style-type: none"> ▪ Street, park, beach and other outdoor sweeping, snow and ice removal, other sanitation services e.g. drain unblocking <i>Excludes</i> disinfecting and extermination services of buildings, etc., and pest control services in connection with agriculture	GATS 4: distribution services CPC 62118, 62278, 62113, 63299	61195, 61295, 62495, 62595
Air pollution control, including "horizontal" services in section I	<p>Services for the assessment, treatment and/or removal of exhaust gases and particulate matter from both mobile and stationary sources:</p> <ul style="list-style-type: none"> ▪ Emission monitoring and control services ▪ Concentration monitoring, control and reduction services of pollutants in ambient air, especially in urban areas. ▪ Cleaning of exhaust gas systems of vehicles, commercial and industrial buildings and complexes. 	GATS 6D: other ES CPC 94040	94900
Noise and vibration abatement, including "horizontal" services in section I	<p>Services for the assessment, reduction or elimination of noise and vibration both at source and dispersed:</p> <ul style="list-style-type: none"> ▪ Noise pollution monitoring, control and abatement ▪ Design, management, etc., of systems for acoustic and sound-proof screening and covering 	GATS 6D: other ES CPC 94050	94900

Sources: OECD based on OECD/Eurostat descriptions, GATS Classification List (MTN.GNS/W/120), Provisional CPC and CPC Version 1.0, APEC environmental services work programme.

However, because of the number of “dual use” services involved in providing environmental services, many countries feel that this would entail unacceptable intrusion into the other GATS W/120 sectoral classifications, particularly those for business and professional services, construction services and education services. These countries suggest that this could have unwanted implications for the stability and predictability (and legal interpretation) of existing specific commitments made by GATS members in these sectors. It would also require development of clear criteria that could be consistently applied for determining when a “dual use” service may be said to be an “environmental” service (that is, used for environmental purposes), as a basis for determining the “likeness” or “unlikeness” of services with environmental end uses and those without. Given the difficulties involved, an alternative approach may be considered. It is outlined below.

The “core” plus “intrinsically related” approach to GATS classification

As an alternative to an “end use” approach, consideration could be given to using the emerging industry profile, as presented in Table 4, to develop general descriptions of “core” environmental services that reflect modern requirements and commercial realities. This could form the basis for efforts to update the W/120 sectoral classification for environmental services to cover, for example, the range of water-related environmental services, instead of simply “sewage services”. Future GATS negotiations in this area could then be undertaken using the updated “core” environmental services classification, giving due attention to the “intrinsically related” (but separately classified) services which are key to the delivery of the “core” services. The focus in the first instance would be on securing agreement on the list of services covered and their description, and then on reaching consensus to use it as the basis for a package of commitments. Thereafter, the task of correlating such a package with existing commitments (and associated CPC numbers) would essentially be a technical exercise.

It should also be emphasised that the approach outlined here – to modernise the existing GATS classification for environmental services without departing significantly from its underlying link to the CPC system or the vertical divisions between sectors – is only one option, albeit the one favoured by the majority of OECD Members. It is in any case clear that the existing classification is inadequate and needs to be supplemented by modernised descriptions and checklists of “core” and “intrinsically related” services, even though the latter are (and may need to remain) covered by other GATS sectoral classifications.

According to this logic, two principal objectives need to be borne in mind. First, preserving the self-contained sectoral lines of W/120, while, second, ensuring that due account is taken of environmental and commercial realities when revising the classification of the environmental services sector for use in the new round of GATS negotiations. This suggests that the appropriate path is to modernise the descriptions of the “core” environmental services (*i.e.* those not covered by the other W/120 sectoral chapters) along the following lines:

- Updating “Sewage Services” to cover water services for human use and wastewater management (the latter to include removal, treatment and disposal of household, commercial and industrial sewage and other wastewater and filtering/removal, treatment and disposal of solid waste from wastewater).
- Updating “Refuse Disposal Services” to cover non-hazardous and hazardous solid waste management services (including collection, treatment and disposal by various permitted means such as incineration, composting, landfill and recycling services including collection, processing and wholesale or retail resale of recycled materials).

- Updating “Cleaning Services of Exhaust Gases” to cover services for protection of air quality and climate (including installation, operation and maintenance of systems to monitor and control emissions from fixed sites, *e.g.* from power stations and industrial buildings, and implementation of control and reduction programmes for mobile emissions, *e.g.* cars and trucks).
- Updating “Noise Abatement Services” to cover noise pollution prevention, abatement and control services (including monitoring of noise and vibration levels and installation of reduction systems and programmes).
- Updating “Nature and Landscape Protection Services” to cover services for protection of biodiversity and habitat (including consultancy services and operational “programme” services for the implementation and review of strategies and systems to protect natural, rural and urban landscape and habitat, and public awareness campaigns).
- Introducing a new item from the general category “Other Environmental Services” to cover services for remediation and prevention services for polluted soil and water (including emergency response, cleanup and longer-term rehabilitation services and monitoring of effluent levels).
- Introducing a new item, “Services for Sustainable Resource Use” (including consultancy services and operational “programme” services for the implementation and review of strategies and systems to promote sustainable agriculture, fishing, forestry and mining and public awareness campaigns).
- Updating the residual item “Other Environmental Services not elsewhere classified” to provide relevant indicative examples (*e.g.* research, development and design services for cleaner technologies and products, and maintenance and repair services for environmental equipment).

Together with a modernised list of the “core” environmental services along these lines, a list of services could also be drawn up showing the “intrinsically related” (but separately classified) services which are key to the delivery of the “core” services. As Table 4 illustrates, such a list is likely to need to focus on architectural and engineering services (including design and project management services), computer modelling services, analytical and testing services and construction services. In pursuing such a “core” and “intrinsically related” approach, some changes to the overall boundaries of W/120 may nevertheless be needed. The prime example is recycling services, which are presently covered by W/120 as a minor element of distribution services. It is arguable that recycling services should be moved into a modernised GATS “core” environmental services sectoral classification.

Chapter 2

FACTORS IN INTERNATIONAL DIFFUSION OF ENVIRONMENTAL GOODS AND SERVICES, INCLUDING TRADE

International exchange of environmental goods and services (EGS) is conditioned by a number of factors, which are analysed below in terms of key supply- and demand-side factors. Policy interventions on the *supply* side are those that affect overall availability and the price of access, so that tariff measures and other trade-related measures that affect market access for EGS can generally be classified as supply-side factors. To the extent that delivery of EGS may rely on the establishment of a commercial presence in a market, investment restrictions or limitations are also relevant supply-side factors. Policies relating to development co-operation, export credits, innovation and intellectual property regimes, also affect the availability of environmental technologies and international trade in EGS. On the *demand* side, the market “pull” for this sector concerns the existence of domestic environmental regulations (including evolving international environmental standards) and their enforcement, consumer pressure (“green consumerism”) and community pressure. Sector analysts agree that demand-side factors are the most important in driving markets for environmental goods and services (see Box 2). The regulatory framework, including its design and enforcement, is the most significant of these (Johnstone, 1997; OTA, 1993).

Box 2. Trade issues for the transfer of seven clean technologies

Under the OECD's Technology and Environment programme, the extent to which trade policies, including intellectual property rights regimes, represented barriers to the diffusion of cleaner technologies was investigated. The following cleaner technologies were studied: fluidised bed combustion, oxygen delignification in the pulp and paper industry, reduction/elimination of the use of chrome in the leather tanning industry, aqueous-based cleaning to eliminate CFC use in the electronics industry, membrane cell technology in the chloralkali industry, ion exchange technology in the metal plating industry and direct reduction technology in the iron and steel industry.

Most exporters and importers surveyed expressed a preference for government action to lower or eliminate tariffs on cleaner technologies, waive local content requirements or foreign exchange restrictions and strengthen patent protection. Generally speaking, however such trade policies appeared to have little effect on technology transfer. It was clear in all seven cases that the key disincentives to diffusion of cleaner technologies, cited by exporters and importers alike, was the lack of environmental requirements and/or enforcement in recipient countries. Industries had mainly imported cleaner technology because new domestic environmental standards forced them to do so. In the case of CFC alternatives, the Montreal Protocol was largely responsible for the introduction of the aqueous-based cleaning technology.

Source: OECD, 1992c.

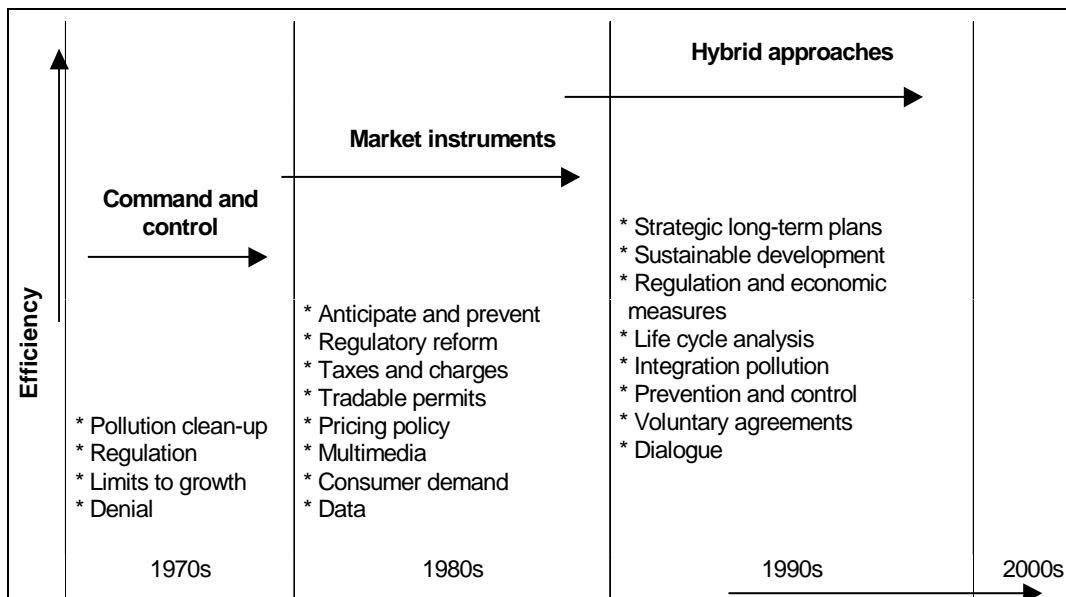
Demand-side factors

Trends in environmental policy

This section recalls the evolution of environmental policy in the OECD area since the 1970s and describes relevant policy instruments (Figure 1). The choice of policies for the kind of environmental

goods and services demanded had direct consequences and the changing direction in environmental policy has implications for the current and future development of EGS markets.

Figure 1. Evolution of environmental policy in OECD countries



Source: OECD, 1997a.

Pollution control and end-of-pipe hardware

Early environmental policy used detailed regulations which specified source-based performance standards. That is, maxima were set for individual media and for each source of emissions within a particular plant. Limits were usually accompanied by a design or technology-based standard or, if these were not specified *per se*, the polluter found he was required *de facto* to conform to a given technology, since he was required to use the “best available technology” (BAT).

The result was standardised, uniform end-of-pipe technology to treat or dispose of the pollutant. During a first stage, development – and enforcement – of such regulations provided a solid basis for developing an environmental goods industry, which concentrated on hardware. Later impetus for innovation or technological development basically came with the upgrading of standards or tightening of enforcement. A firm that had made the necessary investment in plant to meet prescribed emission limits for each of the individual media would otherwise have had no incentive to improve its performance.

Working up detailed regulations is a long and complex process, which requires regulatory agencies to have strong technical capabilities for each environmental medium, and it often became a process of conflictual negotiation. This approach to setting environmental regulations is usually termed *command and control* or *specified compliance*. Once the long process of working out the limits was completed, they were reasonably effective in pushing polluters rapidly towards the new standards and therefore popular with the legislator and the public. However, because this approach involves new investments in abatement equipment, it maximises the costs of compliance.

With experience, many OECD countries have undertaken regulatory reform. Emphasis has moved to *ambient standards*, where limits for a single source were replaced with overall limits for a plant or particular location taken as a whole (facility bubble). This provides an incentive to improve performance in a more cost-effective manner, first by cleaning up the dirtiest sources, where the marginal cost of reducing a unit of pollutant is smallest. Single media-based limits have increasingly been replaced by a multimedia approach, whereby managers (and the regulator) can take a broader view of all emissions from the plant, introducing flexibility and cost effectiveness.

In this period, use of economic instruments, such as taxes, charges, tradable permits, etc., has grown. The main purpose of economic, or market-based, instruments is to change behaviour by punishing (or rewarding) in monetary terms. By taxing an environmental “bad”, these provide an ongoing incentive to find ways to improve environmental performance.

Nonetheless, emphasis during this period was essentially on controlling pollution, whether by setting limits or taxing pollutants. The result in terms of the equipment industry was development and sales of goods which at times incorporated sophisticated technologies but were “add-ons”. Designed to reduce emissions and effluents downstream, without modifying processes or inputs, they constitute the family of end-of-pipe environmental goods.

From pollution control to pollution prevention: cleaner production and products

By the early 1990s, many OECD Members had begun shifting the emphasis of environmental policy towards pollution prevention. In 1991, based on a proposal of OECD Environment Ministers, the OECD Council issued a Recommendation encouraging OECD governments to practice “integrated pollution prevention and control”¹. A priority area of concern was promoting multimedia regulation of polluting sources, so that all environmental pollution and waste requirements for a particular source were assessed at the same time. The Recommendation specifically emphasised pollution prevention to ensure that government regulations provided an incentive for sources to install cleaner technologies.

The principal approaches to pollution prevention and cleaner technologies can be broken down into five main types:

- Simple operating and housekeeping processes.
- Process modification.
- Changes in plant equipment.
- Substitution of less harmful raw materials.
- Redesign of the end product itself.

By concentrating on the entire production process and treating inputs, such as raw materials and energy, as costs to be reduced, systemic changes can be introduced which reduce pollution at the source. Redesigning products or modifying processes and using less toxic inputs and recycling/recovering outputs help to reduce waste and other unwanted pollutants.

Much of the early savings and pollution reduction arises from housekeeping operations, *e.g.* fixing leaks, conserving energy, separating waste streams to allow recovery, and does not involve sophisticated technology. Rather, managerial, auditing and engineering know-how, *i.e. services*, are put to work to make systemic modifications in process. These represent incremental improvements, often the most cost-effective.

In later phases, technologies are used which involve changing the production processes, including reductions and changes in inputs of raw materials and energy. Still later stages involve product innovation, where a less polluting or more recyclable product is developed.

Shifts in demand due to regulatory reform, including private sector initiatives

OECD governments have thus been adapting their arsenal of environmental policy instruments to promote pollution prevention, including the adoption of technologies for cleaner production and products. It is beyond the scope of this chapter to develop these in detail; however, the principal axes of support to pollution prevention and cleaner technologies are briefly set out here (based on OECD, 1992a; 1994c; 1995a; 1997c) to complete the picture. Environmental regulatory reform has emphasised:

- Development of a long-term environmental strategy to set a framework providing strong stimulus for cleaner technologies (*e.g.* the Dutch Environmental Policy Plan Plus).
- Greater use of economic instruments, such as taxes, charges and tradable permits.
- Promotion of voluntary agreements (whereby sectors of the economy pledge to behave in ways designed to achieve environmental goals that are mutually acceptable to government and other interested parties).
- Institution of a mechanism for measuring and reviewing the effects of the regulatory approaches which includes the power to initiate changes; such a mechanism may incorporate a managerial accounting system to provide a unified means of monitoring the effects of various policy tools.
- Emphasis on correcting market failures of imperfect information concerning cleaner technologies (OECD, 1998a).
- Removal of policy distortions which have favoured “end-of-pipe” solutions to environmental protection.
- Public awareness campaigns and education and training programmes.

In sum, governments create demand for pollution prevention and cleaner technologies through a favourable regulatory environment, *i.e.* one that provides appropriate incentives (and limits disincentives) (OECD, 1995b, p. 67).

Shifting demand in emerging economies

The preceding discussion focuses on the fundamental role of the regulatory framework in the OECD area. What is the situation for developing countries and other emerging economies, where environmental protection laws are newer or, while impressive on the books, seldom implemented or enforced? Here again, the trend is towards making environmental policy more cost-effective. UNEP’s programmes emphasise cleaner production in developing countries. In the follow-up to UNCED and the OECD Technology and Environment programme, DAC donors have also worked to promote cleaner production in developing countries by identifying the role that development co-operation can play and exchanging donor and recipient experience (OECD, 1995a).

It is important to encourage the prevention of pollution in developing countries for a number of reasons. Abatement and retrospective cleanup have been expensive in the OECD area, and it is even

more necessary for developing countries to seek cost-effective, cleaner production techniques and to avoid the need for cleanup. It has been suggested that recipient countries may not have been sold the most appropriate environmental goods and technologies. It has also been suggested that they may have received technical assistance or promoted command and control policies that did not adequately address their environmental problems in the most cost-effective way. Therefore, donors are reorienting their efforts to integrate upstream, preventive and needs-driven techniques.

Beyond these general trends, the needs of developing countries can be distinguished by looking at types of environmental service, stage of development, financial capabilities, etc. One industry analyst (Ferrier, 1996) has found that demand in emerging environmental markets tends to follow the following progression: water delivery, wastewater treatment, air pollution control, solid waste services, hazardous waste and finally remediation. If so, demand for basic environmental services can be expected to continue to grow as developing countries (many of which are still in the first stages) progress through these stages as they implement environmental protection programmes.

Others, however, would point to the changing emphasis in environmental policy, to access to OECD experience and to the possibility of technological “leapfrogging”. Dynamic developing economies with high growth rates and high turnover of manufacturing capital stock in particular may be able to invest in new processes based on cleaner techniques and perhaps by-pass end-of-pipe solutions (ten Brink and Haines, 1997).

In any case, there are likely to be countries that will generally need end-of-pipe solutions. Basic water and water and waste treatment services are often still rare in the poorer parts of the third world. As much of Central and Eastern Europe needs waste treatment facilities and remediation of past environmental neglect, traditional pollution management will be a necessity for some time.

Effects of the shift in demand on the environmental goods and services industry

As OECD Members reform their domestic regulatory frameworks and modify their environmental policy instruments, governments are recognising the significance of policy tools, such as those that encourage pollution prevention, for shaping the demand for environmental protection. In developing countries, environmental protection programmes are slowly becoming a reality. The need for basic services remains strong and, in the more advanced developing countries, pent-up demand for both cleanup services and cleaner production techniques is making itself felt.

In both the OECD area and in developing countries, either reform or effective implementation of environmental regulations has altered patterns of demand for environmental goods and services. In what has been a high-growth industry, certain segments are maturing, following saturation of demand in certain areas. Consolidation and mergers and acquisitions, as well as other well-known industry retrenchment patterns, have appeared where actors exceed market possibilities. At the same time, the opening up of niche markets offers opportunities for specialisation.

The balance between goods and services is shifting towards services and the more successful companies are offering packages of goods, systems and services. In many markets, it is increasingly difficult to sell basic products. Emphasis on the systemic, “holistic” approaches that are integral to pollution prevention leads to greater need for software and know-how and for a growing range of services: auditing, measurement and design, as well as consulting and engineering services. Companies offering these services are becoming increasingly internationalised, and the large multinational service companies have successfully entered many foreign markets.

As environmental protection relies less on end-of-pipe solutions (Ferrier, 1996; ten Brink and Haines, 1997), such goods are sold less often on their own; rather they are part of broader strategies for cleaner production. For example, sales of big scrubbers will decline in favour of new management processes, which use clean fuels and are integrated in new capital equipment. Demand is likely to grow for measuring services and analytical devices such as meters.

While this largely describes the situation in the OECD area, demand and supply patterns are also changing in developing countries and in Central and Eastern Europe. At one end of the spectrum, lack of resources and the need for basic goods will concentrate demand on traditional environmental services such as water. More traditional pollution management goods will continue to be in demand in middle income developing countries, and simple, cost-effective housekeeping management techniques to reduce energy and other inputs have, in donors' experience, proved popular at all stages of development. In dynamic developing countries, rapid growth will allow for investment in new, cleaner processes. Competition from developing countries is also emerging as they establish their own environmental industries. This pattern can be expected to continue, with industries moving into the less technological products that characterise the bulk of the environmental goods industry.

Supply-side factors for environmental goods

Tariffs

Average tariff levels for the entire illustrative list of environmental goods are set out in Annex 2, which shows this information for three groups: the Quad (United States, the European Union, Japan, Canada), three other OECD Member countries and seven emerging economies. The *bound* level represents the upper limit at which a country's tariff was fixed under Uruguay Round commitments. The *applied* MFN tariff is the 1996 (non-preferential) level. Table 5 summarises the averages for the bound and applied tariffs for the three country groups and the *Manual* groupings.²

Table 5. Average tariff levels for environmental goods
In *ad valorem* percentage terms

	Quad		Korea, Mexico, Turkey		Emerging economies	
	Bound End UR	Applied MFN 1996	Bound End UR	Applied MFN 1996	Bound End UR	Applied MFN 1996
Pollution management group	2.3	2.9	24.7	8.8	29.4	19.6
Air pollution control	2.0	2.4	24.4	8.1	28.5	16.3
Wastewater management	2.6	3.2	24.5	9.2	27.9	6.8
Solid waste management	3.0	4.0	0.4	9.7	31.1	20.2
Remediation and cleanup	2.6	3.0	29.0	9.6	30.9	22.7
Noise abatement	2.0	2.1	22.1	9.0	33.1	27.6
Monitoring, analysis and assessment	1.4	2.5	17.7	7.3	25.1	13.7
Other groups	3.0	4.1	29.5	9.1	31.0	22.3
Overall environmental	2.5	3.4	25.2	8.9	28.7	18.0

Quad: Canada, European Union, Japan, United States.

Emerging economies: Argentina, Brazil, Chile, Malaysia, India, Indonesia, Thailand.

Source: Annex 3: OECD calculations based on WTO and UNCTAD databases.

As Table 5 and the detailed table in Annex 2 show, average tariff levels in Quad markets are generally low for goods with high relevance to the environmental industry. On individual goods (calculated here for HS-6 product categories), applied rates are generally 6% or less, and often even lower than a “nuisance” level of 3%. Tariff “peaks” (*i.e.* tariffs much higher than average rates for industrial goods) in the range of 10-12% can be found for only a few non-chemical products entering the EU and Canadian markets. Tariffs on chemicals retained on this list (essential for many air and water treatment operations) can be found in three of the four Quad markets at rates between 6% and 11%. Two-thirds of Japanese tariffs in this sector are zero.

Uruguay Round bound tariff levels are mostly lower, indicating commitments already undertaken by the Quad to reduce, and in a few cases eliminate, remaining tariffs. With very few exceptions, tariffs on these environmental goods were bound by the Quad at levels sometimes well below 6%. Relatively high tariffs will remain on certain brooms, dustbins, etc., in the US and Canadian markets, even after full implementation of the Uruguay Round commitments.

Analysis of a group of three other OECD Members shows a different situation. Bound tariff levels after full implementation of Uruguay Round commitments will remain high and well above the applied levels in 1996. In this group, the average of applied and bound tariff levels are 9% and 25%, respectively; only Korea made commitments during the Uruguay Round to bind tariffs at levels averaging less than 10%.

Analysis of a group of seven emerging economies shows a similar pattern, but with higher levels of protection. Average applied levels are 18%, and bound commitments average 29% for the sector as a whole. Nonetheless, many applied rates are 35% and 40%, with many Indian tariffs as high as 100% or 150%. In ascending order of their applied rates, the seven emerging economies rank as follows: Malaysia (6), Indonesia (7), Chile (11), Thailand (12), Argentina (13), Brazil (14) and India (61).

Finally, the goods in this table are generally either capital goods or intermediate inputs for manufacturing. As imports of capital goods and other essential inputs, they play a key role in domestic industry and tend to have lower tariff levels than consumer goods, for which governments often offer protection to domestic producers. Generally, developing nations are less likely to have competing domestic environmental industries. For certain goods, such as those summarised in the monitoring, analysis and assessment category (*e.g.* precision instruments), tariffs are noticeably lower than for other categories. For these high-tech goods, there is even less domestic production than for other environmental goods.

Public procurement

Another major supply-side concern with trade policy implications arises from government procurement practices (OECD, 1996*d*). Within the environmental industry, these are of greatest impact in public utilities such as water supply and treatment, waste collection and disposal, energy-efficient systems and clean process technologies, where governments may face political pressure to rely on domestic, usually local, suppliers.

Public procurement practices are covered by various sets of national and multilateral rules, all of which are limited in scope. The WTO Annex 4 (*i.e.* plurilateral) Agreement on Government Procurement (AGP) has 22 (mostly OECD Member) signatories, together with threshold values for application of its rules, excluded sectors and a limited number of sub-central bodies to which it applies.

The precise extent of discrimination in public procurement is difficult to measure. Overall, for non-defence industries, efforts to quantify the extent of procurement bias have found differences from private-sector import patterns which indicate a degree of preference equivalent to tariffs of 8-18% for the principal OECD markets (Francois *et al.*, 1997) in an analysis that took into account only central government procurement patterns. A survey of US air pollution control firms reported procurement practices in both the public and private sector to be serious problems (US International Trade Commission, 1995). Other considerations such as labour and investment policies influence purchasing decisions by many public authorities.

Public services with the greatest share of demand for environmental services are often provided by local municipal governments,³ which are not subject to AGP disciplines. Local water supply, wastewater treatment and solid waste disposal – the three largest environmental services sectors – represent significant areas of potential barriers to trade, though a trend towards privatisation means that they may increasingly fall under WTO disciplines. The electric power industry is a major buyer of environmental goods and is neither universally private nor generally listed among the state entities covered by the AGP.

Quantification of trade barriers arising from procurement practices is difficult. However, the importance of public participation in the environmental services sector and the frequently expressed view of industry observers suggest that government procurement favours local firms for a number of environmental services.

Technical barriers to trade

In a sector where markets are driven by regulations, industry concerns that such regulations serve as technical barriers to trade are not surprising. Differences in countries' standards can inhibit imports by eroding economies of scale. Furthermore, enforcement and regulation processes create potential costs, delays and uncertainties that may act as procedural barriers to trade. The WTO Agreement on Technical Barriers to Trade (TBT) promotes practices designed to avoid unnecessary effects on trade.

Domestic environmental laws and regulations often determine the kinds of good used to meet environmental requirements, and the environmental goods industry in a producing country tends to be adapted to meeting the requirements of that country's laws and regulations. This affects trade in environmental goods, as evaluations of industry competitiveness repeatedly find that experience and technical rigour, attributable to strict domestic environmental regulation, are important determinants of competitive strength. Strict Japanese regulation of SO_x and NO_x pollution has made Japanese firms export leaders in smokestack scrubbers; the US industry is particularly competitive in hazardous waste treatment owing to US toxic regulations; UK and French water supply and water treatment firms have become world leaders (Ferrier, 1996; Office of Technology Assessment, 1993).

The way that environmental standards are designed can strengthen or limit the possibility of their becoming technical barriers to trade. On the one hand, if environmental standards are established so as to match the strengths of domestic (or favoured foreign) suppliers, there is a risk that the regulatory process may create technical barriers to trade. Developing country markets can be affected if technical assistance to develop environmental regulatory frameworks promotes regulations or technical specifications that favour the donor country's environmental goods producers.

However, if different technologies give equivalent results in terms of environmental quality, a purchaser should be able to choose freely among environmental goods from foreign or domestic sources and not be required to choose a specified technology (*e.g.* that of a domestic producer).

Incentive-based approaches encourage firms to seek the most cost-effective ways to limit environmental damage. Environmental policy in OECD countries has been moving in the direction of standards that set a benchmark for the quality of the surrounding environment (ambient standards) and use of market-based incentives. This represents a shift towards more trade-friendly environmental policy instruments.

Export promotion policies, development assistance and export credits

Practically all OECD Members have policies aimed at promoting exports, including general market information programmes, export credit schemes and tied aid. While these do not necessarily represent barriers to trade, particularly with the progressive tightening of tied aid and export credit disciplines over recent years, they could, in theory, introduce distortions in resource allocation by favouring exports from a country with higher costs which displace exports of a producer with a recognised comparative advantage. Business continues to feel that export markets may not be genuinely open owing to the activities of export financing institutions and that the playing field needs to be levelled by addressing competitors' practices, including for tied aid (Ferrier, 1996; OTA, 1993). It is difficult to determine whether these concerns are largely due to market distortions or whether they reflect the general difficulties of doing business in foreign markets and the relative competitiveness of different segments of the environment industry in various OECD countries. In general, OECD countries recognise that small and medium-sized enterprises (SMEs) have a relatively difficult time setting up the necessary infrastructure to do business overseas and most have special programmes targeting SMEs. To the extent that a significant part of the environment industry is made up of SMEs, dissatisfaction may be a reflection of the more general problem.

Many OECD trade promotion agencies target environmental exports. Others include environmental exports within their ordinary trade finance operations. A number of more general trade promotion programmes that provide information explicitly aim at transferring environmental technology. Activities such as market information, training programmes for foreign customers or domestic exporters and advising on foreign standards may be beneficial. When concentrating aid on SMEs, such programmes help correct the market failures of imperfect information in a fragmented environmental goods industry (OECD, 1998).

The OECD Arrangement on Guidelines for Officially Supported Export Credits (the Arrangement) helps to limit the distortions arising from official support of export financing by providing a framework for official export credits which sets limits on the terms and conditions for credits of two years or more. Its main purpose is to prevent an export credit race in which exporting countries compete on the basis of granting the most favourable financing terms rather than on the basis of the price and quality of the product. Through tied aid, developing countries receive bilateral assistance to purchase exports from the donor country. Disciplines on tied and partially untied aid were introduced into the Arrangement in 1991. Under these additions (known as the "Helsinki Package"), concessional finance for commercially viable exports is in most cases prohibited. Tied aid is limited to funding projects which are not commercially viable but are developmentally sound; a minimum concessionality level for individual transactions (35%) is imposed. Further, its use was directed away from richer developing countries, which should be able to attract commercial credits.

Despite progress since the adoption of the Helsinki Package, it has been alleged that tied aid has been provided for goods and projects that were mainly undertaken to promote trade and not primarily for development assistance (US Office of Technology Assessment, 1993; 1994; Industry Commission, pp. 173-174; Ferrier, 1996). In late 1996, the *ex ante* guidance for tied and partially untied aid was agreed. This codified four years of experience with the Helsinki Package and provided guidance for

project planners, aid agencies, etc., to help them determine at an early stage whether a project would likely be determined commercially viable and therefore ineligible for tied aid.

Table 6 shows that between 1992 and 1996, Development Assistance Committee (DAC) donors extended USD 22.7 billion to water and water treatment projects, renewable energies and general environmental protection, the three categories of the DAC's Creditor Reporting System that are clearly distinguishable as "environmental". Of this amount, USD 14.6 billion was for capital investment, generally equipment. About one-quarter went as tied aid, *i.e.* assistance linked to purchasing of exports from the donor country, or as partially untied aid, *i.e.* assistance linked to exports from donors and from substantially all developing countries. Another 5% was in the form of "mixed credits", which were also used to support exports of equipment from OECD donor countries. Export credits for equipment for renewable energy and general environmental protection were extended by France, Netherlands, Norway and Spain. In addition to these four donors, other Members – Australia, Belgium, Canada, Finland, Italy and Sweden – extended export credits for water and sanitation. China was the largest recipient of donor export credits for environment-related equipment.

Table 6. Environmental goods supported by DAC Members' bilateral development aid, 1992-96

USD millions

	Water supply and sanitation	Renewable energy	General environmental protection
Total bilateral aid	15 727	1 320	5 645
Equipment	11 115	1 206	2 328
Tied or partially untied	(2 807)	(242)	(424)
Mixed credits	(599)	(57)	(44)

Source: DAC Creditor Reporting System.

Notifications by OECD Participants to the Arrangement (other than those reported above as "mixed credits" to the OECD's DAC), are reported in confidence. Figures are not disaggregated by project type, so that it is not known how much goes to support exports of environmental goods. Overall, for exports of goods in all sectors, the officially supported long-term (repayment of five years or more) credit values extended by Participants have oscillated between 17 and 20 billion SDR since 1992. Long-term export credits are typically given to support the export of large-scale capital goods and services, such as passenger aircraft, power generating plants, steel plants, pulp and paper mills, mining machinery, cement plants and chemical plants. Such support has to be extended in accordance with the disciplines of the Arrangement.

Intellectual property rights

Host country failure to protect intellectual property of exporters and investors is occasionally listed as a factor limiting exports of environmental goods and services. For example, a survey of producers in the water and waste industry found that lack of such protection occasionally represented a competitive disadvantage for producers who tend to offer more sophisticated technology in that industry segment. If producers cannot expect to generate returns from their proprietary expertise or technology, they are likely to be reluctant to provide the services or goods (US International Trade Commission, 1995). Or if they do transfer technology, they may prefer to keep it in house and not

license it to subcontractors or other firms, thereby creating a situation of technological “enclaves” (Johnstone, 1997, p. 251).

In practice, however, the environment industry has not, overall, identified intellectual property protection as a priority problem. Nor does it seem to be subject to the problems of large-scale piracy reported for some other goods. Even when cleaner technologies are under patent, the patent and royalty fees do not appear to be significant obstacles either to importers or exporters of industrial technologies in comparison to the cost of capital investments in new plant and machinery (OECD, 1994b, pp. 7-8). The importance of services may offer some protection against spin-off or copying and limits opportunities for misappropriation of expertise. Sellers generally must be able to apply general knowledge of the technology to the client’s specific situation, and goods sales are often part of a package provided by engineering or consulting firms. Co-ordination of the various parts, which is the key to the project’s success, remains in the hands of the firm. The size of projects may represent significant economies of scale, which also tends to discourage illegal copying.

Innovation and technology diffusion support

Most OECD countries’ innovation and technology diffusion policies involve granting financial support for increased supply of cleaner technologies. Table 7 shows the kinds of instruments used: whereas all Members surveyed make project grants, favourable or secured loans are also a popular instrument. Several programmes have mandated evaluation and review mechanisms to ensure that support does not degenerate into subsidies for the implementation of standard technologies (OECD, 1997a).

Table 7. Financial support instruments for promoting cleaner technologies

	Project grants	Favourable interest loans	Secured loans	Royalty grant or loan	Tax relief
Australia	X	X			
Austria	X				
Canada	X	X			X
Denmark	X				
Finland	X	X			
Germany	X	X			X
Greece	X	X			
Italy	X	X			
Japan	X	X			X
Netherlands	X				X
New Zealand	X				
Norway	X		X		
Sweden	X	X	X	X	
Switzerland	X				
United Kingdom	X				
United States	X				
European Union	X				

Source: OECD, 1994c.

The interaction between technology policy and environment policy is currently a focus of discussion at the OECD and in national capitals. Starting from the widespread recognition that environment policy instruments differ widely in their effects on innovation and diffusion of technologies, the policy questions are how to design environmental policy instruments that encourage innovation and how innovation and technology diffusion policies can provide cost-effective, non-trade-distorting support to further the availability and adoption of cleaner processes and products.

For example, if command and control approaches tend to inhibit innovation, they can encourage rapid diffusion of environmental technologies. On the other hand, economic instruments – which in theory provide continuous incentives for environmental improvement – have had to date only mild technology effects, largely because they have not been set at high levels or used extensively. Early indications are that voluntary agreements have not brought much pressure for technological change, although new forms of “environmental compacts” may hold more promise (OECD, 1997b). Particular constraints on innovation arising from environmental regulations include: emphasis on a single medium; implicit biases against new technology; pervasiveness of BAT standards, which *de facto* maintain the technological *status quo* (see Box 3).

Box 3. Policy coherence for cleaner technologies: bias in favour of end-of-pipe goods?

A new “win-win” policy initiative, such as that to liberalise trade in environmental goods and services, should, in order to ensure maximum coherence, take account of past experience with government interventions designed to serve more than one policy objective. Thus, there are examples of the use of tied aid and mixed export credits whose motivations are both to foster development co-operation and to promote national exports or export promotion programmes more generally, including officially supported export credits; or innovation and technology development and diffusion policies targeting environmental technologies.

Donors have now for some time used their development co-operation funds to support environmental protection in developing countries. Tied aid and mixed credits (extending officially supported export credits with bilateral aid) are still widely used to promote exports from firms in donor countries. Developing countries have been very receptive to pollution prevention solutions, particularly the simpler ones involving housekeeping. Experience over recent years has led donors to place greater emphasis on extending “software” rather than “hardware”, *i.e.* more technical assistance for capacity building and less end-of-pipe, equipment-based solutions.

An OECD study, “Export Promotion and Environmental Technologies” (1994d), found that, on the basis of the limited information available, most environmental technology supported by government export credit programmes appeared to be pollution control technology, rather than pollution prevention and clean technology. Among the pollution control technologies supported by export credits were: slag and ash disposal, water clarification, oil spillage control equipment, fume scrubbers, noise shielding, reforestation over refill of open-cut mines and wastewater/sewage treatment facilities. UNIDO also found that developed countries underestimate developing country markets for pollution prevention rather than end-of-pipe technology. In part this finding may also be attributable to the lack of transparency in export credit reporting and data collection, *i.e.* the actual situation is poorly known. Or again this may be because export credits are designed to lower interest rates and lengthen repayment periods for large and expensive plant. However, the OECD study also argued that there was no inherent reason why export credits and general export promotion programmes could not also be targeted to pollution prevention technologies and cited examples of some cleaner technologies which have been supported: renewable energy projects, fluidised-bed combustion, oxygen delignification, direct reduction in iron and steel technologies, capture of methane in oil production, etc.

In their support of innovation and technology development and diffusion, OECD governments increasingly look to environmental technologies. Limited reports suggest that past efforts tended to support end-of-pipe solutions and only small amounts went for pollution prevention R&D. There may be several reasons. In part, setting about to research a single medium and easily identifiable pollution problem may, by its nature, bias R&D in favour of end-of-pipe solutions, particularly as the pollution prevention R&D agenda is not always well known. Moreover, central government monies may target state responsibilities, such as military pollution, and focus on remediation. Today, programmes are addressing pollution prevention and process technologies in response to perceived under-investment by firms. The situation is being investigated at the OECD, through its Working Group on Innovation and Technology Policy.

Source: Gamboni, 1993; Heaton and Banks, 1997; OECD, 1994d; 1995a; 1997a; 1997b; OTA, 1994; Wallace, 1995.

Another essential aspect to ensuring the supply of environmental technologies involves support to technology diffusion. A recent survey of programmes for the diffusion of environmental technologies generally concluded that programmes that produced results and could be effectively emulated were those that promoted clean technologies; they entailed radical changes in processes or products and also produced the most far-reaching benefits to the firm (eco-efficiency). It was also found that an important aspect of promoting diffusion involved giving firms both direct and indirect financial incentives (seed money, accelerated depreciation of investments, minority equity by government, use of environmental investment funds) to adopt new techniques. The best overall approach was found to be provision of services that integrate information sources and technology diffusion services (OECD, 1998a).

Supply-side factors for environmental services

To gain an overall picture of barriers in the sector, the trade and investment regimes of OECD Members and a range of non-OECD members [Argentina, Brazil, Chile, China, Egypt, Hong Kong (China), India, Indonesia, Malaysia, Morocco, the Philippines, Singapore, the Slovak Republic, South Africa, Thailand] were examined and country inventories were made. This section summarises the main types of supply-side barriers facing the environmental services sector. A more detailed, “illustrative list” of such measures can be found in Annex 5.

Cross-border supply

It is likely that at least some environmental services are provided through cross-border supply, generally via fax, post or the Internet. Cross-border supply may be particularly relevant for the transmission of architectural and engineering specifications and design plans for environmental projects, reports of specialist environmental consultants, environmental quality testing and analysis results, computer modelling simulations, etc. However, many environmental services are *in situ* activities for which cross-border supply is generally not technically feasible (*e.g.* the processes for water treatment, waste disposal, emergency cleanup services, construction and installation of environmental equipment, etc.).

Because cross-border supply of services typically utilises mass communications systems (*e.g.* fax, post, Internet), governments may be able to do little to prohibit or regulate these strictly (unlike cross-border supply of goods, which cross borders physically and can be inspected, weighed and subjected to duties at customs stations). Limitations registered in various GATS country schedules indicate that the principal restrictions on cross-border supply of traditional environmental services are regulatory measures such as:

- Requirements that the services so supplied be certified or authenticated by locally registered service providers (in effect, this requires supply through established professional networks or partnership arrangements).
- Requirements that service providers supplying services by cross-border means already have a commercial presence in the “importing” country (in effect, this means that transfer of services is permitted between affiliates of a company based in different locations).

The rise of the Internet in the past few years as an open platform for international provision of information, reports, designs, etc., which is independent from existing “closed” leased-line networks between affiliated companies, greatly increases the scope for cross-border supply of certain services. While it would prove difficult to prohibit or severely restrict cross-border supply of such services via

the Internet, short of blocking access or mounting costly checking procedures, supply may be inhibited by government-mandated regulations, including maintenance of monopoly or exclusive Internet service provider (ISP) rights (typically through a state-owned telephone company) or unduly restrictive requirements on the exchange of data by companies using the Internet to supply their services.

GATS specific commitments for the services comprising or contributing to environmental services date from the Uruguay Round. Far more ES-related services are “unbound” than are bound as no restrictions, but countries diverge markedly in terms of regarding cross-border supply of such services as technically feasible.⁴

Box 4. Environmental services: requirements and restrictions

General (“horizontal”) foreign investment provisions and requirements that may be applicable

No general screening, prior authorisation or registration of proposed foreign investment, or other restrictions.

Uniform screening of investment applications by both domestic and foreign investors according to the same criteria.

Automatic approval after notification and reporting on foreign investment intentions.

Screening of foreign investment proposals:

- Automatic approval except for national security screening.
- Automatic approval below certain value thresholds, but subject to approval above certain value thresholds.
- Approval based on policy guidelines and overall national interest considerations but without an economic needs test or local participation requirements.
- Automatic approval except for specific authorisation or concession requirement for foreign investment in public entities or public works, newly privatised companies or government-contracted services.
- Approval based on economic needs test or “net national benefit” criteria.
- Approval subject to the foreign investor agreeing to specific performance requirements, e.g. export achievements, use of local goods, services or personnel, formal transfer of technology.
- Approval required for full or majority foreign ownership.

Full foreign ownership not permitted, joint venture with local partner mandatory.

Majority foreign ownership not permitted, joint venture in which local partner has majority stake mandatory.

Only acquisition of existing companies permitted, no new establishment permitted.

Only acquisition of existing companies permitted, with foreign equity participation limited to minority stake.

Case-by-case authorisation at political level with ceilings on foreign equity participation varying by sector or within sectors.

Reservation of some sectors or activities, state-owned enterprises to be privatised, or government-contracted services, for investment only by nationals or residents.

Sector-specific restrictions on foreign establishment/investment

Economics needs test for approval of foreign investment in solid waste management services, air pollution services and technical testing and analysis services.

Numerical quotas for the number of operating licenses available for providers of industrial wastewater treatment services; applies to local and foreign investors.

Only joint ventures permitted for supply of environmental, architectural and engineering, construction and related engineering services.

Regulation of contracts by value and number through an annual licensing system in the construction and engineering sector.

Nationality and/or residency requirements for foreign establishment/investment, e.g. for companies operating public utilities or to gain the right to practice professional services such as architecture and/or engineering.

Requirement that foreign businesses hire specified ratios of domestic staff to foreign staff.

Reservation of some service sectors or activities for nationals or residents.

Source: GATS schedules.

Establishment of commercial presence

The majority of international trade in environmental services must take place through commercial presence, including that of service professionals. Thus, general foreign investment requirements, as well as sector-specific features, are very relevant to international trade in environmental services. These can include conditions for approval of foreign investment and limitations on the level of foreign ownership, on the type of legal entity required, on the ownership of specific assets and on the scope of a foreign company's operations. Box 4 summarises the general foreign investment provisions and requirements applicable to environmental services and lists the main sector-specific restrictions affecting foreign investment to establish commercial presence for environmental services.

Entry and temporary stay of services suppliers

Restrictions of this type generally arise from a country's overall immigration regime. Consequently, specific commitments under the GATS tend to be made at the "horizontal" level (*i.e.* applying to all service sectors), with occasional sector-specific qualification of a more or less liberal nature. The information in the country inventories for this category is derived from GATS schedules, supplemented in a number of instances from other sources. Common examples of specific conditions for approval of entry and temporary of service suppliers are summarised in Box 5 below.

Box 5. Conditions typically placed on supply of services by intra-corporate transferees and other professionals

Approval and labour market testing required for technicians, highly qualified professionals, managers and specialists.

Residency requirement for intra-corporate transferees and requirement that the foreign company employ specified numbers of local staff.

Requirement that nine out of ten staff employed by a foreign company must be host country citizens.

Authorisation is subject to economic needs test for foreign managers and technical experts.

Only intra-corporate transferees permitted, subject to a limit of two foreign transferees per operation and training of local staff.

Authorisation is subject to the non-availability of local personnel and training requirements.

Residency requirement for at least one director of a foreign company, local manager and resident agent requirements.

Authorisation of intra-corporate transferees subject to performance requirements (employment creation, transfer of technology, ongoing level of investment).

Source: GATS schedules.

Registration and licensing requirements

Business registration requirements usually arise from taxation and financial regulatory regimes. In some sectors, additional requirements for licensing businesses and professionals for operation/practice arise from consumer protection and public health and safety regulations. Where these apply equally to both foreign and local suppliers, they can be seen as part of the overall regulatory environment for conducting business. However, where registration and licensing requirements for foreign businesses are not automatic and thus subject to approval (or quotas), they may also have the intent or effect of protecting local companies from competition. Some registration/licensing requirements arise from general or sector-specific aspects of foreign investment regimes.

Business licensing requirements

Licenses and permits are a pervasive feature of business regulation in most countries, in that most jurisdictions require a broad range of business activities and professions to obtain licenses for establishment, expansion and ongoing operation. Typically, there are both generic licensing requirements which apply to all businesses and specific requirements which apply to a particular sector or activity. Mandatory licensing requirements are created under government authority, although in some instances they may be operated by private business or professional associations.

A principal rationale for licensing is the notification property of licenses, which facilitates monitoring and enforcement of compliance with regulatory frameworks (*e.g.* taxation, health and safety, consumer protection). Notification/registration requirements usually involve supplying information to a specified agency and compliance with general requirements, *e.g.* relevant health and safety, company and taxation legislation. Licensing typically involves the supply of information via an application to a specified agency, approval prior to undertaking the licensed activity, compliance with minimum standards and enforcement of such compliance. Box 6 provides an indicative list of the general business licensing requirements.

Box 6. Environmental services: indicative list of general and specific business licensing requirements

General requirements

Bearing in mind that an environmental services provider may be *inter alia* an operator of a water or waste treatment plant, an engineering firm, an environmental consultancy firm, etc., examples of “generic” licensing requirements that may apply across a jurisdiction – and thus to direct providers of environmental services – include:

- Registration of business name.
- Planning and building approval procedures for new or expanded businesses and approval for access to utilities.
- Various taxation registration requirements, including for employee income tax, company tax, goods and services tax or value added tax, wholesale sales tax, payroll tax, state and municipal tax, etc.
- Company registration requirements, depending on company size, relating to financial disclosure, risk insurance, etc.
- Trading license and permits to manufacture, import, export or sell specific goods and services.
- Registration of premises for commercial purposes, and licenses or permits to operate equipment and to use or store various materials on those premises.
- Licenses and registrations for operating various types of hazardous equipment, storing or transporting hazardous substances.
- Permits to treat and dispose of waste materials.
- Notification of compulsory contracts with labour, skilled professionals or with other companies as contractors.
- Licenses to supply goods or services under government tender or to undertake government franchise or monopoly functions.

Specific requirements

Enterprise pollution control license, *e.g.* registration of premises in which trade waste is created, license to undertake specified industrial processes that are subject to environmental regulation, permit for controlled treatment or disposal of waste by specified means.

Approval and/or license for construction, installation or other works.

Registration of/permits for equipment (*e.g.* boilers, pressure vessels, cranes).

License to store, transport and dispose of hazardous substances.

Registration of the industrial work place, and license for specific activities.

License or accreditation to national associations for various professions, *e.g.* architects, engineers, surveyors, scientists.

License or accreditation to provide environmental auditing services under a mandatory environmental management scheme.

License or permit to perform environmental impact assessments, provide environmental monitoring data services or other specific environmental services functions.

Source: GATS schedules.

Specific licensing requirements, including those arising from environmental regulations

Typically there are also more specialised licensing requirements applicable to businesses in particular industries regarding regulated matters such as pollution control, worker safety and hygiene, handling and disposal of specified hazardous substances and operation of specified dangerous equipment. Obviously, a major component of environmental services involves helping industrial clients to implement and comply with the terms of such licenses. A number of these specific licenses would also apply directly to some environmental services providers (*e.g.* those operating waste treatment and disposal facilities, those providing specialised environmental data monitoring and analysis, impact assessment or auditing services). Box 6 lists a number of common examples of these specific requirements. (Some types of licenses or permits relating to environmental safety appear in both sections of Box 6; they may be applied at horizontal and/or sector-specific level).

Trade policy issues arising from business licensing requirements

The types of business licensing or permit requirements noted above mostly arise from regulatory frameworks designed to achieve a range of policy objectives involving corporate law, taxation, consumer protection, protection of the environment and improvement of corporate environmental performance. As such, they form part of countries' "right to regulate" and while subject to GATS disciplines in respect of transparency, non-discrimination, etc., should not *in themselves* be regarded as supply-side constraints or barriers to trade in services. Furthermore, those arising directly from regulatory frameworks designed to protect the environment and improve corporate environmental performance obviously play an important role in generating underlying demand for environmental services.

Nevertheless, several of these licensing requirements also apply directly to environmental services providers, *e.g.* the operation of water and waste treatment facilities generally requires a specific license, permit or concession, as does the transport, storage or recycling of solid and hazardous wastes. Furthermore, environmental regulatory agencies are increasingly utilising licensing systems or other forms of mandatory accreditation of environmental services providers to assist in the implementation of and compliance with environmental regulatory objectives and programmes, *e.g.* in contracting services for monitoring compliance with pollution permits through data analysis and performance auditing, for environmental impact assessments, for site preparation and survey work, for pollution and habitat remediation, etc. In addition, specific licenses or concessions may be created for Build-Operate-Transfer (BOT) or Build-Operate-Own (BOO) projects in the water, waste or air pollution segments.⁵

Assuming a market is open to competition, including foreign participation (*i.e.* there is no monopoly or exclusive supplier), the design, implementation and administration of a licensing or permit system may have supply-side effects, including the constitution of trade barriers. In general terms, supply-side constraints arise from inefficiencies in the licensing application and approval process (undue delays, lack of clarity in criteria, multiple approval steps, etc.). By contrast, barriers to trade in the licensing area tend to arise from differences in the treatment of foreign and local companies, including:

- Explicit exclusion of foreign companies from holding licenses.
- Implicit exclusion through the lack of an open application or auction procedure for licenses and permits.
- Limitations on the number of licenses open to foreign and local companies.

- Explicit differences in licensing criteria for foreign and local companies.
- Implicit preference of the licensing agency for local companies.

Moreover, foreign license holders may be required to have their work certified as adequate by local firms. This may be intended to ensure conformity with local environmental and professional standards, but may also represent an informal market-sharing mechanism.

This is not to say that requirements to obtain a license or permit from the Environment Department in order to provide environmental impact assessment or environmental auditing services (e.g. as in Indonesia) or accreditation with a national standards body to provide ISO 14001 certification services (e.g. as in Korea) in and of themselves constitute trade barriers. On the contrary, these licenses create demand for specialised environmental services. However, to ensure efficient supply, administration of the application and approval procedures for licenses to provide environmental services arising from environmental regulatory programmes needs to be reasonable, transparent and non-discriminatory in terms of the duration, criteria, fees and outcomes of the decision-making process.

An initiative to liberalise international trade and investment for environmental services would need to recognise the purpose of such licensing requirements for reaching legitimate environmental regulatory goals and also to recognise that such requirements should not operate to restrain the supply of the services that contribute to achieving those goals. The requirements of the environment framework may thus be seen as contributing drivers on the demand side, with trade policy helping to improve the efficiency of supply to meet that demand.

In GATS terms, the licensing issue may have both a scheduling and a rule-making element. At present, the GATS does not explicitly require licensing requirements to be included in the market access section of Schedules of Specific Commitments, unless licensing is used to limit the number of service suppliers through numerical quotas, monopolies, exclusive supplier rights, economic needs tests, etc. Furthermore, GATS Article VI, which covers all domestic regulation affecting trade in services, currently provides only generalised disciplines for domestic regulations of general application; and these disciplines apply only to sectors where a member has undertaken specific commitments in its GATS Schedule.

For the environmental services sector, specific licensing of service supply arising from environmental regulatory frameworks probably occurs most frequently in the water treatment, waste management and air pollution segments and for specialised data monitoring, environmental impact assessment, environmental auditing and environmental standards conformity assessment services. These are the services that the GATS informal services sectoral classification list already largely defines as “environmental services”.

In addition, there are the horizontal registration, accreditation or licensing requirements that apply to professions that are central to environmental services, such as engineers. There may also be *de facto* registration or accreditation systems arising from professional associations of environmental engineers, pollution remediation experts, environmental consultants and educators, etc., on which a regulatory agency relies as a “pool” of qualified or acceptable service providers. Alternatively, environmental services firms, particularly engineering consultants and environmental impact assessment specialists, may be required to register directly with the government agency that oversees the environmental policy regime. To the extent that membership in or accreditation by such entities is a mandatory condition for doing business or being considered for public contracts, they would need to

be considered within the scope of GATS disciplines for qualifications requirements, technical standards and licensing/authorisation of supply requirements.

While it is necessary to take account of the constraints faced in this regard by less developed countries, their capacities should not be underestimated: a number of countries such as India already operate “one-stop”/“single-window” application and clearance systems for environmental permits and licenses; and environmental impact assessment requirements linked to project approval for new industrial construction and existing facilities producing toxic waste are already a feature of many less-developed countries’ environmental regulatory regimes. Since the 1992 Rio Conference, the World Bank and specialised UN agencies have given priority to improving regulatory capacities in these areas. Nevertheless, deficiencies persist, particularly in relation to resources for enforcement of regulatory compliance and lack of transparency and discretionary decision making which favour the well-connected.

Monopolies and exclusive suppliers

As noted in Chapter 1, there is a strong public service aspect to the core environmental services of water supply and treatment and waste management. Accordingly, governments may elect to provide such services through monopoly public utilities or by awarding concessions for the exclusive supply of such services to private operators, subject to specific service obligations. Alternatively, concessions for the exclusive supply of services by private operators may be granted in the course of privatising services that were previously provided by the government, or to encourage the establishment of private services from the outset. BOT projects for environmental service facilities also usually involve the granting by public authorities of exclusive rights to a private company to build and operate the facility, with the government or its designated operator assuming ownership of the facility either at that time or at a later time, depending on the specifications in the BOT contract. With BOO projects, the completed facility remains in private hands.

In the main, it appears that areas where environmental services are often provided through monopoly public utilities or public concessions of exclusive supplier rights to private operators are:

- Provision of water supply and treatment of wastewater.
- Municipal and/or industrial solid waste collection, treatment and disposal (which may or may not include recycling).
- Inspection and control of cars and trucks relating to air pollution.
- Scientific and technical consulting, testing and analytical services.
- Monitoring and certification services regarding compliance with environmental regulatory standards.
- Engineering and construction of particular infrastructure projects and facilities.

Countries obviously vary in their recourse to monopoly or exclusive supplier rights for a number of reasons, including historic patterns of public ownership and disposition with respect to privatisation. When privatisation is undertaken, it is typically to reduce government outlays and raise efficiency levels through introduction of best practices and technologies, while seeking to maintain or enhance the scope and/or standard of service, hence the incentive of an exclusive supplier concession. For less developed countries, an additional motivation for privatising the provision of certain services by granting exclusive supplier concessions to private companies may be to strengthen national capacities by improving the access of local private providers to external finance, skills and technology.

Case studies undertaken on the role of monopolies in providing environmental services in three non-member economies (Indonesia, Malaysia, Chinese Taipei) shed some light on the role of monopoly concessions in attracting long-term foreign private investment into infrastructure development in this sector. These case studies are presented in Annex 6.

Possible trade-relevant points

Governments clearly retain the right to limit the provision of services to monopoly public utilities or to grant exclusive provision rights to private companies. Nevertheless, bearing in mind that such monopoly or exclusive supplier rights in effect preserve the services concerned from competition from other providers for the duration of the concession, international trade opportunities could be adversely affected when:

- The awarding of concessions for exclusive supplier rights to private operators is not conducted through transparent tendering and bidding processes open to all comers, including foreign suppliers.
- A public monopoly or private exclusive supplier subcontracts other services in the performance of its functions without open and transparent tendering and bidding processes.
- In providing its services, a service provider relies on the ability to access the services or service-related systems provided by a monopoly or exclusive supplier, and such access is not guaranteed on non-discriminatory and reasonable terms. For environmental services, other service providers could require access to monopoly or exclusively provided services “networks” or systems for the collection, treatment and disposal of wastewater, solid and hazardous wastes, environmental data collection, testing and analysis and construction.

This suggests that it may be necessary to consider the relationship between publicly owned and operated monopoly/exclusive service suppliers and public procurement. While GATS Article VIII contains a number of disciplines pertaining to monopolies and exclusive service suppliers,⁶ disciplines for public procurement of services are the subject of ongoing negotiations.

Furthermore, the obligations pertaining to procurement or subcontracting of services by private firms with an exclusive supplier right granted by governments is not clear. GATS Article VIII:5 refers to situations where a WTO member has, formally or in effect, authorised or established a small number of service suppliers and substantially prevents competition among those suppliers in its territory.

Another point for consideration, in view of the fact that some OECD countries and many less developed countries have not yet made specific GATS commitments for a range of relevant sectors, is whether there are ways to improve the clarity and user-friendliness of the scheduling of monopoly or exclusive supplier rights.

Subsidies

WTO rules for goods recognise that subsidised competition can have the effect of restricting or distorting trade, in that domestic subsidies can restrict the ability of foreign goods to compete in the domestic market, whereas export subsidies can distort competitors’ markets and third-country markets. However, although the GATS was intended from the outset to have subsidy rules, these are still under negotiation. For environmental services, some types of subsidies may represent demand drivers rather

than supply barriers, *e.g.* provision of subsidies for research and development for environmental and clean technologies and provision of subsidies to upgrade infrastructure under environmental policy programmes. On the other hand, cross subsidies within or by publicly funded utilities may inhibit competition for the supply of some services.

Government procurement requirements or exemptions

The procurement of environmental services by the public sector would appear to be most relevant for the construction, operation and upgrading of public utilities such as water supply and wastewater treatment, sanitation and solid waste collection and disposal, installation of energy-efficient systems and clean process technologies. Based on the information collated for the country inventories, the principal (and widespread) trade-related barriers to public procurement of environmental services include local preferences, threshold values for open bids and excluded sectors.

Chapter 3

THE POTENTIAL “WIN-WIN” SITUATION: THE ROLE OF TRADE LIBERALISATION FOR ENVIRONMENTAL GOODS AND SERVICES IN IMPROVING ENVIRONMENTAL PROTECTION, ECONOMIC EFFICIENCY AND DEVELOPMENT PROSPECTS

Improving the balance between demand- and supply-side factors: the role of complementary measures

Liberalising trade in environmental goods and services can, for many reasons, be assumed *prima facie* to bring together the elements of a “win-win” situation. In opening domestic markets to the international economy by reducing tariffs and other trade-distorting measures, advanced know-how and environmental technologies will become more readily available: trade in services and capital goods is the most direct channel for transferring technology. Reducing tariffs and other trade-restricting measures means that services and goods will be cheaper and limited environmental protection budgets can be stretched further. Trade liberalisation also provides incentives for technological progress through expansion of market opportunities.

More indirectly, opportunities to realise economies of scale and the effects of increased competition on efficiency can be expected to lead to welfare gains. Subjecting firms to international demand patterns gives firms incentives to undertake investment in environmental technology. Finally, liberalisation of world goods and services markets can provide the necessary preconditions for technology co-operation to generate innovations more closely associated with domestic economic and environmental conditions. In other words, this can help increase local capabilities for innovation and adaptation of domestic technology relative to dependence on transfer of foreign technology.

At the same time, as the foregoing analysis has shown, many factors on both the demand and the supply side affect diffusion of environmental technologies and trade in environmental goods and services. Demand-side factors clearly dominate supply-side factors such as trade barriers. Both need to be taken into account to ensure that trade liberalisation becomes a “win-win” situation. Particularly important factors on the demand side are:

- The environment regulatory framework and choice of environmental policy instruments.
- Recent trends in environmental policy that emphasise the growing importance of environmental software or services in determining the kind of environmental hardware or equipment and other goods.
- The closely related evolution in the kind of environmental hardware demanded, from end-of-pipe technologies and add-on equipment to a variety of goods serving as system inputs to pollution prevention approaches.
- The conditions that distinguish needs for environmental goods and services in developing countries and economies in transition from those in OECD countries.

The implications of these factors for complementing trade liberalisation in environmental goods and services are examined *seriatim* below. They could constitute the basis for developing a framework of complementary measures to trade liberalisation efforts for environmental goods and services.

Strengthening the environmental regulatory framework and choice of policy instruments

The main factor determining the level of environmental protection and use of environmental goods and services is not their availability in general or their cost, but the degree and type of market pull. In other words, the pressure points on rapid diffusion of environmental technology are not high tariffs, although a few trade-related issues do arise. For example, in public procurement, liberalisation efforts to promote more open markets for environmental service contracts let by public entities would undoubtedly help. Overall, however, trade-related issues appear to have relatively little significance. The issue then is how to strengthen demand for environmental services and promote appropriate implementation of environmental policy. With a concomitant emphasis on the importance of the environmental regulatory framework for the amount and type of environmental goods and services, trade liberalisation can help to ensure the availability of the appropriate services.

Second, emphasis on the principal demand factors needs to be complemented by recognition of the importance of the choice of environmental policy instruments and the type of compliance model. How environmental protection regimes are structured is a matter for each polity to decide. While there is no set recipe, certain guiding principles have been recognised in OECD discussions, including the need for continuing incentives, collaborative negotiated compliance models, emphasis on pollution prevention, a long-term environmental strategy coupled with a flexible and dynamic regulatory framework with built-in auditing systems, etc. Effecting reform through a negotiated, multi-stakeholder process rather than through the conflictual specified or enforced compliance model is increasingly recognised as delivering results better in line with pollution prevention strategies.

A framework for complementary measures would:

Reaffirm the consensus on strengthening demand through commitment to pollution prevention/waste minimisation and encourage domestic environmental regulatory reform to promote use of incentives for improvements in environmental performance.

Relationship of environmental goods and environmental services: ensuring complementarity of hardware and software

Solving an environmental problem – particularly in today’s context of promoting integrated, systemic changes in production – necessarily requires a “holistic” approach involving managers and engineers, who in turn call on medium specialists. Thus, the overriding importance of environmental services or “software” will determine the need for environmental hardware or equipment. Ensuring an appropriate balance between goods and services will therefore also have implications for trade liberalisation in these two areas.

Some issues that may be worthy of consideration in determining liberalisation approaches are:

- In terms of the CPC/GATS classifications, the difficulty of distinguishing some of the clean technology services and resource management services, in particular, from pollution management services. The essential difference between the three groups appears to relate to the purpose of the activity rather than the services involved in performing them.

- Many of the “core” activities covered by the OECD/Eurostat pollution management services classification appear to correlate at least broadly with services covered by GATS classification 6/CPC 94. However, design, architectural, engineering, construction and installation and various specialist consultancy services are involved. This is also the case for clean technology services. The resource management group also involves land use advisory and R&D services.
- Consideration could therefore be given to modernising the GATS classification for environmental services to ensure that it covers the “core” services related to environmental media and pollution prevention, control and remediation (*e.g.* water, waste, air/climate, habitat, soil). Consideration could also be given to development of a checklist of the “intrinsically related” services classified elsewhere in the GATS system, to which due attention would be given in any GATS liberalisation initiative that aimed to improve market access for environmental and environmentally related services.

Overall, should there specifically be provision made for simultaneous, or even earlier, liberalisation of environmental services under the GATS when negotiating commitments on market access for environmental goods?

The framework of complementary measures would need therefore to:

Address the timing and sequence of liberalisation of trade in services in relation to that for goods when deciding on the scope and modalities of future liberalisation in environmental goods and services.

Buttressing implementation of pollution prevention by avoiding distortions

The preceding analysis has emphasised the shift in environmental policy from traditional methods of pollution control to pollution prevention, based on integrated or “holistic” approaches. Concomitantly, the kind of environmental goods demanded has been changing, with a shift away from end-of-pipe equipment to an array of goods that serve as inputs to promote cleaner technologies. Tools for consideration include enhanced managerial accounting systems and other environmental audit systems that take a holistic view. This might also incorporate a review of supply-side policies in order to increase the availability of cleaner technologies through collaborative arrangements on innovation as well as strengthened co-operation for a needs-driven diffusion of cleaner technologies.

Anecdotal evidence suggests that during the transition to implementation of pollution prevention policies, other public policies may have lagged, relative to environmental policy, with support mechanisms continuing to favour the sale and development of end-of-pipe equipment (see Box 3 and its sources). Promoting policy coherence by eliminating existing incentives in other policy areas that tend to favour “end-of-pipe” solutions would therefore be important. The rapid phasing out of direct tax concessions, accelerated depreciation and subsidies for end-of-pipe controls was recommended as early as 1992, for example in the context of the OECD’s Technology and Environment programme (OECD, 1992a).

A framework for complementary measures would address the need to:

Ensure, when liberalising market access conditions for environmental goods, an enabling environment that is technologically neutral; promote coherence in other government support policies, avoiding distortions due to more favourable price and access conditions for end-of-pipe technologies at the expense of cleaner technologies and processes.

Fostering diffusion of appropriate technology in emerging economies

The earlier discussion of trends in emerging economies shows a wider spectrum of demand in these countries, but also underscores the growing need for co-operative arrangements that emphasise know-how over hardware. Building know-how, or capacity, including for technology adaptation, is therefore essential so that emerging economies can select the types of technologies appropriate to their conditions. Certain developing countries may move up a traditional demand curve for environmental services, while others may be able to “leapfrog” to pollution prevention and use of cleaner technologies. Under the Kyoto Protocol’s provisions for a clean development mechanism, examples of co-operation are emerging. Direct technical assistance initiatives have been set up under the APEC sectoral liberalisation decision.⁷

A framework for complementary measures would address the needs to:

Strengthen programmes incorporating information programmes on environmental services and assistance on pollution prevention and cleaner technologies tailored to the needs of emerging economies. Since technology transfer first and foremost concerns the private sector, drawing on its experience and enlisting its collaboration is essential.

In this way, coherence can be achieved because it is recognised on both the demand and supply sides that:

- Environmental laws, regulations and standards, and their enforcement, are important in their own right *and* a principal driver of demand for environmental services and associated technologies.
- Open markets for environmental services and technologies create incentives to apply the resources and skills needed to implement and reinforce environmental regulation.

On the demand side, the key elements are implementation and enforcement of appropriate environmental laws, regulations and standards in conjunction with regulatory and institutional capacity building and reform. Bilateral and multilateral assistance and technical support clearly play an important role in support of national reform efforts in a number of areas, such as:

- Institutional capacity building and training of personnel in less developed countries for the preparation and enforcement of environmental standards and regulations in the combination of regulatory-based, market-based and information-based instruments that is appropriate to a country’s environmental profile and level of development.
- Improving public awareness and education concerning improved environmental performance and protection at grass-roots level and public participation in environmental policy and decision making; promoting recognition and involvement of local and traditional eco-system management when it contributes to sustainable use.
- Improving access to environmentally sound technologies, particularly pollution prevention and clean technologies, through commercial transfer and technical assistance to adapt and improve IPR protection and enforcement regimes and to improve local capacities to absorb and utilise environmentally sound technologies and adapt them to local conditions.

On the supply side, the key elements are domestic regulatory reform to improve the efficient allocation and uptake of resources to improve environmental protection and performance, including through trade liberalisation. Box 7 provides an indicative list of possible ways to pursue trade liberalisation for environmental services so as to ensure a “win-win” outcome for open trade, environmental protection and development. (Although the list refers to “environmental services and associated technologies”, it could readily be extended to environmental equipment and products.)

Box 7. Elements for a “win-win” approach to multilateral trade liberalisation of environmental services

Promote concerted multilateral liberalisation of international trade and investment in environmental services and associated technologies:

- Adopt a clear definition of environmental services.
- Identify the main barriers to international trade.
- Set goals for the desired level of market openness to be achieved.
- Underwrite the resulting commitments with pro-competitive principles on transparency and due process in regulatory implementation, including for services supplied by monopoly and exclusive suppliers, and public procurement.

In this way, predictable and secure terms of international competition for environmental services providers can be created, the delivery of improved environmental performance and protection can be made more cost-efficient and the channels for global diffusion of environmental technologies and skills can be broadened.

Ensure that all environmental media – water, solid and hazardous waste, air pollution, sustainable resource use and nature protection – receive priority attention in the trade negotiations, in the provision of technical and capacity-building support and in assistance for the development of efficient domestic regulatory regimes (although individual countries' action plans may emphasise particular media in the short term).

Ensure that due account is taken of the particular interests of less developed countries, in terms of their priority areas for improving provision entering their markets and their existing and emerging strengths as exporters of environmental services.

In securing commitments on liberalised terms of establishment for foreign suppliers of environmental services, *recognise the benefits of encouraging partnerships* – between SMEs and larger firms, between foreign and local firms as well as through public/private partnerships and BOT projects – as a way to help to strengthen domestic environmental capacities and economic opportunities in less developed countries.

Give due attention to the role and obligations of *monopoly or exclusive service suppliers*, including equity and efficiency of service provision, competitive tendering for sub-contracting by such providers and (where relevant) right of access or connection to their services for suppliers of dependant services.

Give due attention to the role of *public procurement* in facilitating the diffusion of environmental services and associated “clean” and “green” technologies and products, particularly for environmental infrastructure projects.

Least developed countries

With respect to the interests and needs of least developed countries (of which 29 are WTO members) in terms of participating in a multilateral initiative to liberalise environmental services, it is worth reflecting on the special difficulties they encounter in participating effectively in the multilateral trading system.⁸

- Developing effective co-ordination among government ministries whose activities have a bearing on the implementation of WTO Agreements.
- Creating the necessary domestic institutional and administrative framework.
- Training officials and establishing modern data processing systems.
- Adapting domestic legislation, regulations and procedures to comply with WTO obligations.
- Designing and implementing policy changes.

The “win-win” proposition in action: case studies of liberalisation of water and waste management services markets in developing economies

This section focuses in practical terms on what the “win-win” proposition means. Discussions at the OECD have indicated that for the “win-win” proposition to gain the confidence and acceptance of policy makers and broader civil society, it would be useful to give concrete examples of “win-win”

benefits accruing to developing countries from liberalisation of their environmental services markets to permit increased trade and private foreign investment. There is also the question of whether and how such liberalisation contributes to developing countries' export opportunities in this and other sectors (and does not only represent increased trade opportunities for firms from industrialised countries).

The initial focus has been on examples in the water supply, wastewater treatment and solid waste management sub-sectors for four reasons. First, they are the most immediate environmental services priorities for most developing countries. Second, they are the most demanding in terms of financial resources. Third, they are the leading areas of privatisation or partial privatisation initiatives in the environmental sector and are therefore increasingly open to international trade and foreign direct investment. Fourth, much more information is readily available for the water and waste sub-sectors, owing to their status as basic services.

This is not to say that there is no scope or need for trade liberalisation in services for other environmental media (*e.g.* air pollution control and remediation, habitat protection and sustainable resource use), areas for which examples could also be provided.

As noted in Chapter 2, government regulation plays a major role in creating demand for environmental services. Generally speaking, then, trade and investment in the environmental services sector arises from deliberate decisions by governments to open up service provision to private actors and to undertake trade and investment liberalisation to permit and encourage the participation of foreign private actors. Two elements are involved: decisions to encourage private participation and to encourage foreign private participation through liberalisation of trade and investment. Without the latter, private participation may be limited to local firms.

The opening of service provision to private participation for water and waste management may take several forms, and principally: privatisation (transfer to private ownership) of existing government-owned utilities; leasing of utilities to the private sector to operate; the letting of public contracts to private companies to provide start-up services on a BOT (to public ownership) basis; the granting of concessions to private companies to provide private services. For a number of other environmental services, the main forms are the letting of contracts by governments for services to assist in programme development and implementation and by private companies for services to implement specific requirements.

For developing countries, the underlying "driver" of decisions to permit private participation is often the compelling nature of the problems faced; *e.g.* rapid population growth, migration to cities already under environmental stress and serious budgetary constraints. Private participation in environmental services provision, particularly water and waste management services, is seen as a way for governments to ease the financial burden of addressing these problems. As the examples show, when developing country governments decide to open these services to private participation, they usually decide to encourage foreign participation.

Private sector participation in water and waste management infrastructure

Unsafe drinking water and inadequate sanitation are among the most serious problems facing developing countries today. More than 1 billion people in rural and urban areas around the world lack access to the most basic water and sanitation services. The environmental and social costs, especially to women and children, are enormous.

According to the UNDP-World Bank Water and Sanitation Program (Prospectus and Toolkits), the achievement of significant improvements in water and sanitation services in many developing countries will, in most cases, require more efficient operation of water utilities and investment in rehabilitating and extending supply systems. Consequently, many central and local governments in developing countries are turning to the private sector to help finance and implement the necessary work. In such “public-private partnerships”, the private sector involvement may take various forms. The extent to which objectives are met depends on three main factors: whether local circumstances are taken into account, whether the regulatory environment is suitable and how well the approach chosen responds to the concerns of those affected. Governments are also encouraged to seek independent advice from experienced professional firms when designing their investment models.⁹

The most common forms of private participation in water and waste management infrastructure projects are set out in Table 8. The main differences are in the allocation of risk and responsibilities, the duration of the arrangement and the assigning of asset ownership. In practice, these options may be combined, *e.g.* management contracts in which the private sector takes on some commercial risks or leases in which the private sector undertakes some investment. Some governments start with simpler options such as service contracts and progress to more complex ones involving more risks and responsibilities for the private sector, such as concessions.

Table 8. Main options for private sector participation

Option	Asset ownership	Operations & maintenance	Capital investment	Commercial risk	Typical duration
Service contract	Public	Public & private	Public	Public	1-2 years
Public management contract	Public	Private	Public	Public	3-5 years
Private lease	Public	Private	Public	Shared	8-15 years
Build-Operate-Transfer contract	Private & public	Private	Private	Private	20-30 years
Concession	Public	Private	Private	Private	25-30 years
Privatisation/divestiture	Private or private & public	Private	Private	Private	Indefinite (may be limited by license)

According to the World Bank and UNDP, the benefits of private sector participation can include:

- Bringing technical and managerial expertise to the sector.
- Improving operating efficiency.
- Large-scale injections of capital and greater efficiencies in the use of that capital.
- Reducing the need for subsidies.
- Increasing responsiveness to consumer needs and preferences.

The specific benefits which a government seeks to achieve will shape the form of private participation that it seeks to attract. For example, if the main goal is efficiency improvements in existing operations, a management contract or lease may be a suitable avenue. If new investment is required, BOT contracts, concessions and divestitures may be considered suitable. However, these options require the provision of a credible regulatory framework that gives the private sector sufficient

incentive to make and recover its investment while assuring that consumer interests will be met. The stability and efficiency of the business climate and of the overall political situation are also important.

It is also worth noting that a range of other services are typically involved in the assessment and selection process for the various options for private sector involvement, such as engineering services to assess the existing system and means of improving it, financial and economic analysis services to estimate and test investment and pricing issues and draw up the prospectus and tender documents, legal services to identify and draft contractual agreements, business management services to develop new organisational models in consultation with employees and other stakeholders, and public relations services to help explain the changes to the public. Some of these tasks may be provided “in house” by the government or outsourced to specialist providers of the services.

Against this background, Annex 7 presents examples of foreign private-sector participation in providing environmental services in developing countries. It gives over 60 examples of foreign private sector participation in the provision of water and waste management services in developing countries in the past decade. The survey covers the development spectrum from economies in a relatively advanced state of industrialisation to the least developed economies. The examples are organised into four categories: concessions to private companies, joint ventures between the public and private sectors, BOT contracts and services contracts.

The survey aims to give the flavour of the type and nature of foreign participation (direct investment, institutional shareholdings, operational participation) and the kinds of possible benefits derived in terms of roll-out of services to the population and industry, environmental quality improvements, participation by local firms, provision of local jobs and wider economic benefits such as those derived from the establishment of high-standard environmental facilities in industrial parks, which themselves generate exports and jobs.

In addition, some examples reveal an upward trend in participation by companies from developing countries in the water and waste sub-sectors in other developing countries. They are often Asian and Latin American countries which have themselves acquired technological and services capacities, in part through the experience of joint venture investment in the environmental sector in their own countries.

In terms of potential opportunities for developing countries to extend their exports of these services to OECD markets, they have so far often focused on water and waste management services markets in their immediate regions. It may be that OECD markets for water and waste management services are the object of long-term private monopolies or are reserved to public sector provision. While private finance in these sub-sectors is certainly more urgently needed in developing countries, some OECD countries might also review the openness of their own environmental services markets to foreign private participation.

It should also be noted that, at a recent Emerging Market Economies Forum Workshop on Barriers to Trade in Goods and Services in the Post-Uruguay Round Context, trade policy representatives from some developing countries indicated the need for undertakings on technology transfer and restrictive business practices in any GATS initiative that sought the opening of their environmental services markets to firms from OECD countries.

“Win-win” outcomes

The examples included in Annex 7 indicate increased foreign participation in the provision of water and waste management services where such sectors are liberalised. It is beyond the scope of this volume to evaluate the actual environmental and economic impacts of the specific projects. However, overall and in many individual examples, there have been a number of “win-win” outcomes from trade and investment liberalisation (*i.e.* foreign participation) in the provision of water and waste management services in developing countries.

Environmental benefits that may be secured from increased trade in these environmental services

- First and foremost, the roll-out of clean water and waste collection services to much greater numbers of citizens, leading to healthier human environments.
- Reductions in the wastage of and/or inequitable access to scarce water resources (*e.g.* through leaks and ease of bypass/siphoning associated with old/inadequate pipe infrastructure).
- Increased availability of drinking water from the introduction of recycling of effluent water for industrial use (which also, once established, produces cost-savings for industry).
- Use of waste recycling to create alternative sources of energy (*e.g.* gas and electricity from garbage recycling systems for use by households, light industry, power stations, fertilisers for small farms).
- Increased opportunities for environmental management education and training, and skills transfer, to other commercial sectors, both for the water and waste media and other environmental services owing to the presence of foreign firms.
- Availability of a larger choice of environmental technologies to address the country’s environmental problems more appropriately, which can often mean a move from end-of-pipe solutions to preventive ones.
- Reinvestment of a share of profits in research and development for new environmental technologies and skills, environmental infrastructure upgrades and new environmental investments.

Economic efficiency and development benefits that may be secured from increased trade in these environmental services

- Relief of pressure on government budgets, including at state and municipal level. Savings may be reallocated to environmental policy, inspection and enforcement budgets, to other social services and to the overall budget balance.
- Creation of skilled and unskilled jobs for local workers, in design, construction and long-term operation of the facilities.
- Foreign and local investment attracted to the community, owing to the availability of water and waste management systems, bringing more jobs, stable economic growth and a larger local tax base.

- Experience of local private-sector partners extended in big and/or specialised projects which can be (and are being) exported to other countries with similar needs and operating conditions.
- BOT operations revert to local ownership at a specified time and comprise significant environmental resources, and sources of jobs, for the future.

Trade “wins”

- Local and foreign companies participating in this trade gain new opportunities to deploy their skills and technologies.
- At global level, trade and investment liberalisation will improve resource allocation through the application of comparative advantage.

Implementation challenges

It is frequently cautioned that the fact that trade liberalisation may create “win-win” opportunities for environmental protection and economic development does not mean that related considerations, including implementation of win-win policies, will necessarily be easy or that there will not be losers. This is the case for the overall balance of “win-win” benefits from a new WTO Round, or in sectors such as agriculture and fisheries, where reductions in existing producer subsidies may pose a threat to the incomes and activities of some recipients. For its part, the environmental services sector is directly involved in the delivery of improved environmental performance, environmental protection and sustainable resource use.

The choice of environmental services projects will primarily reflect national environmental priorities for improving performance, protection and sustainable resources use. Furthering trade policy objectives, such as the liberalisation of services provision through, for example, the opening of procurement markets to foreign suppliers, can contribute to a higher quality of service overall. This is to be distinguished from governance and environmental oversight, which are not matters of trade policy *per se*. However, once national priorities are established, trade liberalisation can contribute positively to environmental protection.

The key implementation challenges relate first and foremost to the need for a credible environmental and commercial policy framework within which private environmental services providers can operate. The capacity to evaluate the economic and environmental aspects of proposed projects is also important. A stable and transparent political framework, mechanisms for public consultation on new arrangements, including investment return and pricing options, the role of foreigners and the incentives they receive and the requirements they face, and open tendering processes are also important factors. Complementary measures, particularly impartial technical assistance in assessing various private sector models, designing the most suitable local model and managing its implementation, are part of the equation. Ongoing assistance with environmental policy development is another. As for potential losers from the opening of markets for the water and waste management sub-sectors of environmental services, these may include, variously, consumers faced by new or higher fees, entrepreneurs in the informal sector who siphon off water for resale or salvage garbage for recycling and employees of monopoly utilities. However, careful design and implementation of market-opening strategies can address most of the potential concerns.

Consumers faced by new or higher fees

Private sector involvement typically leads either to the introduction of fees-for-service where there previously have been no fees (but also inadequate service) or to significant increases in existing nominal fees for services supplied by the government. Increases, even sharp ones, are typical. Such fees and/or the need to limit service to those able to pay may limit service provision. However, fees are a key part of the trade-off involved in a government decision to reduce or cease its direct role as the services provider. Private operators need to charge for the services provided, both to cover investment and operating costs and to generate profits. Pricing of water, and of waste management, is also crucial to the introduction of conservation principles and new attitudes in user households and commercial enterprises.

Price competition may not be feasible in the water supply, sewage treatment and waste collection sub-sectors where single operator concessions are common. It is more feasible for on-site industrial water treatment services. Also, while the issue of limited price competition is mentioned, mention of other potential anti-competitive effects might also be considered, *e.g.* the potential for foreign service providers to dominate the national or global market place. The government needs to take the lead in assessing fair prices (*i.e.* what consumers can reasonably bear) for the level of investment sought, and whether it is willing to fund any gap through subsidies to successful operators. This is part of the preparation of a credible tender process, in which market research on consumer attitudes is increasingly common. It is sometimes necessary for successful private operators to seek to renegotiate the fee structure on which they based their bid, either upwards because it was underestimated, or downwards in light of consumer protests or widespread non-payment. Thus, the legal framework for enforcing fees, and the fee levels themselves, need careful consideration from the outset. Some governments establish water regulatory agencies or ombudsmen to oversee fee structures and deal with consumer complaints.

Entrepreneurs in the informal sector

In many developing countries, siphoning off water from decaying or inadequate pipe systems for personal use or resale or making a living from garbage collection and sorting are common. While sometimes a local “Mr. Big” may control the process, it is more often small entrepreneurs who seek to make a living for their families. They need to be seen as stakeholders in the new arrangements (and as potential employees, as they typically have useful knowledge and experience).

Managers and employees of monopoly public utilities

When privatisation or opening up to foreign investment of monopoly public utilities is contemplated or proposed, managers and employees are typically concerned about being seen as not up to the task of providing effective services and about job losses under the new arrangements. While private investment in public monopolies certainly involves a shift to commercial imperatives such as shareholder returns and productivity gains, these typically are a central issue on which bids are made and tenders assessed and awarded and take some time to be achieved. These are issues for negotiation between the government, the workers and the private company.

Existing private monopoly utilities

These actors may be concerned that further liberalisation will require them to compete with new entrants. However, in the water sub-sector, such operators have typically been awarded concessions or licenses of reasonably lengthy duration (upwards of 15 years) as exclusive suppliers of their service in a particular city or region. The terms of concessions are typically expensive to overturn. The most that could be required during the concession is transitional arrangements to prepare for new entrants at its conclusion, which may include interconnection rights to existing infrastructure. Again, this is an issue for governments to negotiate with incumbents.

Scheduling of GATS commitments

There is no reason why GATS specific commitments for mode 3 (commercial presence) could not be made on a differentiated basis in the water and waste management sub-sectors to reflect a member's openness to one or more of the various foreign investment options. For example, a member could make commitments specifying that the opportunity to bid for participation in any or all public management contracts and leases, BOT projects and concessions that become available is open to foreign companies and consortia, and specifying any limitations thereon (*e.g.* joint venture with local partner required, minimum or maximum foreign equity participation, legal form of foreign company, etc.). This could of course only be done when the sub-sector is not reserved to public sector operation or an existing monopoly supplier. Where this is presently the case in one part of the country but not in others, this could be noted in the schedule.

NOTES

1. OECD Council Recommendation C(90)164/FINAL.
2. For most OECD countries, applied tariff rates are generally higher than their bound levels. As the binding commitments negotiated during the Uruguay Round come into force, the applied levels will decrease to these bound levels. On the other hand, most developing countries' bindings, even after full implementation of Uruguay Round commitments, will remain higher than current applied levels.
3. The relative public/private sector shares vary among OECD Members. In the United States, public sector entities represented in 1994, by revenue, 95%, 33% and 84% of water treatment, solid waste management and water utilities, respectively (Ferrier, 1996).
4. Reasons why cross-border supply have so frequently been left "unbound" in Uruguay Round era GATS schedules may include: the particular sector was not included in the schedule (*e.g.* many developing countries); or despite inclusion of the sector, was left "unbound" because the country does not consider cross-border supply of the services concerned to be technically feasible. More simply, it may have been to refrain from taking on commitments for cross-border supply of those services (*e.g.* in respect of government-contracted services).
5. The issue of whether licensing a private company to build-operate-transfer a facility to government ownership or build-operate-own the facility privately, results in a monopoly or exclusive supplier is not clear. This probably depends on whether the BOT or BOO project is small- or large-scale, and thus is or is not competing with other suppliers in its market.
6. Article VIII:1 requires that each member shall ensure that any monopoly supplier of a service in its territory does not, in the supply of the monopoly service in the relevant market, act in a manner inconsistent with that member's obligations under Article II [MFN] and specific commitments. Article XVII:2 requires that where a member's monopoly supplier competes, either directly or through an affiliated company, in the supply of a service outside the scope of its monopoly rights and which is subject to that member's specific commitments, the member shall ensure that such a supplier does not abuse its monopoly position to act in its territory inconsistent with its commitments. Article VIII:3 contains provisions for consultations on matters arising from Articles VIII:1 and 2. Article VIII:4 specifies that if, after the date of entry into force of the WTO Agreement, a member grants monopoly rights regarding the supply of a service covered by its specific commitments, that member shall notify the Council for Trade in Services no later than three months before the intended implementation of the grant of monopoly rights and the provisions of Article XXI:2, 3 and 4 [Modification of Schedules] shall apply. Article VIII:5 specifies that the provisions of (Article VIII) shall also apply to cases of exclusive service suppliers, where a member, formally or in effect, (a) authorises or establishes a small number of service suppliers and (b) substantially prevents competition among those suppliers in its territory.
7. APEC members have been encouraged to submit and support proposals for economic and technical co-operation projects that will facilitate their trade in EGS liberalisation initiatives. An APEC Cleaner Production Strategy has been developed and approved; it includes a list of generic, illustrative activities for implementing the strategy: *i*) cleaner production training modules; *ii*) sector-based demonstration projects and case studies; *iii*) technical conferences and seminars; *iv*) environmental management systems (*e.g.* ISO 14001) workshops and training activities; *v*) study tours and cleaner production fellowships; *vi*) technical exchanges; *vii*) electronic information exchanges; *viii*) use of

industrial extension support systems to promote cleaner production among SMEs; and
ix) development of guidebooks or manuals.

8. WTO Secretariat, "Implementation of WTO Agreements: Survey of the Difficulties Faced by Least-Developed Countries and the Current Response", WT/COMTD/LDC/W/10, 19 October 1998, Geneva.
9. <http://www.worldbank.org/html/fpd/wstoolkits/Prospectus/pros1.htm>. The toolkits are the product of collaborative work between public and private sectors in World Bank member countries, with financial and advisory support from the UK Department for International Development.

ANNEXES

Annex I

OECD/EUROSTAT ENVIRONMENTAL GOODS AND SERVICES INDUSTRY MANUAL CLASSIFICATION

A. The “POLLUTION MANAGEMENT” group

Environmental equipment and specific materials

Air pollution control

This class includes any activity that produces equipment or specific materials for the treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources. It includes air-handling equipment, dust collectors, precipitators, filters, catalytic converters, chemical treatment and recovery systems, specialised stacks, incinerators, scrubbers, odour control equipment, environmentally less-damaging specialised fuels.

Wastewater management

This class includes any activity that produces equipment or specific materials for the collection, treatment and transport of wastewater and cooling water. It includes pipes, pumps, valves, aeration equipment, gravity sedimentation equipment, chemical treatment and recovery equipment, biological recovery systems, oil/water separation systems, screens/strainers, sewage treatment equipment, wastewater reuse equipment, water purification equipment and other water handling systems.

Solid waste management

This class includes any activity that produces equipment or specific materials for the collection, treatment, transport, disposal and recovery of hazardous and non-hazardous solid waste. It includes waste storage and treatment equipment (thermal, biological, chemical), waste collection equipment, waste disposal equipment, waste handling equipment, waste separation and sorting equipment, recovery equipment, recycling equipment. It also includes equipment for outdoor sweeping and watering of streets, paths, parking lots, etc. It includes equipment, technology or specific materials for the treatment of low-level nuclear waste. It excludes materials for the treatment of high-level nuclear waste. Recycling activities exclude production of equipment or specific materials for the manufacture or production of new materials or products from waste or scrap and subsequent use of these materials or products.

Remediation and clean-up of soil, surface water and groundwater

This class includes any activity that produces equipment or specific materials to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and seawater. It includes absorbents, chemicals and bioremediators for cleaning up, as well as cleaning-up systems either *in situ* or in appropriate installations.

Noise and vibration abatement

This class includes any activity that produces equipment or specific materials to reduce or eliminate the emission and propagation of noise and vibration, both at source and dispersed. It includes mufflers/silencers, noise deadening material, noise control equipment and systems vibration control equipment and systems.

Environmental monitoring, analysis and assessment

This class includes any activity that produces equipment or specific materials for the sampling, measurement, and subsequent recording, analysis and assessment of various characteristics of environmental media. It includes measuring and monitoring equipment, sampling systems, data acquisition equipment, other instruments or machines for measurement. Environmental information systems, analytical software, specific safety and personal protection for environmental purposes are included.

Other

This class includes any activity that produces equipment or specific materials to measure, prevent, limit or correct environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, not included in any other class. These activities should be separately specified and listed.

Environmental services

Air pollution control

This class includes any activity that designs, manages systems or provides other services for the treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources.

Wastewater management

This class includes any activity that designs, operates systems or provides other services for the collection, treatment and transport of wastewater and cooling water. It includes design, management or other services for sewage treatment systems, wastewater reuse systems, and water handling systems.

Solid waste management

This class includes any activity that designs, operates systems or provides other services for the collection, treatment, management, transport, storage and recovery of hazardous and non-hazardous solid waste. It includes design, management or other services for waste handling (collection, transport, separation, sorting and disposal), operation of sites, recycling (including collection of waste and scrap), operation of recycling plants. It includes services for outdoor sweeping and watering of streets, paths, parking lots, etc. Services for the treatment of low-level nuclear waste are included. It excludes services for the treatment of high-level nuclear waste. It excludes services for the manufacture of new materials or products from waste or scrap and the subsequent use of these materials or products.

Remediation and clean-up of soil, surface water and groundwater

This class includes any activity that designs, manages systems or provides other services to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and seawater. It includes cleaning-up systems either *in situ* or in appropriate installations, emergency response and spills clean-up systems. Treatment of water and dredging residues are included.

Noise and vibration abatement

This class includes any activity that designs, manages systems or provides other services to reduce or eliminate the emission of noise and vibration, both at source and dispersed. It includes design, management or other services for acoustic and soundproof screens and street covering.

Environmental R&D

This class includes any systematic and creative activity concerned with the generation, advancement, dissemination and application of scientific and technological knowledge to reduce or eliminate emissions in all environmental media and to improve environmental quality. It includes non-technological research to improve knowledge on ecosystems and the impact of human activities on the environment.

Environmental contracting and engineering

This class includes any activity that investigates feasibility, designs and manages environmental projects not included elsewhere. It includes multidisciplinary environmental contracting and engineering. Environmental management consulting, other environmental consulting services and environmental audit services are included.

Analytical services, data collection, analysis and assessment

This class includes any activity that designs, manages systems or provides other services to sample, measure and record various characteristics of environmental media. It includes monitoring sites, operating both singly and in networks, and covering one or more environmental medium. Health, safety, toxicology studies and analytical laboratory services are included. Weather stations are excluded.

Education, training, information

This class includes any activity that provides environmental education or training or disseminates environmental information and which is executed by specialised institutions or other specialised suppliers. It includes education, training and information management for the general public, and specific environmental workplace education and training. The activities of the general educational system are excluded.

Other

This class includes any activity that provides services to measure, prevent, limit or correct environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, not included in any other class (e.g. general public administration, if it provides specific environmental services not elsewhere classified). These activities should be separately specified and listed.

Construction and installation

This class includes any activity for the construction and installation of facilities for: air pollution control; wastewater management; solid waste management; remediation and clean-up of soil, surface water and groundwater; noise and vibration abatement; environmental monitoring, analysis and assessment; other environmental facilities.

B. The “CLEANER TECHNOLOGIES AND PRODUCTS” group

This group includes any activity which continuously improves, reduces or eliminates the environmental impact of technologies, processes or products.

Cleaner/resource-efficient technologies and processes

Cleaner and resource-efficient technologies which decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions, minimise waste disposal problems, or some combination of these.

Cleaner/resource-efficient products

Cleaner or resource-efficient products which decrease material inputs, improve product quality, reduce energy consumption, minimise waste disposal problems, reduce emission during use, or some combination of these.

C. The “RESOURCE MANAGEMENT” group

Note: In the case of the “Resource management” group, activities aimed at the production of environmental goods and services and related construction are grouped together for convenience. However, it is suggested that, wherever possible, information on these items be separately collected and presented under separate headings for equipment, services and construction.

Indoor air pollution control

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the treatment and renewal of indoor air to remove pollutants. It excludes air-conditioning.

Water supply

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for water supply and delivery systems, both publicly and privately owned. It includes activities aiming to collect, purify and distribute potable water to household, industrial, commercial or other users.

Recycled materials

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for manufacturing new materials or products, separately identified as recycled, from waste or scrap.

Renewable energy plant

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the generation, collection or transmission of energy from renewable sources, including solar, wind, tidal, geothermal or biomass sources.

Heat/energy saving and management

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services to reduce heat and energy use or minimise heat and energy loss (e.g. co-generation). It includes equipment, technology or specific materials to reduce climate change.

Sustainable agriculture and fisheries

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for systems which reduce the negative environmental impact of agriculture and fishery activities. It includes biotechnology applied to agriculture and fishery activities.

Sustainable forestry

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for programmes and projects for reforestation and forest management on a long-term sustainable basis.

Natural risk management

This class includes any activity that produces equipment, technology, or specific materials, designs, constructs or installs, manages or provides other services for systems to prevent or reduce the impact of natural disasters (storms, floods, volcanic eruptions, etc.).

Eco-tourism

This class includes any activity that designs, constructs, installs, manages or provides other services for tourism that involves protection and management of natural and cultural heritage, or education and interpretation of the natural environment, and that does not damage or degrade the natural environment.

Other

This class includes any activity that measures, prevents, limits or corrects environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, which is not included in any other class (*e.g.* nature conservation, habitats and biodiversity). These activities should be separately specified and listed.

Source: OECD (1999), *The Environmental Goods & Services Industry: Manual for Data Collection and Analysis*, Annex 1.

Annex 2

**ENVIRONMENTAL GOODS:
ILLUSTRATIVE CATEGORIES WITH HARMONISED COMMODITY DESCRIPTION AND
CODING SYSTEM (HS) PRODUCT CODES AND TARIFFS**

	HS code	Quad		Korea, Mexico, Turkey		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
A. POLLUTION MANAGEMENT							
1. Air pollution control							
<i>1.1 Air-handling equipment</i>							
Vacuum pumps	841410	1.7	1.71	22.1	7.2	25.0	11.3
Compressors of a kind used in refrigerating equipment	841430	1.6	1.53	21.5	8.9	33.9	22.5
Air compressors mounted on a wheeled chassis for towing	841440	2.7	2.49	21.6	9.1	28.6	12.0
Other air or gas compressors or hoods	841480	1.7	1.84	21.6	8.3	29.1	25.3
Parts for air or gas compressors, fans or hoods	841490	1.9	1.46	23.3	7.9	32.0	25.4
<i>1.2 Catalytic converters</i>							
Filtering or purifying machinery and apparatus for gases	842139	1.9	2.47	20.4	9.0	32.1	23.2
Parts for filtering or purifying machinery	842199	2.0	1.63	20.7	8.2	29.8	15.6
<i>1.3 Chemical recovery systems</i>							
Limestone flux	252100	0.0	0.00	21.7	5.2	27.9	15.6
Slaked (hydrated) lime	252220	0.4	0.60	21.7	6.0	31.4	17.7
Magnesium hydroxide and peroxide	281610	2.6	2.73	17.0	7.4	25.0	15.4
Activated earths							
Filtering or purifying machinery and apparatus for gases*	842139	1.9	2.5	20.4	9.0	32.1	23.2
Parts for filtering or purifying machinery*	842199	2.0	1.6	20.7	8.2	29.8	15.6
<i>1.4 Dust collectors</i>							
Filtering or purifying machinery and apparatus for gases*	842139	1.9	2.5	20.4	9.0	32.1	23.2
Parts for filtering or purifying machinery*	842199	2.0	1.6	20.7	8.2	29.8	15.6
<i>1.5 Separators/precipitators</i>							
Other glass fibre products	701990	5.6	7.2	42.7	9.9	31.3	19.1
Machinery for liquefying air or other gases	841960	3.0	3.5	29.3	4.3	28.6	16.3
Other machinery for treatment of materials by change of temperature	841989	1.1	2.0	26.6	9.1	28.1	14.1
Filtering or purifying machinery and apparatus for gases*	842139	1.9	2.5	20.4	9.0	32.1	23.2
Parts for filtering or purifying machinery*	842199	2.0	1.6	20.7	8.2	29.8	15.6
<i>1.6 Incinerators, scrubbers</i>							
Other furnaces, ovens, incinerators, non-electric	841780	2.1	2.9	22.5	9.9	26.4	10.7
Filtering or purifying machinery and apparatus for gases*	842139						
Parts for filtering or purifying machinery*	842199						
Industrial or laboratory electric resistance furnaces	851410	2.2	3.3	25.8	10.2	26.4	12.0
Industrial or laboratory induction or dielectric furnaces	851420	2.2	3.3	25.8	8.9	26.4	12.0
Other industrial or laboratory electric furnaces and ovens	851430	2.0	2.9	22.8	8.6	26.4	12.0
Parts, industrial or laboratory electric furnaces	851490	2.2	1.4	23.8	7.2	26.4	13.0
<i>1.7 Odour control equipment</i>							
Parts for sprayers for powders or liquids	842490	1.8	2.1	31.6	8.0	26.4	16.4

Quad = Canada, EU, Japan, US; Emerging = Argentina, Brazil, Chile, India, Indonesia, Malaysia, Thailand.

Bound end-UR refers to tariff bindings after implementation of Uruguay Round commitments.

*Indicates that the HS code appears previously in the table.

	HS code	Quad		Korea, Mexico, Turkey		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
2. Wastewater management							
<i>2.1 Aeration systems</i>							
Compressors of a kind used in refrigerating equipment*	841430	1.6	1.5	21.5	8.9	33.9	22.5
Air compressors mounted on a wheeled chassis for towing*	841440	2.7	2.5	21.6	9.1	28.6	12.0
Other air or gas compressors or hoods*	841480	1.7	1.8	21.6	8.3	29.1	25.3
Parts for air or gas compressors, fans or hoods*	841490	1.9	1.5	23.3	7.9	32.0	25.4
<i>2.2 Chemical recovery systems</i>							
Limestone flux*	252100	0.0	0.0	21.7	5.2	27.9	15.6
Slaked (hydrated) lime*	252220	0.4	0.6	21.7	6.0	31.4	17.7
Chlorine	280110	2.0	3.1	21.8	9.3	25.7	19.2
Anhydrous ammonia	281410	2.0	3.1	22.8	5.2	22.9	14.8
Sodium hydroxide solid	281511	2.7	4.0	23.5	8.3	30.7	12.7
Sodium hydroxide in aqueous solution	281512	2.7	4.0	28.3	8.3	27.1	12.0
Magnesium hydroxide and peroxide*	281610	2.6	2.7	17.0	7.4	25.0	15.4
Activated earths*							
Aluminium hydroxide	281830	2.2	2.3	16.4	7.9	25.0	14.3
Manganese dioxide	282010	3.2	3.4	17.2	7.8	25.0	16.6
Manganese oxides (other)	282090	3.3	3.6	17.4	8.2	24.7	16.6
Lead monoxide	282410	4.7	4.9	30.2	11.3	24.6	17.3
Sodium sulphites	283210	3.0	3.5	21.6	8.7	30.0	7.6
Other sulphites	283220	3.4	3.9	21.0	8.7	25.0	15.0
Phosphinates and phosphonates	283510	4.5	3.9	20.0	7.8	25.0	15.2
Phosphates of triammonium	283521						
Phosphates of monosodium or disodium	283522	4.0	6.0	16.8	9.0	27.1	18.0
Phosphates of trisodium	283523	4.2	6.2	16.8	9.0	27.1	19.4
Phosphates of potassium	283524	4.4	4.4	17.8	9.0	27.1	16.6
Calcium hydrogenorthophosphate	283525	2.4	2.9	16.8	7.4	22.5	17.3
Other phosphates of calcium	283526	3.7	5.6	16.8	9.0	23.1	16.6
Other phosphates (excl. polyphosphates)	283529	4.1	3.5	22.1	8.9	27.1	14.6
Activated carbon	380210	2.6	3.0	25.5	9.6	29.3	19.3
Water filtering or purifying machinery and apparatus	842121	2.1	2.9	30.9	8.9	25.7	11.6
Other machinery for purifying liquids	842129	1.7	1.9	19.9	8.1	28.3	22.2
Parts for filtering or purifying machinery*	842199	2.0	1.6	20.7	8.2	29.8	15.6
<i>2.3 Biological recovery systems</i>							
<i>2.4 Gravity sedimentation systems</i>							
Flocculating agents							
<i>2.5 Oil/water separation systems</i>							
Other centrifuges	842119	0.8	1.3	21.3	6.7	23.7	11.3
Parts of centrifuges	842191	1.4	1.3	21.5	7.3	24.3	10.7
Water filtering or purifying machinery and apparatus*	842121	2.1	2.9	30.9	8.9	25.7	11.6
Other machinery for purifying liquids*	842129	1.7	1.9	19.9	8.1	28.3	22.2
Parts for filtering or purifying machinery*	842199	2.0	1.6	20.7	8.2	29.8	15.6
<i>2.6 Screens/strainers</i>							
Other articles of plastic	392690	4.3	5.1	55.2	10.2	39.1	26.5
Water filtering or purifying machinery and apparatus*	842121	2.1	2.9	30.9	8.9	25.7	11.6
Other machinery for purifying liquids*	842129	1.7	1.9	19.9	8.1	28.3	22.2
Parts for filtering or purifying machinery*	842199	2.0	1.6	20.7	8.2	29.8	15.6

	HS code	Quad		Korea, Mexico, Turkey		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
2.7 Sewage treatment							
Flocculating agents							
Woven pile & chenille fabrics of other textile materials	580190	5.7	7.9	29.7	12.7	42.0	33.4
Tanks, vats, etc. > 300 l	730900	2.3	2.9	29.3	11.5	30.8	23.0
Tanks, drums, etc. >50 l <300 l	731010	3.0	3.8	31.0	11.8	31.2	22.3
Cans < 50 l, closed by soldering or crimping	731021	3.2	4.1	29.3	11.0	31.9	23.1
Other cans < 50 l	731029	2.5	3.2	30.4	10.9	31.9	22.8
Hydraulic turbines	841000						
	841011	4.0	5.3	22.2	8.2	25.0	11.3
	841012	4.0	5.3	20.0	8.2	25.0	11.3
	841013	4.0	5.3	20.0	8.2	25.0	11.3
Parts for hydraulic turbines	841090	3.4	4.5	22.2	8.2	24.3	13.0
Incinerators, non-electric*	841780	2.1	2.9	22.5	9.9	26.4	10.7
Weighing machines capacity <30 kg	842381	2.1	3.6	36.0	13.9	26.2	17.9
Weighing machines capacity >30 kg <500 kg	842382	2.1	3.6	28.0	11.3	26.9	17.0
Weighing machines	842389	2.8	3.9	22.6	11.9	26.9	17.0
Parts for sprayers for powders or liquids*	842490	1.8	2.1	31.6	8.0	26.4	16.4
Industrial/lab electric resistance furnaces*	851410	2.2	3.3	25.8	10.2	26.4	12.0
Industrial/lab induction, dielectric furnaces*	851420	2.2	3.3	25.8	8.9	26.4	12.0
Industrial/lab electric furnaces & ovens, n.e.c.*	851430	2.0	2.9	22.8	8.6	26.4	12.0
Parts, industrial/lab electric furnaces*	851490	2.2	1.4	23.8	7.2	26.4	13.0
2.8 Water pollution control, wastewater reuse equipment							
2.9 Water handling goods and equipment							
Articles of cast iron	732510	2.0	2.8	32.7	11.4	49.3	34.9
Root control equipment							
Positive displacement pumps, hand operated	841320	1.8	2.8	22.7	10.2	30.0	22.1
Other reciprocating positive displacement pumps	841350	2.2	2.0	26.5	9.1	25.8	13.4
Other rotary positive displacement pumps	841360	2.3	3.0	25.6	9.5	25.5	13.1
Other centrifugal pumps	841370	2.2	1.8	25.2	10.1	26.8	17.4
Other pumps	841381	2.1	2.8	30.6	10.2	25.5	14.1
Valves, pressure reducing	848110	2.4	2.3	32.7	12.6	28.2	15.0
Valves, check	848130	3.0	3.5	32.7	12.2	30.2	19.0
Valves, safety	848140	1.8	1.9	32.7	11.9	26.3	14.7
Other taps, cocks, valves, etc.	848180	2.6	2.7	32.7	11.9	30.2	19.5
Instruments for measuring the flow or level of liquids	902610	1.6	2.5	17.0	8.2	24.3	14.2
Instruments for measuring or checking pressure	902620	1.3	2.0	17.1	7.8	24.5	13.9
3. Solid waste management							
3.1 Hazardous waste storage and treatment equipment							
Other articles of cement, concrete	681099	2.4	2.7	41.0	12.0	32.1	25.6
Other articles of lead	780600	2.8	4.7	29.3	12.3	35.0	22.2
Other electric space heating and soil heating apparatus	851629	3.4	4.4	37.0	13.0	31.8	28.4
Lasers	901320	3.6	4.5	38.3	8.0	30.7	14.7
Vitrification equipment							
3.2 Waste collection equipment							
Household & toilet articles of plastic	392490	5.0	6.8	63.8	12.2	39.3	36.0
Brooms, hand	960310	9.0	11.4	36.0	11.9	42.1	31.7
Brushes as parts of machines, appliances	960350	2.4	2.6	23.7	10.0	42.1	31.0
Mechanical floor sweepers	960390	4.7	6.5	32.0	11.9	40.0	29.6
Trash bin liners (plastic)							
3.3 Waste disposal equipment							
Compactors							
Refuse disposal vehicles							
Polypropylene sheeting, etc.	392020	5.5	8.0	29.8	11.0	30.7	31.7
3.4 Waste handling equipment							
3.5 Waste separation equipment							
Magnetic separators							

	HS code	Quad		Korea, Mexico, Turkey		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
3.6 Recycling equipment							
Magnetic separators*							
Machinery to clean, dry bottles, etc.	842220	1.2	2.2	21.5	7.6	27.1	16.3
Other mixing or kneading machines for earth, stone, sand, etc.	847439	0.0	1.5	17.1	6.2	23.6	11.3
Other machines for mixing/grinding, etc.	847982	1.9	3.1	32.7	8.9	27.6	16.3
Other machines, n.e.c., having individual functions	847989	1.6	2.5	32.8	10.3	29.6	17.0
Tire-shredding machinery							
3.7 Incineration equipment							
Other furnaces, ovens, incinerators, non-electric*	841780	2.1	2.9	22.5	9.9	26.4	10.7
Parts of furnaces, non-electric	841790	2.7	2.4	21.5	4.9	26.4	13.0
Industrial/lab electric resistance furnaces*	851410	2.2	3.3	25.8	10.2	26.4	12.0
Industrial/lab induction or dielectric furnaces*	851420	2.2	3.3	25.8	8.9	26.4	12.0
Other industrial/lab electric furnaces and ovens*	851430	2.0	2.9	22.8	8.6	26.4	12.0
Parts, industrial/lab electric furnaces*	851490	2.2	1.4	23.8	7.2	26.4	13.0
4. Remediation and cleanup							
4.1 Absorbents							
4.2 Cleanup							
Other electric space heating and soil heating apparatus*	851629	3.4	4.4	37.0	13.0	31.8	28.4
Lasers*	901320	3.6	4.5	38.3	8.0	30.7	14.7
Vitrification equipment							
4.3 Water treatment equipment							
Surface active chemicals (not finished detergents)							
Oil spillage cleanup equipment							
Other electrical machines and apparatus with one function	854389	2.3	2.9	32.8	9.5	23.7	10.0
5. Noise and vibration abatement							
5.1 Mufflers/silencers							
Parts for spark-ignition internal combustion piston engines	840991	2.3	2.3	22.7	9.2	32.9	25.8
Parts for diesel or semi-diesel engines	840999	1.6	1.6	21.7	8.4	29.1	24.4
Silencers and exhaust pipes, motor vehicles	870892	2.0	2.5	21.8	9.3	37.1	32.7
5.2 Noise deadening material							
5.3 Vibration control systems							
5.4 Highway barriers							
6. Environmental monitoring, analysis and assessment							
6.1 Measuring and monitoring equipment							
Thermometers, pyrometers, liquid-filled	902511	0.7	3.3	23.3	9.6	28.6	13.9
Other thermometers, pyrometers	902519	1.3	2.0	20.1	8.6	29.3	11.3
Hydrometers, barometers, hygrometers, etc.	902580	1.1	2.2	21.7	8.3	28.6	13.9
Other instruments for measuring liquids or gases	902680	1.4	2.2	17.0	6.7	23.9	13.5
Parts of instruments for measuring, checking liquids or gases	902690	1.5	2.2	16.8	3.7	23.6	21.9
Instruments for analysing gas or smoke	902710	1.2	2.9	17.2	4.6	19.6	12.7
Chromatographs, etc.	902720	1.5	2.5	17.3	4.8	20.7	9.7
Spectrometers, etc.	902730	1.8	3.5	17.3	4.8	19.8	11.4
Exposure meters	902740	0.9	1.7	17.3	8.1	23.6	18.0
Other instruments using optical radiation	902750	1.3	3.0	17.3	8.1	24.8	12.7
Other instruments for physical or chemical analysis	902780	1.5	2.4	14.8	6.9	25.5	11.3
Parts for instruments, incl. microtomes	902790	1.8	3.0	17.2	7.2	20.1	9.9
Ionising radiation measuring & detecting instruments	903010	1.7	2.7	13.7	7.6	24.6	13.4
Other optical instruments	903149	1.8	2.9	20.7	8.2	29.3	9.8
Other measuring or checking instruments	903180	1.8	2.9	15.3	6.1	27.6	13.6
Manostats	903220	2.3	4.0	31.3	10.2	30.5	19.2
Hydraulic/pneumatic automatic regulate, control instruments	903281	1.7	2.7	13.7	7.6	24.6	13.4
Other automatic regulate, control instruments	903289	1.1	2.0	17.3	9.0	26.2	17.4
Auto emissions testers							
Noise measuring equipment							

	HS code	Quad		Korea, Mexico, Turkey		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
6.2 <i>Sampling systems</i>							
6.3 <i>Process and control equipment</i>							
Thermostats	903210	2.1	3.0	17.1	8.9	30.0	18.9
Electrical process control equipment							
On-board monitoring/control							
6.4 <i>Data acquisition equipment</i>							
6.5 <i>Other instruments/machines</i>							
B. CLEANER TECHNOLOGIES AND PRODUCTS							
1 Cleaner/resource efficient technologies and processes							
Electrochemical apparatus / plant							
Extended cooking (pulp)							
Oxygen delignification							
Ultrasonic cleaning							
Fluidised bed combustion							
2. Cleaner/resource efficient products							
CFC substitutes							
Hydrogen peroxide	280110	2.0	3.1	21.8	9.3	25.7	19.2
Peat replacements (e.g. bark)							
Water-based adhesives							
Paints and varnishes, in aqueous medium, acrylic or vinyl	320910	5.4	6.4	30.5	11.7	44.3	34.8
Other paints and varnishes, in aqueous medium	320990	5.6	6.5	30.5	10.8	44.3	34.9
Double-hulled oil tankers							
Low-noise compressors							
C. RESOURCES MANAGEMENT Group							
1. Indoor air pollution control							
2. Water supply							
2.1 <i>Potable water treatment</i>							
2.2 <i>Water purification systems</i>							
Chlorine*	280110	2.0	3.1	21.8	9.3	25.7	19.2
2.3 <i>Potable water supply and distribution</i>							
Water, incl. natural or artificial mineral water	220100						
Distilled and conductivity water	285100	3.9	5.4	20.0	7.8	24.3	15.4
Ion exchangers (polymer)	391400	4.5	4.5	24.8	10.2	25.7	24.3
3. Recycled materials							
3.1 <i>Recycled paper</i>							
3.2 <i>Other recycled products</i>							
4. Renewable energy plant							
4.1 <i>Solar</i>							
Instantaneous gas water heaters	841911	2.5	3.9	36.0	10.9	34.0	26.1
Other instantaneous or storage water heaters, non-electric	841919	2.5	3.9	36.0	9.0	33.3	26.9
Photosensitive semiconductor devices, incl. solar cells	854140	0.8	1.2	18.3	4.6	27.1	11.7
4.2 <i>Wind</i>							
Windmills							
Wind turbines							
4.3 <i>Tidal</i>							
4.4 <i>Geothermal</i>							
4.5 <i>Other</i>							
Methanol	290511	3.3	6.7	23.8	5.8	25.7	17.4
Ethanol	220710						
Hydroelectric plant							

	HS code	QUAD		Korea, Mexico, Turkey		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
5. Heat/energy savings and management							
Catalysts	381500						
Multiple walled insulating units of glass	700800	1.7	3.6	49.3	11.3	36.4	33.6
Other glass fibre products*	701990	5.6	7.2	42.7	9.9	31.3	19.1
Heat exchange units	841950	1.8	1.4	29.3	6.6	25.8	13.8
Parts for heat exchange equipment	841990	3.0	3.5	29.3	4.3	28.6	16.3
Heat pumps							
District heating plant							
Waste heat boilers							
Burners: fuel other than oil or gas							
Fluorescent lamps, hot cathode	853931	3.1	4.1	25.7	9.3	33.6	30.9
Electric cars							
Fuel cells							
Gas supply, production and calibrating metres	902810	2.4	4.2	31.3	9.8	24.3	17.7
Liquid supply, production and calibrating metres	902820	2.3	4.0	31.3	10.2	30.5	19.2
Thermostats*	903210	2.1	3.0	17.1	8.9	30.0	18.9
6. Sustainable agriculture and fisheries							
7. Sustainable forestry							
8. Natural risk management							
Satellite imaging							
Seismic instruments							
9. Eco-tourism							
10. Other							

Source: OECD based on WTO and UNCTAD databases.

Annex 3

BOUND AND APPLIED TARIFFS ON ENVIRONMENTAL GOODS IN 14 MARKETS

HS code	Canada		EU-15		Japan		United States		Korea		Mexico		Turkey		Argentina		Brazil		Malaysia		India		Indonesia		Thailand	
	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN
252100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	3.0	35.0	10.0	25.0	2.5	35.0	4.0	35.0	4.0	5.0	5.0	40.0	70.0	40.0	5.0	15.0	10.0
252220	0.0	0.0	1.7	2.4	0.0	0.0	0.0	0.0	5.0	3.0	35.0	10.0	25.0	5.0	35.0	4.0	35.0	4.0	30.0	25.0	40.0	70.0	40.0	5.0	15.0	5.0
280110	0.0	0.0	5.5	9.4	2.5	2.8	0.0	0.0	5.5	8.0	35.0	10.0	25.0	9.9	17.5	8.0	17.5	8.0	10.0	10.0	40.0	70.0	40.0	10.0	30.0	17.5
281410	0.0	0.0	5.5	9.4	2.5	2.8	0.0	0.0	5.0	5.0	35.0	0.0	28.4	10.5	17.5	4.0	17.5	1.0	5.0	0.0	25.0	70.0	40.0	5.0	30.0	12.5
281511	0.0	0.0	5.5	10.1	5.3	6.0	0.0	0.0	5.5	8.0	35.0	5.0	30.0	12.0	35.0	8.0	35.0	2.0	20.0	20.0	40.0	-	30.0	15.0	30.0	20.0
281512	0.0	0.0	5.5	10.1	5.3	6.0	0.0	0.0	20.0	8.0	35.0	5.0	30.0	12.0	17.5	8.0	17.5	8.0	30.0	20.0	40.0	-	30.0	15.0	30.0	10.0
281610	0.0	0.0	4.1	4.1	3.3	3.7	2.8	3.1	5.5	8.0	35.0	10.0	10.6	4.1	17.5	6.0	17.5	6.0	5.0	0.0	40.0	70.0	40.0	5.0	30.0	10.0
281830	0.0	0.0	5.5	5.5	3.3	3.7	0.0	0.0	5.5	8.0	32.5	10.0	11.3	5.7	17.5	2.0	17.5	2.0	5.0	0.0	40.0	70.0	40.0	0.0	30.0	15.0
282010	0.0	0.0	5.3	5.3	3.3	3.7	4.2	4.7	5.5	8.0	35.0	10.0	11.1	5.3	17.5	10.0	17.5	10.0	5.0	0.0	40.0	70.0	40.0	5.0	30.0	10.0
282090	0.0	0.0	5.5	6.1	3.3	3.7	4.5	4.7	5.5	8.0	35.0	10.0	11.8	6.6	17.5	10.0	15.6	10.0	5.0	0.0	40.0	70.0	40.0	5.0	30.0	10.0
282410	5.5	2.6	5.5	9.0	4.7	4.9	3.0	3.0	5.5	8.0	35.0	10.0	50.0	16.0	17.5	10.0	17.5	10.0	2.0	0.0	40.0	70.0	40.0	5.0	30.0	15.0
283210	0.0	0.0	5.5	6.5	5.4	6.1	1.2	1.5	5.5	8.0	35.0	10.0	24.2	8.0	35.0	10.0	35.0	10.0	5.0	0.0	40.0	-	40.0	5.0	30.0	10.0
283220	0.0	0.0	5.5	6.5	5.4	6.1	2.8	3.1	5.5	8.0	35.0	10.0	22.4	8.0	17.5	2.0	17.5	2.0	5.0	0.0	40.0	70.0	40.0	5.0	30.0	15.0
283510	5.5	3.0	5.5	5.5	3.9	4.0	2.9	3.1	5.5	8.0	35.0	10.0	19.6	5.5	17.5	4.0	17.5	4.0	5.0	0.0	40.0	70.0	40.0	5.0	30.0	12.5
283522	5.5	11.1	5.5	7.3	3.9	4.3	1.3	1.4	5.5	8.0	35.0	10.0	10.0	9.1	17.5	10.0	17.5	10.0	30.0	0.0	40.0	70.0	30.0	5.0	30.0	20.0
283523	5.5	11.1	5.5	7.3	3.9	4.0	1.9	2.2	5.5	8.0	35.0	10.0	10.0	9.1	17.5	10.0	17.5	10.0	30.0	0.0	40.0	70.0	30.0	15.0	30.0	20.0
283524	5.5	3.0	5.5	7.3	3.9	4.3	2.8	3.1	5.5	8.0	35.0	10.0	13.0	9.1	17.5	10.0	17.5	10.0	30.0	0.0	40.0	70.0	30.0	5.0	30.0	10.0
283525	0.0	0.0	5.5	7.3	3.9	4.3	0.0	0.0	5.5	8.0	35.0	5.0	10.0	9.1	17.5	10.0	10.0	10.0	5.0	0.0	40.0	70.0	30.0	5.0	30.0	15.0
283526	5.5	11.1	5.5	7.3	3.9	4.0	0.0	0.0	5.5	8.0	35.0	10.0	10.0	9.1	17.5	10.0	14.2	10.0	5.0	0.0	40.0	70.0	30.0	5.0	30.0	10.0
283529	5.5	2.0	5.4	6.3	3.9	4.0	1.7	1.9	5.5	8.0	35.0	10.0	25.8	8.8	17.5	3.0	17.5	3.0	30.0	0.0	40.0	70.0	30.0	5.0	30.0	10.0
284700	5.5	7.7	5.5	6.1	3.3	3.4	3.5	3.7	5.5	8.0	35.0	10.0	38.3	6.9	17.5	10.0	17.5	10.0	30.0	0.0	40.0	70.0	40.0	7.5	30.0	20.0
285100	5.5	11.1	4.1	4.2	3.3	3.7	2.7	2.8	5.5	8.0	35.0	10.0	19.6	5.4	17.5	4.7	17.5	4.7	5.0	0.0	40.0	70.0	35.0	7.5	30.0	10.0
290511	5.5	8.2	5.5	10.8	0.0	0.0	2.3	7.8	5.0	5.0	35.0	0.0	31.5	12.3	20.0	12.0	20.0	0.0	5.0	0.0	40.0	80.0	40.0	5.0	30.0	13.5
320910	6.5	8.1	6.5	7.9	4.0	4.5	4.8	5.1	6.5	8.0	35.0	15.0	50.0	12.0	20.0	14.0	20.0	14.0	25.0	15.0	150.0	150.0	40.0	17.0	30.0	22.5

HS code	Canada		EU-15		Japan		United States		Korea		Mexico		Turkey		Argentina		Brazil		Malaysia		India		Indonesia		Thailand	
	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN
320990	6.5	8.1	6.5	7.9	4.0	4.2	5.5	5.9	6.5	8.0	35.0	12.5	50.0	12.0	20.0	14.0	20.0	14.0	25.0	15.0	150.0	150.0	40.0	17.5	30.0	22.5
380210	0.0	0.0	3.2	4.4	2.9	2.9	4.4	4.8	6.5	8.0	35.0	15.0	35.0	5.7	20.0	12.0	20.0	12.0	30.0	5.0	40.0	70.0	40.0	15.0	30.0	10.0
391400	6.5	3.5	6.5	6.9	5.0	5.6	0.0	2.0	6.5	8.0	35.0	15.0	33.0	7.6	20.0	2.0	20.0	2.0	5.0	0.0	40.0	100.0	40.0	30.0	30.0	25.0
392020	6.5	12.1	6.5	10.7	4.8	5.0	4.0	4.2	6.5	8.0	33.0	12.0	50.0	13.0	25.0	13.3	25.0	11.3	30.0	27.5	40.0	100.0	40.0	30.0	30.0	29.0
392490	6.5	12.2	6.5	7.3	3.9	4.3	3.2	3.4	6.5	8.0	35.0	20.0	150.0	8.6	25.0	18.0	25.0	18.0	30.0	30.0	100.0	100.0	40.0	30.0	30.0	45.0
392690	6.3	7.0	4.9	5.5	2.0	3.3	4.1	4.7	6.5	8.0	34.2	15.3	125.0	7.2	25.0	15.3	25.0	15.3	21.1	9.3	100.0	100.0	40.0	18.3	37.5	16.1
580190	6.0	8.0	8.0	12.9	5.9	6.3	3.1	4.5	13.0	8.0	35.0	15.0	41.0	15.0	35.0	18.0	35.0	18.0	29.0	22.0	100.0	100.0	40.0	25.0	30.0	40.0
681099	5.9	5.5	1.7	2.3	0.0	0.0	1.9	2.9	13.0	8.0	35.0	20.0	75.0	8.0	35.0	8.0	35.0	8.0	20.0	10.0	40.0	100.0	40.0	12.5	30.0	30.0
700800	0.0	6.1	3.0	3.9	0.0	0.0	3.8	4.2	13.0	8.0	35.0	20.0	100.0	6.0	35.0	12.0	35.0	12.0	50.0	50.0	40.0	100.0	40.0	10.0	30.0	40.0
701990	11.2	15.1	7.0	8.0	0.0	0.0	4.4	5.8	25.0	8.0	35.0	11.7	68.1	10.0	35.0	12.0	35.0	12.0	14.3	15.0	40.0	60.0	40.0	10.0	30.0	14.0
730300	6.0	7.9	3.2	4.2	0.0	3.1	0.0	3.9	13.0	8.0	35.0	10.0	30.0	10.5	35.0	12.0	35.0	12.0	30.0	-	40.0	70.0	32.0	18.8	30.0	10.0
730431	0.0	3.2	0.0	4.7	0.0	1.6	0.0	5.7	0.0	8.0	34.0	12.0	14.7	6.7	35.0	24.0	34.6	16.0	16.0	15.0	40.0	70.0	40.0	5.0	30.0	10.0
730900	3.8	3.4	2.2	2.9	3.3	3.6	0.0	1.6	13.0	8.0	35.0	15.0	40.0	11.4	35.0	10.0	35.0	18.0	23.3	10.0	40.0	70.0	40.0	25.0	17.0	17.0
731010	6.0	7.9	2.7	3.5	3.3	3.9	0.0	0.0	13.0	8.0	35.0	15.0	45.0	12.5	35.0	14.0	35.0	14.0	13.3	8.3	40.0	70.0	35.0	11.7	35.0	27.0
731021	6.7	8.8	2.7	3.6	3.3	3.9	0.0	0.0	13.0	8.0	35.0	15.0	40.0	10.0	35.0	14.0	35.0	14.0	13.3	8.3	40.0	70.0	40.0	17.5	35.0	27.0
731029	4.0	5.2	2.7	3.6	3.3	3.9	0.0	0.0	13.0	8.0	35.0	13.0	43.3	11.7	35.0	14.0	35.0	14.0	13.3	8.3	40.0	70.0	40.0	15.0	35.0	27.0
732510	6.4	8.4	1.7	2.7	0.0	0.0	0.0	0.0	13.0	8.0	35.0	12.0	50.0	14.3	35.0	18.0	35.0	18.0	25.0	10.2	150.0	150.0	40.0	10.0	35.0	27.0
780600	3.0	7.3	2.5	4.3	3.0	3.6	2.8	3.5	13.0	8.0	35.0	15.0	40.0	13.9	35.0	16.0	35.0	16.0	5.0	0.0	85.0	85.0	40.0	7.5	20.0	20.0
840991	4.8	3.3	2.7	3.6	0.0	0.0	1.8	2.3	13.0	8.0	35.0	12.8	20.0	6.7	35.0	16.2	30.6	16.7	30.0	18.6	40.0	100.0	40.0	1.7	30.0	16.7
840999	2.5	0.8	2.7	3.6	0.0	0.0	1.2	2.2	10.2	7.6	35.0	11.0	20.0	6.7	35.0	16.0	25.0	16.0	8.8	8.8	40.0	100.0	40.0	2.5	30.0	16.7
841011	7.9	9.4	4.5	5.1	0.0	0.0	3.7	6.8	6.5	8.0	35.0	10.0	25.0	6.5	35.0	10.0	35.0	18.0	5.0	0.0	25.0	35.0	30.0	0.0	20.0	5.0
841012	7.9	9.4	4.5	5.1	0.0	0.0	3.6	6.8	0.0	8.0	35.0	10.0	25.0	6.5	35.0	10.0	35.0	18.0	5.0	0.0	25.0	35.0	30.0	0.0	20.0	5.0
841013	7.9	9.4	4.5	5.1	0.0	0.0	3.7	6.8	0.0	8.0	35.0	10.0	25.0	6.5	35.0	10.0	35.0	18.0	5.0	0.0	25.0	35.0	30.0	0.0	20.0	5.0
841090	5.3	6.3	4.5	5.1	0.0	0.0	3.7	6.8	6.5	8.0	35.0	10.0	25.0	6.5	35.0	22.0	30.0	18.0	5.0	0.0	25.0	35.0	30.0	0.0	20.0	5.0
841320	6.2	8.1	0.9	1.3	0.0	0.0	0.0	1.8	13.0	8.0	35.0	20.0	20.0	2.5	35.0	18.0	35.0	18.0	5.0	2.5	40.0	70.0	40.0	15.0	30.0	20.0
841350	5.6	4.0	1.4	2.2	0.0	0.0	1.7	1.8	13.6	8.0	35.0	13.3	30.9	5.9	35.0	22.0	35.0	18.0	9.2	0.0	25.0	35.0	36.3	0.0	15.0	7.5
841360	6.0	8.1	1.5	2.3	0.0	0.0	1.7	1.8	13.6	8.0	35.0	15.0	28.3	5.6	35.0	18.0	33.6	18.0	5.0	0.0	25.0	35.0	40.0	2.5	15.0	7.5
841370	5.6	4.1	1.6	2.4	0.0	0.0	1.6	0.9	15.5	8.0	35.0	16.7	25.2	5.6	35.0	22.0	35.0	18.0	7.9	20.0	25.0	35.0	40.0	2.5	20.0	13.3
841381	6.0	8.1	0.9	1.3	0.0	0.0	1.7	1.8	14.5	8.0	35.0	16.3	42.3	6.2	35.0	22.0	33.3	18.0	5.0	0.0	25.0	35.0	40.0	5.0	15.0	7.5
841410	3.1	1.6	1.3	2.1	0.0	0.0	2.4	3.2	15.0	8.0	35.0	8.3	16.4	5.3	35.0	10.0	25.0	18.0	5.0	0.0	25.0	35.0	40.0	0.0	20.0	5.0
841430	4.7	1.8	1.7	2.3	0.0	0.0	0.0	2.0	13.0	8.0	35.0	15.0	16.4	3.8	35.0	11.5	25.0	13.5	12.5	0.0	40.0	110.0	40.0	0.0	60.0	11.7
841440	6.1	3.8	2.2	3.1	0.0	0.0	2.6	3.1	13.0	8.0	35.0	15.0	16.8	4.4	35.0	10.0	35.0	18.0	30.0	0.0	25.0	35.0	30.0	5.0	20.0	5.0
841480	3.5	2.1	2.0	2.8	0.0	0.0	1.2	2.4	13.0	8.0	35.0	12.5	16.7	4.5	35.0	10.0	35.0	18.0	19.0	14.5	40.0	110.0	20.0	0.8	30.0	12.5
841490	5.0	1.5	1.1	1.6	0.0	0.0	1.5	2.7	13.0	8.0	35.0	12.3	22.0	3.5	35.0	20.9	32.0	17.4	21.7	15.7	40.0	100.0	40.0	0.0	30.0	12.5
841780	3.1	4.0	1.7	2.7	0.0	0.0	3.8	5.0	13.0	8.0	38.0	15.0	16.6	6.8	35.0	6.7	35.0	12.0	5.0	0.0	25.0	40.0	40.0	0.0	20.0	5.0
841790	5.1	1.9	1.7	2.7	0.0	0.0	3.8	5.0	13.0	8.0	35.0	0.0	16.6	6.8	35.0	22.0	35.0	18.0	5.0	0.0	25.0	35.0	40.0	0.0	20.0	5.0

HS code	Canada		EU-15		Japan		United States		Korea		Mexico		Turkey		Argentina		Brazil		Malaysia		India		Indonesia		Thailand	
	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN
841911	7.5	9.8	2.6	3.3	0.0	0.0	0.0	2.4	13.0	8.0	35.0	15.0	60.0	9.6	35.0	29.0	35.0	20.0	28.3	20.0	40.0	70.0	40.0	12.5	35.0	20.0
841919	7.5	9.8	2.6	3.3	0.0	0.0	0.0	2.4	13.0	8.0	35.0	12.5	60.0	6.5	35.0	24.5	35.0	30.0	28.3	20.0	40.0	70.0	40.0	12.5	30.0	20.0
841939	4.1	2.7	1.7	2.7	0.0	0.0	0.0	2.5	13.0	8.0	37.1	1.7	40.0	5.0	35.0	10.0	35.0	18.0	5.0	0.0	25.0	35.0	40.0	0.0	20.0	5.0
841950	6.3	1.2	0.9	1.2	0.0	0.0	0.0	3.4	13.0	8.0	35.0	9.2	40.0	2.7	35.0	10.0	33.3	18.0	12.5	12.5	40.0	35.0	15.0	5.0	20.0	5.0
841960	6.1	8.0	1.7	2.7	0.0	0.0	4.0	3.4	13.0	8.0	35.0	0.0	40.0	5.0	35.0	10.0	35.0	18.0	5.0	0.0	40.0	70.0	40.0	0.0	20.0	5.0
841989	3.5	4.5	1.1	1.5	0.0	0.0	0.0	1.9	12.7	8.0	35.0	14.3	32.2	5.0	35.0	10.0	35.0	18.0	5.0	0.0	40.0	55.0	40.0	0.0	16.7	5.0
841990	5.9	1.9	0.6	1.4	0.0	0.0	0.0	2.6	10.4	8.0	37.5	12.5	52.8	4.2	35.0	17.3	35.0	14.7	27.5	21.3	35.0	35.0	40.0	0.0	20.0	5.0
842119	1.5	1.4	0.4	1.0	0.0	0.0	1.3	2.9	13.0	8.0	35.0	10.0	16.0	2.1	35.0	10.0	31.2	18.0	0.0	0.0	25.0	35.0	40.0	0.0	10.0	5.0
842121	6.0	8.0	0.9	1.4	0.0	0.0	1.7	2.3	15.0	8.0	35.0	12.0	42.7	6.6	35.0	10.0	35.0	18.0	5.0	0.0	25.0	35.0	40.0	0.0	15.0	7.5
842129	6.1	4.0	0.9	1.4	0.0	0.0	0.0	2.3	8.7	8.0	35.0	14.2	15.9	2.2	35.0	8.4	35.0	10.8	14.8	5.0	40.0	110.0	28.0	5.0	20.0	5.0
842139	6.1	5.3	1.4	2.2	0.0	0.0	0.0	2.3	9.7	8.0	35.0	13.9	16.5	5.1	35.0	15.5	35.0	13.5	30.0	10.0	40.0	110.0	30.0	0.0	30.0	2.5
842191	4.1	0.4	1.7	2.5	0.0	0.0	0.0	2.3	13.0	8.0	35.0	10.0	16.5	3.8	35.0	12.7	25.0	11.3	5.0	0.0	40.0	35.0	20.0	0.0	20.0	5.0
842199	6.1	1.4	1.7	2.8	0.0	0.0	0.0	2.3	10.3	8.0	35.0	12.5	16.8	4.2	35.0	22.0	30.0	18.0	18.3	8.3	40.0	35.0	30.0	0.0	30.0	15.0
842220	3.1	4.0	1.7	2.4	0.0	0.0	0.0	2.2	13.0	8.0	35.0	11.3	16.4	3.5	35.0	10.0	25.0	18.0	5.0	0.0	40.0	70.0	40.0	0.0	20.0	5.0
842381	6.7	8.8	1.7	2.8	0.0	0.0	0.0	2.6	13.0	8.0	35.0	20.0	60.0	13.7	35.0	16.0	33.3	18.0	5.0	0.0	40.0	70.0	25.0	5.0	20.0	5.0
842382	6.7	8.8	1.7	2.8	0.0	0.0	0.0	2.6	13.0	8.0	35.0	20.0	35.9	6.0	35.0	10.0	33.3	18.0	5.0	0.0	40.0	70.0	30.0	5.0	20.0	5.0
842389	6.7	8.8	1.7	2.8	0.0	0.0	2.8	3.8	13.0	8.0	35.0	20.0	19.8	7.8	35.0	10.0	33.3	18.0	5.0	0.0	40.0	70.0	30.0	5.0	20.0	5.0
842490	4.7	3.3	1.7	2.8	0.0	0.0	0.7	2.3	9.8	8.0	35.0	10.0	50.0	6.0	35.0	18.0	35.0	16.0	5.0	25.0	25.0	35.0	40.0	5.0	20.0	5.0
847439	0.0	2.9	0.0	1.2	0.0	0.0	0.0	1.7	0.0	8.0	35.0	8.3	16.2	2.4	35.0	10.0	25.0	18.0	5.0	0.0	25.0	35.0	30.0	0.0	20.0	5.0
847982	6.0	7.5	1.7	2.8	0.0	0.0	0.0	2.2	13.0	8.0	35.0	11.7	50.0	7.0	35.0	10.0	28.3	18.0	5.0	0.0	40.0	70.0	40.0	0.0	20.0	5.0
847989	5.0	6.6	0.7	1.2	0.0	0.0	0.5	2.4	15.3	8.0	35.6	16.5	47.5	6.3	35.0	9.6	33.3	14.4	5.0	2.5	40.0	70.0	38.6	6.3	30.0	5.0
848110	5.4	2.9	2.2	3.1	0.0	0.0	1.9	3.0	13.0	8.0	35.0	15.0	50.0	14.7	35.0	22.0	25.0	18.0	12.5	8.8	40.0	40.0	40.0	0.0	20.0	5.0
848130	6.4	5.9	2.2	3.2	0.0	0.0	3.6	5.1	13.0	8.0	35.0	14.0	50.0	14.7	35.0	22.0	31.0	18.0	10.7	7.1	40.0	60.0	40.0	0.0	30.0	15.0
848140	3.2	1.5	2.2	3.2	0.0	0.0	2.0	3.0	13.0	8.0	35.0	13.0	50.0	14.7	35.0	22.0	29.0	18.0	10.0	7.1	25.0	40.0	40.0	0.0	20.0	5.0
848180	4.7	3.1	2.2	3.2	0.0	0.0	3.5	4.7	13.0	8.0	35.0	13.1	50.0	14.7	35.0	21.0	30.5	18.0	10.9	8.1	40.0	60.0	40.0	3.3	30.0	15.0
851410	6.6	8.6	2.2	3.0	0.0	0.0	0.0	1.5	17.5	8.0	35.0	18.8	25.0	3.7	35.0	10.0	35.0	18.0	5.0	0.0	25.0	40.0	40.0	0.0	20.0	5.0
851420	6.6	8.6	2.2	3.0	0.0	0.0	0.0	1.5	20.0	8.0	32.5	15.0	25.0	3.7	35.0	10.0	35.0	18.0	5.0	0.0	25.0	40.0	40.0	0.0	20.0	5.0
851430	7.0	9.2	1.1	1.5	0.0	0.0	0.0	1.0	10.0	8.0	33.3	14.2	25.0	3.7	35.0	10.0	35.0	18.0	5.0	0.0	25.0	40.0	40.0	0.0	20.0	5.0
851440	6.5	8.5	2.2	3.0	0.0	0.0	0.0	1.5	10.0	8.0	35.0	17.5	25.0	3.7	35.0	10.0	35.0	18.0	5.0	0.0	40.0	40.0	40.0	0.0	20.0	5.0
851490	6.7	1.1	2.2	3.0	0.0	0.0	0.0	1.5	6.5	8.0	35.0	10.0	30.0	3.7	35.0	22.0	35.0	18.0	5.0	0.0	25.0	35.0	40.0	0.0	20.0	5.0
851629	7.5	9.8	2.7	3.9	0.0	0.0	3.6	3.7	16.0	8.0	35.0	20.0	60.0	11.0	35.0	30.0	35.0	30.0	17.5	12.5	40.0	70.0	40.0	25.0	30.0	20.0
853931	7.4	9.7	2.7	3.6	0.0	0.0	2.3	3.2	25.0	8.0	35.0	15.0	17.0	4.9	35.0	18.0	35.0	18.0	30.0	-	40.0	100.0	40.0	15.0	30.0	20.0
854140	0.0	0.0	3.3	4.7	0.0	0.0	0.0	0.2	0.0	8.0	35.0	0.0	20.0	5.8	35.0	4.7	15.0	8.5	0.0	0.0	40.0	50.0	40.0	2.5	35.0	5.5
854389	4.3	4.9	2.6	3.6	0.0	0.0	2.2	3.0	13.3	8.0	35.0	11.8	50.0	8.8	35.0	9.1	35.0	7.8	5.0	5.0	-	-	22.5	7.5	20.0	20.0
854810	3.7	0.0	2.4	3.3	0.5	0.0	2.7	0.7	8.5	6.9	34.8	20.0	24.5	7.3	35.0	11.0	26.2	11.0	9.9	14.0	-	-	38.2	5.0	23.7	12.6
870590	6.1	4.0	3.7	4.7	0.0	0.0	0.0	2.2	15.4	8.0	50.0	10.0	17.5	5.7	35.0	10.0	35.0	20.0	35.0	35.0	40.0	60.0	5.0	5.0	40.0	25.0
870892	3.1	4.0	3.8	4.7	0.0	0.0	1.2	1.5	13.0	8.0	35.0	13.3	17.4	6.5	35.0	18.0	25.0	18.0	15.0	15.0	40.0	100.0	60.0	25.0	60.0	41.7

HS code	Canada		EU-15		Japan		United States		Korea		Mexico		Turkey		Argentina		Brazil		Malaysia		India		Indonesia		Thailand	
	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN	Bound	MFN
901320	6.8	8.9	4.7	5.4	0.0	0.0	3.1	3.6	20.0	8.0	35.0	10.0	60.0	6.1	35.0	14.0	35.0	18.0	5.0	0.0	40.0	40.0	40.0	15.0	35.0	5.0
902511	1.9	3.0	0.9	2.4	0.0	0.0	0.0	7.6	0.0	8.0	35.0	15.0	35.0	5.7	35.0	18.0	35.0	18.0	5.0	0.0	40.0	40.0	40.0	5.0	20.0	5.0
902519	1.9	2.2	1.8	2.6	0.0	0.0	1.8	3.3	8.0	8.0	35.0	14.0	17.2	3.9	35.0	9.0	35.0	9.0	0.0	0.0	40.0	40.0	40.0	5.0	30.0	5.0
902580	0.9	2.9	1.9	2.7	0.0	0.0	1.6	3.4	8.0	8.0	35.0	12.5	22.1	4.3	35.0	18.0	30.0	18.0	0.0	0.0	40.0	40.0	40.0	5.0	30.0	5.0
902610	2.4	2.2	2.1	3.4	0.0	0.0	2.0	4.3	8.0	8.0	35.0	12.1	8.1	4.6	25.0	20.0	20.0	18.3	0.0	0.0	40.0	40.0	30.0	5.0	30.0	5.0
902620	1.5	1.7	1.9	2.9	0.0	0.0	1.6	3.6	8.0	8.0	35.0	11.4	8.3	3.9	25.0	18.0	21.3	18.0	0.0	0.0	40.0	40.0	30.0	5.0	30.0	5.0
902680	1.6	1.7	1.8	2.8	0.0	0.0	2.1	4.5	8.0	8.0	35.0	8.3	7.9	3.8	25.0	18.0	25.0	18.0	0.0	0.0	32.5	37.5	30.0	5.0	30.0	5.0
902690	2.8	2.5	1.1	1.7	0.0	0.0	2.1	4.6	8.0	8.1	35.0	0.0	7.3	3.0	25.0	16.0	35.0	16.0	5.0	0.0	40.0	100.0	5.0	5.0	30.0	5.0
902710	0.0	2.3	2.5	4.2	0.0	0.0	2.4	5.2	8.0	8.0	35.0	0.0	8.7	5.9	25.0	10.0	22.5	18.0	5.0	0.0	25.0	40.0	5.0	5.0	30.0	5.0
902720	1.5	2.2	2.5	4.2	0.0	0.0	1.9	3.7	8.0	8.0	35.0	0.0	8.9	6.3	25.0	2.5	35.0	4.5	0.0	0.0	25.0	40.0	5.0	5.0	30.0	5.0
902730	2.3	4.5	2.5	4.0	0.0	0.0	2.5	5.5	8.0	8.0	35.0	0.0	8.9	6.3	25.0	7.5	28.8	13.5	0.0	0.0	25.0	37.5	5.0	5.0	30.0	5.0
902740	0.0	0.0	2.5	4.4	0.0	0.0	1.2	2.5	8.0	8.0	35.0	10.0	8.9	6.3	25.0	0.0	35.0	0.0	5.0	0.0	40.0	100.0	5.0	5.0	30.0	10.0
902750	0.0	2.3	2.5	4.4	0.0	0.0	2.5	5.5	8.0	8.0	35.0	10.0	8.9	6.3	25.0	10.0	33.9	18.0	5.0	0.0	25.0	40.0	30.0	5.0	30.0	5.0
902780	2.3	2.9	1.7	2.8	0.0	0.0	1.9	3.9	8.0	8.0	27.5	6.7	8.9	5.9	25.0	7.1	35.0	10.9	5.0	0.0	25.0	40.0	33.3	5.0	30.0	5.0
902790	2.4	3.1	2.5	4.2	0.0	0.0	2.3	4.5	8.0	8.1	35.0	7.5	8.5	5.9	25.0	4.4	30.6	3.6	0.0	0.0	25.0	40.0	5.0	5.0	30.0	5.0
902810	5.1	8.2	2.1	3.3	0.0	0.0	2.6	5.4	9.0	8.0	35.0	10.0	50.0	11.5	25.0	20.0	35.0	18.0	5.0	0.0	40.0	60.0	10.0	5.0	30.0	10.0
902820	4.6	7.2	2.1	3.3	0.0	0.0	2.6	5.6	9.0	8.0	35.0	12.5	50.0	10.0	25.0	18.0	35.0	18.0	18.3	12.5	40.0	60.0	40.0	5.0	30.0	10.0
903010	2.9	4.7	2.1	2.8	0.0	0.0	1.6	3.5	0.0	8.0	35.0	10.0	6.0	4.7	25.0	22.0	22.5	11.0	0.0	0.0	40.0	40.0	30.0	5.0	30.0	5.0
903149	3.7	3.0	0.0	1.2	0.0	0.0	3.4	7.4	9.8	8.0	35.0	10.0	17.3	6.6	35.0	10.0	35.0	18.0	5.0	0.0	-	-	40.0	15.0	35.0	5.0
903180	3.0	4.4	2.7	3.8	0.0	0.0	1.7	3.6	7.7	8.0	27.5	5.0	10.7	5.3	35.0	10.3	28.3	14.1	5.0	0.0	40.0	40.0	30.0	15.0	30.0	5.0
903210	5.0	5.7	1.8	2.8	0.0	0.0	1.7	3.6	8.0	8.0	35.0	15.0	8.2	3.8	35.0	18.0	35.0	18.0	10.0	0.0	40.0	60.0	30.0	5.0	35.0	20.0
903220	4.5	3.3	1.4	2.0	0.0	0.0	1.6	3.6	8.0	8.0	35.0	20.0	7.5	3.5	35.0	18.0	25.0	18.0	5.0	0.0	40.0	40.0	30.0	5.0	30.0	10.0
903281	0.0	2.7	1.4	2.0	0.0	0.0	1.6	3.5	8.0	8.0	35.0	12.5	7.7	3.9	35.0	18.0	35.0	18.0	5.0	0.0	40.0	60.0	30.0	5.0	30.0	10.0
903289	1.6	2.7	1.4	2.3	0.0	0.0	1.5	3.2	8.0	8.0	35.0	14.3	8.9	4.7	25.0	17.1	30.8	20.9	2.5	0.0	40.0	60.0	30.0	5.0	30.0	7.5
960310	9.4	12.4	3.7	4.5	2.5	2.7	20.4	26.1	13.0	8.0	35.0	20.0	60.0	7.7	35.0	18.0	35.0	18.0	30.0	15.0	100.0	100.0	40.0	20.0	30.0	40.0
960350	3.5	0.9	2.7	3.6	3.3	3.9	0.0	2.0	13.0	8.0	35.0	15.0	23.0	7.1	35.0	18.0	35.0	18.0	30.0	15.0	100.0	100.0	40.0	20.0	30.0	35.0
960390	10.6	14.1	3.4	4.7	3.6	4.1	1.2	3.1	13.0	8.0	35.0	20.0	47.9	7.7	35.0	18.0	35.0	18.0	25.0	8.8	100.0	100.0	30.0	20.0	30.0	31.7

Chile applied a flat rate of 11% on all goods in 1996. Its Uruguay Round bound rate commitment is 25% across the board.

Source: UNCTAD and WTO tariff databases.

Annex 4

MATRIX OF EXISTING GATS COMMITMENTS FOR ENVIRONMENTAL SERVICES

The following matrix shows the commitments made in the Uruguay Round by OECD and emerging non-OECD economies in each of the four GATS environmental services sub-sectors. Commitments made by small developing and least-developed countries are not shown.

In accordance with GATS practice, the use of the term “none” in this matrix means no restrictions or limitations on market access or national treatment, as the case may be, rather than that no commitments have been made.

Matrix key

Matrix headings		Generic listings		Specific listings	
Mode 1	Cross-border supply	None	Bound, as no restrictions or limitations on market access/national treatment applying	Env. operating license req.	Environmental operating license required
Mode 2	Consumption abroad	Unbound	Unbound (no commitment made)	Ec. needs test	Establishment of commercial presence subject to economic needs test
Mode 3	Commercial presence	Unbound*	Unbound due to lack of technical feasibility	Commercial presence req.	Commercial presence required (for presence of persons)
Mode 4	Presence of natural persons	Unbound ex horiz. restr.	Unbound except for horizontal restrictions	Foreign equity limit	Foreign equity limit
Market access	Market access	Horiz. restr.	Existence of horizontal restrictions	Monopoly	Existence of monopoly
National treatment	National treatment				

6A. Sewage services

Country	Mode 1		Mode 2		Mode 3		Mode 4	
	Market access	National treatment	Market access	National treatment	Market access	National treatment	Market access	National treatment
Australia	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Canada	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Czech Republic	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
EC	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Iceland	Unbound*	Unbound*	None	None	Env. operating license req.	None	Unbound ex horiz. restr., Env. operating license req.	None
Japan	Unbound*	Unbound*	None	None	None/Horiz. restr.	None/Horiz. restr.	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Korea (industrial wastewater collection & treatment only)	Unbound	None	None	None	Suppliers limited to 25	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Norway	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Switzerland	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Turkey	Unbound	Unbound	None	None	None	None	None	None
United States (for private sector contracts)	None	None	None	None	None	None	Unbound ex horiz. restr.	None
Slovak Republic	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Slovenia	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
South Africa	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Thailand	Unbound	Unbound	None	None	None/Horiz. restr.	None/49% foreign equity limit	Horiz. restr.	None

6B. Refuse disposal services

Country	Mode 1		Mode 2		Mode 3		Mode 4	
	Market access	National treatment	Market access	National treatment	Market access	National treatment	Market access	National treatment
Australia	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Canada	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Czech Republic	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
EC	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Hungary	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Iceland	Unbound*	Unbound*	None	None	Env. operating license req.	None	Unbound ex horiz. restr., Env. operating license req.	None
Japan	Unbound*	Unbound*	None	None	Limited no. licenses oil waste disposal at sea	None/Horiz. restr.	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Korea (industrial refuse collection transport disposal only)	Unbound	None	None	None	Ec. needs test & operat. approval required	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Norway	Unbound	Unbound	None	None	Monopoly for some wastes	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Switzerland	Unbound*	Unbound*	None	None	None; except Unbound for garbage dump	None	Unbound ex horiz. restr.; Commercial presence req.	Unbound ex horiz. restr.; Commercial presence req.
Turkey	Unbound	Unbound	None	None	None	None	None	None
United States (private sector contracts)	None	None	None	None	None	None	Unbound ex horiz. restr.	None
Slovak Republic	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Slovenia	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
South Africa	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Thailand	Unbound	Unbound	None	None	None/Horiz. restr.	None/49% foreign equity limit	Horiz. restr.	None

6C. Sanitation and similar services

Country	Mode 1		Mode 2		Mode 3		Mode 4	
	Market access	National treatment	Market access	National treatment	Market access	National treatment	Market access	National treatment
Australia	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Canada	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Czech Republic	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
EC	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Hungary	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Iceland	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	None
Japan	Unbound*	Unbound*	None	None	None	None/Horiz. restr.	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Norway	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Switzerland	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Turkey	Unbound	Unbound	None	None	None	None	None	None
United States	None	None	None	None	None	None	Unbound ex horiz. restr.	None
Slovak Republic	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Slovenia	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
South Africa	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Thailand	Unbound	Unbound	None	None	None/Horiz. restr.	None/49% Foreign equity limit	Horiz. restr.	None

6D. Other services

Cleaning services of exhaust gases (including industrial emission abatement)

Country	Mode 1		Mode 2		Mode 3		Mode 4	
	Market access	National treatment	Market access	National treatment	Market access	National treatment	Market access	National treatment
Canada	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
EC	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Iceland	Unbound*	Unbound*	None	None	Env. operating license req.	None	Unbound ex horiz. restr.; Env. operating license req.	None
Japan	Unbound*	Unbound*	None	None	None	None/Horiz. restr.	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Korea	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Norway	Unbound	Unbound	None	None	Govt. monopoly	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Poland	None	None	None	None	None	None	Unbound ex horiz. restr.	None
Switzerland	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
United States	None	None	None	None	None	None	Unbound ex horiz. restr.	None
South Africa	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Thailand	Unbound	Unbound	None	None	None/Horiz. restr.	None/49% foreign equity limit	Horiz. restr.	None

Noise abatement services

Country	Mode 1		Mode 2		Mode 3		Mode 4	
	Market access	National treatment	Market access	National treatment	Market access	National treatment	Market access	National treatment
Canada	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Iceland	Unbound*	Unbound*	None	None	Env. operating license req.	None	Unbound ex horiz. restr./Env. operating license req.	None
Japan	Unbound*	Unbound*	None	None	None	None/ Horiz. restr.	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Korea	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Norway	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Poland	None	None	None	None	None	None	Unbound ex horiz. restr.	None
Switzerland	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
United States	None	None	None	None	None	None	Unbound ex horiz. restr.	None
South Africa	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Thailand	Unbound	Unbound	None	None	None/ Horiz. restr.	None/ 49% foreign equity limit	Horiz. restr.	None

Nature and landscape protection services

Country	Mode 1		Mode 2		Mode 3		Mode 4	
	Market access	National treatment	Market access	National treatment	Market access	National treatment	Market access	National treatment
Canada	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
EC	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Iceland	Unbound*	Unbound*	None	None	Env. operating license req.	None	Unbound ex horiz. restr. Env. operating license req.	None
Japan	Unbound*	Unbound*	None	None	None	None/Horiz. restr.	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Norway	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Switzerland	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
United States	None	None	None	None	None	None	Unbound ex horiz. restr.	None
South Africa	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Thailand	Unbound	Unbound	None	None	None/Horiz. restr.	None/49% foreign equity limit	Horiz. restr.	None

Other environmental protection services

Country	Mode 1		Mode 2		Mode 3		Mode 4	
	Market access	National treatment	Market access	National treatment	Market access	National treatment	Market access	National treatment
Canada	None	None	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
EC	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Iceland	Unbound*	Unbound*	None	None	Env. operating license req.	None	Unbound ex horiz. restr.; Env. operating license req.	None
Japan	Unbound*	Unbound*	None	None	None	None/Horizontal restr.	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Norway	Unbound	Unbound	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
Switzerland (part of CPC 9409)	Unbound*	Unbound*	None	None	None	None	Unbound ex horiz. restr.	Unbound ex horiz. restr.
United States	None	None	None	None	None	None	Unbound ex horiz. restr.	None
Thailand	Unbound	Unbound	None	None	None/Horizontal restr.	None/49% foreign equity limit	Horizontal restr.	None

Annex 5

INDICATIVE LIST OF MEASURES AFFECTING TRADE IN ENVIRONMENTAL SERVICES

Cross-border supply (GATS mode 1)

- Requirement to obtain authorisation, license or permit in order to market and supply services.
- Requirement to use monopoly or otherwise specified network access or connection provider.
- Access and/or connection to Internet or other forms of electronic network limited by specific government regulation.
- Cross-border transfer of capital, payments and/or use of credit cards for such transactions subject to authorisation.
- Establishment of full commercial presence required.
- Cross-border transfer of capital, payments and/or use of credit cards for such transactions not permitted.
- Commercial presence in country in the form of local partnership required, to maintain supply advantage for permitted local providers.
- Commercial presence in country required, and granted only to specified “brand-name” entities.
- Consumption/purchase abroad (GATS mode 2)
- Permitted only through a designated local partner, to maintain supply advantage for permitted local providers.
- Consumer required to use a monopoly or otherwise specified network access or connection provider.
- Consumer access and/or connection to Internet or other electronic networks available only through monopoly or exclusively authorised provider.
- Transfer of capital, payments and/or use of credit cards for such transactions subject to authorisation
- Permitted only through firms with commercial presence in country or specified “brand-name” entities.
- Transfer of capital, payments and/or use of credit cards for such transactions not permitted.

Physical establishment of commercial presence (GATS mode 3)

Investment approval

- Subject to approval based on policy guidelines and overall national interest considerations but without economic needs test or local participation requirements.
- Automatic approval except for specific authorisation or concession requirement for foreign investment in public entities or public works, newly privatised companies or government-contracted services.
- Scope of foreign business limited to specified activities, narrower than those permitted local firms.

- Automatic approval below certain value thresholds, but subject to review and approval above fixed value thresholds.
- Approval of foreign investment required, based on economic needs test or “net national benefit”. This may also include general or specific, indicative or mandatory requirements on the foreign firm regarding local employment, technology transfers, ongoing investment, etc. (Note: the criteria for and application in practice of economic needs tests is the crucial determinant of whether it is moderately, quite or highly restrictive).
- Approval required for full or majority foreign ownership.
- Full foreign ownership not permitted, joint venture with local partner mandatory but foreign partner may hold 51% of equity.
- Case-by-case authorisation at political level with ceilings on permitted foreign investment varying by sector or within sectors; without clear, consistently applied criteria for approval.
- Majority foreign ownership not permitted, only minority share in compulsory joint venture permitted.
- Acquisition of full or part share of existing business not permitted, restrictions on establishment of new business.
- No establishment of new businesses permitted. Numerical quotas for operating license. (This may apply only to foreign investors or to both foreign and domestic investment). Hostile take-over of existing business not permitted.
- No establishment of new businesses permitted, only minority shares in existing businesses permitted.
- Existence of monopoly or exclusive provider such that foreign investment to establish a competing firm is not permitted.
- Reservation of some sectors or activities, state-owned enterprises to be privatised, or government-contracted services, for investment only by nationals or permanent residents.

Legal form of foreign company

- Corporations, private limited companies and subsidiaries permitted, but direct establishment of branches of foreign companies not permitted.
- Branching permitted subject to quotas on number and/or geographic location of branches.
- Only sole proprietorships or partnerships permitted (often applies cross-sectorally in the professional services).
- Only joint venture or representative office permitted.
- Only joint venture as limited liability company permitted.
- Incorporation required with foreign equity participation ceiling and mandatory local partnership.
- Only representative office permitted, for promotional reasons and undertaking research for head office only.
- Only one legal form permitted (*e.g.* joint-stock company, private limited liability corporation, joint venture).

Licensing/authorisation for provision

- Licensing and authorisation to provide services granted only to companies permitted to establish, with licenses limited numerically or subject to significant limitations on foreign equity participation, employment of specified number of local staff, etc.

Nationality/residency requirements

- Natural persons designated as local agents of foreign companies must be permanent residents.
- Requirement that foreign established companies have at least one locally resident director, one local manager and that each branch have at least two resident agents.
- Requirement that providers established in one part of a country have a minimum number of resident providers or agents for provision in another part of a country.
- Requirement that the chief executive officer (CEO) be national or citizen of host country.
- Requirement that more than 50% of directors are national of host country.
- Requirement that all directors are resident of host country.
- Prior residency required to obtain operating license while residency not permitted without license.

Temporary entry/stay of service providers (GATS mode 4)

- Bound only for definitions of personnel permitted, with generally applicable time limits and/or conditions not specified, such that these may then be arbitrarily or discriminatorily applied.
- Permission subject to passing local examination to be recognised as professional or specialist.
- Requirement to complete or undertake further training in the host country in order to be recognised as professional or specialist.
- Permission subject to approval and labour market tests for specific categories of personnel.
- Permission for intra-corporate transferees and specialists is subject to general or specific labour market testing and non-availability of local staff, with the latter decided by host authorities without input from the foreign company concerned.
- Approval for intra-corporate transferees and specialists are subject to general economic needs test.
- Requirements for local recognition of experience and/or qualifications for professionals and specialists, for which the criteria are vague, non-transparently or arbitrarily applied or discriminatory.
- Requirement that a specified proportion of foreign staff have local understudies for training/ transfer of skills.
- Authorisation of intra-corporate transferees subject to performance requirements (*e.g.* employment creation, transfer of technology, ongoing level of investment).
- Requirement that specified, significant proportion (*e.g.* >70%) of staff of foreign established company be nationals of host country, regardless of experience/qualifications.
- Numerical limitations on foreign nationals in senior positions (*e.g.* company managers, executives, senior professionals and specialists) and/or requirements of a specified number of host-country nationals relative to foreign nationals in each such category.
- Only intra-corporate transferees permitted, subject to quantitative limits on foreign transferees per operation, and mandatory training of local staff.
- Provision of services by self-employed persons not permitted.

Restrictions or limitations on provision, transfer and processing of information and data (all GATS modes)

- Requirement that provision and transfer of all or specified types of information take place on designated or monopoly networks.
- Prohibition on representative offices established to provide research for foreign parent from publishing or circulating their work in the host country.
- Prohibition on foreign affiliates established in a country transferring specified types of financial information to their parent company.
- Requirement that personal or commercial information is not to be transferred out of the country in which it was generated, without specifying the policy reasons for the restriction or permitting transfer subject to adherence to reasonable standards.
- General prohibition on transfer of specified types of data (personal, financial institutional, commercial) without specifying the policy reasons for the prohibition or permitting transfer subject to adherence to reasonable standards.

Source: OECD inventory of measures relevant to the international provision of environmental services. The inventory was based on GATS schedules and OECD reports and a number of national and regional trade policy reports, including those prepared by APEC, Australia, Canada, European Commission, Hong Kong (China), Hungary, Japan and the United States.

Annex 6

CASE STUDIES ON THE ROLE OF PRIVATE SECTOR MONOPOLIES AND EXCLUSIVE RIGHTS IN THE PROVISION OF ENVIRONMENTAL SERVICES

Indonesia

To overcome domestic financing constraints, Indonesia has in recent years begun to privatise the provision of some water-related and solid waste services through concessions to private operators. This has proceeded on an *ad hoc* basis, partly at local level and partly at national level. The main barriers are structural, in that the market is still emerging due to lack of resources for consistent enforcement of existing environmental laws and there is not a high degree of competition. Consequently, there little awareness of available products and services, so that suppliers typically have to help develop the market through education, training and technology transfer programmes.

Wastewater

Sewerage and water treatment and recycling are not centralised, and co-ordinated planning and enforcement is lacking. The Environment Ministry focuses on raising domestic industry awareness on water quality issues, particularly pollution control (*e.g.* Small-Scale Industries Impact Control programme, Marine Pollution Control programme, Clean Production Technology programme, and Prokasih Clean Water programme).

Investment is therefore on a by-project basis, involving both multilateral and bilateral soft loan and grant-funded investment and private direct investment. Several independent schemes have commenced in some major cities (*e.g.* Jakarta, Surabaya), involving BOT projects and small-scale sewerage systems. The main sources of demand for wastewater and water treatment projects arise from aid projects, multinational companies and a small number of Indonesian companies that want to improve environmental performance. Local partnerships are seen as key to success in a fragmented market. Principal opportunities for foreign suppliers in this context are supply of integrated systems and equipment, localised BOT projects and consultant engineering and training services.

Solid waste

Hazardous waste: The Indonesian Environmental Protection Agency, BAPEDAL, introduced regulations on hazardous waste in 1994-95 and a national plan involving awarding concessions for the operation of nine modern hazardous waste treatment plants around the country over the next decade. The first opened in 1994 and is jointly owned by the government, an Indonesian firm and a US firm. The main customers are the chemicals, oil/gas, automotive and metal works sectors.

Non-hazardous waste: Management of solid waste (MSW) is not centralised and there is a lack of co-ordinated planning, investment and enforcement. The market is consequently underdeveloped, and programmes rely substantially on aid funding and foreign provision of technologies and expertise. Medan and Bandung have established model programmes with centralised authority and fee collection. Reorganisation of MSW in other cities is under way, creating demand for services and equipment for landfill, transport and storage of waste, collection and separation, and recycling; and for integrated MSW services, engineering and consulting. Public-private sector partnerships to share investment, risk and profits are seen as the principal mechanism for

developing the country's MSW infrastructure, through Improve-Operate-Own, Build-Operate-Transfer and Build-Operate-Own, leasing concessions and some service contracting to the government funded largely by donor finance. The localised nature of planning, the role of tied aid and soft loans and the need for local partners and connections complicate the transparency of the concession-awarding process.

Malaysia

Aside from Singapore, Malaysia is probably the most advanced country in south-east Asia in terms of environmental management. Efforts began in earnest in the early 1990s as part of the Mahathir Government's "2020 Vision" to lift Malaysia into the ranks of developed countries by 2020. Amendments to the Environmental Quality Act in 1996 consolidated the regulatory and enforcement authority of the Department of Environment. The priorities are wastewater, solid waste and hazardous waste, air pollution, environmental management and, in the longer term, environmental remediation.

Privatisation forms a major component of the government's approach. The awarding of concessions is generally on a "first come, first served" basis (bids are unsolicited, so that, rather than issuing an invitation to bid to all comers, the government is approached by a consortium). Domestic firms in partnership with foreign firms usually win the concessions. All concessions are managed by the Economic Planning Unit, which sets the fees that can be charged to service users. Most big concessions have already been awarded. Concession holders periodically seek subcontractors for contributing services and equipment; foreign suppliers can apply.

Water supply

Privatisation of upgrading, development and operation of water treatment plants began in 1989. During the Sixth Plan period (1991-95), a number of water supply projects were privatised; treatment plants in three states were privatised, and construction of four others were completed on a BOT basis. Concessions for treatment plants or bulk water supply have generally been undertaken on a BOT basis with Malaysian entities that are part or majority owned by French or British water operators; with distribution remaining under the control of local authorities.

According to the Seventh Plan (1996-2000), privatisation will be conducted on a "total approach" basis covering all aspects, including distribution and billing. In addition, state regulatory authorities will be established. The country is also moving towards privatisation and corporatisation of water utilities to further improve efficiency in operation and management of treatment plants. In 1994 the Johor State Water Department was the first state water authority to be corporatised; it is fully owned by the Johor state government. In 1995 the Water Supply Division of the Kelantan JWD was privatised, and is jointly owned by the state government and Thames Water plc of the United Kingdom.

Wastewater

The provision of sewerage services was privatised in 1993. Indah Water Konsortium (IWK), headed by United Utilities plc of the United Kingdom, Berjaya Industrial Bhd. and three other local investors, was awarded the concession to overhaul the country's sewerage system and operate it for 28 years. The project is Malaysia's costliest and is the largest such project in the world. Subsequently, United Utilities swapped most of its stake for a substantial holding in a separate company, which has exclusive rights to maintain IWK's sewerage plants and public networks. Resistance by industrial and business users to the fee structure led to a three-year discounting. Next, general consumers refused to pay fees without improvements in services, leading the government to introduce a revised billing system and a large soft loan to the company to make up revenue shortfalls.

The *on-site provision* of wastewater treatment and prevention services through centralised systems for large industrial and housing estates is regulated at state or municipal level and is open to foreign investment. Malaysia has a very competitive domestic consulting and engineering base, generally with imported equipment, particularly for advanced systems. Integrated services incorporating process design and engineering, pollution

prevention technologies and wastewater recycling as well as advanced waste recovery systems and ultra-pure water technologies are in demand in the country's export sectors.

In the area of *wastewater monitoring*, there are many independent water laboratories competing primarily on cost. The Department of Environment requires industrial facilities to provide monthly effluent analysis reports, which contributes to demand for these services.

Solid waste services

For *non-hazardous waste*, an Action Plan for a Beautiful and Clean Malaysia was introduced in 1988 to improve local management and planning of waste management in four stages to 2010. This plan co-ordinates the modernisation of the non-hazardous waste infrastructure, which relies on landfill, with attendant problems of illegal dumping, leaching, landfill gases and open burning. The state of Selangor awarded a concession to French group Sita to provide a modern "sanitary landfill".

To accelerate the process, the government decided to privatise the solid waste sector and in 1994 announced plans for a National Solid Waste Management programme, estimated to cost MYR 10 billion (USD 2.9 billion). Thirty companies were invited to bid for the project and more than 50 submitted tender documents. The plan divided the country into four geographic zones to be managed by four different consortia with 20-year concessions for collection, storage, transport, treatment and recycling of all non-hazardous waste. The plan made clear that domestic control would be favoured for the businesses operating the concessions.

The four consortia selected involve mostly Malaysian companies, with foreign providers of technology and methods as consultants or subcontractors. The start of privatised operations was delayed when the government decided to review the economics of the programme because of complaints about the proposed fees for service, as had arisen in the water privatisation scheme. The review involved studying the Selangor project and proceeding on a trial basis with the concessions granted in the Kuala Lumpur and Johor Baru areas. In part, the fee problems arise because economic incentives for waste minimisation, reduction and recycling have not been introduced, so that the charges proposed for collection and disposal are below actual costs. Accordingly, demand for on-site services to implement waste minimisation, reduction and recovery strategies is forecast to rise sharply.

Although the solid waste concessions are exclusive, opportunities for foreign providers are reported to exist in supporting niches such as small-scale incinerators, on-site waste treatment facilities for companies and industrial estates, provision of products and services to the recycling industry and consulting services to national and local government and companies on waste strategy, particularly the economics of the sector.

For *hazardous waste*, problems with illegal dumping, together with the Basle Convention ban on trade in such wastes, led the government to enact a national programme to create a hazardous waste treatment capability. A monopoly concession was awarded to a local consortium, Kualiti Alam, which will utilise Danish technology (Denmark has provided significant funding for the programme) to construct the treatment facility. The facility has a monopoly for all off-site hazardous waste treatment in the country. Detailed compulsory notification for generation, treatment, storage, transportation and safe disposal is required, with stiff penalties imposed on violators and tax incentives to encourage compliance; creating demand for services and equipment from individual firms and industrial estates.

To combat desludging and waste oil dumping in Malaysian waters, the government plans to privatise environmental *air surveillance and monitoring services*, and contracted a Swedish-Malaysian group to perform a feasibility study.

As part of wider health services privatisation, the Ministry of Health has awarded contracts to three companies for management of *hospital waste* by incineration.

Testing and analysis services: A concession was awarded to Alam Sekitar in 1995 for monopoly supply of environmental monitoring data to the government.

Chinese Taipei

The principal environmental regulatory bodies are the Environmental Protection Agency (EPA) and the Ministry of Economic Affairs' Industrial Development Bureau. The 1987 Guidelines for Environmental Policy outline four principles for environmental regulation: prevention of pollution, polluter pays, public participation and privatisation of government functions. The country was estimated to spend USD 365 billion on environmental protection over the following years. Acceptance of bids is reportedly based on proven performance in Chinese Taipei or another Asian market, ability to meet specifications and price competitiveness. There is a preference in both public and private sectors for "full service" suppliers, so stand-alone suppliers usually find it beneficial to form alliances in their segment.

Water and wastewater

For *sewerage services*, the national system is government-controlled and provided by the Taiwan Water Supply Corporation under the ownership and regulation of the Ministry of Interior and provincial and municipal authorities. There is a multi-billion dollar programme to upgrade and create modern sewerage systems, driven by water shortages, poor water potability and contamination of land and water from dumping of untreated sewage. The Taiwan Water Supply Corporation tends to contract engineering and construction services from a small list of domestic suppliers, who in turn sub-contract from local contractors and equipment suppliers. Price is the dominant criteria; however, demand for advanced treatment systems is reportedly growing.

For *industrial wastewater services*, the EPA is attempting to improve enforcement through introduction of emission permits. It has identified 10 000 companies to which it wants to apply the permit system and estimates that half will be unable to meet standards and will require new treatment systems. Local companies reportedly supply much of the basic equipment and local installation services. Demand for advanced and integrated systems and monitoring, process design and minimisation services are reportedly not filled by domestic supply. Consulting and engineering services for wastewater is dominated by a few large local firms with close ties to end-use industries. Several large state-run domestic firms (*e.g.* Taipower, Taisugar) are leading customers.

For *solid waste management*, there is a move towards privatisation of municipal incinerators, waste recycling facilities and industrial waste treatment centres, creating demand for foreign technology and advanced systems.

For *air-pollution control*, the central government introduced tougher emission standards in 1998 for both stationary and mobile sources, using a system of permits and fees alongside a national network of air quality monitoring stations. Foreign suppliers have about 90% of the market for air pollution equipment and consultancy, often through technology partnerships with local companies. Growth is anticipated in the industrial sector as SMEs seek to conform to emission standards. The market for consulting and monitoring services for air pollution mostly is for sales to the EPA and related government agencies; although approval from the EPA is not required for contracting with industry.

Source: Asia Environmental Trade Ltd. and Environment Business International Inc.

Annex 7

EXAMPLES OF THE “WIN-WIN” FOR ENVIRONMENTAL PERFORMANCE AND SOCIAL DEVELOPMENT FROM TRADE LIBERALISATION IN WATER AND WASTE MANAGEMENT MARKETS IN DEVELOPING COUNTRIES

Note on sources: A variety of sources were used for the following case studies. The Web sites of companies directly involved in water and waste projects were consulted, as well as those of international organisations and other sites dedicated to water and waste issues. A list of sources used can be found at the end of this Annex.

CONCESSIONS

Argentina: water distribution

Further to an international public tendering process, in March 1997 Aguas Cordobesa won a 30-year concession contract for the distribution of drinking water for Cordoba City (the second largest Argentinean city), to service 1 200 000 inhabitants. Aguas Cordobesa includes Lyonnaise des Eaux, Aguas de Barcelona (Agbar) and five Argentinean companies. The service has been in place since 1 May 1997. Lyonnaise des Eaux has responsibility for upgrading the service, improving relations with customers and reducing the rate of unpaid bills. The expected turnover should be around USD 50-60 million.

Argentina: water and sewerage

As part of Argentina's extensive privatisation programme of the early 1990s, a concession for operation of the Buenos Aires Metropolitan water and sewerage system was awarded to Aguas Argentinas (AA), a consortium led by Lyonnaise des Eaux. The concession covers an urban zone of 1 200 square kilometres with 9 million inhabitants (of whom 6 million have access to drinking water) and 5 million connected to the network. AA agreed to a 30-year investment plan of USD 4 billion to connect 100% of the population in the concession area to drinking water and 90% to sewerage facilities. In three years, AA has facilitated connection, either to water or sewerage, for 1 million households and increased the capacity of treatment plants by 30%. Drinking water supplies have grown and quality has improved. Increased efficiency has led to economic and environmental benefits through the reduced use of chemicals. Commercial incentives have led AA to check water quality more frequently than required by the regulations and to re-examine wastewater treatment issues.

Argentina: water and wastewater

In May 1999, Azurix, an affiliate of the US-based company Enron, was awarded 30-year concessions for water and wastewater in two regions of the province of Buenos Aires. The first region covers the southern area of the province (including the industrial city of Bahia Blanca), with a population of 430 000; the second covers a population of 1 520 000 (including the provincial capital and industrial centre of La Plata and the rural areas in the interior of the province). Azurix will fund the transaction through a combination of debt financing and equity capital.

Brazil: water

Limeira City awarded a 30-year concession contract to a foreign consortium, Aguas de Limeira (which includes Suez-Lyonnaise des Eaux) for the development and the management of facilities which remain public property. The network supplies 25 000 inhabitants. Under the concession contract, USD 120 million will be invested during a 30-year period, including USD 45 million during the first five years. The investment aims at extending distribution of drinking water to 100% of the population and collecting wastewater for 95% of households.

Chile: water

Agbar (Suez-Lyonnaise des Eaux) is in charge of a concession of water services in Valdivia (a city of 120 000 inhabitants). In 1997, Agbar took a 20% share in a water distribution company in the Quinta region (about 100 000 inhabitants). Further to a public international tendering, the Chilean government selected Lyonnaise des Eaux and Agbar for the partial privatisation of the Aguas de Santiago de Chile which covers 44 communities. This concession has no time limit and concerns water distribution for 5 million inhabitants and the upgrading of the city's sanitation. The project includes a 42% participation of the Suez Lyonnaise des Eaux/Agbar consortium in EMOS, the Santiago de Chile water distribution company, which owns the water and sanitation installation. Company management will be controlled by the private sector. Activity and turnover are expected to increase quickly owing to an investment programme aimed at building sanitation plants.

China: water treatment

In February 1997, Compagnie Générale des Eaux (CGE) obtained a 20-year contract to upgrade and operate a water treatment plant in Tianjin (China's third largest city with more than 10 million inhabitants). This plant is one of the most important producers of drinking water (500 000 cubic meters per day). The concession represents USD 18 million annual turnover and an additional investment of USD 30 million is planned. CGE will upgrade and construct a new 13-kilometre pipeline. CGE Tianjin Waterworks' shareholders are CGE (55%) and its local partner, Tianjin Waterworks Company, which is owned by the Public Utility Office of the Tianjin's municipality.

Gabon: water and electricity supply

In March 1997, CGE won a public tendering for the privatisation of SEEG, the Electricity and Water Society in Gabon. This is a 20-year concession, with FRF 14 billion turnover. CGE will ensure the production and distribution of drinking water and electricity for the whole country. This contract represents FRF 700 million in annual turnover (200 million for water and 500 million for electricity). The Gabonese State has granted 100% of the stake to the CGE. For its part, CGE was responsible for the listing of SEEG on the stock exchange and will eventually transfer 49% of the capital to the public.

Indonesia: water

In June 1997, Thames Water (United Kingdom) entered into an agreement with PAM Jaya (the existing public water supply authority in Jakarta) to establish the consortium PT Thames PAM Jaya. For the next 25 years the consortium will manage, operate, maintain and develop the water supply system for the eastern half of Jakarta. The concession includes the operation of drinking water treatment facilities and the distribution system. In addition, the concessionaire will reduce non-revenue water, provide more connections, develop the water distribution network and carry out billing and collection activities. The aim of the project is to help to provide water supplies to support Jakarta's continued growth. It will deliver a steady upgrade of the system without capital outlay by the Indonesian authorities, which will continue to set water tariffs.

The main source of untreated water is the West Tarum Canal, which is fed from the Jatiluhur Reservoir. The company will liaise with the Indonesian Reservoir and Canal Authority (POJ) to try to reduce the pollution currently entering the West Tarum Canal via nearby rivers. Around 80% of the staff are from PAM Jaya.

Indonesia: water

The Batam Industrial Development Authority (BIDA) awarded a 25-year concession contract to Adhya Tirta Batam, a joint venture between the UK-based Biwater and, as local partners, Bangun Cipta Kontraktor and Syabata Cemerland, to undertake improvements in water quality in accordance with World Health Organization recommendations. The installation of bulk meters and loggers throughout the network and the use of leak detection equipment has already resulted in a reduction of over 18% of unaccounted-for water.

Over the past 24 months, residents of Batam (an island) have benefited from the concession. Substantial refurbishment work has been completed at all five of the island's existing treatment plants, increasing capacity by 40%. New processes and modern, high-tech instrumentation and controls have replaced out-of-date equipment. All treated water storage reservoirs are being drained and refurbished and a comprehensive refurbishment of the water distribution system is under way. With additional industrial and domestic water consumers being connected at the rate of 500 a month, a new computerised billing system has been introduced and a customer service office opened in the main town area.

Malaysia: water

In 1997, OTV (Générale des Eaux), in association with the Japanese company Hazama, signed a FRF 1.06 billion contract for the second phase of the drinking water plant in Sungai, Selangor in Malaysia. The contract was signed with Puncak Niaga SDN BHD, the concessionaire company responsible for production of drinking water in Selangor State (4.1 million inhabitants). The plant will have a capacity of 1 million cubic meters a day. OTV had previously obtained a FRF 750 million contract in 1996 for the construction of the first phase of this plant, which supplies Kuala Lumpur's south-west region.

Malaysia: water

In 1998, Générale des Eaux took over for 26 years (*i.e.* until 2024) a concession for the production of drinking water in Perak State, supplying 600 000 inhabitants. Générale des Eaux (Vivendi) became a shareholder with 26% of shares in the Intan Utilities company, concessionaire for the production of drinking water in Perak State and its suburbs (the "Great Ipoh"). In addition, for the different maintenance and equipment contracts it will create Kristal Utama, in which it is to hold 75% of the stakes.

Morocco: water distribution

In April 1997, the urban community of Casablanca signed a 30-year concession contract with the Moroccan enterprise Lydec, for water distribution, sanitation and electricity distribution. Lydec's shareholders are Suez-Lyonnaise des Eaux (35%), Elyo (24%), EDF International (18%), Endesar (18%) and Aguas de Barcelona (5%). The project forms part of a general programme implemented by the government to privatise certain public services, in order to assure their efficiency and development.

The contract covers 23 communities (450 000 subscribers over 1 000 square kilometres), and concerns 3.3 million inhabitants for water distribution and 470 000 subscribers for electricity distribution. It involves total investments of MAD 30 billion (FRF 18 billion), a third of which from the consortium, to be allocated as follows: MAD 5 billion for potable water, MAD 16 billion for sanitation and MAD 9 billion for electricity.

In 1999, it was estimated that 75% of households were connected to the drinking water network and that the share should reach 85% in five years, 95% in ten years and 100% after 25 years. The electricity supply is

planned to reach the international standard for output of 94% in five years, following the agreed extension of the network and the implementation of a programme to optimise energy consumption. The sanitation aspect of the concession involves constructing facilities, including purification plants, to change the current practice of discharging polluted water directly into coastal waters.

Philippines: water and sewerage services

The Metropolitan Waterworks and Sewerage System (MWSS), the water supply, treatment and distribution utility serving metropolitan Manila, Rizal and part of Cavite, was privatised in August 1997. The utility covers over 11 million people and 37 municipalities. MWSS awarded 25-year concessions to two consortia to assume full operational and investment responsibility for the city's water and sewerage system.

The Manila Water Company Inc. (MWC) and Maynilad Water Services Inc. (MWS) are expected to spend up to USD 7 billion during the concession period to improve and expand the system. MWC is a joint venture of Ayala Corp. of the Philippines, United Utilities of the United Kingdom and the US-based Bechtel Corp. MWS is a consortium composed of the Philippine industrial group Benpres Holdings Corp. and *Lyonnaise des Eaux*.

Pursuant to the concessions, MWC and MWS divide between them the responsibilities for management and development of the water system in the eastern and northern parts of the city. Before the implementation of the concessions, only two-thirds of the population of Manila had access to piped water supply and only 11% were connected to the sewerage network. More than half of the water that was treated to drinking water standards was never billed to customers owing to leakage, illegal connections, faulty meters and poor billing practices. One of the first steps taken in the Manila project was to repair system leaks and install new meters throughout the concession area to improve efficiency and generate steady revenue.

Philippines: water

The Asian Development Bank agreed for the first time, in 1999, to provide USD 170 million (a USD 45 million loan and a co-financing loan of USD 126 million) to a privatised utility, Maynilad Water Services, Inc., under a 25-year concession contract for water and sewerage services in Western Metro Manila. This project aims at improving the water distribution system, at expanding water coverage to 98% of the concession area and sewerage and sanitation coverage to 93%. Maynilad is responsible for the renovation and operation of the water system. Under this project equity financing of USD 135 million will be provided by Maynilad's sponsors (Benpres Holdings Corp. of the Philippines, *Suez-Lyonnaise des Eaux*, and *Lyonnaise Asia Water Limited* of Singapore).

Philippines: water

Générale des Eaux won in 1998 a 25-year concession contract for drinking water services and sanitation for the future business area in Manila, Fort Bonifacio, which will have 600 000 inhabitants. This contract will generate total turnover of FRF 3 billion over the next 25-years. It includes the conception, the construction and the operation of the drinking water distribution network and collection system and used water treatment. The construction of a water treatment plant, a double network (drinking/non-drinking water), a wastewater collection network and a sanitation plant.

Seychelles: cleaning and waste management

The government of the Seychelles has awarded SITA, a subsidiary of *Lyonnaise des Eaux*, a 20-year-contract for the integrated cleaning and waste management of the Island of Mahe. Supported by the EU, SITA will carry out collection, recycling, waste processing, beach and street cleaning activities. The EU will fund a project to build a burial site on the Archipelago.

South Africa: water and sanitation

Water and sanitation services SA (WSSA), a subsidiary of Suez-Lyonnaise des Eaux, manages one of the first water concessions in Queenstown, South Africa. Under the concession, the water network was extended to neighbouring townships, increasing the connections to drinking water from 4 500 to 14 000.

South Africa: water

In August 1999, the UK-based water company Biwater signed a 30-year water and sanitation concession contract for the City of Nelspruit, South Africa. Through the Greater Nelspruit Utility Company, Biwater and its local partner, Sivukile Investments Pty Ltd., are expected to improve and accelerate the delivery of water and sanitation services in the Greater Nelspruit area. An anticipated investment of ZAR150 million (GBP 15 million) will be made in new and upgraded facilities in the first five years of the project. The signing of the contract by Nelspruit Council and the Greater Nelspruit Utility Company followed a long and complex tendering and negotiation process.

South Africa: water and wastewater services

In February 1997, the Borough of Dolphin Coast advertised a concession, for which four consortia out of 13 applicants pre-qualified. In January 1999, the first concession for private management of the supply of water and wastewater services was granted to a consortium led by the UK SAUR group. Valued at GBP 100 million and for a term of 30 years, the contract was awarded by the Borough of Dolphin Coast, in the province of Kwazulu Natal, north of Durban.

Operations under the contract began with the creation of Siza Water Company Pty Ltd. in April 1999. The company is a consortium led by the SAUR Services, which has a 58% shareholding. The second major shareholder is Metropolitan Life Limited, the sixth largest life insurer in South Africa, which holds 23%. Other consortium members are South African investment companies, of which WDB Investment Holdings Pty Ltd. Under the contract, Siza Water is responsible for the management of water and wastewater services, the take-over, maintenance and replacement of existing infrastructure and the financing and construction of new infrastructure needed to supply water to the population. Siza Water's supply region spans an area of 150 square kilometres, serving a population that peaks at 56 000 in high season.

According to the terms of the concession, Siza Water is the service provider and whatever it invests in infrastructure, operations and personnel development will revert to the municipality at the end of the 30-year contract. The municipality should then be in a position to continue the service with an enhanced infrastructure and fully trained staff. Alternatively, it may decide to continue with private sector participation.

Trinidad and Tobago: water

The government of Trinidad and Tobago has adopted a two-phase approach to privatising its water services. In the first phase, a pre-concession or enhanced management contract was awarded through a competitive bidding process. The second phase involves the private operator's responsibilities for operation and maintenance. A consortium of two British companies – Severn Trent Water International and George Wimpey Caribbean Ltd. – was selected and the management contract took effect in April 1996. While the recruitment of the pre-concession operator went forward, the government began a series of initiatives to improve the economic viability of the Water and Sewerage Authority (WASA). In 1994, it granted WASA the right to increase tariffs by 35% for customers receiving water for more than 12 hours a day.

Trinidad and Tobago started reform with limited regulatory capacity, and, because of a desire to move quickly, the government proceeded with private participation without developing a full-fledged regulatory regime. Instead, it incorporated some regulatory aspects, such as performance standards, into the contract. This feature

was enough to attract world-class operators willing to finance working capital and assume high operational and commercial risks.

West Bank: water

Générale des Eaux in partnership with Khatib and Alami, an environmental consulting firm, signed a concession contract in June 1999 for the provision of drinking water and water sanitation services. Covering the province of Bethlehem (150 000 inhabitants) and Hebron (450 000 inhabitants), the contract has a duration of four years and involves investments of FRF 42 millions. Générale des Eaux (Vivendi) will be responsible for ensuring the quality of drinking water and the commercial operations of the network. It will also direct upgrading of facilities and an eventual extension of the network.

JOINT VENTURES

Colombia: water service provision

Facing huge inefficiencies and poor service, the government of Cartagena liquidated the public water and sewerage utility and created a mixed-capital company, Acuacar., to serve the city's 750 000 inhabitants. Acuacar is jointly owned by the government of Cartagena and Aguas de Barcelona, a Spanish provider of water services. It has been awarded a 26-year operation and maintenance contract, and assumed control of the system in 1995. The City of Cartagena continues as the owner of the system, with sole responsibility for funding expansion. Aguas is to provide operating services and receive a fixed percentage of total revenue and dividend distributions from Acuacar's profits. Substantial investment in maintenance and rehabilitation has occurred and water quality has improved.

El Salvador: wastewater treatment

A joint venture, design-built project was agreed between San Salvador airport authorities and Delcan, a Canadian company. Comision Ejecutiva Portuaria Autonoma (CEPA) and Delcan's services are provided under an internal subcontract with AQSA, a Salvadorian general contractor. The project involves the design, equipment procurement, commissioning and operator training for a 1 050 cubic meters per day cyclic activated sludge wastewater treatment plant for the international airport.

Philippines: water and wastewater

Operations Management International Inc. (OMI) began conducting a feasibility study in the province of Cavite in January 1997 to identify the immediate and long-term water and wastewater needs of the province and to determine whether it could implement solutions using privatisation techniques. On 12 June 1997, OMI signed a memorandum of agreement with the province granting the OMI team the exclusive right to develop a final technical proposal and investment plan. In November 1997, a USD 250 million partnership was signed between OMI and the provincial government. In the joint venture agreement, OMI, the province and local water districts agreed to work together to implement a fast-track programme to finance, design, construct and manage new water supply infrastructure. First and foremost, the new water plant will supply water to the people of Cavite. In addition, the design, construction and long-term operation and maintenance of the system will create some 1 000 jobs for skilled and semiskilled workers. It is hoped that the availability of water will help attract commercial and industrial developers to Cavite, create more jobs and contribute to the long-term economic growth and viability of the province.

Taiwan: wastewater treatment

The Taipei Sanitary Bureau consulted with the Operations Management Inc. (OMI) in order to start up and operate Asia's newest and largest wastewater treatment plant for an initial two-year period. The Pa-Li plant can treat 1 229 242 cubic meters per day. The ten-year plan is to expand to 3 229 242 cubic meters per day. Located in a rapidly expanding section of Taipei, the plant will have a staff of 124 and serve a metropolitan area of 4 million people. Lacking the necessary experience for operating such a large wastewater plant, the Taipei Sanitary Bureau specified in its request for proposals (RFP) that several key positions should be filled by expatriates with the right mix of credentials to ensure starting up and operating the facility properly. The RFP also specified that the international partner team with a local firm. For this project, OMI chose a local engineering firm, SuperMax Engineering Enterprise Co. Ltd. SuperMax will maintain the collection system.

BUILD-OPERATE-TRANSFER (BOT)

China: water treatment

China's first water supply BOT project was approved in July 1998 and will be built in Chengdu, capital of Sichuan province. This is the first urban water infrastructure project approved by the government using foreign funds under a BOT plan. The project should help to meet the demand for water, which is currently increasing by 10-15% a year.

The consortium Générale des Eaux-Marubeni won the BOT contract for the drinking water treatment plant of Chengdu City (3.2 million inhabitants). The 18-year contract covers the conception, construction, operation and maintenance of a water treatment plant with a capacity of 400 000 cubic meters of clean water a day and a 27-kilometre water pipeline. Générale des Eaux will also be in charge of the operation and maintenance of the water connections, which will be transferred to Chengdu City at the end of the contract.

China: water

Suez-Lyonnaise des Eaux, associated with the Hong Kong New World Group through their joint subsidiary Sino-French, signed two contracts, in March 1998, for the distribution of drinking water with Zhongshan City (1.5 million inhabitants) in the province of Canton. Under these contracts, Sino-French (66%) and the municipality will take over and manage two drinking water plants with a capacity of 700 000 cubic meters per day. Work is planned to extend the capacity to 1.3 million cubic meters per day. Sino-French will ensure the operation of these units for a period of 22 years. At full capacity, the contracts should represent a turnover of FRF 100 million.

China: water treatment

In 1995, the Shanghai Municipal Waterworks Company (SMWC) awarded a contract for the design, construction and operation of a drinking water treatment plant to Thames Water's joint venture company in China with Bovis, the British construction company. Construction began in the north of Shanghai in early 1996 and the plant was completed in 1998. The total capacity of the plant is 400 million litres per day. It will supply 2 million people in Shanghai.

Colombia: water

A 20-year development plan has been put in place for Santa Fe de Bogota, with the implementation of three residential water treatment plants. These plants will be developed according to a two-phase strategy: the first will

consist of the primary treatment of residual/wastewater, the second will consist of the secondary biological treatment of wastewater. In September 1994, the District of Santa Fe de Bogota granted the concession for the treatment system of the Bogota River to the French consortium Lyonnaise des Eaux – Degrémont. The consortium transferred implementation of the first phase to a commercial Colombian company, Bogotana de Aguas y Saneamiento (BAS).

The consortium will be responsible for the design and the construction (three years) and for plant operation (27 years) and will finance the entire project. After 30 years, the plant will be transferred to the District. During the first three years, there will be no contribution from the district. The city will start paying the consortium a tariff calculated according to the cubic meters of used water treated in the station when the plant begins operations. Construction started in September 1997.

Hong Kong (China): construction and operation of a solid waste transfer facility

Hong Kong (China) has issued a BOT for the construction and operation of its solid waste transfer facilities, which include a transfer station and fleet of transfer trucks. Further to a competitive tendering process to select the winning firm, the station was built and is currently in operation.

India: wastewater and waste

In 1995, the Municipal Corporation of Greater Bombay (MCGB) awarded R.V. Anderson Associates Limited (RVA), a Canadian environmental engineering and technology management firm, a USD 3 million contract to upgrade the Corporation's sewerage operation and maintenance services. The project helped raise the capability and efficiency of Bombay's Water Supply and Sewerage Division (WSSD) to operate, manage and maintain the sewerage collection system. These improvements will also improve the health and safety of the staff involved in the operation of these facilities. The project team carried out technical assessments for all major facilities, including pumping stations, treatment facilities, lagoons and existing and proposed marine outfalls. The assessments were used to define existing operating water quality and environmental conditions and to prepare an effective programme of improvements. A final report and recommendations are being implemented through training, procurement and monitoring phases that will place the municipality on a sound footing to meet the pressing environmental challenges.

Malaysia: water treatment

Suez-Lyonnaise des Eaux concluded the following BOT contracts between 1989 and 1992:

- Taiping, in the Perak State, supplying 300 000 inhabitants, for the construction of a drinking water treatment plant, extension of the distribution network and rehabilitation of the existing infrastructure.
- Johor Bahru, capital of the Johor State, supplying 600 000 inhabitants, for the rehabilitation of the drinking water production infrastructure and the distribution network and the construction of a new water treatment plant.
- Kota-Kinabalu, capital of Sabah State, serving 500 000 inhabitants, for the construction of a production water plant and a dam and the management and renovation of the five existing stations.

South Africa: water

The government of South Africa has sought BOTT (Build-operate-train-transfer) proposals for new rural water systems, including a requirement that local residents be trained to run the system once it is built. Implementation of the training requirement is to be monitored by South Africa's Department of Water Affairs.

South Africa: water

OTV (a subsidiary of Générale des Eaux) will modernise and exploit for a period of 20 years a de-pollution plant for used water in Durban. The aim of this EUR 76 million BOOT contract (build, own, operate, transfer) is the construction of a treatment plant for the recycling of process effluent water. The plant will provide companies that previously used drinking water for their processes, with 40 000 cubic meters of water per day for an annual amount of EUR 3.9 million. The Durban municipality will charge a fee for the utilisation of effluents and will use surplus resources to supply the poorest areas.

Trinidad and Tobago: seawater desalination

Ionics Inc. and Hafeez Karamath Engineering Services Ltd have entered into a BOOT joint venture to build, own, operate and transfer a USD 120 million, 109 090 cubic meters per day seawater desalination plant. Under a 23-year contract with the Water and Sewerage Authority of Trinidad and Tobago (WASA) the joint venture, Desalination Company of Trinidad and Tobago Ltd. (Desalcott) will supply water to Trinidad's Point Lisas Industrial Park, to make the water supply currently being used by the Industrial Park available for other purposes.

Vietnam: waste

Ho Chi Minh City authorities have commissioned three foreign companies to undertake BOT projects for the treatment of the city's rubbish. The US-based Premiere International Trading and Consulting Inc. is performing a pre-feasibility study on producing gas and fertiliser from rubbish. The USD 70 million project will use rubbish as fuel for power plants. Canada's Pourslo System Inc. will use rubbish to generate electricity and Netherlands' Official Development Assistance will upgrade the Go Cat Rubbish Treatment site.

Vietnam: water

Two 100% foreign-invested water projects are under way in Ho Chi Minh City. The first BOT project, the Binh An Water Plant, is being implemented by a Malaysian company. The plant has USD 35.8 million invested capital and a design capacity of 100 000 cubic meters of water per day. The city's existing water plants are able to supply an estimated 800 000 cubic meters per day, which is below the current demand of more than 1 million cubic meters. The Binh An water treatment plant began supplying treated water to Ho Chi Minh City in August 1999. Vietnam's first BOT project will supply 85% of its 100 000 cubic meters a day capacity to the state-owned Thu Duc Water Supply Plan during its first year of operation. The project will contribute to reducing the shortage of water. The corporation is expected to recover its capital investment within 12 years.

A larger water project, the Lyonnaise Vietnam water plant, is fully owned by the French Lyonnaise des Eaux Group, with a USD 12 million investment capital. The Lyonnaise Vietnam Water Company Ltd., a joint venture between Suez Lyonnaise des Eaux and Pilecon Engineering Berhad of Malaysia, will provide Ho Chi Minh City with a daily volume of 300 000 cubic meters of treated water under a contract signed in July 1999. The contract falls within the framework of a BOT project set up in 1997. The USD 135 million project includes the construction of a pumping station, a water treatment plant and a 25-kilometre pipeline. It also calls for the operation and maintenance of the facilities of the BOT water treatment system and sets strict rules for the quality and reliability of production. The project is expected to create more than 60 local jobs. The Lyonnaise BOT contract is one of a few water supply projects aiming to supply Ho Chi Minh City, which requires some 1.1 million cubic meters of treated water per day.

Vietnam: water

Ho Chi Minh City authorities have granted a license for the second phase of the Saigon River Water Supply Project to Paragon Holdings of Malaysia. Under the project, Paragon will set up the Grand Imperial Saigon

Water Company to construct and run a water plant in the outlying district of Hoc Mon with a daily capacity of 300 000 cubic meters over 25 years. The USD 149.3 million project also includes building a pumping station in Hoa Phu Commune, Cu Chi District, to pump water from the West Bank of the Saigon River and the installation of a 20-kilometre pipeline. The Saigon River Water Investment Company will be the sole purchaser. Construction is expected to begin in mid-2000, and water supply operations by early 2003. The construction and operation would be undertaken by Boris and Thames Water, two British affiliates of Paragon. This is the third BOT water supply undertaken by foreign company to be licensed in the city.

Vietnam: water

A contract for construction and equipment supply for the fourth phase of a water supply project in Ho Chi Minh City has been signed between the Hanoi Water Company and the successful bidder Vikowa (a joint venture between Kolon Company of the Republic of Korea and the Vietnam Import-Export Construction Corporation, Vinaconex). This phase of the project includes the construction of new water plants (in Tay Ho precincts and Thanh Tri outskirts), the drilling of 18 new wells and the installation of almost 700 kilometres of water pipes. Total investment is estimated at VND 630 billion (USD 48 million) of which USD 32 million from World Bank loans. The plants are due to be operational in 2001 and supply 60 000 cubic meters of water per day for Hanoi and bringing the city's water output to 490 000 cubic meters per day. The contract for consultation and construction supervision was awarded to a joint venture between GKW of Germany and Plancenter of Finland.

Construction for a water supply factory for the Dung Quat industrial area started in May 1999. The factory is designed to produce 15 000 cubic meters of water per day is being built by the Vietnam Import-Export Construction Corporation (Vinaconex) under a BOT contract. Vinaconex plans to invest an estimated VND 56 billion (USD 4.03 million) in the factory which is expected to be operational in the first quarter of 2000. The factory expects to retrieve the invested capital after seven years of operation. The water supply projects in Bac Giang, Bac Ninh, Ha Tinh and Vinh Long provinces have been implemented with financial assistance from the Australian government. This total investment capital of VND 564 billion comes mainly from Australia's non-refundable aid. The five-year project aims to build new water supply facilities for 405 500 inhabitants in the five towns of Bac Giang and Bac Ninh in the northern provinces, Ha Tinh central province and Tra Vinh Long southern province.

Vietnam: water supply

In March 2000, Vietnam granted a license to Paragon Holdings of Malaysia for the second phase of the Saigon River Water Supply Project in Ho Chi Minh City. Under the BOT project, Paragon will set up the Grand Imperial Saigon Water Company to construct and run a water plant in the outlying district of Hoc Mon with a daily capacity of 300 000 cubic meters over 25 years. Construction of the USD 149.3 million project was expected to begin in mid-2000. It will begin supplying water by early 2003. The Saigon River Water Investment Company will be the sole purchaser.

SERVICES CONTRACTS

Argentina: water and sewage management

A group headed by SAUR International and Enron, a US energy company, was awarded a 95-year contract in 1998 for the distribution of water and the management of the sewage system for the town of Mendoza, Argentina, its suburbs and several other towns in the province.

Argentina: waste collection

CGEA-Onix (Suez-Lyonnaise des Eaux) won a FRF 700 million contract for collecting domestic waste and for cleaning of Buenos Aires after a public tendering launched in 1997. The city was divided into four parts, and CGEA-Onix won the second largest area (600 000 inhabitants). The six-year contract came into force on 1 February 1998.

Brazil: water

In 1998, Compagnie Générale des Eaux (Vivendi) was awarded a USD 5 million contract by CASA (Companhia Cartanense de Aguas e Saneamento), the Santa Catarina state water distribution company. The contract is for the supply and installation of a wastewater sanitation plant in Chapeco City. The plant will treat wastewater for 66 400 inhabitants. OTV's Brazilian subsidiary, in association with IVAI, a local civil works company, will have turnkey responsibility for civil works and the sewer system.

China: water

The consortium OTV Cadagua has won a contract for the construction of a drinking water plant in Nanjing. This FRF 42 million contract was obtained from the Nanjing Water Supply Company. The plant will be built in two phases: during the first, the consortium will provide a 250 000 cubic meters per day plant (pumped from Yangtze Jiang River) which will reach 500 000 cubic meters to supply more than 2 million inhabitants in the second phase. Construction in the preliminary phase will be the responsibility of the Nanjing Municipality Engineering Design Institute and will then be completed by OTV, which will provide electromechanical equipment, supervise the installation, the beginning of operations and education of personnel.

Colombia: private sector management of solid waste

In 1994, Bogota issued four different service contracts for waste collection and street sweeping services for four sections of the city. Bogota also issued an operation and maintenance contract for local landfill operations.

Gaza (technical assistance)

Suez-Lyonnaise des Eaux has received a contract following an international tender to manage water services and sanitation in Gaza. This four-year contract, financed by the World Bank, includes installation, management, network and station rehabilitation and education of personnel.

Indonesia: water, project management, technical and procurement

In July 1999, SNC Lavalin, a Canadian company was awarded a CAD 14 million contract to strengthen the capabilities of the Indonesian government (Sub-Dinas Pengairan Organisation) in the planning, design, construction, operation, maintenance and management of water resources. The goal of the project is to improve, in a sustainable manner, the effectiveness and efficiency of irrigation operations and development of water resources in North Sulawesi. The project, to be completed by 2000, involves providing training, procurement, creating and supporting local organisation for operations and maintenance of irrigation facilities, strengthening the provincial institutions and staff and ensuring environmental protection.

Jordan: water and wastewater operation and maintenance

In February 1999, the Lyonnaise des Eaux Group, in a consortium with Montgomery Watson Arabtech Jadaneh (25% share) obtained the water and wastewater management contract for Amman, following an international call for tender. The 51-month contract provides for water and wastewater management and maintenance for the Great Amman territory and its 1.6 million inhabitants. The principal target for the project is to improve water distribution by reducing leakage, securing quality supply constancy and operating an efficient customer service. The World Bank has granted a USD 55 million loan for the contract duration to cover investment, to upgrade the existing water plants and networks and to restructure the water services.

Malaysia: water

The Malaysian Rural Water Supply Schemes provide a piped water supply on a turnkey basis to 4.2 million inhabitants throughout the country's 13 states over an area spanning 4 000 kilometres. It has implemented 134 schemes on 600 sites, including 70 treatment plants, 342 reservoirs, 4 major dams, 48 pumping stations, 67 river intakes, 20 bore holes, 18 maintenance centres, three staff training centres and the shipment of over 93 000 tonnes of products manufactured by Biwater in the United Kingdom. In addition, almost 300 kilometres of access roads were constructed.

Mozambique: water

In September 1999, the Aguas de Mocambique consortium and Fundo de Investimento e Patrimonio do Abastecimento de Agua (FIPAG) entered into a contract for water supply to Maputo and the four major cities of Beira, Quelimane, Nampula and Pemba in Mozambique. Aguas de Mocambique is a consortium led by SAUR International (38.5%), IPE-Aguas de Portugal (31.5%) and five national investment organisations known as MAZI Mocambique (30%). SAUR International is part of the SAUR Group, a group of companies specialising in the private management of public utilities. IPE-Aguas de Portugal is a state-owned company incorporated in the IPE Group and leads a group of water supply and sewage companies, serving 60% of the Portuguese population.

The contract is valued at USD 25 million and has two parts: a 15-year lease contract, to manage the water supply and distribution system for Maputo and a five-year management contract for water supply and distribution services for the four cities. The contract provides for supplying 2.5 million people with water services. Aguas de Mocambique anticipates turnover to be approximately USD 50 million in the first five years. In addition to water supply services, Aguas de Mocambique will be involved in a programme of pipeline refurbishment (around 160 kilometres); refurbishment of connections (approximately 33 000) and fire hydrants; water meter replacement (50 000) and the creation of new connections (54 000). These programmes rely upon financing from the World Bank and will be managed by the consortium.

Puerto Rico: water

Thames Water is involved in the supply of water to the North Coast area of Puerto Rico, which includes San Juan, the capital. Following the drought of 1994, the Puerto Rico Aqueduct and Sewer Authority (PRASA) implemented the "North Coast Superaqueduct Project". Under the project, Thames Water, in co-operation with an American partner, the Dick Corporation, was awarded a design, build and operations contract by PRASA for a new drinking water treatment plant, water storage facilities, and a 60 kilometre trunk pipeline. The contract was worth USD 300 million and was subsequently extended to include the design, construction and operation of five North Coast municipality interconnections.

Water is extracted from the River Arcibo and stored in a 1.3 billion litre reservoir which was created for the project. Once treated, the water is piped to the San Juan metropolitan water distribution system, which serves twelve municipalities. The aim of the project is to produce drinking water in the most cost-effective and

environmentally sound way possible. Construction of the necessary infrastructure has been undertaken by 80% local suppliers.

Venezuela: wastewater

In October 1999, SNC-Lavalin signed a USD 25 million contract with the Venezuelan Ministry of Environment and Renewable Natural Resources to implement the first phase of a USD 45 million wastewater collection and treatment system to serve the cities of Trujillo and Valera in Trujillo State in north-western Venezuela. The contract comprises engineering, procurement, construction and project management. Approximately 60% of the project should be completed in the first phase, which is set to start in November 1999, by 2002, with the second phase to follow immediately afterward. Financing has been arranged jointly by SNC-Lavalin Capital Inc. and Société Générale, with guarantees from the Export Development Corporation (EDC) of Canada and Export-Import Bank of the United States. This sanitation project is part of the Venezuelan government's master plan to protect the environment and improve the quality of life of the population of Trujillo State. At present, untreated wastewater from Trujillo and Valera is discharged directly into the Motatán river basin, a main tributary of the Lake Maracaibo basin.

Venezuela: water management

Lake Maracaibo has undergone severe degradation over the last century. Delcan was engaged to review the existing legal and institutional framework for pollution regulation and to make recommendations for strengthening the institutional structure. A pollution control strategy was developed for the urban and industrial areas along the East Coast of the Lake Maracaibo basin. A storm water management study was prepared and the agencies responsible for the operation and monitoring of the water supply and pollution control infrastructure were reorganised. In addition to the environmental study, Delcan:

- Reviewed and provided operational guidance for a number of existing plants.
- Designed and procured new pumps and controls for 19 existing raw sewage pumping stations.
- Designed two new biological nutrient removal sewage plants to serve a population of 400 000.
- Designed four large sewage pumping stations and 20 kilometres of forcemain.
- Designed an experimental farm for disposal of treated effluent by irrigation.
- Procured equipment for the plants, pumping stations and maintenance of the system through EDC funding. The total cost of the work was USD 100 million.

**Definitions used in this annex for private sector participation
in environmental services markets**

Operation, maintenance and services contract

The public sector remains the primary provider of the infrastructure and only contracts out portions of its operation to the private sector. The private sector carries out one or more specified tasks or services for periods from five to seven years. It must perform the service at the agreed costs and must typically meet performance standards set by the public sector. The contract is generally awarded through traditional competitive bidding procedures. The private sector is paid a predetermined fee for the service and does not have a relationship with the end users, all financial interactions being directly with the government. The public sector is responsible for funding any capital investments needed to expand or improve the system.

Build-operate-transfer (BOT) contracts

Under a BOT, the private sector finances, builds and operates a new infrastructure facility or system according to performance standards set by the government. The operation period is usually 10-20 years. The public sector retains ownership of the infrastructure facilities and becomes both the customer and the regulator of the service. The private sector provides the capital to build the new facility. In return, the public sector agrees to purchase a minimum level of output to ensure that the private operator recovers its costs during operation.

Build-operate-train-transfer (BOTT) contracts

BOTTs are a simplified form of BOTs. Substantial private investment is not sought and mixed shareholdings are required in the operating company. The contract is awarded through a government procurement contract. The objective is to build local capacity to operate the new facility at the time of transfer.

Concessions

A private firm (the concessionaire) is awarded full responsibility for the delivery of infrastructure services in a specified area, including all related operation, maintenance, fee collection and management activities. It is responsible for any capital investment required to build, upgrade or expand the system, as well as for financing investments through tariffs paid by system users. The public sector establishes performance standards and ensures that the concessionaire meets them. The fixed infrastructure assets are entrusted to the concessionaire for the duration of the contract (25-30 years) but remain government property.

Joint ventures

Joint ventures are companies jointly owned by the public and the private sectors, in which they assume co-responsibility for the delivery of infrastructure. The public and private sector partners can either hold shares in a new company or assume joint ownership of an existing company, which provides urban infrastructure services. Joint ventures are alternatives to full privatisation.

Community-based provision

Community-based provision starts when financial or institutional limitations prevent the government from providing adequate waste and water services to particular sectors of the population, forcing residents to find their own means of meeting their needs. Community-based providers might include individuals, families, or local micro-enterprises. Initial organisational and material costs are often provided by non-governmental organisations (NGOs), private charities, official development assistance (ODA), the government or the community itself. Maintenance costs are generated by local charges or revenues. Community-based organisations often play a key role in organising poor residents into taking collective action and in representing their interests in negotiations with non-governmental organisations and governments.

List of sources

Company Web sites

Azurix: <http://www.azurix.com>
Bechtel: <http://www.bechtel.com/>
Biwater UK: <http://www.biwater.co.uk>
Degrémont: <http://www.degremont.fr/>
OTV: <http://www.otv.fr/>
SITA: <http://www.sita.fr/>
SAUR UK: <http://www.saur.co.uk/home.html>
Suez Lyonnaise des Eaux: <http://www.suez-lyonnaise-eaux.com/>
Thames Water: <http://www.thames-water.com/>
Vivendi: <http://www.vivendi.com>
Delcan: <http://www.delcan.com>
Trojan Technologies: <http://www.trojanuv.com>
SNC-Lavalin: <http://www.snc-lavalin.com>
AGRA: <http://www.AGRA.com>
Canadian Industry-Environmental Affairs: <http://strategis.ic.gc.ca/SSG/ea01338e.html>

International organisation Web sites

The World Bank: <http://www.worldbank.org/>
International Finance Corporation – World Bank Group: <http://www.ifc.org>
UNDP: <http://www.wsp.org/> (water and sanitation programme)
The European Investment Bank: <http://www.eib.eu.int>

Other Web sites

WWInternational: <http://www.wwinternational.com/> (Internet portal for water and waste containing link to online magazines: water world, water and wastewater international, worldwide waste management, *prevención de la contaminación*)
Waternunc: <http://www.waternunc.com/> (Business-to-business Web site dedicated to the water sector and containing press releases)

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