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Environmental Goods and Services
A Synthesis of Country Studies

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Abstract

This study presents a synthesis of 17 country studies on environmental goods and services (EG&S) commissioned by the OECD, UNCTAD and the UNDP. The countries examined are Brazil, Chile, China, Cuba, the Czech Republic, the Dominican Republic, Guatemala, Honduras, Israel, Kenya, Korea, Mexico, Nicaragua, Pakistan, Panama, Thailand and Vietnam. Its aim is to identify determinants of demand for EG&S; to show common themes and experiences in the EG&S markets of different countries; and to draw attention to key trade, environment and development policy linkages. It also seeks to contribute to the exchange of expertise and experience in the area of trade and environment so that liberalisation of trade in EG&S can benefit all countries, developing and developed alike.

JEL Classifications: F14, F18, Q56

Keywords: environmental goods, environmental services, trade, developing countries

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ENVIRONMENTAL GOODS AND SERVICES
A SYSTHESIS OF COUNTRY STUDIES

Executive Summary

In 2003, the OECD's Joint Working Party on Trade and Environment (JWPTE) commissioned seven country studies to examine the benefits realised by recent OECD members and observers from the liberalisation of trade in environmental goods and services. At about the same time, similar country studies were undertaken by UNCTAD (six studies) and the UNDP (four studies). This paper examines all 17 country studies commissioned by the three international organisations, covering: Brazil, Chile, China, Cuba, the Czech Republic, the Dominican Republic, Guatemala, Honduras, Israel, Kenya, Korea, Mexico, Nicaragua, Pakistan, Panama, Thailand and Vietnam.

The paper is intended to inform discussions of the development dimension of environmental goods and services (EG&S) by providing background on how EG&S markets have been evolving in recent years in developing and emerging economies. The first section identifies the key determinants of demand for EG&S. Generally, countries with complementary determinants of demand have experienced stronger growth in their EG&S markets than countries with contradictory determinants of demand. Results suggest that demand for EG&S is driven by the interplay of determinants, rather than by any single determinant.

The nature of the market for EG&S in each of the 17 countries is also reviewed. Consumption of EG&S has grown over the last decade and is expected to expand significantly in the next five to ten years. While it is not surprising that Japan, the United States and the European Union continue to be major exporters of environmental goods (as defined by the OECD and APEC lists), the direction of the trade flows has varied according to importing region: the Latin American countries seem to favour US suppliers, while Asian counties source their EG&S predominantly from Japan, and increasingly from China. Anecdotal evidence suggests that imports are being used to remedy environmental problems that locally produced EG&S cannot resolve. Many developing countries are exploiting niche markets and developing their own export capacity.

The paper also examines in greater detail demand determinants in four key areas: water supply and wastewater treatment, solid-waste management, hazardous-waste management and air pollution control. In most of the 17 countries the public sector remains largely responsible, either directly or indirectly, for providing these services. At the same time, new policies and regulations are being introduced to increase the participation of the private sector, and many publicly controlled services are being outsourced to private (domestic and foreign) companies. Many countries' environmental laws and standards, often introduced in the 1990s, need strengthening, suggesting new opportunities for EG&S markets in the future.

Introduction

The development of agricultural and industrial capacity, allied with the phenomenon of urban and suburban sprawl, puts pressure on the environment. The challenge for any society is to remedy the problem in ways that are both economically efficient and environmentally effective.

The liberalisation of trade in environmental goods and services (EG&S), which are broadly defined as those that measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as manage waste, noise and ecosystems,[1] can help meet this challenge. For importing countries, fewer and

1. The definition of EG&S in the OECD/ Eurostat Environmental Goods and Services Industry: Manual for Data Collection and Analysis (OECD/Eurostat, 1999) includes goods derived from biological resources such as

lower barriers to trade in EG&S can translate into greater access to the most efficient, diverse and least expensive goods and services on the global market. For exporters, liberalisation can create new market opportunities and spur development of globally competitive industries dedicated to environmental improvements (*e.g.* via technology development or diffusion).

In recognition of the importance of liberalising trade in EG&S, WTO ministers, meeting in Doha, Qatar, in November 2001, mandated negotiations on "the reduction or, as appropriate, elimination of tariff and non-tariff barriers to environmental goods and services".[2] They recognised also the importance of technical assistance and capacity building in the field of trade and environment and encouraged the sharing of expertise and experience with members wishing to perform environmental reviews at the national level. At the same time, the ministers specifically "instructed the [WTO] Committee on Trade and Environment (CTE) to give particular attention to the effect of environmental measures on market access, especially in relation to developing countries, in particular the least developed among them, and those situations in which the elimination or reduction of trade restrictions and distortions would benefit trade, the environment and development".[3]

Shortly afterwards, at the 2002 Johannesburg World Summit on Sustainable Development, heads of state and government, national delegates and leaders from non-governmental organisations (NGOs), businesses and other major groups, advocated supporting voluntary WTO-compatible market-based initiatives for the creation and expansion of domestic and international markets for environmentally friendly goods and services.[4]

In 2003, the OECD commissioned seven country studies on EG&S markets, and trade and other policies affecting those markets. These studies, on Brazil, Chile, the Czech Republic, Israel, Kenya, Korea and Mexico, attempted to:

- Identify the factors driving developments in the market for environmental EG&S.
- Review the EG&S market size and structure.
- Analyse the institutional, regulatory and policy issues affecting the full realisation of benefits, both from liberalisation and from expansion of the market for EG&S.
- Identify relevant issues regarding specific sub-sectors within the EG&S sector.
- Note whether there has been any national strategy to enhance the market for EG&S and whether trade liberalisation has played a significant role in boosting the market.

Since the Doha Ministerial, UNCTAD and UNDP have also examined the factors that have driven changes in the international market for EG&S. The six UNCTAD country studies attempted to outline challenges and opportunities for Central American and Caribbean countries in liberalising trade in EG&S.[5]

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water, wood, biological material, medicinal plants, artisanal products, edible fruits, non-timber forest products as well as agricultural products. It also includes services provided by ecosystems such as carbon sequestration, as well as human activities, such as wastewater activities, solid-waste management, hazardous-waste management, and noise and vibration abatement. The use of this definition is without prejudice to the WTO negotiations on environmental goods and services.

2. Paragraph 31(iii) of the Doha Ministerial Declaration, WT/MIN(01)/DEC/1 of 20 November 2001.

3. Paragraph 32(i) of the Doha Ministerial Declaration, WT/MIN(01)/DEC/1 of 20 November 2001.

4. United Nations, Report on the World Summit on Sustainable Development, 2002, paragraph 99.

5. Cuba, the Dominican Republic, Guatemala, Honduras, Nicaragua and Panama.

Four UNDP country studies aimed to provide a more substantive link between trade in EG&S and human development in China and Hong Kong, Pakistan, Thailand and Vietnam.[6]

This chapter presents a synthesis of all 17 country studies (Table 1). In each case, local experts were involved in drafting the study, and staff members of the international organisation were involved in the editing. Given that many different contributors can claim to have contributed to the final texts, and that the three international organisations emphasised slightly different issues, there is a surprising similarity across the studies. All use a broad definition of EG&S which is comprehensive enough to include biological products and services provided by ecosystems as well as human activities.[7] Each study provides information on both technical and substantive issues relating to the EG&S sector in a particular country and each examines the implications of liberalising trade in EG&S.

The general aim of this chapter is to identify determinants of demand for EG&S; to show common themes and experiences in countries' EG&S markets; and to draw attention to key trade, environmental and development policy linkages associated with EG&S liberalisation. It also seeks to contribute to the exchange of expertise and experience in the area of trade and environment and to help ensure that liberalisation of trade in EG&S works for all countries.[8]

The first section of the chapter outlines determinants of demand, such as: the state of the economy; population and population growth; the state of the environment; and pressure from stakeholders, civil society and consumers in each of the countries reviewed. It also documents changes in national (environmental and trade) policy, strengthened institutional mechanisms, commitments to international (regional and multilateral) environmental agreements (MEAs), and the implementation of complementary measures that may have driven demand for better environmental quality and increased use of EG&S.

6. The UNDP and UNCTAD case studies have not been endorsed or reviewed by OECD member countries.

7. The definitions used in the case studies are without prejudice to the WTO negotiations on environmental goods and services.

8. Unless otherwise stated, the data have been taken directly from the country studies and have not been checked for accuracy.

Table 1. Country studies on EG&S commissioned by the OECD, UNCTAD and the UNDP

Country	Organisation	Principal authors	Title
Brazil	OECD	Oswaldo dos Santos Lucon and Fernando Rei	Liberalising Trade in Environmental Goods and Services in Brazil
Chile	OECD	Annie Dufey, Edmundo Claro and Nicola Borregaard	Liberalising Trade in Environmental Goods and Services in Chile
China	UNDP	Peter Hills	Trade in Environmental Services and Human Development, Country Case Study — China and Hong Kong Special Administrative Region
Cuba	UNCTAD	Cristobal Felix Diaz Morejon	Cuba: Análisis de los Servicios Ambientales [Cuba: study on environmental goods and services]
Czech Republic	OECD	Vladimir Dobes and Vladislav Bizek	Liberalising Trade in Environmental Goods and Services in the Czech Republic
Dominican Republic	UNCTAD	Catherin Cattafesta	República Dominicana: Servicios relacionados con el medio ambiente [Dominican Republic: environment-related services]
Guatemala	UNCTAD	Evelio Alvarado, Humberto Mazzei and Rubén Morales	Guatemala: Informe nacional sobre los Servicios Ambientales [Guatemala: national study on environmental services]
Honduras	UNCTAD	Jenny Suazo and Néstor Trejo	Honduras: Los servicios ambientales en Honduras con vistas a la formulacón de posiciones nacionales de negociación post-Doha [Honduras: environmental services in Honduras from the perspective of formulating national negotiating positions post-Doha]
Israel	OECD	Joshua Golovaty	Liberalising Trade in Environmental Goods and Services in Israel
Kenya	OECD	Moses M. Ikiara and John M. Mutua	Liberalising Trade in Environmental Goods and Services in Kenya
Korea	OECD	Jintaek Whang and Jae-Hyup Lee	Liberalising Trade in Environmental Goods and Services in Korea
Mexico	OECD	Carlos Muñoz Villarreal	Liberalising Trade in Environmental Goods and Services in Mexico
Nicaragua	UNCTAD	Margarita Núñez-Ferrera	Nicaragua: Situación de servicios ambientales [Nicaragua: situation with respect to environmental services]
		José Guillermo López López	Situación de bienes ambientales (BA) en Nicaragua según listas OCDE y APEC [Situation with respect to environmental goods (EG) in Nicaragua according to the OECD and APEC lists]
		José Guillermo López López	Nicaragua: Acceso a mercados exteriores del bien ambiental etanol [Nicaragua: access to foreign markets of the environmental good ethanol]
Pakistan	UNDP	Syed Ayub Qutub	Trade in Environmental Services and Human Development, Country Case Study — Pakistan
Panama	UNCTAD	Artístides Hernández	Panamá: Estado de los servicios ambientales en el marco de la apertura económica [Panama: study of environmental services within the context of economic opening]
Thailand	UNDP	Sitanon Jesdapipat	Trade in Environmental Services and Human Development, Country Case Study — Thailand
Vietnam	UNDP	Nguyen Thanh Giang	Trade in Environmental Services and Human Development, Country Case Study — Vietnam

The following section considers the market for EG&S in each of the countries examined. The analysis differentiates domestic and export markets and provides some information on the extent to which the demand for EG&S has been met by locally produced goods and services or by imports. The section also specifically considers the extent to which trade has actually helped to address local environmental

problems and the extent to which local environmental problems have led to the development of new industries.

Authors of the country studies were asked to focus on key environmental media or issues. As most chose to examine water supply and wastewater treatment, solid-waste management, hazardous-waste management and air pollution control — issues on which a certain amount of information was available — the subsequent section considers these issues in greater detail.

Determinants of demand

Economic performance

The 17 countries studied vary considerably in their economic makeup, performance and outlook (Table 2). Israel and Korea are categorised by the World Bank as high-income economies without substantial indebtedness. Kenya, Nicaragua, Pakistan and Vietnam are low-income economies with moderate to serious indebtedness, and the rest are middle-income economies with moderate-to-low indebtedness. Such factors greatly affect the sums that governments can spend on EG&S. Many of the countries without adequate financial means are looking to the private sector (and overseas) for assistance.

Table 2. Economic performance of examined countries in 2003

Country	Trade in goods (% of GDP)	Value added in services (% of GDP)	FDI, net inflows (% of GDP)	Aid (% of GNI)	GDP per capita, PPP basis (USD)
Brazil	25	75	2.0	0.1	7 838
Chile	56	57	4.1	0.1	10 274
China	60	33	3.8	0.1	5 003
Cuba	..	..	..	..	..
Czech Republic	111	57	2.8	0.3	18 154
Dominican Rep.	81	58	1.9	0.5	7 108
Guatemala	38	58	0.5	1.0	4 109
Honduras	66	56	2.9	5.9	2 709
Israel	62	..	3.5	0.4	23 132
Kenya	43	65	0.6	3.4	1 041
Korea	62	62	0.5	-0.1	19 148
Mexico	55	70	1.7	0.0	9 146
Nicaragua	61	56	4.9	20.7	3 221
Pakistan	30	53	0.6	1.3	2 018
Panama	30	76	6.2	0.3	6 416
Thailand	109	46	1.4	-0.7	7 007
Vietnam	115	38	3.7	4.5	2 304

Source: World Bank, *World Development Indicators Database*, www.worldbank.org/data/wdi2005/index.html and www.worldbank.org/data/wdi2005/wditext/Cover.htm, accessed 17 October 2005.

Currently, total trade in goods (the sum of merchandise exports and imports) represents 30-60% of gross domestic product (GDP) in most of the countries surveyed. However, the Czech Republic, Thailand and Vietnam trade goods in excess of their GDP. Comparable figures on trade in services were not included in most of the studies and are not readily available.

Net inflows of foreign direct investment (FDI) account for between 2% and 6% of GDP in most of the countries reviewed. Several among the low-income countries (Guatemala, Kenya and Pakistan) have significantly lower net inflows. Aid, as a percentage of gross national income (GNI), is less than 1% in most cases, but nearly 6% in Honduras and over 20% in Nicaragua.

Most of the countries studied have witnessed variable GDP growth over the last ten years (Table 3). China is the notable exception as it has experienced momentous and almost uninterrupted growth for almost two decades. The 1997 economic crisis in Southeast Asia severely affected the growth of the Thai and Korean economies, but these countries have since had a significant economic recovery. GDP per capita at purchasing power parity (PPP), which is a useful concept for comparing living standards and examining productivity levels over time, shows that Israel, Korea and the Czech Republic generate more wealth per person than Brazil, Chile, Mexico and Thailand, which in turn generate more than all the others.

Table 3. GDP and GDP growth of examined countries in 1993, 1998 and 2003

Country	1993		1998		2003	
	Current GDP (USD billions)	Annual % growth	Current GDP (USD billions)	Annual % growth	Current GDP (USD billions)	Annual % growth
Brazil	438	4.9	788	0.1	506	0.5
Chile	44	7.0	73	3.9	72	3.3
China	432	13.5	946	7.8	1417	9.3
Cuba	..	..	..	1.2	..	..
Czech Republic	34	0.1	61	-1.1	90	3.7
Dominican Rep.	10	3.0	16	7.4	17	-0.4
Guatemala	11	3.9	19	5.0	25	2.1
Honduras	3	6.2	5	2.9	7	3.5
Israel	66	5.6	104	3.3	110	1.3
Kenya	5	0.4	11	1.6	14	1.8
Korea	362	6.1	345	-6.9	608	3.1
Mexico	403	1.9	421	4.9	639	1.4
Nicaragua	2	-0.4	4	3.7	4	2.3
Pakistan	51	1.8	62	2.6	82	5.0
Panama	7	5.5	11	7.4	13	2.0
Thailand	125	8.3	112	-10.5	143	6.9
Vietnam	13	8.1	27	5.8	39	7.2

Source: World Bank, *World Development Indicators Database*, www.worldbank.org/data/wdi2005/index.html, accessed 17 October 2005.

Countries with high incomes, low indebtedness, large FDI inflows, some aid or strong GDP growth should have seen demand for EG&S increase over time. In countries with more than one of these attributes, growth in demand should be even stronger. In countries that have seen their standard of living increase there is anecdotal evidence of an environmental Kuznets curve (EKC) at work.[9] That is to say, as per capita income rises, so does the demand for environmental quality.

9. According to the EKC hypothesis — coined by Seldon and Song (1994) following earlier papers by Grossman and Krueger (1991) and others — countries follow a two-stage development path. Owing to the scale effect

Population and population growth

The size of the population of the 17 countries examined varies considerably (Table 4). China is the world's most populous country, with over 1 billion inhabitants. Panama, the least populous country in the study, has about 1/450th of that number, with only 2.9 million inhabitants. The size of the population is obviously an important determinant of the total volume of EG&S consumed.

Table 4. Population, population growth and life expectancy of the examined countries

Country	Population in 1993		Population in 1998		Population in 2003		Urban population		Life expectancy at birth (years)
	Millions	Annual % growth	Millions	Annual % growth	Millions	Annual % growth	% of total in 1993	% of total in 2003	
Brazil	155	1.5	166	1.3	177	1.20	77	83	69
Chile	14	1.7	15	1.4	16	1.18	84	87	76
China	1178	1.1	1242	1.0	1288	0.62	30	39	71
Cuba	11	0.4	11	0.6	11	0.66	74	76	77
Czech Rep.	10	0.1	10	-0.1	10	0.01	75	74	75
Dominican Rep.	7	1.7	8	1.7	9	1.45	56	59	67
Guatemala	9	2.6	11	2.6	12	2.59	42	46	66
Honduras	5	2.9	6	2.7	7	2.50	41	46	66
Israel	5	2.7	6	2.3	7	1.84	91	92	79
Kenya	25	2.7	29	2.4	32	1.81	28	39	45
Korea	44	0.9	46	0.7	48	0.57	76	80	74
Mexico	88	1.8	95	1.4	102	1.45	73	75	74
Nicaragua	4	3.0	5	2.7	5	2.55	54	57	69
Pakistan	116	2.5	132	2.4	148	2.41	31	34	64
Panama	3	1.9	3	1.6	3	1.47	54	57	75
Thailand	58	1.1	60	0.7	62	0.65	30	32	69
Vietnam	70	2.0	77	1.4	81	1.10	21	26	70

Source: World Bank, World Development Indicators Database, www.worldbank.org/data/wdi2005/index.html, accessed 17 October 2005.

Size is not everything, however. The rate and nature of population growth also has an important bearing on demand for EG&S. The population of the Czech Republic has fallen slightly over the last decade, while in Guatemala, Honduras, Nicaragua and Pakistan, population growth rates in excess of 2% a year are putting increasing strain on the environment. In Israel, a similarly high growth rate, mostly due to immigration, is also accompanied by urbanisation; over 90% of Israel's population now lives in urban areas. Conversely, the populations of China, Guatemala, Honduras, Kenya, Pakistan, Thailand and Vietnam are still predominantly rural. However, the speed of rural-urban migration in these countries means that it will not be long before most of their populations are also concentrated in towns and cities.

(more production is associated with more emissions) and the composition effect (countries will increase their manufacturing output relative to agricultural and services output), initial economic growth is associated with higher levels of environmental pollution. However, as services become more important and the overall population becomes increasingly aware of environmental damage, the second stage of development is characterised by decreasing emission levels.

Generally, in countries where the population is growing or where it is becoming concentrated in towns as a result of rural-urban migration, the demand for environment-related infrastructure related to water, sewage and solid-waste management has increased. The Czech Republic is a notable exception. There, the demand for infrastructural EG&S (and other EG&S) has increased, even though the population has been declining and rural-urban migration has been static, which suggests that other determinants are at play.

State of the environment

The state of the environment differs enormously in the 17 countries examined (Table 5). China, the world's third largest country, covers an area of 9.6 million square kilometres. Given China's size, the diversity of its topography, plant and animal life is only to be expected. Similarly, Brazil, the world's fifth largest country, has an astounding richness and diversity of land, flora and fauna. In contrast, Israel, which has only 22 140 square kilometres, is a dry country where agriculture is only possible in the north. Its main body of water, the Dead Sea, is too salty for most plants and animals.[10] As a result, Israel only has 0.05 hectare of arable land per inhabitant, slightly more than the 0.04 hectare of arable land per capita in Korea but ten times less than the 0.5 hectare per capita of arable land in Nicaragua. The amount of arable land per capita provides a useful indicator of how intensively the land is used and how much maintenance and management is required to conserve it.

Most of the countries examined are having difficulty coping with the environmental effects of large and rapidly urbanising populations. These pressures have exacerbated problems of water shortages (especially in Israel, Mexico and Kenya), sewage and solid-waste disposal. As a result, most of the studies highlight the need to improve the efficiency and quality of basic infrastructure-related environmental services such as water and sanitation.

Water shortages and access to clean water are recurring themes. According to the World Bank (2005), most of the countries surveyed provide upwards of 90% of their urban populations with access to an improved source of water, ranging from 89% in Kenya to 99% or 100% in Chile, Guatemala, Honduras, Israel and Panama. Rural populations are generally less well served. In 2002, 25% or more of the rural populations in almost half of the countries covered (Brazil, Chile, China, Kenya, Korea, Mexico, Nicaragua and Vietnam) still did not have access to an improved water source.

Information on access to improved sanitation facilities[11] is also regularly included in the studies. In China, only 69% of the urban and 29% of rural populations have such access. The lack of foreign investment, modern technology and advanced management practices was blamed for these poor figures. However, the strength of a country's finances is not the only determining factor. Kenya, the country with the lowest GDP per capita (measured at PPP) among the countries examined, manages to provide improved sanitation to 56% of its urban and 43% of its rural population.

10. There has been much research into desalination processes.

11. Note that the term "sanitation facilities" is used here as in the World Bank's World Development Indicators and should not be confused with "sanitation services", a term used at the World Trade Organization to refer to services related to street and beach cleaning, and snow removal.

Table 5. Key indicators of the state of the environment, 2002 or latest available year

Country	Surface area (thousands of square kilometres)	Arable land (hectares per capita)	Urban population with access to improved sanitation facilities[1] (%)	Rural population with access to improved sanitation facilities (%)	Rural population with access to improved water source[2] (%)	Energy use (kg of oil equivalent per capita)	CO_2 emissions (metric tons per capita)[3]
Brazil	8 515	0.34	83	35	58	1 093	1.8
Chile	757	0.13	96	64	59	1 585	3.9
China	9 598	0.11	69	29	68	960	2.2
Cuba	111	0.24	99	95	78	1 262	2.8
Czech Rep.	79	0.30	..	..	..	4 090	11.6
Dominican Rep.	49	0.13	67	43	85	948	3.0
Guatemala	109	0.11	72	52	92	616	0.9
Honduras	112	0.16	89	5	82	505	0.7
Israel	22	0.05	100	..	100	3 191	10.0
Kenya	580	0.15	56	43	46	489	0.3
Korea	99	0.04	99	99	71	4 272	9.1
Mexico	1 958	0.25	90	39	72	1 560	4.3
Nicaragua	130	0.36	78	51	65	544	0.7
Pakistan	796	0.15	92	35	87	454	0.8
Panama	76	0.19	89	51	79	1 028	2.2
Thailand	513	0.26	97	100	80	1 353	3.3
Vietnam	332	0.08	84	26	67	530	0.7

1. Data refer to the percentage of the population with at least adequate excreta disposal facilities (private or shared, but not public) that can effectively prevent human, animal and insect contact with excreta. Improved facilities range from simple but protected pit latrines to flush toilets with a sewerage connection. To be effective, facilities must be correctly constructed and properly maintained.

2. Data refer to the percentage of the rural population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, and rainwater collection. Unimproved sources include vendors, tanker trucks, and unprotected wells and springs. Reasonable access is defined as the availability of at least 20 litres a person a day from a source within one kilometre of the dwelling.

3. Data are for 2000.

Source: World Bank, World Development Indicators Database, www.worldbank.org/data/wdi2005/index.html, accessed 17 October 2005.

Pressure from stakeholders, civil society and consumers

In all the countries examined, environmental pressure groups, often allied with interested academics, have grown in size and influence over the last two decades. Businesses, especially those dependent on customers in developing countries, have also emerged as agents for change. Many European and North American multinationals are now required by their shareholders to meet quality standards similar to those in their home countries. Sometimes, as in the case of Kenya's tourism industry, protection of the environment is seen as an important selling point. In many other countries, pressures from foreign buyers to deal only or mainly with companies that have instituted a certified environmental management plan have increased awareness of the environment in the business community and stimulated the emergence of associated services.

Multilateral environmental agreements and related mechanisms and institutions

All of the countries studied are signatories to multilateral environmental agreements (MEAs). Table 6 shows the dates of entry into force of a few key MEAs. The impact of becoming parties to these agreements has varied considerably. For some, the main effects have been to gain access to funding aimed at helping the countries comply with the agreements. For others, commitment to an MEA has strengthened and targeted domestic pressure on environmental issues that may otherwise have been ignored.

Commitment to a new MEA is not the only way inter-governmental pressure makes itself felt. Brazil's hosting of the first United Nations Conference on Environment and Development, in 1992, was a watershed event that galvanised local interests to push for new and tighter environmental regulations. Similarly, the presence of the headquarters of the United Nations Environment Programme (UNEP) in Nairobi has had a significant influence on Kenya's environmental policies.

Environmental policy

There seem to have been two distinct phases in the development of environmental policies in most of the countries surveyed. The first, beginning sometime between the mid-1980s and the mid-1990s, typically saw the enactment of a country's first major environmental laws.[12] These often followed earlier OECD examples, taking a command-and-control, and often technology-specific, approach to pollution control. However, the resources provided for implementing and enforcing these laws were often inadequate. Assaults on the environment frequently went unmonitored and unpunished.

The second phase, beginning in the early to late 1990s, saw the replacement of the earlier laws with more comprehensive and more integrated legislative packages. Some of the new laws are only now beginning to be implemented. Many of them allow for more flexibility in the application of user charges and other economic instruments. In Kenya, for example, the implementation of the Environmental Management and Co-ordination Act (1999) and the Water Act (2002) is expected to improve the country's weak regulatory framework, as the government has for the first time given power to environmental authorities to apply economic instruments to the management of the environment and natural resources.

12. A few countries introduced the notion of the citizens' right to a clean environment in their Constitutions.

Table 6. Membership of key MEAs and dates of ratification, acceptance, approval or accession

Country	Vienna Convention for the Protection of the Ozone Layer	Montreal Protocol on Substances that Deplete the Ozone Layer	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Convention on Biological Diversity	United Nations Framework Convention on Climate Change	Kyoto Protocol
Date of signature of MEA	1985	1987	1989	1992	1992	1997
Entry into force of MEA	1988	1992	1992	1994	1994	2005
Brazil	1990	1990	1992	1994	1994	2002
Chile	1990	1990	1992	1994	1995	2002
China	1989	1991	1991	1993	1994	2002
Cuba	1992	1992	1994	1994	1994	2002
Czech Republic	1993	1993	1993	1993	1994	2001
Dominican Republic	1993	1993	2000	1996	1999	2002
Guatemala	1988	1990	1989	1995	1996	1999
Honduras	1988	1993	1995	1995	1996	2000
Israel	1992	1992	1994	1995	1996	2004
Kenya	1989	1989	2000	1994	1994	2005
Korea	1993	1992	1994	1994	1994	2002
Mexico	1988	1989	1991	1993	1994	2000
Nicaragua	1993	1993	1997	1995	1996	1999
Pakistan	1993	1993	1994	1994	1994	2005
Panama	1989	1989	1991	1995	1995	1999
Thailand	1989	1989	1997	2004	1995	2002

Agreement	Subject
The 1985 Vienna Convention for the Protection of the Ozone Layer Protection	Aims to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer. www.unep.org
The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer	Aims to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it, with the ultimate objective of their elimination on the basis of developments in scientific knowledge, taking into account technical and economic considerations and bearing in mind the developmental needs of developing countries. www.unep.org
The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Aims to ensure that the management of hazardous wastes and other wastes including their transboundary movement and disposal is consistent with the protection of human health and the environment whatever the place of disposal. www.basel.int
The 1992 Convention on Biological Diversity	Aims to conserve the biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources, taking into account all rights over those resources and technologies, and by appropriate funding. www.biodiv.org
The 1992 United Nations Framework Convention on Climate Change	Aims to achieve stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. www.unfccc.int
The 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change	Aims to ensure that the aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A to the Protocol do not exceed the assigned amounts, with a view to reducing overall emissions of such gases by at least 5% below 1990 levels in the commitment. www.unfccc.org

Sources: UNEP (www.unep.org/dec/links/);
EC (www.europa.eu.int/comm/environment/international_issues/agreements_en.htm).

Industry's responses to the introduction of new environmental laws, voluntary schemes, co-operative mechanisms and improved enforcement methods, have all led to greater demand for EG&S. In addition, there has been a shift from traditional end-of-pipe activities to the use of cleaner technologies, which

reduce pollutants at source. As a result, new environmental regulations and standards inspired by evolving technological developments have become important drivers within the industry.

In some of the countries surveyed, government departments have attempted to draw attention to the role of EG&S within a broader framework of (trade and) environmental policy, by setting up new offices dedicated to EG&S. For example, the Dominican Republic created a Commission on Environmental Services in 2001, within the Ministry of Environment and Natural Resources. In Honduras, the Unit for Environmental Goods and Services, within the Ministry of Natural Resources, aims to strengthen national capacities to address EG&S and is supported by a National Commission on Environmental Goods and Services. In Nicaragua, the Ministry of Environment and Natural Resources (MARENA) has an Office of Environmental Services that is in charge of identifying the benefits of trade in environmental goods and services.

Trade policy

Many of the countries surveyed began unilaterally to reduce tariffs and, in general, lower barriers to trade in environmental goods even before the completion of the Uruguay Round in 1994. Such liberalisation often went hand in hand with the enactment of a country's first major environmental laws (mid-1980s to mid-1990s) and privatisation schemes.

At the end of the Uruguay Round of multilateral trade negotiations (1986-94) many countries bound their tariff rates in their schedules of concessions. The idea behind "binding" a tariff is to give traders and investors market security and knowledge of the costs of trade in goods, as countries can only with difficulty raise the tariff above the bound rate. Any WTO member wishing to break its commitments (*i.e.* to raise a tariff above the bound rate) must negotiate with the countries most adversely affected, and this can result in compensation for their trading partners' losses of trade. During the Uruguay Round, developed countries increased the percentage of tariff lines for which tariff rates are bound, from 78% to 99%. Economies in transition increased their bindings from 73% to 98%. For developing countries, the increase was also considerable: from 21% to 73%. Among developed countries, the bound rates are generally the tariffs actually applied. However, most developing countries often apply lower tariffs than what they have bound, so the bound rates serve as ceilings.

Table 7 shows the current applied most-favoured nation (MFN) rates and the bound rates at the end of the Uruguay Round negotiations for environmental goods in selected groups of countries. The Quad (Canada, European Union, Japan, United States) had, and still has, the lowest MFN applied rates and bound rates, which are almost equivalent.

Fourteen of the countries surveyed took part in the Uruguay Round and made binding commitments in relation to tariffs on industrial goods, which include most of the goods currently used to protect the environment. Panama made binding commitments in 1997 when it joined the WTO, and China similarly made commitments in 2001. As of October 2005, Vietnam had not yet finalised its commitments as it was still in the process of acceding to the WTO.

Table 7. Weighted average tariff levels for environmental goods in *ad valorem* percentage terms[1]

Country group	Applied MFN rate[2]	Bound rate at the end of the Uruguay Round, 1995[3]
All countries	4.3	7.5
All high-income economies	1.9	3.1
OECD countries	3.7	6.0
Low and middle-income economies	8.1	15.6
Least developed countries	9.6	51.1
Quad countries (Canada, European Union, Japan, United States)	1.7	1.8
Czech Republic, Hungary, Poland, Slovak Republic	8.4	6.4
Emerging Asia (China, Hong Kong [China], India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Chinese Taipei, Thailand, Vietnam)	4.5	7.4
Emerging Eastern Europe (Estonia, Latvia, Lithuania, Romania, Russian Federation, Slovenia, Ukraine)	6.6	19.8
Korea, Mexico, Turkey	10.0	22.5
Emerging South America (Argentina, Brazil, Chile, Venezuela)	11.7	29.7

1. The definition of environmental goods is based on the combined APEC and OECD lists, but excluding goods from HS chapters 1-24.

2. Applied rates for each country are those at the beginning of 2005 or for the latest available year, and are weighted by the value of imports. Specific-rate tariffs (*i.e.* those levied per tonne or other unit) are not included.

3. Only WTO members for which bound tariff schedules were available are included.

Source: World Integrated Trade Solutions (http://wits.worldbank.org/).

It is noteworthy that the tariffs applied to most environmental goods in most of the developing countries studied are around 10%, a figure almost five times higher than the applied MFN rate of the Quad countries. Lowering the applied rates or narrowing the gap between bound rates and applied rates would give traders and investors additional market opportunities and greater security within the trading system.

Tariffs are not the only obstacles to trade. Technical regulations and industrial standards (otherwise known as technical barriers to trade, or TBTs) often vary from country to country and can make business difficult for producers and exporters. Surprisingly, however, few of the country studies mentioned any difficulty with TBTs or other non-tariff barriers (NTBs) in relation to trade in environmental goods.

Most of the country studies focused on the liberalisation of trade in environmental services. They note that it has been patchier than liberalisation of environmental goods and has encountered more obstacles. A recurring theme is the reluctance on the part of some countries to make commitments related to services such as sewage collection and treatment and solid-waste management (refuse disposal services) for fear that poorer members of their populations might have difficulty accessing these services.

A quick glance at the commitments made in environmental services (Table 8) shows that only five of the 17 countries have made any commitments and that the commitments made rarely cover the full range of environmental services. Vietnam has not made any commitments, but is not yet a member of the WTO. However, it is likely to make commitments in environmental services when it joins as Panama and China and most other new members have done (WTO, 2003).

Table 8. Summary of countries making specific commitments in respect of environmental services during the Uruguay Round or on accession to the WTO

Country	Sewage services	Refuse-disposal services	Sanitation and similar services	Cleaning services of exhaust gases	Noise and vibration abatement	Nature and landscape protection services	Other environmental protection services
Brazil							
Chile							
China	X	X	X	X	X	X	X
Cuba							
Czech Republic	X	X	X				
Dominican Rep.							
Guatemala							
Honduras							
Israel	X	X	X	X	X		
Kenya							
Korea	X	X		X	X	X	X
Mexico							
Nicaragua							
Panama				X	X	X	
Pakistan							
Thailand	X	X	X	X	X	X	X

Sources: WTO, "Background Note by the Secretariat, Environmental Services", S/C/W46, 1998; and WTO, "Note by the Secretariat, Accession to the World Trade Organization", 28 May 2003, WT/ACC/10/REV1.

Where there has been reluctance to fully liberalise the service sectors by making specific multilateral commitments in WTO schedules or lowering tariffs on environmental goods, many countries have sought alternatives in the form of overseas funding, aid or investment through the creation of joint ventures with foreign firms.

Regional trade agreements

EG&S are specifically addressed in a few regional trade agreements (RTAs). During the late 1990s the Asia-Pacific Economic Co-operation (APEC) economies identified environmental goods and services as priority (or "fast track") sectors for early voluntary liberalisation. The original target was to have, in almost all cases, zero-rate tariffs by 2005 or before. The US-Jordan Free Trade Agreement, which entered into force in December 2001, will, over ten years, eliminate tariffs on many environmental goods and will remove trade restrictions on certain environmental services. The Canada-Costa Rica Free Trade Agreement, which entered into force in October 2002, provides immediate duty-free access to most environmental goods. Under CAFTA-DR, the United States, the Dominican Republic, and the Central American countries that are party to the Agreement will accord substantial market access across their entire services regime, including environmental services, subject to very few limitations or restrictions.[13]

13. Under the CAFTA-DR, parties use a so-called "negative list" approach to scheduling commitments on services, as opposed to the "positive list" approach used in the GATS.

The reports on Brazil, Israel and Kenya mention that participation in bilateral and regional trade agreements has stimulated trade in EG&S. Brazil attributes the growth in its EG&S market to its participation in MERCOSUR, for example. Israel attributes the growth in its EG&S market to its free trade agreements with the United States, with the member states of the European Union and with its other major trading partners. Kenya's trade in goods has been facilitated by the regional schemes, EAC and COMESA. The study of Mexico indicates that participation in NAFTA has strongly stimulated trade in EG&S.

Table 9 shows the surveyed countries' membership in regional trade agreements. Mexico is a party to more trade agreements than the rest, which may account for the stimulation of its trade in EG&S.

The market for EG&S

Most of the countries reviewed do not have adequate data on their EG&S markets, and the task of estimating environmental market size is often complicated by differences in market definitions. Although the authors of the country studies consistently use a broad definition of EG&S, which in each case includes products of natural ecosystems and in some cases services provided by ecosystems, the results are not readily comparable. For example, one study includes ethanol as an environmental good, and another tourism as an environmental service. Such elastic definitions of EG&S make claims about the economic performance of individual EG&S markets that are difficult to substantiate or to refute.

For an indication of the overall size of the environment industry, it is useful to bear in mind some general statistics on EG&S. According to Grant Ferrier of Environmental Business International Inc. (EBI), in 1990 the industry was estimated to have generated revenues of around USD 360 billion worldwide. By 2001, revenues surpassed USD 550 billion, and in 2005 they are expected to reach USD 620 billion.[14] Revenues are split about equally between environmental goods and environmental services.

Firms in OECD member countries currently account for about 90% of the global EG&S market, but over-capacity has slowed market growth in many of their domestic markets. The most rapid rates of growth now occur in transition and developing countries.

14. Grant Ferrier, personal communication with Ronald Steenblik. The EBI definition encompasses more goods than appear on the OECD or APEC lists, and more services than included in the WTO (W/120) definition. For example, it includes revenues from sales of products from certified organic farms and sustainably managed forests, and revenues received by certified eco-tourism locations.

Table 9. Participation of selected countries in regional trade agreements

Country	APEC	ASEAN	CACM	CAFTA-DR	CEFTA	COMESA	EAC	MERCOSUR	LAIA	NAFTA	SAPTA
Brazil								●	●		●
Chile	●								●		●
China	●										
Cuba									●		
Czech Republic					●						
Dominican Rep.				●							
Guatemala			●	●							
Honduras			●	●							
Indonesia	●	●									
Israel							●				●
Kenya						●					
Korea	●										●
Mexico	●								●	●	●
Nicaragua			●	●							
Panama											
Pakistan											●
Thailand	●	●									
Vietnam	●	●									

APEC	Asia-Pacific Economic Co-operation
ASEAN	Association of Southeast Asian Nations
CACM	Central American Common Market
CAFTA-DR	Central American-Dominican Republic Free Trade Agreement
CEFTA	Central European Free Trade Agreement
COMESA	Common Market of Eastern and Southern Africa
EAC	East African Cooperation
LAIA	Latin American Integration Association
MERCOSUR	Southern Common Market
NAFTA	North American Free Trade Agreement
SAPTA	South Asian Preferential Trade Arrangement

Source: WTO.

Domestic markets for EG&S

In light of the different determinants of demand outlined above, it would not be surprising to find considerable differences in the domestic markets for EG&S in the countries examined. However, there are a number of striking similarities.

First, all 17 EG&S markets have grown over the last decade and are expected to expand significantly in the next five to ten years. Country studies that quantify annual growth forecast it to run at between 8% and 12% during the first decade of this century. Such figures imply that growth of the EG&S markets in these countries far outstrips growth in OECD countries, where EG&S markets are mature. Second, most of the studies note a significant shift in the structure of countries' EG&S industries, from traditional end-of-pipe activities to the use of cleaner technologies that reduce pollutants at source.

Third, although there are usually a few, large government-owned or multinational firms operating in the domestic markets for EG&S in most of the countries studied, the sector tends to be dominated by small and medium-sized enterprises (SMEs). The Brazilian state-owned company, SABESP, is the only company from a developing country ranked among the world's top 50 environmental companies (WTO, 1998). The possibility of mergers and acquisitions of environmental companies is barely mentioned in the studies, though such consolidation, to the extent it would allow exploitation of economies of scale and scope, could make goods and services cheaper in some countries.

A recurring theme in all of the studies is that information and data about the EG&S market are hard to come by. For most authors, the lack of appropriate statistics makes the assessment of the size of domestic EG&S markets difficult. Much of the information provided by national sources is qualitative and requires a fair amount of judgement.

Bearing in mind these caveats, a couple of the studies do highlight differences in growth patterns in their trade in EG&S. The study of China, for example, which expects 16% growth in environmental services, predicts that the markets for environmental equipment in that country will actually decline in the next few years. Clearly, more information is required before it can be inferred that these figures are representative of a more general trend.

A few studies quantify the number of companies or individuals employed in the EG&S market. The study of China reports some 10 000 environmental enterprises and institutions in 2000, employing 1.8 million people. The Israel study estimates that around 1 000 companies currently supply EG&S, triple the number at the beginning of the 1990s. Almost 95 000 people are employed in Korea's EG&S industry.

Although the relative importance of individual segments of the EG&S market varies among countries, most studies focus on water supply and wastewater treatment, solid-waste management, hazardous-waste management and air pollution control, the areas for which information is most readily available. These are highlighted as being the most important to the countries reviewed. It is therefore notable that in most of the countries surveyed public authorities remain largely responsible for delivering these services, regarded locally as public services, and long-term investment is made without any expectation of immediate or substantial returns. Monopolies, either municipal or state authorities or regulated private companies, have been built up around the provision of the relevant goods and services.

This situation is changing. All of the country studies report that privatisation and deregulation are creating an ever larger role for the private sector in the delivery of goods and services in all four areas, and particularly in solid-waste management and hazardous-waste management. There are few concerns about the participation of foreign and domestic private-sector suppliers in these areas, although issues of ownership and control of essential public infrastructure have been used by governments to resist liberalisation efforts in the past.

In countries that liberalised their EG&S markets in the 1990s, some domestic suppliers were disadvantaged in the short run. The Czech study, for example, describes how lack of adequate information available to domestic firms about the market, and a lack of local capacity, allowed foreign firms initially to dominate the market. However, Czech firms are strengthening and regaining market share.

Also, in countries that had liberalised their EG&S markets, there is anecdotal evidence of the contribution of liberalisation to solving environmental problems.[15] Some country reports acknowledge that locally produced goods have at times been unable to solve some local environmental problems, and that imports proved more useful. However, few or no examples are given.

Imports of EG&S

Many of the studies include figures for imports of EG&S. Interestingly, EG&S imports account for 5-10% of total imports in each country, and imports and foreign investments are expected to rise (both in real terms and in relation to total imports) over the coming years.

The nature of the goods and services imported varies from country to country. Chile's imports, for example, are concentrated in water and wastewater equipment and services. Kenya's imports include large or technologically sophisticated capital goods, such as trucks, tippers and wind turbines.

Most of these imports have originated from France, Germany, Japan or the United States. This is not surprising as these are the world's leading net exporters of environmental goods and services. Latin American countries show a preference for imports from the United States, while Asian countries seem to prefer Japanese products. For example, the United States was the leading exporter to Brazil of environmental technologies, with a 35% market share; Germany occupied second place (25%) and French companies ranked third (15%). Recent estimates show that the United States is also the leading supplier of Chile's environmental technology imports (45%), with the European Union[16] and Asia having 35% and 20% market shares, respectively.

Exports of EG&S

Exports of EG&S received careful attention in most of the country studies. Each report asserts that export capacity and overseas sales have been increasing, and will continue to do so. However, to repeat the earlier caution, most of the countries reviewed do not have good data on their EG&S markets. Moreover, definitions of environmental goods are not yet standardised across countries, hence the composition of each country's set of environmental goods varies. The report on Chile notes that, of the USD 438 million worth of EG&S the country exported in 2001 (representing about 2.4% of Chile's total exports), some 85% of the export value was accounted for by just one product: methanol.

Only the Czech report highlights the substantial barriers that exporters have faced and the problems associated with lack of capital and the inaccessibility of export credits, suggesting that it may only be a problem for countries in an advanced stage of development. Similarly, only a few studies suggest lowering applied tariff rates or narrowing the gap between bound and applied rates. Almost no studies refer to difficulties with non-tariff barriers (NTBs) or other technical barriers to trade.

Yet all countries have managed to export some EG&S. The "environmental goods" identified in the case studies as "environmental exports" include products of organic agriculture (Chile), water-conserving irrigation equipment (Israel), desalinisation equipment (Israel), efficient wood stoves (Kenya), mineral water (Kenya), and even wild game harvested from sustainably run ranches (Kenya). The targeting of such niche markets has been highly successful.

15. For specific examples of how EG&S have contributed to solving environmental problems in developing countries, see Chapter 3 of this volume.

16. The term "European Union" refers here to the 15 member states of the European Union as of December 2003.

Some other goods and services are identified in the studies as being ripe for export. Israel is developing innovations for industries requiring specialised technologies. Czech suppliers are targeting markets in other countries in the region, as well as in Asia, such as China. In fact, China is the leading export destination for EG&S for most of the countries studied.

Selected sectors

Authors of the country studies were asked to focus on key environmental media or issue areas. As most include water supply and wastewater treatment, solid-waste management, hazardous-waste management and air pollution control, this section highlights some of the details of these four market sub-sectors. Table 10 shows the sectors selected by the authors of the country studies.

Table 10. Sectors of the EG&S industry highlighted in the country studies

Country	Water & wastewater treatment	Solid-waste management	Hazardous-waste management	Air pollution control
Brazil	X	X	X	In transport
Chile	X			X
China	X	X		X
Cuba	X	X		
Czech Republic		X		X
Dominican Republic	X	X	X	
Guatemala		X		
Honduras		X		
Israel	X			
Kenya	X	X		
Korea	X			
Mexico	X			
Nicaragua	X	X		X
Panama		X		
Pakistan	X	X	X	X
Thailand	X	X	X	X
Vietnam	X	X	X	X

Sources: OECD, UNCTAD and UNDP.

It is noteworthy that water and wastewater treatment, management of solid and hazardous waste, and air pollution control services are considered extremely important across all the countries surveyed, irrespective of their level of economic development. However, demand for technologies to address problems related to air pollution from power plants and factories seems to be greater in countries that can be considered "newly industrialising" (Chile, China, the Czech Republic and Korea, in particular) than in others.

Water supply and wastewater treatment

Water supply employs goods and services associated with the collection, purification and distribution of water, whereas wastewater treatment is associated with the operation of systems or the provision of other services for the collection, treatment and transport of wastewater and cooling water. Most of the countries reviewed focused on existing needs in water supply and wastewater treatment, and it is generally

acknowledged that most domestic markets have undergone some transformation and improvement since the 1980s. The actual nature of change and the tangible improvements made have varied.

For example, in Chile, where the state was the main owner, administrator and enforcing body in the water and wastewater industry until 1989, the industry has since been run by independent firms. In Korea, water supply and wastewater services were among the first environmental services to involve private companies. The government has encouraged the participation of private companies, and several foreign firms have entered the market by establishing partnerships with major Korean contractors.

In the Dominican Republic, decentralised state-owned corporations still manage water services, but the private sector is playing an increasing role in the administration and collection of user charges. Similarly, in Brazil, where a new policy allows water supply and wastewater management services to be provided either by state companies (under current concessions), municipal-owned utilities (where concessions have not been given), or private companies (under new concessions), the transformation is only partial. Brazil's publicly owned Environmental Sanitation Technology Company (CETESB) still dominates the market, but has developed several cleaner production and capacity-building initiatives at state, national and international levels, services which it may be able to export to other MERCOSUR countries.

In Cuba, drinking water and wastewater management services are still state-owned and controlled, but are well developed. Around 95% of the population has access to an improved water source and to improved sanitation facilities. Nevertheless, large investments are needed to maintain and upgrade existing infrastructure, as well as to develop new facilities.

Although changes are well documented, the improvements made in each case are anecdotal. Some studies regard falling prices for water as a sign of improvement, while others acknowledge the link between rising prices, investment and improved levels of service. Few of the studies express concern over the privatisation of water supply and wastewater management, even in countries where these have traditionally been viewed as public services.

Whatever the structure and state of the water supply and wastewater treatment, most authors see constraints on the supply of water as potentially seriously constraining countries' economic growth. Water is a fundamental input to agriculture, energy production, manufacturing and tourism, and vital for achieving public-health goals. Rapid population growth in many countries is expected to put further pressure on water resources.

Most of the authors acknowledge that their country's current pattern of water use is unsustainable. Low prices (whether fixed by publicly owned companies or through regulations governing private companies) and high levels of investment in infrastructure rarely go hand in hand. Almost all countries want to introduce pricing that reflects the real cost of the water supplied and to take urgent measures to boost supply and rationalise demand. Some countries fear future conflicts over water, and, indeed, conflicts over water access are already commonplace in Kenya.

Solid-waste management

Solid-waste management refers to the provision of services related to the collection, treatment, transport, storage or recovery of non-hazardous waste. It includes management and other services related to waste handling, the collection and purchasing of waste and scrap, and the operation of recycling plants. The management of low-level nuclear waste is also included.

In many of the countries studied, solid-waste management is characterised by low coverage, uncontrolled dumping of waste and inefficient public services. It is also one of the largest EG&S sectors in

terms of revenue, and public procurement accounts for most of the market. Like water and wastewater treatment, solid-waste management has been, and still is, one of the key areas targeted for reform in the countries studied. However, the nature, depth and benefits of change have not been even.

No countries appear to have fully privatised solid-waste management, although Panama has opened up solid-waste management to private companies in all of its largest municipalities except Panama City. The largest contributing factor is the lack of confidence in the efficiency of public services.

In most countries, the shift from public to private management has been partial. For example, in Nicaragua the public sector remains largely responsible for the provision of most environmental services, particularly those associated with refuse collection and disposal, but some contracts have been offered to the private sector. Similarly, in Brazil, municipalities — which are legally responsible for the management of municipal solid waste — usually lack the necessary capital and know-how to build and operate modern landfills. They have therefore started to transfer the collection and disposal of municipal solid waste to the private sector, through bidding. In Honduras, waste management falls under the responsibility of municipal authorities. Still, municipal legislation authorises the outsourcing of approximately 50% of such services, in particular waste collection. Waste collection has been privatised in the 22 largest municipalities, and there are also small service providers, such as community groups and individuals, that operate in the informal sector. In some cases, concessions have been granted to international companies for the treatment and final disposal of solid and organic wastes. And in the Dominican Republic, foreign suppliers play a significant role in collecting and managing solid and hazardous waste; recycling is carried out entirely by private companies.

In Cuba, the collection and disposal of municipal solid waste, as well as recycling activities, are carried out entirely by state-owned companies. They face constraints related to lack of equipment, technology and finance. Likewise, in Kenya, local authorities, which remain wholly responsible for solid-waste management, have been unable to cope with the collection, treatment and disposal of municipal solid waste owing to the large volumes of waste generated daily, insufficient investment and lax enforcement. The situation has led to very negative impacts on soil and water, the generation of greenhouse gases, and the endangering of the public's health and safety. It has also spurred residents (in relatively wealthy neighbourhoods) to form neighbourhood associations to organise rubbish collection and disposal themselves, or to contract with private firms to provide these services.

Again, although changes are well documented, the improvements are anecdotal. None of the studies expresses concern over the implications of privatising solid-waste management, which has traditionally been viewed as a public service in most countries.

Hazardous-waste management

Hazardous-waste management is sometimes lumped together with solid-waste management, and many of the studies treat the two together. Like solid-waste management, hazardous-waste management refers to the provision of services related to the collection, treatment, transport, storage or recovery of hazardous wastes. It includes design, management or other services for waste handling, and the operation of recycling plants. Services related to toxic wastes and high-level nuclear wastes are also included.

A large number of studies highlight that many companies say that they cannot afford to properly dispose of their hazardous wastes. There are not enough landfills able to handle special wastes, and the costs of incineration — the only alternative to land disposal in most localities — are high. Diffuse dumping of toxic wastes is a problem that has proved difficult to tackle. Little of the packaging for agrochemicals is disposed of properly, and waste from new technologies, such as computers and cellular-phone batteries (which often contain heavy metals), is rarely segregated.

The studies do not give the management of hazardous wastes the same attention as water and wastewater supply or (non-hazardous) solid-waste management, but some nevertheless note that it is a key area for reform. In the study of the Dominican Republic, which cites the liberalisation of hazardous-waste management as a success story, foreign suppliers now play a significant role in the collection and management of hazardous waste.

Air pollution control

Air pollution control includes managing systems or providing other services for the treatment or removal of exhaust gases and particulate matter from both stationary and mobile sources. Few of the country studies give details about their air pollution control, although most refer to it as an area in need of reform.

The Brazilian study observes that Brazil suffers from considerable problems with air pollution, especially in metropolitan areas, which contain about 70% of the country's population and industry. Private companies, selected through international bidding, carry out vehicle inspections as part of a pollution-abatement programme. The government is also looking into the possibility of providing incentives for natural gas technologies (switching from diesel), the use of hybrid electric buses in specific urban corridors, the use of cleaner diesel (with less sulphur), and the development of a large fleet of flexible-fuel (alcohol and gasoline) passenger vehicles. Indeed, cleaner fuels, especially cleaner diesel and natural gas and ethanol, form an important part of Brazil's strategy to improve its air quality.

Concluding observations

This synthesis report has drawn upon 17 country studies prepared by consultants to the OECD, UNCTAD and the UNDP, all nationals of the countries examined. Its general aim is to highlight common themes and experiences emerging from these studies and to draw attention to key trade and environmental policy linkages.

Much about the current and potential future markets for environmental goods and services in developing and newly industrialising countries is still poorly understood. It is commonly acknowledged that much of the information relating to trade in EG&S is anecdotal or difficult to substantiate. As countries respond to demands for a cleaner environment, the need for further analysis and improved data on the sector will become, if anything, even greater.

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