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FUTURE LIBERALISATION OF TRADE IN ENVIRONMENTAL GOODS AND SERVICES:

ENSURING ENVIRONMENTAL PROTECTION AS WELL AS ECONOMIC BENEFITS

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PREFACE

Prepared in the Trade directorate by Dale Andrew with assistance from Rachel Thompson, this document was presented to the Joint Session of Trade and Environment Experts as part of the OECD work programme on trade and environment. The text is released as an unclassified document under the responsibilty of the Secretary-General of the OECD with the aim of bringing information on this subject to the attention of a wider audience.

This study can also be found on the world wide web at http://www.oecd.org/ech/docs/envi.htm . It is also available in French.

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INTRODUCTION

This note has been prepared in response to a request by the OECD Joint Session of Trade and Environment Experts to develop a framework for future trade liberalisation efforts in the environmental goods and services sector, including the role for complementary measures. Part I discusses the definitional problems in the environmental goods and services industry and sets out the results of the recently completed classification in the OECD/Eurostat working group of national experts. Illustrative attempts are presented to match industry activities with, respectively for goods and for services, HS product categories and CPC categories. Part II categorises into supply- and demand-side considerations the main factors conditioning the diffusion of environmental technologies, including trade-related measures in environmental goods and services. Based on the analysis in the earlier sections, Part III sets out four sets of issues to be addressed in assessing the role for complementary measures designed to help ensure that future initiatives on trade liberalisation not only bring economic benefits but also enhance cost effective environmental protection. Part IV contains a concluding remark.

I. COVERAGE OF THE ENVIRONMENTAL GOODS AND SERVICES INDUSTRY

A. 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"[1]. A number of issues associated with the definition and separating out of individual items, particularly in order to measure them, are discussed below. These have been addressed by an informal working group of national experts from OECD countries, meeting under the auspices of OECD and Eurostat (the Statistical Office of the European Communities), which has now developed a common definition and classification of the environment industry in order to improve the collection of consistent information on various economic aspects. This general classification with its main Groups and categories (set out in Annex I) is being used by several Member countries as a basis in launching detailed national surveys of the industry's activities (France, Canada, US, Germany, etc.).

Table 1. Mapping environment activities

Business activities ***Environmental segments***	**Equipment manufacturing**	**General services operation and maintenance**	**Engineering services**	**R&D**	**Construction and installation of facilities**	**.....**
POLLUTION MANAGEMENT						
Air pollution control						
Waste water management						
Solid waste management						
Remediation/ clean up of soil and water						
Noise/ vibration abatement						
Monitoring, analysis, assessment						
CLEANER TECHNOLOGIES AND PRODUCTS						
RESOURCE MANAGEMENT						

Source: *Environmental Goods and Services Industry Manual,* OECD, Paris 1999.

As background to the discussion of the definitional and measurement issues, a good overview of the OECD/Eurostat approach to the industry can be found in the following table, drawn from the working group's forthcoming *Environmental Goods and Services Industry Manual* (hereinafter referred to as the *Manual).* Its prime objective is to provide a flexible classification framework for mapping environment industry activities which is currently accurate and useful but which also can be adapted to future needs, as this industry is in the process of experiencing substantial structural changes, including concentration,

privatisation, moving from end-of-pipe to integrated and cleaner technologies, and shifts to totally new activities.

The matrix in Table 1 combines environment industry business activities of different general kinds (columns) and the related environmental industry segments (rows). These latter segments (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*.

Table 2. Global environmental market, 1996

(US$bn)	US/ Canada	Western Europe	Japan Aus/NZ	Asia/Africa L. America	Eastern Europe	World
EQUIPMENT	47.7	29	20.5	10.1	1.7	108.9
water equipment & chemicals	17.2	10.5	6.3	4.3	0.8	39.1
air pollution control	16	7.3	3.6	3.1	0.4	30.4
instruments & information	2	1.6	1.1	0.5	0.1	5.3
waste management	11.5	9.1	9	2	0.4	32
process/prevention technology	1	0.5	0.5	0.2	0	2.2
SERVICES	93	69.6	49.5	14	2.6	228.6
Solid waste mgt	34.9	29.5	31	5.8	1.1	102.3
hazardous waste mgt	6.3	5.2	4	0.9	0.3	16.7
consulting & engineering	15.1	8.4	1.7	1.4	0.3	26.9
remediation & industrial	8.8	3.7	1.4	0.9	0.2	15
analytical services	1.3	1	0.6	0.2	0.1	3.2
water treatment services	26.6	21.8	10.8	4.8	0.6	64.6
RESOURCES	42.8	34.8	24.1	11	2.9	115.6
water utilities	29	19.7	13.5	8.6	2.4	73.2
resource recovery	12.3	13.6	9.5	1.7	0.4	37.5
environmental energy	1.5	1.5	1.1	0.7	0.1	4.9
TOTAL	183.4	133.5	93.9	35.3	7.1	**453**

Source: Environment Business International

In 1996, the global environment industry was estimated at US$ 453 bn (Table 2). (While covering similar activities, this estimate emphasises recovery/recycling perhaps more than does the *Manual* definition). Markets in the OECD area represent over 90 percent of the total. Basic infrastructural services of waste treatment, water treatment and water supply take more than half, and equipment nearly another quarter, of the total.

In the following two sections particular problems in defining and measuring trade in environmental goods and environmental services, respectively are discussed.

Box 1. Some examples of environmental goods and services

Air Pollution Control Examples include filters, catalytic converters and emissions scrubbers (products), and turnkey contracts (services).

Water and Waste Water Treatment Examples include membranes, chemical dosing, pipes and ranks (products), control system, aerobic and anaerobic systems; trenchless boring and facilities management (services).

Waste Management Examples include landfill liners and composters (products), and collection and disposals (services).

Remediation of Contaminated Land This includes the identification, assessment and remediation of contaminated sites. Examples include adsorbents and injection equipment (products), and sampling/analysis (services) and **marine pollution control,** including booms and adsorbents (products), and emergency response (services).

Noise and Vibration Control Examples include acoustic enclosures and noise barriers (products), vibration measurement systems, and noise and vibration measurement (services).

Environmental Monitoring and Instrumentation Examples include monitors and instruments (products), and installation and maintenance (services).

Energy Management Examples include electronic high-efficiency light bulbs and low-energy boilers (products) and energy audits (services).

Source: Adapted from P. ten Brink and R. Haines, 1997

B. Identifying environmental goods and measuring trade

If defining the environmental industry is fraught with difficulties, measuring exports and imports in 'environmental goods' is perhaps even more difficult. The OECD/Eurostat exercise concentrated on defining relevant industry *activities*, including for purposes of developing coherent, comparable statistics for national surveys. Matching industry codes, such as NACE and ISIC, with trade codes for the various segments of the industry was looked into but not followed up since it was difficult to find ISIC categories for all environment activities and because the CPC categorisation for services was not well developed. This was therefore not pursued since it was not a priority activity for the working group.

It was however essential to have a list of goods in order to analyse levels of tariff protection. In the absence of any internationally agreed list, the Secretariat has set about to attempt such a classification. The result appears below in Annex 2. This list of environmental goods with their corresponding trade product codes must be considered illustrative and preliminary in nature.

The list has been structured by 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 (HS). But there exists no HS chapter for 'environmental goods' as there does for example for

cotton goods (52); steel products (73) or electrical equipment (85), etc. In a first step, lists of goods produced and used by the environment industry must be assembled.

Finding HS product categories for these goods is not strictly possible on an internationally comparable basis. The HS system has six digits in common among WTO members. But each national nomenclature can be developed to levels of 8, 10 or more digits. Identifying environmental goods on the basis of six digit HS product category codes (as was done here), involves capturing categories of goods at a higher level of aggregation than that which would generally allow environmental goods to have their own distinct code. For some products this is not serious, because the environmental good is generally identifiable within HS 'national lines', that is with a lower HS sub-category code within the higher level HS6 category. Since such detailed sub-categories (beyond six digits) are not harmonised, however, the ways nations carve up the category result in differences of definition. Agreeing on the equivalent contents of detailed national -- i.e. more than six digits -- HS categories, would involve a vast multilateral consultation exercise. Therefore in the first instance, limiting 'environmental goods' to six digit categories is the only practical way to compare tariff levels across markets.

Problems abound also in determining the contents of a list of 'environmental goods'. The most serious concerns the ***multiple use*** of products. 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.[2] Similar conditions hold for most environmental products, including pumps, filters, incinerators and chemicals which bind polluting substances. This multiple use problem complicates the process of estimating industry size. Inevitably one must either exclude certain products with clear environmental uses or run the risk of including some sales, production, trade, etc. in products which are of non-environmental use. For purposes of its illustrative list of products in Annex 2, the Secretariat has taken a relatively wide-sweeping approach, barring few products which are considered by expert evaluators to have more than negligible environmental use.

For ***customs policy purposes*** and trade nomenclatures, 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 must be able to distinguish a good on the basis of objective characteristics and not according to purchasing industry or end use. In investigating environmental goods, on the other hand, interest revolves around how the product is to be used.

Identifying environmental goods which embody particular processes, which have been defined as 'cleaner', is also a serious problem. A piece of equipment using a cleaner technology, will have within it the ***embedded technology***, to which one can point as the 'location' of the environmental protection justifying its marking as an environmental good. Cleaner technology, by definition, involves changes in production and products upstream, rather than using add-ons or other end-of-pipe facility downstream to separate the harmful effluents after production. Under the second Group on the illustrative list of environmental goods, a number of cleaner technologies have been identified, but 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 in traditional pollution control scrubbers are added-on. 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 challenges to definition and description. Thus products and services are often classified by medium of pollution, clustering around air, water, solid waste, noise, along with sustainability of energy and other natural resource use. Distinctions and categories most useful

for one part may not be appropriate for another. Recovery of pollutants rarely offers the opportunity for re-use in air pollution, but does routinely for chemical disposal. Similarly, micro-biological hazards are rarely serious issues in air pollution. As a result, dispersal technology is appropriate to some problems (and some areas) but inappropriate for others.

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

In the case of ***cleaner technologies***, as opposed to 'end-of-pipe' equipment which capture pollutants from the output stream, 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. More careful paint spraying to reduce VOC emissions, is such an example. 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, are examples from the chemicals industry. As pollution prevention options can be more economical than equivalent end-of-pipe measures, and pollution is managed as another kind of resource use, then reducing 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 changes motivated by economic savings.

Definition of clean***er*** technologies also raises a problem of relativism. A technology which reduces use of resources or reduces 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 which become available with innovation and technological progress.

C. Delimiting the scope of environmental services

As noted in Section A above, the environment industry is evolving rapidly beyond its traditional focus on pollution control and remediation/clean-up activities to also incorporate a broader range of pollution management, cleaner technology and resource management activities. In such activities, environmental products, technologies and services are increasingly offered on an integrated basis, whether "horizontally" through a firm or group of firms bringing together the range of materials and expertise required to undertake an entire project in a particular environmental field, or "vertically" through firms specialising in, for example, construction and engineering across several environmental fields.

Therefore specialist services are both important in their own right and increasingly integral to the effective utilisation of environmental technologies and products in pollution and resource management projects. This synergy suggests that it would be desirable to pursue liberalisation of international trade in environmental services in tandem with efforts to liberalise international trade in environmental products and clean technologies.

As with environmental products, it is difficult to delineate the precise boundaries of the environmental services sector because of definitional problems arising from multiple-use on the one hand, and embedded environmental technologies and skills on the other hand, given that a number of environmental services are also provided in commercial contexts that do not relate directly to improved environmental protection or performance. The clearest examples of this arise for architectural and design services, engineering, construction and installation services, land-use (e.g., agricultural, forestry, urban planning) advisory services, R&D services, technical testing and analysis services, and recycling 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.

Thus one of the essential initial tasks in identifying environmental services and considering the potential for liberalisation is to analyse the present classifications of such services for the purposes of collecting international trade statistics and scheduling multilateral liberalisation commitments against the emerging industry profile, as classified by the *Manual*.

OECD/Eurostat Manual classification and CPC/GATS coverage

As described in Section A, and reflecting the industry's evolution, the *Manual* classification includes services provided to measure, prevent, limit, minimise or correct environmental damage to water, air, and soil, as well as problems related to waste, noise and eco-systems. The classification encompasses services relating (i) to pollution management, including those relating to the construction and installation of facilities for such purposes; as well as services relating to the installation and utilisation of (ii) cleaner technologies and products, and (iii) of technologies and products which reduce environmental risk and minimise pollution and resource use.

The cleaner technology services and resource management services classifications appear even more likely than the pollution management services classification to require "bundling" together with products and technologies.

However, the environmental services classifications used in the provisional Central Product Classification[3] and in the sectoral guidelines for the scheduling of commitments under the General Agreement on Trade in Services[4] reflect the traditional conceptualisation of the industry as being focused mainly on waste management and pollution control. Nevertheless, both classifications do contain sub-classifications for nature and landscape protection services and environmental protection services not covered elsewhere. The relationship between provisional CPC Division 94 and GATS sectoral classification 6 is shown in Table 3 below.

The other services sectoral classifications used in the GATS MTN/GNS/W/120 guidelines as a basis for scheduling of commitments are: business, communications, construction and related engineering, distribution, education, environmental, financial, health related and social, tourism and travel related, recreational, cultural and sporting, and transport services, and other services not included elsewhere.

Many of the services activities described in the OECD/Eurostat classification of the environmental industry appear capable of being covered by the GATS environmental services classification, especially "D -- Other"; such as water and air quality monitoring, assessment and modelling; biological and ecosystem studies; environmental impact assessments and audits; site

remediation activities. However, there is also some overlap between the OECD/Eurostat environmental services classification and some of the other GATS sectoral classifications for, e.g., various business and professional services, construction and related engineering services, distribution services in respect of recycling, and education services.

Table 3. CPC and GATS categories of environmental services

CPC Division 94: Sewage and Refuse Disposal, Sanitation and Other Environmental Protection Services	**GATS** sectoral classification 6: Environmental Services
9401 Sewage Services	A. Sewage Services
9402 Refuse disposal services	B. Refuse disposal services
9403 Sanitation and similar services	C. Sanitation and similar services
9404 Cleaning services of exhaust gases 9405 Noise abatement services 9406 Nature and landscape protection services 9409 Other environmental protection services n.e.c.	D. Other

It should be noted that in drawing guidance from the provisional CPC, the GATS approach reflects the concern of Uruguay Round negotiators, in constructing the first multilateral trade framework for services in the early 1990s, to ensure that the GATS sectoral classification system be a manageable and practical negotiating tool, readily linkable to national services statistics classifications, whilst covering the commercially significant sectors in international services trade. As with the CPC system, the GATS sectoral classifications are therefore intended to be self-contained and mutually exclusive of one another to the maximum extent possible. The following Table 4 provides a comparison beetween the sub-sectors of relevance to the OECD *Manual*'s classification of environmental services and their GATS provisional CPC classifications.

Table 4. GATS sub-sectors of relevance to *Manual* classification of environmental services

Selected * GATS services sub-sectoral classifications	Provisional CPC classification
1. BUSINESS SERVICES	
A. Professional Services	
a. Legal Services	
b. Accounting, auditing and book-keeping services	862
d. Architectural services	8671
e. Engineering services	8672
f. Integrated engineering services	8673
g. Urban planning and landscape architectural services	8674
k. Other	
C. Research and Development Services	
a. R&D services on natural sciences	
b. R&D services on social sciences and humanities	851
c. Interdisciplinary R&D services	852
E. Rental/Leasing services without operators	853
c. Relating to other transport equipment (i.e. not ships or aircraft)	
d. Relating to other machinery and equipment	83101, 83102
F. Other Business Services	83106-83109
c. Management consulting service	
d. Services related to management consulting	865
e. Technical testing and analysis services	866
f. Services incidental to agriculture, hunting and forestry	8676
g. Services incidental to fishing	881
h. Services incidental to mining	882
i. Services incidental to manufacturing	883+5115
j. Services incidental to energy distribution	884+885 (except for 88442)
m. Related scientific and technical consulting services	887
n. Maintenance and repair of equipment (not including transport equipment)	8675
o. Building-cleaning services	633+8861-8866
	874
3. CONSTRUCTION AND RELATED ENGINEERING SERVICES	
A. General construction work for buildings	512
B. General construction work for civil engineering	513
C. Installation and assembly work	514+516
D. Building completion and finishing work	517
E. Other	511+515+518
5**. EDUCATIONAL SERVICES**	
A. Primary education services	921
B. Secondary education services	922
C. Higher education services	923
D. Adult education services	924
E. Other education services	929
9. TOURISM AND TRAVEL RELATED SERVICES	
C. Tourist guides services	7472
D. Other	

* Included here are the GATS sub-classifications which may be of most relevance to the *OECD Environmental Goods and Services Industry Manual* classification for services.

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

International exchange of environmental goods and services are conditioned by a number of factors, which are separated here between the supply and demand sides. Policy interventions on the *supply* side are those that affect overall availability and the price of access. Thus 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 may also be relevant supply side factors. Other policies, including development co-operation, export credits and innovation policies and intellectual property regimes also affect the availability of environmental technologies and international trade in EGS and are discussed with the other supply side issues. On the other side, the *demand* or market 'pull' for this sector concerns the existence of a domestic environmental regulations, (including evolving international environmental standards) and their enforcement; consumer pressure ('green consumerism') and community pressure. Sector analysts concord that the 'pull' or demand side factors are the most important in driving markets for environmental goods and services. The most significant of these is the regulatory framework, including its design and enforcement[5] and sub-section B below focuses on this aspect.

A. Supply-side factors

1. Tariffs on environmental goods

Average tariff levels for the entire illustrative list of environmental goods are set out in Annex 2 for the groups of Quad countries, three other OECD Members and seven emerging economies. The *bound* level represents the upper limit at which a country's tariff has been fixed under Uruguay Round commitments. The *Applied MFN* tariff is the 1996 (non-preferential) level. Table 5 below summarises the averages for the bound and applied tariffs for the three country groups and the *Manual* groupings.[6]

As can be seen from the summary Table 5 and the detailed Annex Table, in **Quad** (the largest OECD) markets, average tariff levels are generally low for goods in the industry. On individual goods (calculated here for HS6 product categories), applied rates are generally 6 percent or below, and often even lower than a "nuisance" level of 3 percent. For only a few exceptions outside the chemical sector, can tariff peaks be found for products entering the EU and Canadian markets in the range of 10-12%. 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 percent. Two-thirds of Japanese tariffs in this sector are zero.

Bound, end of Uruguay Round commitment levels, are mostly lower, indicating commitments already undertaken by the Quad to reduce, and in a few cases eliminate, the remaining tariffs. With but a very few exceptions, tariffs on these environmental goods were bound by the Quad at levels below 6 percent and often lower. 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.

Table 5. Average tariff levels for environmental goods
(in percentage)

	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
Waste Water 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 & 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, EU, Japan, US
Emerging economies: Argentina, Brazil, Chile, Malaysia, India, Indonesia, Thailand
Source: ANNEX, Table 3: OECD Secretariat calculations based on WTO and UNCTAD data bases.

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

The group of seven **emerging economies** show a similar pattern, but with higher levels of protection. Average applied levels are 18 percent, and bound commitments 29 percent for the sector as a whole. Despite the average, many a*pplied* rates are commonly at 35 and 40, with many Indian tariffs as high as 100 and 150 percent. In ascending order of their *applied* rates, these 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 generally represent 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 in relation to consumer goods, for which governments often offer protection to their domestic producers. Generally, developing nations are less likely to have competing domestic environmental industries. For certain goods, such as those summarised in the Monitoring and Assessment category (e.g. precision instruments), tariffs are noticeably lower than for other categories. For these high tech goods, domestic production within developing countries is even less wide-spread than for other environmental goods.

2. Public Procurement

Another major trade-related concern resides in government procurement practices.[7] Within the environmental industry, these are of greatest concern in public utilities such as water supply and treatment; waste collection and disposal; energy efficient systems and clean process technologies. Governments may find it easier to turn to domestic, usually local, suppliers.

Public procurement practices are covered by various sets of national and plurilateral rules, but all limited in scope. In the WTO, the Agreement on Government Procurement has 22 (mostly OECD member) signatories, threshold values for application of its rules, excluded sectors and only a limited number of sub-central bodies to which it applies.

The precise extent of discrimination in procurement is difficult to measure. Overall for non-defence industries, efforts to quantify the extent of procurement bias found differences from private sector import patterns indicating a degree of preference equivalent to 8-18 percent tariffs for principal OECD markets.[8] That analysis took into account only central government procurement patterns. A survey of U.S. air pollution control firms reported procurement practices in both the public and private sector to be serious problems.[9] 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 sectors are often provided by local, municipal governments[10], which are not subject to GPA disciplines. Local water supply, waste water 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 GPA.

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

3. Technical barriers to trade

In a sector where markets are driven by regulations, it is not surprising to hear concerns expressed that such regulations serve as technical barriers to trade. Differences in standards between countries can inhibit imports by eroding economies of scale. Furthermore the enforcement and regulation processes create potential costs, delays and uncertainties which can become barriers to trade. Most industries are subject to these concerns. The WTO Technical Barriers to Trade (TBT) Agreement promotes practices designed to avoid unnecessary effects on trade.

Trade in environmental goods is influenced by domestic environmental laws and regulations, which often determine the kind of good used to meet requirements. The environmental goods industry in a producing country will tend to be adapted to the requirements of its own domestic laws and regulations. This is demonstrated by evaluations of competitiveness in the industry, which repeatedly find that experience and technical rigour, created by strictness of domestic environmental regulation, are important determinants of competitive strength. For example, the strict Japanese regulation of SOx and NOx pollution has made them export leaders in smokestack scrubbers; the US industry is particularly

competitive in hazardous waste treatment due to US toxic regulations; UK and French water supply and water treatment firms have become world leaders[11].

By crafting environmental norms to match the strengths of the domestic (or favoured foreign) suppliers, there is a fear that the regulatory process might create technical barriers to trade. Developing country markets can also be influenced when technical assistance on environmental regulations promote regulations or technical specifications which favour the donor country's environmental goods producers.

The way that environmental norms are designed can limit the possibility of their becoming technical barriers to trade. If different technologies give equivalent, ambient results in terms of environmental quality, then a purchaser should be able to choose freely among the environmental goods from foreign or domestic sources rather than being required to choose a domestic producer because of a specified technology. Incentive-based approaches allow firms to discover the most cost-effective ways to limit environmental damage. As discussed below in the section on demand-side policies, environmental policy in OECD countries has been evolving in the direction of ambient standards (i.e. which set a benchmark for the quality of the surrounding environment) and use of market-based incentives. This probably represents a move towards use of more trade-friendly environmental policy instruments.

4. 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 displacing exports of a producer with a recognised comparative advantage. A perception continues on the part of business[12] that export markets may not be genuinely open due to the activities of export financing institutions and that the playing field needs to be levelled by addressing competitors' practices, including those of tied aid. It is difficult to determine to what extent these concerns arise due to market distortions or in fact reflect 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 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 the ordinary operations of their trade finance operations. A number of more general trade promotion programmes, based on providing information, explicitly aim to transfer environmental technology. These 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 small and medium sized enterprises such programmes help correct the market failures of imperfect information in a fragmented environmental goods industry[13].

In OECD, the Arrangement on Guidelines for Officially Supported Export Credits, 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 who grants 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 of 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 to commercially viable exports is in most cases prohibited. Tied aid is limited to fund projects which are not commercially viable and developmentally sound and a minimum concessionality level for individual transactions (35 percent) is imposed. Further its use was redirected 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[14]. 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.

The table below shows that between 1992 and 1996 DAC donors extended $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 clearly distinguishable as 'environmental'. Of this amount, $14.6 billion was for capital investment, generally consisting of equipment. About one quarter went as tied aid or partially untied aid -- that is assistance linked to purchasing of exports from the donor country, or, for the latter, to donors and substantially all developing countries. Another five percent was in the form of 'mixed credits', 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. The largest recipient of donor export credits for environment related equipment was China.

Table 6. Environmental goods supported by DAC Members' bilateral development aid, 1992-1996

(US$ mn)

		Water Supply & 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 Export Credit Arrangement on official export credits and credit guarantees, (other than those reported above as "mixed credits" to the OECD DAC), are reported in confidence. Nor are figures disaggregated by project type. It is therefore not known how much has gone 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 OECD Participants have oscillated between 17 and 20 billion SDR since 1992. Typically long-term export credits are 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.

5. 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, in principle they will be reluctant to provide the services or goods[15]. Or if TNCs do transfer technology, they may keep it in-house and not want to license it to subcontractors or other firms, leading to a situation of technological "enclaves".[16]

In practice, however, the environment industry has not, overall, identified intellectual property protection as a high ranking 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.[17] The importance of services may offer some protection against spin-off or copying and limits the opportunities for misappropriation of the expertise. Sellers generally must be able to apply general knowledge of the technology to the specific situation of the client, and goods sales are often part of the package provided by an engineering or consulting firm. 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 copying.

Box 2. Trade issues in 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 in the diffusion of cleaner technologies was investigated. Specifically the following seven cleaner technologies looked at were:

-- 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;

-- direct reduction technology in the iron and steel industry.

Most exporters and importers surveyed expressed a preference for governments taking actions to lower or eliminate tariffs on cleaner technologies, waive local content requirements or foreign exchange restrictions and strengthen patent protection. *However, generally speaking, such trade polices 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. The main reasons that industries had imported cleaner technology was that new domestic environmental standards had forced them to do so. In the case of CFC alternatives, it was the Montreal Protocol which was largely responsible for the introduction of the aqueous-based cleaning technology.

Source: OECD (1992 c)

6. Innovation and technology diffusion support

Most OECD countries' innovation and technology diffusion policies involve granting financial support for the increased *supply* of cleaner technologies. Table 7 shows the kinds of instruments in use: 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.[18]

The interaction between the realms of technology policy and environmental policy is currently a focus of discussion in OECD and national capitals. Starting from the wide-spread recognition that environmental policy instruments differ widely in their effects on innovation and diffusion of technologies, the policy question becomes how to design environment policy instruments which encourage innovation; and how innovation and technology diffusion policies can provide cost-effective, non trade-distorting support to further 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 only mild technology effects to date, 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 changes, although new forms of "environmental compacts" may hold more promise.[19]

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.

Particular constraints on innovation arising from environmental regulations include: emphasis on a single medium; implicit biases against new technology; pervasiveness of "best available technology" (BAT) standards, which de facto encourages use of the technological status quo.

Another essential aspect to ensuring the *supply* of environmental technologies beyond innovation, involves support to technology diffusion. A recent survey of programmes for the diffusion of environmental technologies, generally concluded that those diffusion programmes which produced results and could be effectively emulated were those that promoted clean technologies -- those which 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 part of diffusion promotion involved giving incentives to firms to adopt new techniques -- both direct and indirect financial incentives (seed money; accelerated depreciation of investments; minority equity by government, use of environmental investment funds). The best overall approach was found to consist of providing services which integrated information sources and technology diffusion services.[20]

Box 3. Policy coherence for cleaner technologies: bias favouring 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, examples arise with the use of tied aid and mixed export credits whose motivations are both to foster development co-operation and 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. Use of tied aid and mixed credits (extending officially supported export credits with bilateral aid) is still wide-spread to promote exports from firms in donor countries. Developing countries have been very receptive to pollution prevention solutions, particularly the simpler ones involving housekeeping. This experience over recent years has meant that donors are today placing greater emphasis on extending 'software' rather than 'hardware', i.e. more technical assistance for capacity building and less end-of-pipe, equipment solutions.

In an OECD study on *Export Promotion and Environmental Technologies*, it was 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: 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 in the nature of the beast: export credits are designed to lower interest rates and lengthen repayment periods for large and expensive plant. But the OECD study also felt that there was no inherent reason that export credits and general export promotion programmes could not also be targeted on pollution prevention technologies; and cited examples of some cleaner technologies which have been supported including: 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 target environmental technologies. Limited reports suggest that efforts had tended in the past to support end-of-pipe solutions and only small amounts targeted for pollution prevention R&D. This may be for several reasons. In part, the démarche of 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. Put another way, the pollution prevention R&D agenda is not always well known. Or central government monies may target State responsibilities, such as military pollution, and focus on remediation. Today programmes are targeting pollution prevention and process technologies, in response to the perceived market failure here of under investment by firms. The actual situation is currently being investigated in the OECD Working Group on Innovation and Technology Policy.

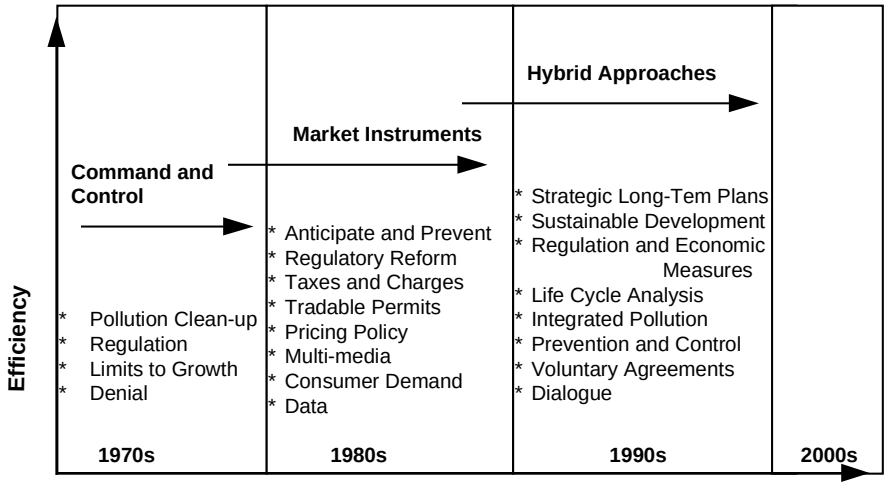
Source: Gamboni; Heaton and Banks; OECD (1994c; 1995a; 1997a,b);OTA (1994); Wallace.

B. Demand-side factors

1. Trends in environmental policy

This section recalls the evolution of environmental policy in the OECD area since the 1970s, including a description of policy instruments. Consequences of the choice of policy tool for the kind of environmental goods/services demanded have been direct, as are the implications for the current and future development of EGS markets of the changing direction in environmental policy.

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 set in a manner 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 with a design or technology-based standard or if not specified *per se*, the polluter found he was required *de facto* to conform to a given technology, since 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 upgrading of standards or tightening of enforcement. An individual firm otherwise had no incentive to make continual improvements in its performance, assuming that it had made the necessary investment in plant to meet prescribed emission limits for each of the individual media.

Working up detailed regulations is a long and complex process, demanding strong technical capabilities on each medium from regulatory agencies. 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 is completed, it has been reasonably effective in pushing polluters rapidly towards the precise new norms -- and therefore popular with legislator and the public. However it maximises the costs of compliance -- since it involves new investments in abatement equipment.

Experience has brought about regulatory reform in many OECD countries. Emphasis has moved onto *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, allowing clean-up of the dirtiest sources first, where the marginal cost of reducing a unit of pollutant is smallest. Single media-based limits have increasingly been replaced by a multi-media approach, whereby managers (and the regulator) can take a broader view about all emissions from the plant, introducing flexibility, and cost effectiveness.

In this period, use of economic instruments, such as taxes, charges, tradeable permits, etc. has grown. The main purpose of economic, or market-based instruments, is to create a change in behaviour by punishing (or rewarding) in monetary terms. By taxing an environmental 'bad', these provide an ongoing incentive to find ways of improving 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 incorporating at times sophisticated technologies, but which were 'add-ons'. Designed to reduce emissions and effluents down-stream, 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".[21] A priority area of concern was to promote multi-media 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 toward pollution prevention and cleaner technologies can be broken up into five main types:

- simple operating and housekeeping processes;
- process modification;
- changes in plant equipment;
- substitution of less harmful raw materials; and
- 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 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 do not involve sophisticated technology. Rather the emphasis is putting managerial, auditing and engineering know-how, i.e. *services*, 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. And, still later stages involve product innovation, where a less polluting or more recyclable product is developed.

Shifts in demand from regulatory reform, including private sector initiatives.

OECD governments have thus been adapting their arsenal of environment policy instruments to promote pollution prevention, including the adoption of technologies for cleaner production and cleaner products. Whilst it is beyond the scope of this note to develop these in detail, the principal axes of support to pollution prevention and cleaner technologies are briefly set out here to complete the picture [22].

Environmental regulatory reform has emphasised:

- development of a long-term environmental strategy in order to set a framework providing strong stimulation for cleaner technologies (e.g. Dutch Environmental Policy Plan Plus);
- greater use of economic instruments, such as taxes, charges and tradeable permits;
- promotion of voluntary agreements (whereby sectors of the economy pledge to behave in ways designed to achieve environmental goals mutually acceptable to government and other interested parties);
- instituting a mechanism for measuring and reviewing the efforts of the regulatory approaches with the power to initiate changes; such a mechanism may incorporate a managerial accounting system to provide a unified means to monitor effects of various policy tools in a coherent form;
- emphasis on correcting market failures of imperfect information on cleaner technologies [23];
- removal of policy distortions which have favoured ‘end-of-pipe’ solutions to environmental protection; and
- public awareness campaigns and education and training programmes.

Overall, it might be summed up that governments create demand for pollution prevention and cleaner technologies by developing a favourable regulatory environment, i.e. one that provides appropriate incentives (and limits disincentives). [24]

2. Shifting demand in emerging countries

Discussion above has focused on the fundamental role of the regulatory framework in the OECD area. But what about developing countries and other emerging economies, where environmental protection laws are newer or, while impressive on the books, are seldom implemented or enforced? Emphasis has been shifting in the developing world too on how to make environment policy more cost effective. UNEP's programmes emphasise cleaner production in developing countries. DAC donors have in the follow-up to UNCED and an inter-Directorate programme on Technology and Environment worked to promote cleaner production in developing countries by identifying the role of development co-operation and exchanging donor and recipient experience.[25]

The importance of fostering pollution prevention in developing countries arises for a number of reasons. If pollution abatement and retrospective clean-up have been expensive in the OECD area, *a fortiori* it is even more essential for developing countries to orient environmental protection to cost-effective means integrating resource use consideration in production techniques and avoiding clean-up. It has been suggested that recipient countries might not have been sold the most appropriate environmental goods and technologies, or have received technical assistance promoting command and control policies which may not have adequately addressed their environmental problems in the most cost-effective way. For a number of reasons, 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[26] has found that demand in emerging environmental markets tends to follow a progression as below:

1. water delivery;
2. wastewater treatment;
3. air pollution control;
4. solid waste services;
5. hazardous waste; and
6. remediation.

If this situation holds, then demand for basic environmental services can be expected to continue to grow as developing countries progress through these various stages (many are still at the low end of the spectrum) in implementing environmental protection programmes.

On the other hand, others would point to the changed emphases in environmental policy, access to OECD experience in the field and possibilities of technological 'leapfrogging'. Particularly, dynamic developing economies experiencing high growth rates and a high turnover of manufacturing capital stock[27] are more able to invest in new processes based on cleaner techniques and thus perhaps by-pass end-of-pipe solutions.

But in any case a middle tier of countries may still be in need overall of end-of-pipe solutions. Needs for basic water, water and waste treatment services are still abundantly great in poorer parts of the third world. Much of Central and Eastern Europe is still in need of waste treatment facilities and remediation of past environmental neglect pointing to the need for traditional pollution management for some time.

3. Effects of shifting demand on the environmental goods and services industry

As seen in the discussion above, early government interventions to support cleaner technologies have tended to target the supply side. On the demand side, OECD Members are reforming their domestic regulatory frameworks. In re-tooling their arsenal of environmental policy instruments, governments are recognising the significance of the *kind* of policy tool for shaping the *nature* of demand for environmental protection, such as the encouragement of pollution prevention. In developing countries, evolving environmental protection programmes are slowly becoming reality; the need for basic services continues to be strong and in more advanced developing countries the pent-up demand for both clean-up services and cleaner production techniques is making itself felt.

How are these shifts in environmental protection demand patterns affecting the environmental goods and services industry?

Both in the OECD area and developing countries, either reform or effective implementation of environmental regulations has been altering patterns of demand for environmental goods and services. In what has been a high growth industry, certain segments are now showing well-known signs of maturing, following the saturation of demand in certain areas. Reactions are coming in terms of consolidation and mergers and acquisitions and other well-known industry retrenchment patterns, where too many actors are present for market possibilities. But the opening up of niche markets is offering opportunities for specialisation.

The balance between goods and services is clearly evolving in the direction of services[28]. The more successful companies are offering packages of goods, systems and services. Sales of basic products are increasingly difficult in many markets. Emphasis on systemic, 'holistic' approaches inherent in pollution prevention leads to increased needs for know-how rather than hardware. Use of soft-ware implies a growing range of *services*: auditing; measurement; design; as well as consulting and engineering services. Service sectors are perhaps the most dynamic and becoming increasingly internationalised. The large multinational service companies have successfully implanted themselves in many foreign markets.

Industry analysts are reporting that environmental protection is relying less on end-of-pipe solutions[29]. Or at least, these goods are not being sold in isolation to the extent previously, but rather are part of broader-based strategies for cleaner production. Thus there will be fewer big scrubbers sold, but new management processes, using clean fuels and integrated in the sales of new capital equipment. Continued growth in demand would be expected for measuring services and analytical devices such as meters.

If the above largely describes the situation in the OECD area, developing countries and central and east European countries also show a whole range of shifting demand patterns. While at one end, lack of resources and crying needs for basic goods will concentrate demand on traditional environmental services such as water, demand for more traditional pollution management goods will continue in middle income developing countries. Nonetheless, use of simple, housekeeping management techniques to reduce energy and other inputs have in donors' experience proved popular due to their cost-effectiveness, at all stages of development. In dynamic developing countries, it can be expected that rapid growth will allow investment in new, cleaner processes. Competition from developing countries is also emerging as indigenous environmental industries are set up. This pattern can be expected to continue as local industries move into the lower tech end of the spectrum -- which characterises the bulk of the environmental goods industry.

C. Supply factors affecting environmental services

A number of the demand factors affecting environmental goods identified in the preceding sections are also relevant to services. On the supply side, whilst tariffs are not relevant to services, a range of domestic measures can operate to inhibit the international supply of services and thereby constitute barriers to market access. For services this typically includes national barriers to the entry or operation of international services suppliers, limitations on rights of establishment of commercial presence via investment, and preferential treatment for national service suppliers that may be provided under general or sectoral regulatory frameworks.

As part of the Uruguay Round, a relatively limited number of commitments on market access and national treatment (i.e. treatment no less favourable than that accorded to domestic services and services suppliers) for a fairly narrow range of environmental services. The scope of these commitments is analysed below. In addition, the multilateral services rules framework is incomplete in respect of several matters that may affect the supply of environmental services (as well as, of course, that of a range of other services), such as government procurement, subsidies, and the domestic regulation of services through technical standards, licensing and professional qualifications standards. Work in these areas is ongoing in a number of Committees set up under the auspices of the WTO Council for Trade in Services. Another round of multilateral negotiations on services is due to commence in the WTO no later than 2000.

The OECD Trade Directorate has commenced a project to assess barriers to services trade in a number of key sectors, including environmental services. This work involves the compilation of inventories of barriers, at both horizontal and sectoral levels, to be categorised according to their trade-restrictiveness. For environmental services, the project covers barriers to crossborder trade of physical establishment and temporary stay of suppliers in-country, as well as a range of domestic regulatory measures such as licensing, monopolies, government procurement and intellectual property rights. An initial survey of barriers to trade and investment in the environmental services sector is being assembled and an updated version should be publicly available before mid-1999.

In the meantime, a useful starting point for consideration is the extent to which environmental services and factors affecting their supply are already the subject of commitments made in the Uruguay Round negotiations.

Environmental services was not a high-profile focus of the Uruguay Round services market access negotiations. Nevertheless, the WTO Secretariat's analysis[30] of the scope of UR commitments made under the GATS environmental services sector indicates that 48 countries[31] made commitments under one or more of the four GATS environmental services sub-sectors of sewage services, refuse disposal services, sanitation and similar services and "other" environmental services, usually for all four of the GATS "modes of supply"[32] by which services are provided internationally.

By way of background it is perhaps useful to note here that each WTO member is required to maintain a country Schedule of Specific Commitments for services that sets out the specific commitments it has undertaken. However it is not mandatory to make commitments in all of the twelve GATS sectoral chapters listed in the GATS scheduling guidelines. For each sector in which commitments are made, the national measures which limit or place conditions on the market access and the national treatment afforded to foreign services or service suppliers are listed, according to each of the four GATS "modes of supply" of services.

It is possible to inscribe that there are no limitations ("none") or that no commitments are being made at this time ("unbound"). Countries may also inscribe "additional commitments" in respect of regulatory measures affecting trade in services that are not covered by market access and national treatment scheduling, such as technical standards and qualifications licensing. It is also possible to inscribe 'horizontal' commitments or limitations on market access or national treatment for an entire sector or, indeed, to do so across an entire Schedule (i.e., for all 12 sectors).[33]

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 as Annex 5 to this paper.

Most OECD countries made commitments on market access and national treatment for at least three of the four GATS environmental services sub-sectors, with the exception of Mexico and New Zealand, which have not made any GATS commitments for the sector. The coverage of OECD commitments tends to be comprehensive for sub-sectors A (sewage services), B (refuse disposal services), and C (sanitation and similar services); with more unevenness in the scope of commitments made for sub-sector D (air pollution cleaning services, noise abatement services, nature and landscape protection services, and other environmental protection services n.e.c).

A small number of developing countries have also made commitments in one or more, and sometimes all four, of the GATS sub-sectors. However, it is noteworthy that emerging economies, including from ASEAN and Latin America, have not made any commitments in the environmental services chapter of their GATS schedules; exceptions are South Africa and Thailand.

A preliminary analysis of the existing GATS commitments in the sector as presently classified indicates that, for the countries which made commitments, the principal conditions or limitations applying to market access and national treatment for sewage, refuse disposal and sanitation services are as follows:

- Existence of general conditions (i.e. applied horizontally) affecting market access and national treatment for *the temporary movement of service suppliers*. However, a number of countries have left this mode of supply unbound apart from noting the application to this sector of their horizontal conditions. This means they could introduce sector-specific limitations on market access and national treatment granted to environmental service suppliers at a later date.

- *Limitations on establishment of commercial presence appear to be few.* A couple of OECD countries refer to the application of their horizontal limitations as affecting national treatment for the establishment of commercial presence for sub-classification D -- Other Services. One links rights of movement of service suppliers to requirements to establish a commercial presence for the service within the country for refuse disposal services. One limits market access for establishment of refuse disposal services through application of an economic needs test. Another requires environmental operating licences as a condition of market access to establish a commercial presence for sewage, refuse disposal and 'other' services, but not for sanitation services. Other OECD countries have not listed specific or general conditions or limitations on the establishment of commercial presence, for either market access or national treatment, for the sub-sectors they have included. One of the more advanced developing countries applies horizontal limitations on market access and limits national treatment for establishment of commercial presence through foreign equity participation being held to no more than 49 percent.

- A few OECD countries have listed *operating license requirements* as a limitation on otherwise unrestricted market access for refuse disposal services. There are also a couple of instances where the number of license holders are limited for specific aspects of market access for provision of sewage services and refuse disposal services, or where there "may" be a requirement for operating licenses to be sought for market access via the establishment of commercial presence and temporary movement of service suppliers in the "other" services categories. A couple of countries list as limitations to unrestricted market access the existence of monopoly situations for some refuse disposal waste categories and of government monopolies for control systems for air pollution from exhaust gases, including non-profit requirements.

- Most countries have left *mode 1, cross-border supply*[34], unbound due to lack of technical feasibility. The growth predicted for provision of information, design and consultancy services via *electronic commerce* may be cause for revisiting this issue in the future.

- Generally speaking, those less developed countries which have made commitments in this sector tend to have scheduled no limitations on market access or national treatment for establishment of commercial presence and have left temporary movement of service suppliers "unbound" except as indicated in their horizontal conditions, for the sub-sectors scheduled.

As regards barriers to trade for the range of other activities relevant to environmental services in the terms covered by the OECD/Eurostat *Manual* classification, it would be necessary to examine other sections of a representative range of GATS schedules, so as to assess the conditions and limitations that may apply to market access and/ or national treatment. These are likely to be contained largely, but not only, in the business services and construction and related engineering services chapters.

Subsequent to development of any "priority list" for services liberalisation (and classification correlation work), an important issue to be considered is whether it is possible or desirable to "carve-in" most or all of those services to an elaborated GATS sectoral classification 6/CPC 94 or to "carve-out" the environmental aspects of services provision from the other relevant GATS sectoral classifications such as business services, construction services. Annex 4 contains a preliminary overview of how environmental services, as classsified in the OECD *Manual*, are covered in the GATS classification guidelines.

The 1997 Information Technology Agreement (ITA) may provide a relevant model for the development of an environmental services classification for WTO negotiations. In that negotiation, the first step involved broad agreement on the products to be covered and generation of political and business support for an agreement. As the products were spread across several HS chapters and there were disagreements on nomenclature, technical correlation work was needed to match up the products to be covered with the relevant HS codes, after which negotiations on tariff reductions, time-frames, etc. could be undertaken in earnest. A similar approach to environmental services would thus require correlation work to match the activities agreed for liberalisation from the *Manual* classification with the existing GATS/CPC-based services sectoral classifications.

III. LIBERALISING TRADE IN ENVIRONMENTAL GOODS AND SERVICES TO IMPROVE ENVIRONMENTAL PROTECTION: A ROLE FOR 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 transfer of technology. Reducing tariffs and other trade-restricting measures means that services and goods will be cheaper. Limited environmental protection budgets can be stretched further. Trade liberalisation also provides incentives for the generation of technological progress through expansion of market opportunities.

More indirectly, opportunities to realise economies of scale and 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 pre-conditions for technology co-operation in order to generate innovations more closely associated with domestic economic and environmental conditions. In other words, this can help increase local capabilities for domestic technology innovation and adaptation, relative to dependence on transfer of foreign technology.

At the same time, as shown by the analysis above in Section II, there is a multiplicity of factors both on the supply side and the demand side which affect diffusion of environmental technologies and trade in environmental goods and services. Demand-side factors clearly dominate, relative to the host of supply side factors such as trade barriers. These therefore need to be taken into account to ensure that trade liberalisation becomes a 'win-win' situation. Particularly important factors *on the demand side* are:

A) the environment regulatory framework and choice of environmental policy instruments;

B) recent trends in environmental policy emphasising the growing importance of environmental software or *services* in determining the kind of environmental hardware or *equipment and other goods*; and, closely related to this;

C) the 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; and

D) the different conditions which distinguish needs for EGS in developing countries and economies in transition from those in OECD countries.

The implications of these four points for complementing trade liberalisation in EGS 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.

A. 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 nor their cost, but arises from the degree and type of market pull. In other words, the pressure points on rapid diffusion of environmental technology are not high tariffs. A few trade-related questions do arise. For example, in public procurement, liberalisation efforts promoting more open markets for environmental service contracts let by public entities would undoubtedly help. But overall trade-related questions appear relatively low in significance. The issue then becomes 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 amount and type of environmental goods and services, trade liberalisation can then help to ensure the availability of the appropriate services.

Secondly, such emphasis on the principal demand factor needs to be complemented by the recognition of 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 to a flexible and dynamic regulatory framework, 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 to bear results closer 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.

B. Relationship of environmental goods and environmental services: ensuring complementarities of hardware and software

Solving an environmental problem -- particularly in today's context of promoting integrated, systemic changes in production -- necessarily involves 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 needs for environmental hardware or equipment. Ensuring an appropriate balance between goods and services will therefore also have its implications for trade liberalisation in these two areas.

Some issues that may be worthy of consideration in determining liberalisation approaches could be as follows:

- The difficulty of distinguishing some of the clean technology services and resource management services, in particular, from pollution management services in terms of the CPC/GATS classifications. 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 activities covered by the pollution management services classification appear to correlate at least broadly with services covered by GATS classification 6/CPC 94. In addition, consultancy and construction, engineering and installation services are involved. This is also the case with clean technology services. The resource management group also involves land use and R & D services.

- Consideration could also be given to how countries would ascertain that a service is being offered/provided directly for the purposes of environmental protection and improved environmental performance. This is presumably relevant in light of GATS rules regarding non-discrimination between "like" services. To the extent that limitations continued to apply to market access or national treatment for, say, a particular engineering service, but were removed for such a service where provided for environmental purposes, there could need to be clear criteria to distinguish the services as not being "like".

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

C. Buttressing implementation of pollution prevention by avoiding distortions

The analysis above has emphasised the evolution 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, away from end-of-pipe equipment to an array of goods which serve as inputs to promote cleaner technologies. Tools for consideration include enhanced managerial accounting systems and other environmental audit systems taking a 'holistic' systemic view. This might also incorporate reviewing supply-side policies with a view to enhancing 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[35] suggests that during this transition period to implementation of pollution prevention policies, other public policies may have been lagging relative to environmental policy with support mechanisms continuing to favour sales and development of end-of-pipe equipment. Promoting policy coherence by eliminating existing incentives in other policy areas which tend to favour 'end-of-pipe' would therefore be important. The rapid phasing out of direct tax concessions, accelerated depreciation and subsidies for end-of-pipe controls was recommended already in 1992, for example, in the context of the OECD's technology and environment programme[36].

Thus a framework for complementary measures would address the need to:

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

D. Fostering diffusion of appropriate technology in emerging economies

Discussion above presented an overview of trends in emerging economies. The analysis shows a wider spectrum of demand in these countries, but also underscores the growing need for co-operative arrangements which emphasise know-how over hardware. Building know-how, or capacity, including on technology adaptation, is essential therefore to allow emerging economies to select the types of technologies appropriate for their conditions. Certain developing countries may move up a traditional demand curve for environmental services whilst others may be able to 'leapfrog', e.g. 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[37].

A framework for complementary measures would address the needs to:

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

IV. CONCLUDING REMARK

Trade liberalisation in environmental goods and services has a strong *potential* for win-win. As in other similar situations, however, there is an apparent need to accompany trade liberalisation of environmental goods and services with complementary measures. Potential pitfalls could be avoided through complementary measures addressing four sets of issues, identified in section III above. These could be addressed in a *framework for future trade liberalisation efforts* aimed at eliciting discussion at inter-governmental and domestic levels, including with private sector actors, to ensure strengthened environmental protection alongside the economic benefits expected from increased market access. The four points sketched out above can hopefully serve to further national reflection on how to approach complementary measures designed to accompany trade liberalisation of environmental goods and services.

ANNEX 1: OECD/EUROSTAT ENVIRONMENTAL GOODS AND SERVICES INDUSTRY MANUAL CLASSIFICATION

The "POLLUTION MANAGEMENT" Group

A. Environmental Goods

Air pollution control

This class includes any activity that produces equipment, technology 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.

Waste water management

This class includes any activity that produces equipment, technology or specific materials for collection, treatment and transport of waste water 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, waste water reuse equipment; water purification equipment and other water handling systems.

Solid waste management

This class includes any activity that produces equipment, technology or specific materials for 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. It also includes equipment for outdoor sweeping and watering of streets, paths, parking lots, etc. It includes equipment, technology or specific materials for treatment of low level nuclear waste. It excludes high level nuclear waste. Recycling activities excludes manufacture or production of new materials or products from recovered waste or scrap and subsequent use of these materials or products.

Remediation and cleanup of soil, surface water and groundwater

This class includes any activity that produces equipment, technology or specific materials to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and sea water. It includes absorbents, chemicals and bio-remediators 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, technology 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, technology or specific materials for sampling, measurement, and subsequent recording, analysis and assessment of various characteristic 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 are included.

B. Environmental Services

Air pollution control

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

Waste water management

This class includes any activity that designs, operates systems or provides other services for collection, treatment and transport of waste water and cooling water. It includes design, management or other services for sewage treatment systems, waste water reuse systems, 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, transports 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 treatment of low level nuclear waste are included. It excludes high level nuclear waste. It excludes services for manufacture of new materials or products from recovered waste or scrap and subsequent use of these materials or products.

Remediation and cleanup 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 sea water. It includes cleaning-up systems either *in situ* or in appropriate installations, emergency response and spills cleanup 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 designing, management or other services for acoustic and sound-proof screens and street covering.

Environmental R&D

This class includes any systematic and creative activity which is 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 creative scientific and technological activities for the development of cleaner products, processes and technologies. 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 which are not included elsewhere. It includes multidisciplinary environmental contracting and engineering. Environmental management consulting, and auditors 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, both operating 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 work-place education and training. The activities of the general educational system are excluded.

C. Construction

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

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 technology

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

Cleaner/resource efficient product

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

The "RESOURCES MANAGEMENT" Group

NOTE: In the case of the "Resources management" group, activities aimed at the production of environmental goods and services and connected construction are gathered together for convenience. However, it is suggested that wherever possible information on these items be separately collected and presented.

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.

Potable water treatment and distribution

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 any 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 recovered waste or scrap, or preparation of such materials or products for subsequent use.

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 biomass, solar, wind, tidal, or geothermal sources. (Do we wish to include renewable energy collection and plant management, etc.?)

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 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 do 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. These activities should be separately specified and listed.

Source: OECD *Environmental Goods and Services Manual*, 1999, Annex 1.

ANNEX 2: ENVIRONMENTAL GOODS: ILLUSTRATIVE LIST WITH HS PRODUCT CODES AND TARIFFS

	HS Code	QUAD		K, M, T		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
A. POLLUTION MANAGEMENT GROUP							
1. Air pollution control							
1.1 Air-handling equipment							
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
1.2 Catalytic converters							
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
1.3 Chemical recovery systems							
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
1.4 Dust collectors							
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
1.5 Separators/precipitators							
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
1.6 Incinerators, scrubbers							
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 & 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
1.7 Odour control equipment							
Parts for sprayers for powders or liquids	842490	1.8	2.1	31.6	8.0	26.4	16.4

	HS code	QUAD		K, M, T		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
2 Waste water management							
2.1 Aeration systems							
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
2.2 Chemical recovery systems							
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 & phosphonates	283510	4.5	3.9	20.0	7.8	25.0	15.2
Phosphates of triammonium	283521						
Phosphates of mono 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
2.3 Biological recovery systems							
2.4 Gravity sedimentation systems							
Flocculating agents							
2.5 Oil/water separation systems							
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

	HS code	QUAD		K, M, T		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
2.6 Screens/strainers							
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
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-elec*	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
Indl & lab elec resist furnaces*	851410	2.2	3.3	25.8	10.2	26.4	12.0
Indl & lab inductn, dielec furnaces*	851420	2.2	3.3	25.8	8.9	26.4	12.0
Indl & lab elec furns & ovens, nes*	851430	2.0	2.9	22.8	8.6	26.4	12.0
Parts, indl & lab elec furns*	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							
Cast 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

	HS code	QUAD		K, M, T		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
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							
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, nes, 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 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 & 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

	HS code	QUAD		K, M, T		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
4. Remediation and cleanup							
4.1 Absorbents							
4.2 Cleaning-up							
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 radiations	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		K, M, T		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
6.2 Sampling systems							
6.3 Process and control equipment							
Thermostats	903210	2.1	3.0	17.1	8.9	30.0	18.9
Electrical process control equipment							
On board monitoring/control							
6.4 Data acquisition equipment							
6.5 Other instruments/machines							
B. CLEANER TECHNOLOGIES AND PRODUCTS Group							
1 Component of cleaner/resource efficient technology							
Electrochemical apparatus / plant							
Extended cooking (pulp)							
Oxygen delignification							
Ultrasonic cleaning							
Fluidized bed combustion							
2. Component of cleaner/resource efficient product							
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. Potable water treatment and distribution							
2.1 Potable water treatment							
2.2 Water purification systems							
Chlorine*	280110	2.0	3.1	21.8	9.3	25.7	19.2
2.3 Potable water supply and distribution							
Waters,including 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 Recycled paper							
3.2 Other recycled products							

	HS code	QUAD		K, M, T		Emerging	
		Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996	Bound end UR	Applied MFN 1996
4. Renewable energy plant							
4.1 Solar							
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, include solar cells	854140	0.8	1.2	18.3	4.6	27.1	11.7
4.2 Wind							
Windmills							
Wind turbines							
4.3 Tidal							
4.4 Geothermal							
4.5 Other							
Methanol	290511	3.3	6.7	23.8	5.8	25.7	17.4
Ethanol	220710						
Hydroelectric plant							
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							

* indicates that HS code appears previously in table

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

Quad = Canada, EU, Japan, US; **K,M,T** = Korea, Mexico & Turkey; **Emerging** = Argentina, Brazil, Chile, India, Indonesia, Malaysia, Thailand.

Source: OECD Secretariat calculations, based on WTO and UNCTAD data bases.

ANNEX 3: BOUND AND APPLIED TARIFFS ON ENVIRONMENTAL GOODS IN FOURTEEN MARKETS

	CANADA		EU-15		JAPAN		USA		KOREA		MEXICO		TURKEY		ARGENTINA		BRAZIL		MALAYSIA		INDIA		INDONESIA		THAILAND	
HS code	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

	CANADA		EU-15		JAPAN		USA		KOREA		MEXICO		TURKEY		ARGENTINA		BRAZIL		MALAYSIA		INDIA		INDONESIA		THAILAND	
HS code	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

	CANADA		EU-15		JAPAN		USA		KOREA		MEXICO		TURKEY		ARGENTINA		BRAZIL		MALAYSIA		INDIA		INDONESIA		THAILAND	
HS code	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

	CANADA		EU-15		JAPAN		USA		KOREA		MEXICO		TURKEY		ARGENTINA		BRAZIL		MALAYSIA		INDIA		INDONESIA		THAILAND	
HS code	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 percent on all goods in 1996. Its Uruguay Round *bound* rate commitment is 25 percent across the board.

Source: UNCTAD and WTO tariff data bases

ANNEX 4: ENVIRONMENTAL SERVICES: PRELIMINARY CORRELATION BETWEEN GATS AND THE OECD *MANUAL* CLASSIFICATIONS

The following chart is a preliminary, informal comparison of the CPC classifications used in the GATS and the first, Pollution Management Group of the OECD/Eurostat Environmental Goods and Services Industry Manual classifications for various environmental services. (The chart is being further refined).

GATS classification 6 (with CPC codes)	**OECD/Eurostat *Manual* classifications** **Pollution management Group**
A. Sewage services (CPC 9401)	• **Waste water management**
sewage removal, treatment and disposal services Excludes collection, purification and distribution services of water CPC 18000 (GATS?) Excludes construction, repair and alteration CPC 51330 (GATS 3B civil engineering construction services)	design, operation of systems or provision of other services for the collection, treatment and transport of waste water and cooling water. It includes design, management or other services for sewage treatment systems, waste water reuse systems, water handling systems
B. Refuse disposal services (CPC 9402) **C. Sanitation & similar services (CPC9403)**	• **Solid waste management**
• Refuse disposal services: refuse collection and disposal services; collection services of garbage, trash, rubbish and waste (household, commercial and industrial); transport services and disposal services; waste reduction services. Excludes dealing and wholesale services (CPC 62118 and 62278; GATS 4 distribution services) Excludes R&D services on environment issues (CPC 85; GATS 1C Business services (R&D)) • Sanitation and similar services: Sanitation and similar including outdoor sweeping, snow and ice clearing. Excludes disinfecting/exterminating buildings (CPC 87401; GATS(1F)(o) – Other Business Building Cleaning Services.) Excludes pest control for agriculture (CPC 88110; GATS 1F(f) services incidental to agriculture, hunting and forestry).	design, operation of systems or provision of 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 (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 treatment of low level nuclear waste are included. Excludes high level nuclear waste. Excludes services for manufacture of new materials or products from recovered waste or scrap and subsequent use of these materials or products.

D. Other services • Cleaning services of exhaust gases **(CPC 9404)**	• **Air pollution control**
Emission monitoring and control services of pollutants into the air, whether from mobile or stationary sources; concentration monitoring, control and reduction services of pollutants in ambient air.	Design, managing systems or providing other services for treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources.
• Noise abatement services **(CPC 9405)**	• **Noise and vibration abatement**
Noise pollution monitoring, control and abatement services, e.g. traffic-related noise abatement in urban areas	Design, managing systems or providing other services to reduce or eliminate the emission of noise and vibration both at source and dispersed. Includes designing, management or other services for acoustic and sound-proof screens and street covering.
• Nature and landscape protection services (**CPC 9406**) Ecological system protection services, e.g. of lakes, coastlines and coastal waters, dryland, etc., including their respective fauna, flora and habitats. Services consisting in studies on the interrelationship between environment and climate (e.g. greenhouse effect), including natural disaster assessment and abatement services. Landscape protection services n.e.c. • Other environmental protection services n.e.c. (**CPC 9409**)	• **Remediation and cleanup of soil, surface water and groundwater.** Design, operation of systems or provision of other services to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and sea water. Includes cleaning-up systems either in situ or in appropriate installations, emergency response and spills cleanup systems. Treatment of water and dredging residues are included. • **Analytical services, data collection, analysis and assessment.** Design, manage systems or provision of other services to sample, measure, and record various characteristics of environmental media. Includes monitoring sites, both operating 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.

GATS Business Services – R&D natural sciences and engineering; **CPC 85** as well as GATS Environmental Services 6D – Other Services, **CPC 9406, 9409**	• **Environmental R&D** Any systematic and creative activity which is 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. Includes creative scientific and technological activities for the development of cleaner products, processes and technologies. It includes non-technological research to improve knowledge of eco-systems and the impact of human activities on the environment.
GATS Construction and related Engineering Services **(CPC 51330)**	Services related to activities for the construction and installation of facilities for: air pollution control; waste water management; solid waste management; remediation and cleanup of soil, water and groundwater; noise and vibration abatement; environmental monitoring; analysis and assessment; other environmental facilities.
GATS Environmental Services 6D Other Services, CPC 9409; possibly also GATS 5E – Educational Services – Other	• **Education, training, information** Provision of environmental education or training or dissemination of environmental information and which is executed by specialised institutions or specialised suppliers. Includes education, training, and information management for the general public, and specific environmental work-place education and training. The activities of the general educational system are excluded.

ANNEX 5: MATRIX OF GATS COMMITMENTS

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 here.

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 MA/NT applying	EOP req.	environmental operating license required
Mode 2	consumption abroad	U	unbound (no commitment made)	E.N. Test	Establishment of commercial presence subject to economic needs test
Mode 3	commercial presence	U*	unbound due to lack of technical feasibility	CP req.	commercial presence required (for presence of persons)
Mode 4	presence of natural persons	U/H	unbound except for horizontal restrictions	F.Equ.L	foreign equity limit
MA	market access	H	existence of horizontal restrictions	Monop.	existence of monopoly
NT	national treatment				

6A Sewage services

Country	Mode 1 MA	Mode 1 NT	Mode 2 MA	Mode 2 NT	Mode 3 MA	Mode 3 NT	Mode 4 MA	Mode 4 NT
Australia	U*	U*	none	none	none	none	U/H	U/H
Canada	none	none	none	none	none	none	U/H	U/H
Czech R	U	U	none	none	none	none	U/H	U/H
EC	U*	U*	none	none	none	none	U/H	U/H
Iceland	U*	U*	none	none	EOP req.	none	U/H, EOP req.	none
Japan	U*	U*	none	none	none/H	none/H	U/H	U/H
Korea (industrial waste water collection & treatment only)	U	none	none	none	suppliers limited to 25	none	U/H	U/H
Norway	U	U	none	none	none	none	U/H	U/H
Switzerland	U*	U*	none	none	none	none	U/H	U/H
Turkey	U	U	none	none	none	none	none	none
USA (for private. sector contracts)	none	none	none	none	none	none	U/H	none
Slovak R	U	U	none	none	none	none	U/H	U/H
Slovenia	U*	U*	none	none	none	none	U/H	U/H
So. Africa	none	none	none	none	none	none	U/H	U/H
Thailand	U	U	none	none	none/H	none/49% F. Equ.L	H	none

6B Refuse Disposal Services

Country	Mode 1 MA	Mode 1 NT	Mode 2 MA	Mode 2 NT	Mode 3 MA	Mode 3 NT	Mode 4 MA	Mode 4 NT
Australia	U*	U*	none	none	none	none	U/H	U/H
Canada	none	none	none	none	none	none	U/H	U/H
Czech R	U	U	none	none	none	none	U/H	U/H
EC	U*	U*	none	none	none	none	U/H	U/H
Hungary	none	none	none	none	none	none	U/H	U/H
Iceland	U*	U*	none	none	EOP req.	none	U/H, EOP req.	none
Japan	U*	U*	none	none	limited no. licenses oil waste disposal at sea	none/H	U/H	U/H
Korea (industrial refuse collection transport disposal only)	U	none	none	none	E.N. Test & operat. approval required	none	U/H	U/H
Norway	U	U	none	none	monop. for some wastes	none	U/H	U/H
Switzerland	U*	U*	none	none	none; except U for garbage dump	none	U/H; CP req.	U/H; CP req.
Turkey	U	U	none	none	none	none	none	none
USA (for private. sector contracts)	none	none	none	none	none	none	U/H	none
Slovak R	U	U	none	none	none	none	U/H	U/H
Slovenia	U*	U*	none	none	none	none	U/H	U/H
So. Africa	none	none	none	none	none	none	U/H	U/H
Thailand	U	U	none	none	none/H	none/ 49% F.Equ.L.	H	none

6C Sanitation and similar services

Country	Mode 1 MA	Mode 1 NT	Mode 2 MA	Mode 2 NT	Mode 3 MA	Mode 3 NT	Mode 4 MA	Mode 4 NT
Australia	U*	U*	none	none	none	none	U/H	U/H
Canada	none	none	none	none	none	none	U/H	U/H
Czech R	U	U	none	none	none	none	U/H	U/H
EC	U*	U*	none	none	none	none	U/H	U/H
Hungary	none	none	none	none	none	none	U/H	U/H
Iceland	U*	U*	none	none	none	none	U/H	none
Japan	U*	U*	none	none	none	none/H	U/H	U/H
Norway	U	U	none	none	none	none	U/H	U/H
Switzerland	U*	U*	none	none	none	none	U/H	U/H
Turkey	U	U	none	none	none	none	none	none
USA	none	none	none	none	none	none	U/H	none
Slovak R	U	U	none	none	none	none	U/H	U/H
Slovenia	U*	U*	none	none	none	none	U/H	U/H
So. Africa	none	none	none	none	none	none	U/H	U/H
Thailand	U	U	none	none	none/H	none/49% F.Equ.L	H	none

6D Other Services

Cleaning services of exhaust gases (including industrial emission abatement)

Country	Mode 1 MA	Mode 1 NT	Mode 2 MA	Mode 2 NT	Mode 3 MA	Mode 3 NT	Mode 4 MA	Mode 4 NT
Canada	none	none	none	none	none	none	U/H	U/H
EC	U*	U*	none	none	none	none	U/H	U/H
Iceland	U*	U*	none	none	EOP req	none	U/H; EOP	none
Japan	U*	U*	none	none	none	none/H	U/H	U/H
Korea	none	none	none	none	none	none	U/H	U/H
Norway	U	U	none	none	govt monop.	none	U/H	U/H
Poland	none	none	none	none	none	none	U/H	none
Switzerland	U*	U*	none	none	none	none	U/H	U/H
USA	none	none	none	none	none	none	U/H	none
So. Africa	none	none	none	none	none	none	U/H	U/H
Thailand	U	U	none	none	none/H	none/49% F.Equ.L	H	none

Noise Abatement services

Country	Mode 1 MA	Mode 1 NT	Mode 2 MA	Mode 2 NT	Mode 3 MA	Mode 3 NT	Mode 4 MA	Mode 4 NT
Canada	none	none	none	none	none	none	U/H	U/H
Iceland	U*	U*	none	none	EOP req	none	U/H; EOP	none
Japan	U*	U*	none	none	none	none/H	U/H	U/H
Korea	none	none	none	none	none	none	U/H	U/H
Norway	U	U	none	none	none	none	U/H	U/H
Poland	none	none	none	none	none	none	U/H	none
Switzerland	U*	U*	none	none	none	none	U/H	U/H
USA	none	none	none	none	none	none	U/H	none
So. Africa	none	none	none	none	none	none	U/H	U/H
Thailand	U	U	none	none	none/H	none/ 49% F.Equ.L	H	none

Nature and Landscape protection services

Country	Mode 1 MA	Mode 1 NT	Mode 2 MA	Mode 2 NT	Mode 3 MA	Mode 3 NT	Mode 4 MA	Mode 4 NT
Canada	none	none	none	none	none	none	U/H	U/H
EC	U*	U*	none	none	none	none	U/H	U/H
Iceland	U*	U*	none	none	EOP req	none	U/H; EOP	none
Japan	U*	U*	none	none	none	none/H	U/H	U/H
Norway	U	U	none	none	none	none	U/H	U/H
Switzerland	U*	U*	none	none	none	none	U/H	U/H
USA	none	none	none	none	none	none	U/H	none
So. Africa	none	none	none	none	none	none	U/H	U/H
Thailand	U	U	none	none	none/H	none/ 49% F.Equ.L	H	none

Other environmental protection services

Country	Mode 1 MA	Mode 1 NT	Mode 2 MA	Mode 2 NT	Mode 3 MA	Mode 3 NT	Mode 4 MA	Mode 4 NT
Canada	none	none	none	none	none	none	U/H	U/H
EC	U*	U*	none	none	none	none	U/H	U/H
Iceland	U*	U*	none	none	EOP req	none	U/H; EOP	none
Japan	U*	U*	none	none	none	none/H	U/H	U/H
Norway	U	U	none	none	none	none	U/H	U/H
Switzerland (part of CPC9409)	U*	U*	none	none	none	none	U/H	U/H
USA	none	none	none	none	none	none	U/H	none
Thailand	U	U	none	none	none/H	none/ 49% F.Equ.L	H	none

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NOTES AND REFERENCES

1. OTA (1994), p. 149.

2. Melling (1996).

3. A revised CPC, Version 1.0 was approved in 1997 and is due for publication in early 1998. This classification replaces the provisional CPC. This will require updating of the Balance of Payments Classification of International Transactions in Services (BPM5) and GATS classifications which are currently linked to the provisional CPC. The environmental services classification of the provisional CPC has not been adjusted but there are changes in the CPC classifications for construction services, health and education services, operational leasing services (other business, professional and technical services), that may be relevant to environment services as more broadly defined by the OECD/Eurostat *Manual* classification.

4. The Uruguay Round "Services sectoral classification list", GATT/WTO document MTN/GNS/W/120, (Geneva, GATT, 1991). This list is not mandatory but rather a set of guidelines for the scheduling of GATS commitments. A WTO Member may use a different classification so long as this is understood and clearly presented. The listing tends to form at least the basis for Members' schedules with some Members making use of more elaborated sub-categories and/or footnotes to describe what has or has not been included under the various sectoral classifications.

5. Johnstone; OTA (1993).

6. 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.

7. OECD (1996d).

8. Francois, Nelson and Parmeter (1997).

9. US ITC (1995).

10. The relative public/private sector shares vary among OECD members. In the US, public sector entities represented in 1994, by revenue, 95%, 33% and 84%, respectively, of water treatment, solid waste management and water utilities (Ferrier).

11. Ferrier; OTA (1993).

12. Ferrier; OTA(1993).

13. OECD (1998).

14. OTA (1993; 1994); Industry Commission, p 173-174; Ferrier.

15. US ITC (1995).

16. N. Johnstone, p. 251.

17. OECD (1994b), p 7-8.

18. OECD (1997a).

19. OECD (1997b).

20. OECD (1998a).

21. OECD Council Recommendation C(90)164/FINAL.

22. Based on OECD (1992a; 1994c; 1995a; 1997c).

23. OECD (1998a).

24. OECD (1995b), p 67.

25. OECD (1995a) Report of a workshop held in Hanover, Germany.

26. Ferrier (1996).

27. P. ten Brink and R. Haines.

28 *ibid*.

29. Ferrier (1996); ten Brink and Haines, *op. cit*.

30. WT/CTE/W/67/Add.1, Annex III "Environmental benefits of removing trade restrictions and distortions", note by WTO Secretariat, 13 March 1998.

31. Australia, Austria, Bulgaria, Canada, Central African Republic, Colombia, Czech Republic, Ecuador, El Salvador, European Community 15, Gambia, Guinea, Hungary, Iceland, Israel, Japan, Korea, Kuwait, Lesotho, Liechtenstein, Morocco, Norway, Panama, Poland, Qatar, Romania, Rwanda, Sierra Leone, Slovak Republic, Slovenia, South Africa, Switzerland, Thailand, Turkey, United Arab Emirates, United States.

32. The four modes are defined in GATS Article I as the supply of a service: (a) from the territory of one Member into the territory of any other Member ("cross-border supply"), (b) in the territory of one Member to the service consumer of any other Member ("consumption abroad"), (c) by a service supplier of one Member, through commercial presence in the territory of any other Member ("commercial presence"), and (d) by a service supplier of one Member, through

presence of natural persons of a Member in the territory of any other Member ("movement of persons").

33. GATS "horizontal" limitations usually relate to generally-applicable restrictions on foreign investment or the temporary movement of persons for the supply of services.

34. Traditionally this mode of supply was interpreted as relating to broadcast-type transmissions of services across borders; making it technically not feasible to bind the mode for services not offered in conjunction with telecommunications technology. It is also not always easy to distinguish this mode from mode 2, consumption/purchase abroad, which originally was interpreted as relating to the movement of the consumer abroad, as in tourism services; but has recently been interpreted as having a broader relevance to, for example, purchase of financial services abroad.

35. See Sources for Box 3 above.

36. OECD (1992a).

37. 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 initiative. An APEC Cleaner Production Strategy has been developed and approved, including 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.