OECD Trade and Environment Working Paper No. 2004-04

Identifying Complementary Measures to Ensure the Maximum Realisation of Benefits from the Liberalisation of Trade in Environmental Goods and Services

Case Study: Brazil

Oswaldo Lucon and
Fernando Cardozo Fernandes Rei
Sao Paulo State Environmental Secretariat

OECD

Joint Working Party on Trade and Environment

Unclassified **COM/ENV/TD(2003)116/FINAL**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development **24-Aug-2006**

English - Or. English

ENVIRONMENT DIRECTORATE
TRADE DIRECTORATE

COM/ENV/TD(2003)116/FINAL
Unclassified

Joint Working Party on Trade and Environment

IDENTIFYING COMPLEMENTARY MEASURES TO ENSURE THE MAXIMUM REALISATION OF BENEFITS FROM THE LIBERALISATION OF EG&S

CASE STUDY: BRAZIL

by Oswaldo Lucon and Fernando Cardozo Fernandes Rei
Sao Paulo State Environmental Secretariat

English - Or. English

JT03212742

ABSTRACT

This study discusses the impact of liberalizing trade in environmental goods and services in Brazil. In the 1990s, Brazil made significant progress in streamlining its regulatory processes, tightening pollution regulations and strengthening enforcement, all of which encouraged several industrial sectors to invest heavily in pollution prevention, end-of-pipe control or remediation, and forced exporting sectors to comply with even stricter standards to satisfy consumers in foreign markets. Experience with Brazil also reveals that the surge of investments in environmental goods and services, in particular those from the private sector can be attributed to the increasing number of companies with environmental management systems and the adoption of international environmental performance standards by exporters and multinational companies.

Key words: environmental goods and services, trade liberalization, trade and environment, Brazil

ACKNOWLEDGEMENTS

This research was commissioned by the OECD Trade Directorate from two independent consultants, Mssrs. Oswaldo dos Santos Lucon and Fernando Rei, for the Joint Working Party on Trade and Environment's work programme on environmental goods and services. The project was managed by Ronald Steenblik. In view of the interest of the topic, the note has been issued in the OECD Trade and Environment Working Paper series in order to make the information more widely available. It has been de-classified on the responsibility of the Secretary-General.

The report is available on the OECD website in English and French at the following URL addresses: http://www.oecd.org/trade.

TABLE OF CONTENTS

Tables

Figures

ABBREVIATIONS

ABIMAQ	*Associação Brasileira dos Fabricantes de Máquinas e Equipamentos,* the Brazilian Association of Machinery and Equipments
AFEEVAS	*Associação dos Fabricantes de Equipamentos para Controle de Emissões Veiculares*, the Brazilian Association of Vehicular Emissions Control Equipment Producers
ALCA	the Free Trade Area of the Americas
BNDES	*Banco Nacional de Desenvolvimento Econômico e Social*, the National Bank for Economic and Social Development
BOT	Build, operate and transfer
CDM	Clean Development Mechanism
CET	Common External Tariff of Mercosul
CETESB	*Companhia de Tecnologia de Sanemaneto Ambiental*, Environmental Sanitation Technology Company (São Paulo state environment agency)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
ERC	Emission Reduction Certificates
EIA	Environmental impact assessment
EMS	Environmental management system
EU	European Union
FDI	Foreign Direct Investment
FTAA	Free Trade Area of the Americas
GATS	General Agreement on Trade in Services
GATT	General Agreement on Trade and Tariffs
GDP	Gross Domestic Product
IBAMA	*Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis*, the Brazilian Institute for Environment and Natural Renewable Resources
IBGE	*Instituto Brasileiro de Geografia e Estatísitca*, the Brazilian National Institute for Geography and Statistics
ICMS	*Imposto sobre a Circulação de Mercadorias e Serviços,* the Merchandise and Service Circulation tax
IMF	International Monetary Fund
IPI	*Imposto sobre Produtos Industrializados,* Industrialised Product tax
MDIC	Brazilian Ministry of Industry and Trade
MEA	Multilateral Environmental Agreements
Mercosul (also Mercosur)	*Mercado Comum do Sul,* the Southern Common Market
MMA	Brazilian Ministry of the Environment
MRE	Brazilian Ministry of Foreign Affairs
MSW	municipal solid waste(s)
MTBE	methyl tertiary butyl ether
MW	megawatts, energy unit
NAFTA	North American Free Trade Agreement
NGO	Non-Governmental Organisation
PND	*Plano Nacional de Desestatização,* the Brazilian National Privatisation Program
Ppm	parts per million
PROCONVE	*Programa Nacional de Controle de Emissões Veiculares*, the Brazilian National Program for Vehicular Air Emissions Control
PROMOT	*Programa Nacional de Controle de Emissões por Motocicletas,* Emission Control Program for Motorbikes
BRL	reais, Brazilian currency (USD 1 = BRL 2.50 as of May 2005)

SABESP	*Companhia de Saneamento Básico do Estado de São Paulo,* the Brazilian São Paulo State Water and Wastewater Company
SMA	Brazilian São Paulo State Environmental Secretariat
SMEs	Small and Medium Size Enterprises
UNCED	UN Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
VOCs	volatile organic compounds
WSSD	World Summit for Sustainable Development
WTO	World Trade Organisation
ZPE	Zona de Processamento de Exportação, *Export processing zone*

EXECUTIVE SUMMARY

The Doha Ministerial Declaration called for negotiations on trade liberalisation in environmental goods and services (EG&S) to enhance the mutual supportiveness of trade and environment. EG&S can also be linked to the goals of the 2002 Johannesburg World Summit on Sustainable Development (WSSD), which affirmed that sustainable development was dependant of strong commitments such as tangible targets and timeframes for renewable energy and basic sanitation. For developing countries, this set of goals comprises an easier access to environmentally sound technologies and expertise, capacity building and an improved market for their environmentally preferable products and services. In this sense, this paper addresses some of the main issues regarding the possible effects of trade liberalisation in Brazil.

Until the end of the 1970s reducing their environmental impacts was not of key concern to the industries in Brazil. In response to mounting environmental problems, however, tougher environmental legislation was enacted in the 1980, although the laws were poorly enforced. In the 1990s, Brazil made significant progress in streamlining its regulatory processes, tightening pollution regulations and strengthening enforcement — making the country one of the first in Latin America to implement a coherent package of environmental legislation. In addition, individual states developed their own environmental laws; the most advanced probably being the State of São Paulo. Stricter regulations and enhanced enforcement forced several industrial and mining sectors to invest heavily in pollution prevention, end-of-pipe controls or remediation. Exporting sectors such as pulp and paper, and the food industries were forced to comply with even stricter standards to satisfy consumers in foreign markets, mostly European. Meanwhile, North American multinationals were required by their shareholders to meet quality standards similar to those in their home countries.

The public sector, directly or through multilateral funding agencies is still the main investor of the environment industry in Brazil. The private sector investment, however, has been growing and is now responsible for around two-thirds of investment in Brazil's infrastructure (some USD 20 billion in 2000), especially in the energy sector. A recent survey conducted by the Brazilian Infrastructure Association (ABDIB) estimated that approximately USD 251 billion would be invested in Brazilian infrastructure projects through 2006. Of this total, 42% would be in the generation, transmission and distribution of electricity; 23% would be in expanding the nation's transportation infrastructure; 18% for oil and gas, and 9% in sanitation projects.

There is a wide range of factors driving investments in EG&S: an increasing number of companies with environmental management systems; and the adoption of international standards of environmental performance by exporters and multinational companies. Environmental legislation is only one of many. Opportunities arise in areas such as waste management, water and wastewater management, air pollution control, the remediation of contaminated land and renewable energy. Brazil's water and environmental sectors have great potential for growth over the next few years, especially if the Kyoto Protocol comes into force.

Introduction

This national case study surveys the determinants of shifts in international demand for Brazilian environmental goods and services, including national policy and strengthened institutional mechanisms. It examines also Brazil's commitments under regional and multilateral environmental agreements, and assesses implementation of other complementary measures that may have driven demand for better environmental quality and increased use of EG&S. It further assesses the extent to which demand for EG&S in Brazil has been met by locally produced goods and services vs. imports.

The World Trade Organization is currently engaged in negotiations on the liberalisation of trade in EG&S. Defining the scope and clarifying the relevance of existing provisions is necessary to determine to what extent goods and services of potential interest to developing countries — including environmentally preferable products — could benefit from trade liberalisation, and how negotiations will affect the development of EG&S sectors in developing countries, including countries' ability to increase their participation in world trade.[1]

The study aims to verify whether unilateral, regional and multilateral trade liberalisation efforts have facilitated EG&S imports. In this context it discusses the appropriateness and absorption of imported environmental technology and know-how, and their effects on foreign and local suppliers and consumers. It examines also how the export capacity of Brazil's EG&S industry has evolved.

Among the many environmental issues that could be addressed, the study concentrates on wastewater treatment, waste management (including hazardous waste) and the search for cleaner transport fuel. The first two represent the largest shares of prospective investment in EG&S in Brazil and the third reflects the trend away from the traditional end-of-pipe, command-and-control approach to environmental protection in favour of a more modern view, which are closely linked to the Millennium Development Goals. Achieving such goals was the objective of the Brazilian Energy Initiative, introduced at the 2002 Johannesburg World Summit for Sustainable Development (WSSD), which proposes a target of a 10% share for renewable sources in global energy supply by 2010— an international agreement aiming to address, simultaneously, cleaner energy, sustainable consumption patterns, job creation, energy security and free trade. At the regional level, even before WSSD, environment ministers of Latin American and Caribbean countries had approved the 10% target in May 2002 (UNEP, 2002). Brazil has set a legal target of 10% by 2026 for electricity from renewable sources such as small hydroelectricity projects, wind and biomass.

[1] A clear definition of EG&S would help in identifying barriers to international trade in EG&S and in improving strategies to develop coherent trade policies. OECD (1999) mentions "measuring, preventing, limiting, minimizing or correcting environmental damage to water, air and soil, as well as problems related to waste, noise and ecosystems". UNCTAD (2003) states that an environmental good can be understood as equipment, material or technology used to address a particular environmental problem or as a product that is itself "environmentally preferable" to other similar products because of its relatively benign impact on the environment. UNTAD also notes that environmental services have been defined as human activities to address particular environmental problems (e.g. wastewater management). For discussions on the definition and inclusion of forest products, see Borregaard and Dufey (2001). For certified organic products, ecotourism and resource management, see Borregaard *et al.* (2002). For Brazil's position regarding the definition of EGS, see MMA (2001).

Brazil: key facts (2002)	
Population (est.)	169 million
Population growth rate	1.3%
Nominal GDP	USD 570 billion
Per capita GDP	USD 3 300
Unemployment rate:	8%
Government expenditure as share of GDP	5%
Foreign exchange reserves	USD 30 billion
Ratio of debt service to exports	31%
Exports plus imports (FOB value)	USD 64 billion

Source: IBGE (2003)

Economic policy context

In the 1990s, Brazil undertook economic reforms that improved its economic resilience. In 1994, it initiated an economic stabilisation plan, which reduced long-standing inflation, and it launched one of the world's largest privatisation programmes. High dependence on external financing, however, made the economy vulnerable to shocks in the international financial system. A currency devaluation in early 1999 helped moderate the resulting economic downturn, but growth slowed considerably in 2001-02, to less than 2%, because of a slowdown in major markets, the high interest rates (still 19.75% a year as of May 2005) that the Central Bank imposed to combat inflationary pressures, and a 20% shortfall in hydroelectricity production during 2001 compared with the previous year.

The economy was hampered in the early part of the decade by several other factors as well, most notably an economic crisis in Argentina and falling growth in major world economies Since 1999, the government has been dedicated to fiscal discipline, and in May 2000, it passed the Fiscal Responsibility Law, which sets strict limits on government spending at all levels. The government also initiated a monetary policy measure wherein the Central Bank strives to keep inflation within two percentage points of a government target. More recently, the government began reforming the tax code and public pensions. Such reforms have improved international investors' risk perceptions regarding Brazil, but the country is still dependent on volatile sources of capital. The balance of payments, meanwhile, has emerged as a concern. Brazil has been financing its large current-account deficit with record levels of foreign direct investment (FDI).

Brazil can offer high returns on investment because of the size of the economy, domestic market growth and competitive advantages such as climate, natural resources and a highly trained, technically advanced workforce. Shortcomings affecting foreign investment stem from the sometimes inefficient bureaucracy, a complex, costly tax structure and high interest rates, with private banks often charging up to 180% a year (5% a month) on loans.

Table 1. Selected economic indicators, 1998-2003

Economic indicator	1998	1999	2000	2001	2002	2003[a]
GDP (real annual change, %)	0.1	0.8	4.4	1.4	1.5	-1.4
Inflation (CPI, annual var. in %)	1.7	8.9	6.0	7.7	12.5	15.4
Exchange rate (BRL per USD)	1.208	1.789	1.955	2.320	3.533	2.967
Current account (USD millions)	-33 416	-25 335	-24 225	-23 215	-7 693	-17 725

a) Partial results: GDP change as of second quarter, inflation as of July, exchange rate for August, current account as of June.

Source: LatinFocus (2003).

The government has been moving away from its traditional role as the dominant force in shaping economic growth: it has reduced its presence in economic activities through privatisation, deregulation and removal of impediments to competition. In 1990, it launched the National Privatisation Programme (PND), the largest such initiative in Latin America. Until August 2001 it had risen more than USD 28 billion selling state-controlled companies and shareholdings and transferred USD 9.2 billion in debt to the private sector, according to the National Bank for Economic and Social Development (BNDES). The PND does not limit foreign capital participation in the voting stock of privatised companies, though in some cases sector-specific laws may do so. U.S. investors account for 43% of foreign participation, followed by Spanish firms with 36%.[2]

Brazil's land area of 8.5 million km^2 translates into considerable demand for infrastructure. Problems with infrastructure affect production and trade. Most of the country's seaports are inefficient. The highway network is adequate, but tolls and fuel costs add significantly to road transport costs. The rail network is limited, and freight charges are high by international standards. Geographic constraints and environmental concerns have limited the development of river transport. Hydropower accounts for over 90% of the country's electricity generating capacity, but the high cost and capital-intensiveness of new large hydroelectric projects has slowed capacity expansion considerably. The 2001 electricity shortage forced the government to review its policies with the aim to reduce impediments to investment in hydroelectric and thermal power generation and in upgrades to transmission networks linking independent systems within Brazil and linking Brazil to its neighbours.

The government is looking to the private sector to undertake such infrastructure investment. Several highways and railways have been privatised. New roads are planned or being built and air transport is expanding.

Developments in environmental policy

Regulations

Beyond basic sanitation and local end-of-pipe pollution abatement, broad environmental issues started being seriously discussed in Brazil in the 1980s, in response to increased urbanisation and pollution arising from economic growth. Constraints on access to water, inadequate sewage treatment and waste

2 In 2000, FDI totalled USD 154 billion, of which USD 80 billion came from the United States, Spain and the fiscal havens of Cayman Islands, Virgin Islands, Bahamas and Bermuda. FDI flowed mainly to the communications and banking sectors, but industry accounted for USD 10.2 billion of the total, energy for USD 6.4 billion and other service sectors for USD 7.0 billion.

management, air pollution, soil and water contamination, resource depletion and loss of biodiversity are some of the issues that forced rapid changes in legislation. In 1988, the constitution was changed to incorporate the right to a healthy environment, and not just in terms of economic activities and government decisions. Institutions were established to devise national strategies and environmental protection plans, and laws were enacted to protect water bodies, mineral resources, marine areas, fisheries, forestry, endangered species and the atmosphere. An environmental impact assessment (EIA) became mandatory for certain project categories defined by law, such as landfills, wastewater treatment plants, incinerators, and energy plants above 10 MW of capacity. Other projects also had to undergo environmental study and obtain official approval if the country's environmental protection agency, the Brazilian Institute for Environment and Natural Renewable Resources (IBAMA), determined that they could adversely affect the environment. Rules were established for the management of hazardous waste and emissions, and ambient quality standards were set for air and water.

The 1997 National Water Resource Policy and National Water Management System introduced further changes, such as promoting multiple uses of water (taking into account quantity and quality, integrated with environmental management), and adopting hydrographic basins as the geographic units for planning. Each basin is managed by a committee of representatives from the government, water users and society at large, which approve water-use rights. The committees are supported by water basin agencies, an approach inspired by the French model.

Steps were taken also to stiffen penalties and strengthen enforcement. Over the last two decades, IBAMA has progressively increased its fines and enforcement. The 1998 Environmental Crimes Law provides for heavy penalties against polluters, and repeated infractions can lead to prison or closure of facilities. Under the law, heavy fines were imposed for major environmental accidents (e.g. an oil spill in Guanabara Bay in January 2000) and for long-term soil contamination such as that produced by organochlorine products in Paulínia in 2002. Notification of environmental accidents has become faster and more detailed, increasing public awareness. At the state level, agencies can take measures even more restrictive than those of the federal government. In São Paulo state, for example, any unauthorised activity that directly degrades the environment is defined as a crime. Those responsible can be prosecuted and may be liable for administrative, civil or criminal penalties, including fines and having to repair the damage.

Enforcement and effective environmental control are hampered nonetheless by poor co-ordination among environmental, economic and social agencies, a lack of qualified professionals and inadequate resources for training and monitoring. Economic pressure from interest groups affected by enforcement actions, who often can bypass environmental agencies, is a persistent problem. Illegal economic activities and uncontrolled urbanisation have effects that legislation alone cannot address. To tackle such problems, the government is putting more resources into public information and awareness efforts and the training of new public attorneys and other enforcement professionals.

There has also been significant growth in the environmental dimension of financial services. In 1988, BNDES, Brazil's leading financial institution, began requiring compliance with environmental legislation for all projects it finances. Credit is conditional on the applicant's ability to demonstrate compliance with environmental negotiations. In 1994, BNDES signed the United Nations Environment Programme (UNEP) Statement by Financial Institutions on the Environment and Sustainable Development. All projects financed by BNDES are subject to EIAs. Specific project categories include protection of watersheds and biodiversity; water, air and soil pollution control; waste collection, treatment and disposal; environmental recovery and decontamination; sustainable agriculture; prevention of occupational hazards; process improvement through cleaner production and energy efficiency; and environmental monitoring and environmental management systems. BNDES also provides financing to foreign companies established in Brazil.

Financing EG&S

Both BNDES at the national level and CETESB at the state level (in São Paulo, the most developed; CETESB is both a public enterprise and the state environment agency, as Box 1 shows) provide funding at the official long-term interest rate (9.75% a year as of June 2005) plus spreads of 1-5%. PROCOP, the CETESB fund, is particularly successful. Initiated by the World Bank in 1980, it was also supported by the São Paulo State Government until 1996, and then was restructured as a revolving fund. Focusing on pollution prevention projects, it covers up to BRL 2.5 million (about USD 0.8 million) for each project, charges the lowest spreads in the market and requires the shortest grace period (six months); it also requires warranties covering 125% of the value of the loan. The BNDES instrument, FINAME, is available nationwide but is not limited to EG&S. The funding is available only for large projects.[3] Private banks intermediate public funding for small and medium-sized enterprises (SMEs), charging spreads of 4.5-5%. In sum, funding cannot be considered a significant barrier to the development of EG&S in Brazil.

Business attitudes towards the environment

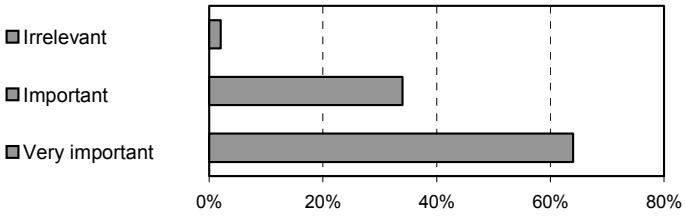
In 2002, the Brazilian-German Chamber of Industry and Commerce (AHKBRASIL, 2002) conducted an environmental survey of 1 012 associated companies. As Figure 1 shows, most of the companies responding regarded environmental issues as "important" or "very important" to their business, yet they overwhelmingly regarded their own environmental impact as "small". Around 70% of their environment-related investment has concerned wastewater treatment and waste management. Cost was cited more often than lack of knowledge as the factor most limiting the introduction of new technology.

In 2003, around 1 000 Brazilian companies were certified to the ISO 14001 standard: 22% in the chemical, petrochemical and pharmaceutical industries and 17% in the automotive sector. There is much room for improvement, as services accounted for only 3.5% and public services, sanitation and hydroelectricity production for 2% (Meio Ambiente Industrial, 2003). A typical ISO 14001-certified company in Brazil is large, exports to OECD countries, also holds ISO 9000 certification, and has demonstrated concern about the environmental pattern of its supply chain. Interest in achieving ISO 14001certification is growing.

[3] For more information on FINAME, see www.bndes.gov.br/linhas/finame.asp. Information on PROCOP is available at www.cetesb.sp.gov.br/Servicos/financiamentos/procop.asp.

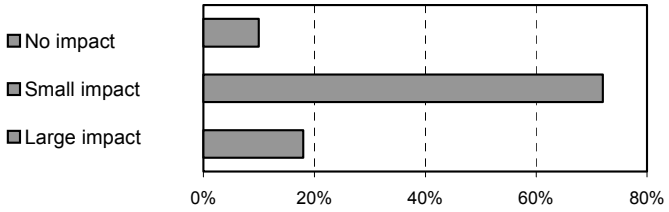
Figure 1. Business attitudes towards the environment in Brazil (AHKBRASIL, 2002)

How important are environmental issues to the operation of your business?



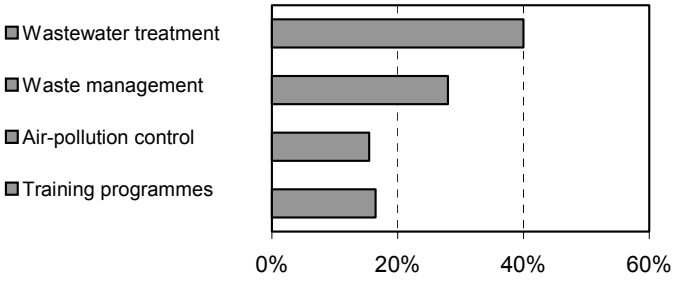
Numbers of companies responding: 50

How much of an impact does your company have on the environment?



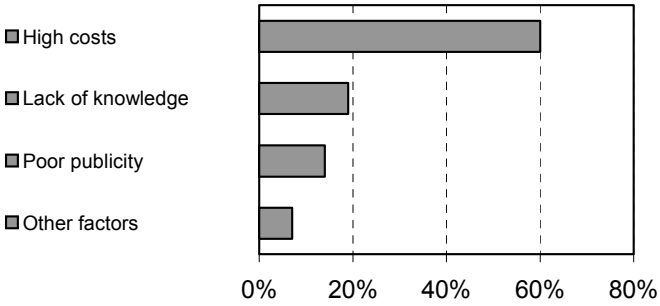
Numbers of companies responding: 36

In what area was your company's environmental investments concentrated?



Numbers of companies responding: 72

What do you consider to be the factor most limiting the introduction of new technologies?



Numbers of companies responding: 50

International environmental policy

As Annex 1 shows, Brazil is a party to many multilateral environmental agreements (MEAs). Notable in terms of their effects on domestic policy are:

- The 1985 Vienna Convention for the Protection of the Ozone Layer and the 1990 Montreal Protocol on Substances that Deplete the Ozone Layer, and amendments. Brazil's plan to phase out most ozone-depleting substances (ODS) by 2010, through industrial retrofits and ODS-free technology, has succeeded thus far. The deadline for chlorofluorocarbon imports is 2007; the country ceased production in 1999. In addition, methyl bromide is to be drastically reduced by 2006 and eliminated by 2015. Since 1995, users of one or more tonne per year of ODS have had to register with IBAMA. The national ODS phase-out programme includes regressive production quotas, increased taxation of ODS users and tax exemptions for alternatives, eco-label programmes, access to financing (directly or through the Montreal Protocol Multilateral Fund) for SMEs, regulations for control of fugitive emissions and quality assurance programmes.

- The 1973 Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the 1992 Convention on Biological Diversity. Membership in CITES has had direct effects in several economic activities, especially marine fishing, forestry and agriculture. Improved R&D, monitoring and EIA have increased understanding of issues, clarifying potential environmental controversies, especially those related to projects in rainforests or other fragile ecosystems and to eco-labelling criteria (e.g. for sustainable fishing).

- The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Brazil prohibits the export and import of hazardous waste. It drew up a framework Nation Policy for Solid Wastes (NPSW) in 1991 but Congress has not yet approved it. Among other measures, the NPSW would establish management plans for urban waste, "special solids" and dangerous waste; set detailed rules regarding the establishment and operation of landfills and the disposal of expired medication, tyres and packaging; and provide fiscal incentives for recycling. Brazilian legislation already prohibits imports of used tyres and mandates the return of electronic batteries to retailers. Waste producers are subject to the Environmental Crimes Law, which covers a broad range of liabilities, including dumping at sea.

- The 1992 United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol. As one of the countries that proposed the concept of the clean development mechanism, Brazil has been investigating opportunities for projects to mitigate carbon emission. Its vast forested area offers carbon sequestration, and it is also exploring alternatives to fossil fuels, especially in transport.

Trade policies

Brazil began unilaterally to liberalise its trade regime in 1990, and since then has made substantial progress in reducing tariffs (e.g. from a 32% average to 11% over one five-year period). Imports increased significantly as a result, while exports grew by a more modest 43% between 1993 and 2000. Commitments made during the Uruguay Round of trade negotiations bound Brazil's tariff at 55% for agricultural products and 35% for industrial products. The average applied tariff was 13.7% in 2000, compared with 32% in 1990 and 52% in 1987. The average tariff on finished goods was 15.8%, on semi-processed goods 11.9% and on raw materials 8.9%.

Imports are subject to various taxes and fees. The three main taxes are calculated on a cumulative basis, accounting for the bulk of importing costs: the Import Tax (II), ranging in most cases between 10% and 20%; the Industrialised Product Tax (IPI) of up to 15%; and the value-added Merchandise and Service Circulation Tax (ICMS), which is 18% in São Paulo state. Brazilian exports are exempt from IPI and most are also exempt from ICMS, but both are imposed on products made and sold in Brazil. They are not considered a cost for the importer, since the value is credited after sale; but it affects the final price to the consumer. Table 8 shows how these and other taxes and fees typically add 20-30% to the price of an imported capital good, compared with one produced domestically.[4] As with domestic products, the interest rates on credit to finance the purchase are very high.

Brazil has not signed the plurilateral Agreement on Government Procurement of the World Trade Organization (WTO) and does not necessarily use the same procedures as developed-country signatories. Government procurement gives preference to domestically supplied goods and services. A major motivation for setting up joint ventures, which is common in Brazil, is to compete in the government procurement market[5] or in regulated markets such as energy. Local representation, relatively easy to establish, allows foreign firms to bid on government contracts for technical services. The Concessions Law does not restrict participation by foreign companies in bidding. Bid announcements normally try to create an attractive market for international players. Interested companies can arrange to organise a consortium, generally including a Brazilian company for practical reasons.

No discriminatory restrictions in Brazil exist as regards the customary import channels (e.g. agents, distributors, import houses, trading companies, subsidiaries and branches of foreign firms). Contract clauses are freely negotiated between foreign and local firms. Licensing agreements are a common means of access to the Brazilian market. Direct imports from foreign manufacturers, without local representation, are possible, and franchising is thriving, with foreign groups expanding their participation. Product sales are typically price-driven, though quality has become increasingly important since the opening of the market to imports in the early 1990s.

Brazil has four free-trade zones, all in the Amazon region. Foreign firms established in these zones may use their own hard-currency resources for tax-free imports of machinery and raw materials. Firms in the zones may not produce goods subject to export quotas. Licence and authorisation requirements remain in effect as regards health, national security and environmental protection.

Concerning intellectual property rights, Brazil is a member of the World Intellectual Property Organization and has signed the Universal Copyright Convention, the Paris and Bern conventions and the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights. Although copyrights are legally protected regardless of whether they are registered, legitimate complaints have been expressed about poor enforcement.

One of Brazil's main priorities is to strengthen regional trade, especially through the Mercosur customs union formed in 1995 by Brazil, Argentina, Paraguay and Uruguay. Chile and Bolivia became

---

4 Overall, Brazil's tariffs on capital goods average 14%; by comparison, the EU's average tariff on imports of Brazilian capital goods is 5%. Problems in the sector include technological deficiencies, the small scale of production (by international standards), an underdeveloped supply chain and sales-management and after-sales capacities abroad. Although foreign companies had a 60% share in the supply chain incomes, this sector is considered by Vermulm and Erber (2002) to be very sensitive to unrestricted trade liberalization.

5 Although a 1993 law requires major procurement at all government levels to be open to competitive bidding and awarded to the lowest bidder, with no distinction between Brazilian and foreign enterprises, in case of a tie for low bid preference may be given to a Brazilian firm. International bidding is required for most procurement with international development bank funding.

associate members in 1996, Peru did so in 2003 and Venezuela has expressed interest, reinforcing the links between Mercosur and the Andean Community. Mercosur, with more than 200 million consumers, is the world's fourth-largest trading bloc, after NAFTA, the EU and ASEAN. It is negotiating a trade agreement with the EU and is involved in conducting negotiations or consultations with the South African Development Community, Australia and New Zealand, the Commonwealth of Independent States, India, Korea, China and Israel.

No import duties are charged within Mercosur. Member countries apply a common external tariff, ranging from 2% to 20% [or zero to 23%], to products imported from outside the bloc. Each country has an "exemption" list allowing charging higher import taxes for certain goods, including some capital goods. Such lists are to be phased out by 2006.

Between 1990 and 1998, Mercosur regional trade tripled to USD 21 billion. Argentina is Brazil's main trading partner after the United States, and Brazil is the most important market for Argentine products, absorbing 30% of Argentina's exports. In 2001, Brazil's exports within Mercosur were valued at USD 6.4 billion and imports at USD 7 billion from the bloc — roughly 12% of its total merchandise trade. Since 2001, however, trade within the bloc has declined and disputes on certain products have emerged. Even so, member countries remain committed to strengthening the bloc. The aim is for Mercosur's remit eventually to extend beyond trade to regional integration in other areas, including education, culture, justice, transports, energy and the environment. For example, once Brazil took the lead in developing regulations limiting emissions, other Mercosur members quickly followed suit.

Brazil's EG&S market

A lack of appropriate statistics makes it hard to assess the size of the country's EG&S market, and much information provided by local sources is qualitative and hence subjective.[6] Using the OECD definition and the UNCTAD database, Borregaard *et al*. (2002) estimated that EG&S imports in 2000 totalled USD 3.2 million.

Brazil is one of the world's largest producers and exporters of machinery and equipment. Most of the more than 4 000 companies and 175 000 workers in this sector are based in São Paulo; the country's most developed and populated state. Producing capital goods for about 30 subsectors, many have links with the EG&S market, especially as regards basic sanitation, cleaner production and cleaner fuel.

6 Improving the definition of EG&S would help address this problem. In the many discussions of what the concept of EG&S should cover, it is clear that cleaner production issues need to be included. This approach would both increase the size of the market and make it harder to estimate.

Box 1. CETESB: Environmental Sanitation Technology Company

The Companhia de Tecnologia de Saneamento Ambiental (CETESB) is the only company from a developing country ranked among the world's top 50 EG&S companies (Chaytor, 2002). CETESB, a public company, serves as the São Paulo state environmental agency. It has developed cleaner-production and capacity-building initiatives at the state, national and international levels. Such services could eventually be exported to other Mercosur countries dealing with similar problems. Over the years, the CETESB has developed the capacity to absorb, adapt and modify environmentally sound technology imported from developed countries. It runs training programmes to upgrade the technical skills of its personnel; and it also conducts EIAs of large construction projects and issues approvals where appropriate.

The company runs many projects of great importance to the country and the region. In co-operation with the U.S. Environmental Protection Agency and with funds from the World Bank, the CETESB has started a pilot project with a group of private firms in São Paulo state to replace end-of-pipe technology with cleaner production methods. It has begun importing technology to clean up industrial sites, manage water resources and incinerate industrial waste, adapting it to local conditions. It also runs a project to reduce air pollution from mobile sources in São Paulo.

The results of these projects are relevant to other countries in the region that are tackling urban air pollution, reliance on end-of-pipe technology and have a limited capacity to deal with highly sophisticated technologies. The CETESB has provided consultancy services to Argentina, Uruguay, Paraguay and Mexico, has opened its training courses to technicians from other countries of the region and Portuguese-speaking Africa, and is thinking about developing a marketing strategy to help it sell its services at market prices to other countries. The income generated by these activities will provide a new source of financing for environmental initiatives in São Paulo state.

The Brazilian-German Chamber of Industry and Commerce estimated foreign investment in environmental technology in Brazil at USD 3 billion in 2002. The main product areas were equipment, engineering and consulting services, and instrumentation associated with pollution control and clean-up. The group forecast market growth of around 7% a year. Ricardo Rose of the Chamber estimated the market breakdown as follows in 2003: air-pollution control, USD 230 million; water and wastewater treatment, USD 1.6 billion; and solid waste treatment, USD 1.2 billion. Trade Partners UK (2003) put investment in the industry over 1999-2004 at USD 10-15 billion and projected that the total would reach USD 42 billion by 2010.

Brazil imported EGs worth USD 840 million in 2002. The United States is the leading exporter of environmental technology to Brazil, with a 35% share. U.S. firms have been increasing their presence in Brazil in recent years, partly because of trade agreements, geographic proximity and aggressive marketing but also through export incentives.[7] Germany, in second place with 25%, has built on a long tradition of supplying high-quality equipment, especially instruments for laboratories, monitoring and control. So far, however, the recent market opening and privatisation have drawn little interest from German investors. French companies, with 15%, are an increasing presence in Brazil's environmental market, focusing on the water, wastewater and waste-management sectors. French water companies, in particular, have shown interest both in participating in privatisation and in buying existing companies. Canada, Spain, Portugal, the United Kingdom, Italy and Japan account for most of the remaining 25% of the market.

Table 2 summarises electricity generation and consumption in Brazil over 1990-2001. The electricity market is expected to grow 4.5% a year to 2010, requiring annual investment of about USD 34 billion.[8]

7 By "incentives" — used deliberately here to avoid controversy regarding WTO definitions — several forms of government assistance are meant, including R&D, direct and indirect subsidies and greener procurement favouring export sectors.

8 The breakdown, from the Ministry of Mines and Industry, is: USD 22.6 billion for large hydro projects (>30 MWe), USD 5.8 billion for gas-burning thermal plants, USD 0.9 billion for coal-fired plants, USD 2.5 billion for nuclear power, USD 1.8 billion for small hydro and USD 0.3 billion for wind and biomass generation.

Energy projects are the source of much EG&S demand, particularly in connection with EIA services, pollution-abatement equipment and emission monitoring (Table 3). Legislation in 2002 established the Incentive Programme for Renewable Energy Sources (PROINFA) to promote technology exploiting such renewables as wind power and small-scale hydropower. The law requires electricity utilities to add 3 300 MW in renewables-based capacity by 2006 and states that at least 10% of the nation's electricity supply must be provided by renewables by 2026. Solar energy received an additional boost from recent legislation aiming to ensure that all isolated communities are supplied with electricity by 2010.

Table 2. Electricity generation and consumption in Brazil, 1990-2001 (in billion kWh).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Net Generation	219.6	231.2	238.4	248.6	256.6	271.8	287.1	303.5	317.1	327.0	339.5	321.2
hydroelectric	204.6	215.6	221.1	232.7	240.3	251.4	263.1	276.2	288.6	290.0	301.7	265.5
nuclear	1.9	1.4	1.7	0.4	0.1	2.4	2.3	3.0	3.1	3.8	4.9	14.3
solar/wind/biomass	4.9	5.3	6.6	6.7	7.2	7.4	8.5	9.5	9.8	11.4	12.0	14.8
conventional thermal	8.1	9.0	9.1	8.8	9.1	10.6	13.1	14.7	15.6	21.9	20.8	26.6
Net Consumption	228.6	242.1	246.3	259.4	271.7	288.2	307.2	322.7	334.3	344.0	358.7	335.9
Imports	24.4	27.1	24.6	28.2	33.1	35.5	40.2	40.5	39.4	39.9	43.0	37.2
Exports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: US DoE/EIA (2003).

Table 3. Comparison of markets for selected EG&S in Brazil (USD million[a])

	Pollution control equipment and services			Electrical power systems			Laboratory and scientific equipment		
	1999	*2000*	*2001[b]*	*1999*	*2000*	*2001[c]*	*1999*	*2000*	*2001[d]*
Total sales	2 800	2 900	3 900	1 900	1 930	2 180	95	110	95
Local production	1 960	2 030	2 730	1 750	1 800	2 015	75	90	75
Exports	-	-	-	140	200	215	-	-	-
Imports	840	870	1 170	290	330	380	20	20	20

a) Converted at a rate of USD 1.00 = BRL 2.45 (June 2001).
b) Estimates by environmental consulting firms.
c) Estimates by environmental consulting firms.
d) Import market shares: United States 40%, Europe 50%, Japan 10%.

Source: AHKBRAZIL (2003).

Good opportunities in the environmental sector involve services and cleaner technology, especially in waste management, water and wastewater management, air-pollution control, soil remediation and renewable energy. Management of solid wastes (municipal and agricultural) is particularly promising now that the Kyoto Protocol has come into force.

Services: environmental consulting

Brazil ranks 33rd among the world's service exporters, with a 0.6% share. (The top ten countries account for 57.5% of the total volume of USD 1.46 trillion.) The country's balance of services registered a deficit of USD 7.5 billion in 2001, plus USD 20 billion in interest, dividends and transferred profits. Brazil's service providers have considerable expertise in several areas, notably engineering

(USD 1.5 billion exported in 2000). Others sectors, such as tourism, offer much potential for development. Consulting represented 5.6% of the USD 12.5 billion of FDI in the service sector in 2001.[9]

Brazilian consulting firms have extensive experience in planning, design and construction management. Other areas of expertise include water quality studies and analysis, water and wastewater treatment, and environmental impact and risk assessment and related matters. Many of the country's architectural, construction and engineering companies are internationally recognised as competitive and experienced, and certain larger firms have won contracts abroad. Some Brazilian consulting firms have links of some form to North American or European consulting companies or have worked in consortia on special projects or contracts. Brazil's economic crisis caused the number and size of Brazilian consulting companies to diminish, and the practice of contracting with a third party to develop parts of a contract has become the norm. It is also usual for a medium-sized or small company to rely on an independent consultant for overall orientation or conception of a project while the contracting company's staff develops the executive design. Many foreign experts in sanitary engineering have worked as part-time consultants for local firms.

Small enterprises have too few resources to respond adequately to increasing demand for environmental technology resulting from growing consumer sophistication and environmental awareness. Medium-sized companies usually try to comply with local legislation but tend to be more concerned with their survival than with environmental issues. Several larger exporting companies have adopted environmental management systems and tools such as ISO 14001 and Responsible Care. Such moves imply not only resources but also international knowledge, evidenced by concern with presenting a good image to consumers and suppliers.

Some private Brazilian firms export environmental technologies and services, including to neighbouring countries that may prefer these firms to developed-country enterprises because of their knowledge of environmental problems specific to the region, cultural affinities, a similar language and greater understanding of how business is carried out in the region. If Brazilian legislation becomes the basis for development of environmental legislation in other Mercosur countries, export opportunities will dramatically increase (UNCTAD, 1998).

No official statistics are available on activities of foreign architectural, engineering and construction companies in Brazil. Trade sources suggest that the volume of services offered by such firms probably represents less than 1% of the market. Brazilian legislation requires foreign architectural, engineering and construction firms to be established in Brazil or have a local partner. Several foreign firms have successfully entered the market in partnership with established Brazilian firms.

Review of selected sectors

Water and wastewater

Basic sanitation, including wastewater treatment and water supply, is one of Brazil's most urgent needs, especially in the sprawling urban areas. These sub-sectors command the largest share of environmental investment in Brazil, at USD 1.3 billion (2002), or 0.2% of GDP — still far below the minimum 1% recommended by the World Health Organisation for countries with a similar Human Development Index. Around 86% of the population has access to water supply, leaving 15 million without. Only 51% of those with access to piped water are connected to public sewerage, leaving some 39 million with no adequate sewage disposal. And for the half who are connected, only about 20% of their sewage is

[9] http://www.investeBrazil.org.br/asp/printer_view.asp?sid=83&infoId=370&sTag=Setores_5Servicos

treated. Moreover, the situation is worsening, partly because of poor urban planning and budgetary reallocations to other priorities. The Brazilian Geography and Statistics Institute (IBGE) reported that in 2001 almost 10 million households, or 23% of the total, lacked public water supply. Wastewater collection or septic tanks covered 62% of households in 2000. The Ministry of Health attributes 65% of hospitalisations to the low quality of sanitation services in the country. Inadequate wastewater treatment also increases the costs of making water safe for human consumption.

The structure of Brazil's water and wastewater-treatment industry was profoundly influenced by the 1971 National Sanitation Plan, still the basis for the country's sanitation policy. It provided for each state to form a public enterprise to provide water and sewerage services. Such enterprises still operate 86 of the 140 utilities serving cities of over 100 000 people, and 26 of the 27 state capitals. The 1988 constitution made municipalities responsible and legally empowered them to grant authority for local services, including water supply and sewerage. It also gave them the right to establish their own public services. Municipal-owned utilities now operate in 46 cities of over 100 000 and in one state capital, Porto Alegre.

The significant improvements in water supply and sanitation during the 1980s were not enough to keep up with urban population growth. Moreover, shortages of public investment funds limited further progress. Development of sanitation generally parallels improvements in overall economic conditions, but in periods of economic crisis, such as Brazil experienced during much of the 1980s, sanitation works are typically put on hold in favour of other infrastructure and industrial investments. Maintenance also suffered, resulting in declining output and water losses. Political intervention kept water charges low, further starving the utilities of funds.

Fiscal austerity continues to limit government investment in water and wastewater infrastructure. Even if this had not been so, public investment in sanitation probably could not have kept pace with the increasing demand. Investment in wastewater treatment is eligible for federal grants and financing by multilateral institutions, such as the Inter-American Development Bank, the World Bank and Japan's Overseas Economic Cooperation Fund, through contracts with the federal government, which transfers funds to state and local agencies. Recently funding by such institutions has been affected by global economic problems and restrictive policies. State and municipal funds are also available. States and municipalities can apply for federal funding, principally from the Caixa Economica Federal and BNDES. Funds for project finance and corporate finance are available through private banks, pension funds and the capital market, but BNDES is practically the only source of long-term financing for large infrastructure projects in Brazil.

By the 1990s, the need for private-sector participation and decentralisation in water services had become starkly evident. The government began developing a new framework for implementing public sanitation policy and determined that the constitution and the 1995 Concession Law gave authority for concessions to municipalities. Most concessions held by the public enterprises formed by the states under the 1971 sanitation plan will have expired by 2005. As a consequence, about 3 700 municipalities have to launch bidding for concession renewals or new concession contracts.[10]

Current policy allows sanitation services to be provided by state enterprises under existing concessions, municipal utilities if concessions have not been given, or private companies under new concessions. The BNDES encourages privatisation only if the conceding authority consents and the

[10]. The companies set up by the states operate local services through concessions granted by municipalities. Most concessions are for 25 to 30 years. The Concession Law confirmed that municipalities are the conceding authority and made bidding mandatory for new concessions or to renew existing ones. The law requires state companies to compete with private firms on an equal footing. There is a legal controversy on the validity of the law, but no definition has been issued to date.

necessary regulatory framework and agencies are in place. The most likely options for private-sector participation (PSP) in water supply and sewerage in Brazil are third-party service contracts (the simplest and most common form of Private-sector participation), concessions (catching on slowly but seen as the best solution for financing, constructing and improving systems), build-operate-transfer (BOT) contracts (attractive to investors but rare; the best known are projects by Sabesp, the São Paulo state water services company, and Copasa, its counterpart in Minas Gerais state) and joint ownership (sale of shares to the private sector without loss of public control[11]).

Private-sector participation in water supply and sewerage in Brazil is still beset by monopoly problems, however, and many political and labour groups continue to oppose privatisation. Only eight cities have granted concessions to private companies to manage their water supply, though more than 30 municipalities have privatised wastewater services. Most Private-sector participation has been in São Paulo state via BOT contracts (Table 4). Though little Private-sector participation has occurred so far, the regulatory framework favours increasing involvement by Brazilian and international private companies in the sector, and international companies are already active in the Brazilian market.[12] Strong market growth can be expected, through BOT, in wastewater treatment.

Table 4. Concessions in some interior cities of São Paulo and Rio de Janeiro states

City and state	Population ('000)	Type of contract[a]	Investment (USD million)[b]	Tariff USD/m3)
Araçatuba SP	180	S	12	0.38
Itu SP	250	S	17[c]	0.38
Jaú SP	250	W	11	0.32
Jundiaí SP	470	S	28	0.37
Limeira SP	218	F	100	0.55
Ourinhos SP	148	S	12	0.47
Ribeirão Preto SP	450	S	30	0.30
Lake Region cities RJ	520	F	165	0.70[d]
Campos RJ	350	F	64	n.a.
Niterói RJ	450	F	150	n.a.
Petrópolis RJ	240	F	90	n.a.

a) F: full concession, water and sewage; S: BOT, sewage treatment; W: BOT, water supply.
b) Converted from BRL at the time the concession was granted: e.g. 1995 USD = BRL 1.00; 1996 USD = BRL 1.05; 1997 USD = BRL 1.10; 1998 USD = BRL 1.20.
c) Of which 70% from BNDES.
c) Plus a USD 0.70 fixed charge.

Source: Industry Canada (1999).

11 The only case to date involves the Parana State Water Company, which sold 39.71% of its voting capital to a consortium led by the French group Vivendi (now Veolia).

12 They include Alfa Laval, Saint-Gobain, Degrémont, Dorr-Oliver Eimco, Environmental Dynamics, ITT Flygt, Hansen Transmissions, Munters, Black & Veatch, Pieralisi, Sanitaire, Simon-Hartley, Sulzer, US Filter, Westfalia Separator and Praxair.

Brazil's market is considered the seventh best prospect[13] for water and wastewater by the United States, valued at USD 1.7 billion (1998) and with annual growth of 10% (U.S. Department of Commerce, 2002). In 2003, the National Sanitation Equipment Industry Syndicate (Sindesan) estimated that the 44 private contracts signed for 2025-30 will require USD 900 million in investment. Private investors raised USD 200 million of the USD 300 million invested through December 2001, while public companies provided the rest. Some USD 250 million more is expected to be invested in 2002-06 (Revista Gerenciamento Ambiental, 2003).

Just to enable existing systems to meet current demand requires at least USD 20 billion more than what Brazil is now spending. To keep pace with demand growth would require additional expenditure of about USD 2-4 billion a year for the next 15 years from 2002. The 20 large projects under way as of 2002 are expected to require investment of about USD 8 billion in the period 2002-2007. Meeting current demand for household wastewater treatment alone would require investment of some USD 30 billion (AHKBRASIL, 2002; CEC, 1996).

Industrial effluent

Only 30% of the industrial effluent discharged in Latin America is adequately treated, mostly by large companies that are subject to relatively strict environmental control (thousands of SMEs operate clandestinely). In Brazil, industrial firms are required to treat their wastewater before discharging it into any river or other body of water. Limits on loads are set by regulations. Fines are levied for inadequately treated discharges. In metropolitan centres such as Rio de Janeiro and São Paulo, industrial wastewater accounts for around 30% of the organic load discharged to water bodies.

Around 20% of industry is responsible for almost 80% of industrial pollution loads. Environmental compliance agreements between major polluters and local enforcement agencies set deadlines for pollution abatement or prevention. Recent regulations require several types of industry, along with municipal sewage treatment plants, to monitor processes and waste periodically, as part of their environmental audits, with an eye to identifying potential pollution and environmental degradation and improving the effectiveness of their control and treatment.

Brazilian suppliers can meet more than 90% of the water and wastewater sector's technology needs at prices competitive in the international market, at least at current exchange rates (USD 1 = BRL 2.5).[14] The exceptions are automation and laboratory equipment. Indeed, Brazilian manufacturers, often working under licence agreements or in affiliation with foreign companies, supply most equipment needed in the sector overall. A typical example is the market for ductile iron pipe and fittings, which is dominated by the French company Saint Gobain Canalisation (formerly Pont-à-Mousson). Although local water service companies are allowed to import equipment, fittings and components, they usually prefer to buy domestically — particularly from companies with local manufacturing or assembly plants — because prices for local items are less exposed to exchange-rate fluctuations, and delayed deliveries or shortages of spare parts are less common.

---

13 The first six are Japan, China, Spain, the United Kingdom, the Republic of Korea and Mexico.

14 In 1995, Sabesp, the country's largest water and wastewater utility, opened a purchase of water meters to international bidding, supported by the World Bank. The international price was USD 20-30 a unit, compared with USD 40-60 locally. No tariff or non-tariff barriers played a role; the main factor was the exchange rate, which, at BRL-USD parity, favoured imports. This situation forced technological improvements in local production and helped weaken a national oligopoly.

Foreign companies involved in private concessions or privatised utilities tend to favour equipment bought in their countries of origin. Products that are based on simple technology or produced under licence can be made competitively in Brazil. As the Brazilian aircraft and automotive industries showed in the 1990s, an open market would not necessarily threaten the development of the domestic water and wastewater equipment industry, as long as the local industry is protected under WTO rules against dumping and illegal subsidies.

Solid and hazardous waste

Municipal solid waste

The second-largest segment of the Brazilian environmental market is municipal solid waste (MSW) management, a category that includes household, commercial and non-special industrial wastes. Turnover in this industry totalled about USD 14 billion in 2002 on a volume of 102 000 tonnes a day. Waste treatment has a business potential of USD 330 million a year (BRL 1 billion/yr) in sales, as of 2002. However, insufficient environmental enforcement and low penetration of the concept of corporate social responsibility among SMEs reduces this potential by two-thirds. Current incomes from such services are around USD 80 million (BRL 240 million) a year.

Nationwide, Brazil generates around 59 000 tonnes of urban household solid wastes every day.[15] Some 76% of this waste is hauled to open dumps, and 23% is disposed of in controlled or sanitary landfills (Table 5). Large metropolitan areas produce up to 16 million tonnes of household solid wastes a day.

Table 5. Waste treatment methods

Method	Amount treated (t/year)		% (2000)
	(2001)	(2000)	
Landfill	598 631	670 689	71
Co-processing (*e.g.* in cement kilns)	159 669	94 279	19
Incineration	32 880	8 542	4
Physical-chemical treatment	28 128	20 882	3
Incineration of health service waste	29 733	9 371	3
Total	849 041	803 763	100

Source: ABETRE (2003).

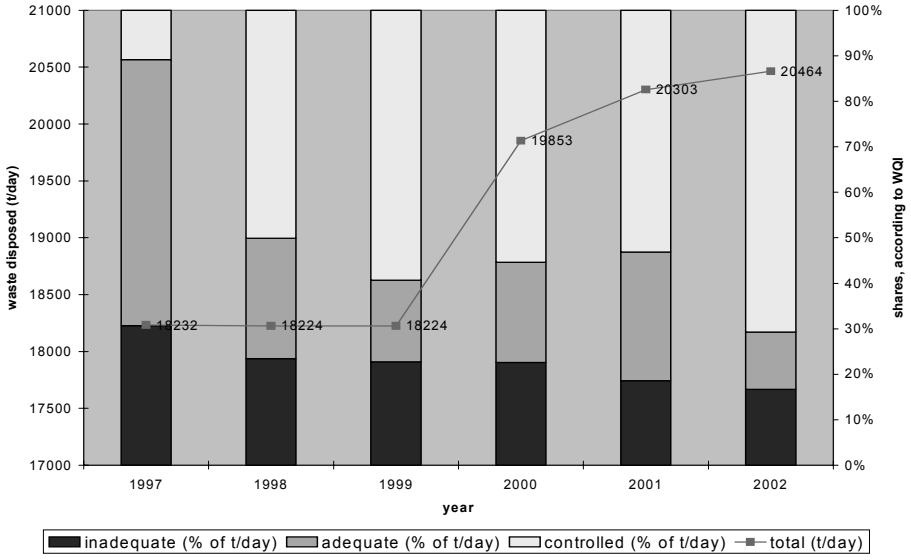
Municipalities are legally responsible for the management of MSW. As they usually lack the capital and know-how to build and operate modern landfills, they have started transferring waste collection and disposal to the private sector through public bidding. The usual arrangement is for a company or joint venture to charge the municipality a fee for providing the service. Municipal services collect around 70% of MSW produced. Disposal is a major problem: incineration is little used and few landfills are built, or properly operated. The vast majority of the 5 507 municipalities simply dump their waste, taking no measures to prevent leachate from infiltrating soil and groundwater or to keep poor families from

[15] Brazil has 180 million inhabitants, 75% of which lives in urban area generating o.4 to 0.5 Kg/day of MSW.

scavenging. Industrial and medical waste is often mixed with household waste — a practice several authorities tolerate.

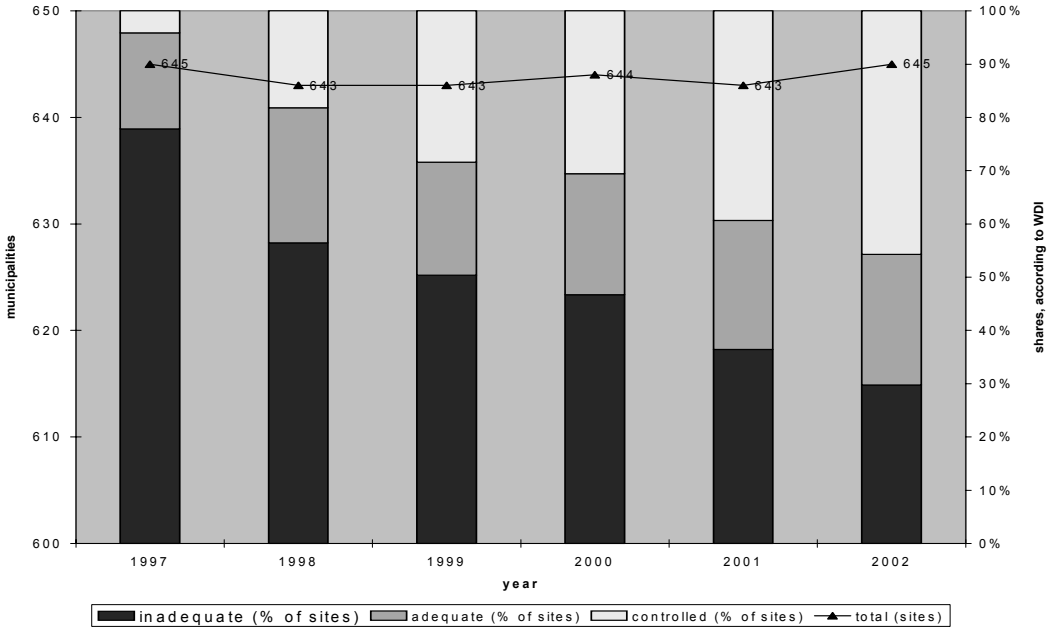
In São Paulo state, most of the larger landfills, which account for the majority of the disposed waste are classified as "controlled" (i.e. well-operated), the highest ranking in the Waste Quality Index[16] (Figures 2 and 3). Most of the landfills classified as "inadequate" are open dumps, while "adequate" signifies flaws in construction, operation or both. The number of controlled sites is increasing as CETESB sets tighter deadlines for compliance. New taxes on waste, promotion of extended producer responsibility and policies encouraging the formation of waste-collection co-operatives in the state capital (which generates nearly 13 000 tonnes of MSW daily) are resulting in increased separation at source and recycling.

Figure 2. Landfills in São Paulo state, 1997-2002: Waste Quality Index ranking by share of total waste disposal



16 On the ten-point index, a landfill scoring less than six is classified as having "inadequate" infrastructure and operating conditions; "adequate" landfills score six to eight and "controlled" more than eight (CETESB, 2002).

Figure 3. Landfills in São Paulo state, 1997-2002: Waste Quality Index ranking by share of total sites



Around 180 municipalities recycle waste. The federal government finances recycling facilities, total or partially, through BNDES, as well as waste-minimisation co-operatives for some sectors, such as metallurgy. Brazil boasts the world's highest rate of aluminium-can recycling (87%, or 121 000 tonnes in 2002), thanks to an efficient collection system and the income that discarded cans represent for many poor city dwellers. One-third of plastic bottles were recycled in 2001, out of a total of 270 000 tonnes generated (compared with 26% of 255 000 tonnes in 2000). Of the 887 000 tonnes of glass waste generated in 2002, 44% was recycled. There is still room for an expansion of recycling, which will continue to require waste-collection equipment, size reducers and separators.

Energy recovery from MSW is another option. Brazil's MSW has a relatively high organic content, and the tropical-subtropical climate creates favourable conditions for methane production in landfills. Methane recovery could both reduce national emissions of a potent greenhouse gas and provide a relatively clean fuel for generating electricity. About 50% of the country's methane emissions from waste and wastewater arise from just 13 landfills (25% from the two largest). It is estimated that methane reserves at these 13 landfills could sustain 60-144 MW of electrical generating capacity. Energy recovery from landfill gas currently is virtually nil (Lucon *et al.*, 2000).

Used tyres are a major problem. Demand for reconditioned tyres is much smaller than the volume of tyres discarded. Most used tyres are disposed of in landfills or, worse, burned in open dumps. One disposal option would be incineration in cement kilns, but the resulting emissions would make the kilns exceed their emission limits. Recycling tyres with a steel content of up to 40% poses an additional technological challenge, but also provides a promising opportunity. The National Tyre Industry Association has invested USD 500 000 in three recycling facilities in São Paulo.

Brazil has a backlog of around 100 million used tyres in need of proper disposal, and it is being prospected by developed countries as a preferential deposit for 900 million units annually. Imports of used tyres have been prohibited since 1991. Reconditioned tyres continue to be smuggled into Brazil from

Uruguay and Paraguay, however, and are represented as having been used and reconditioned locally. In the decade after the ban was imposed, an estimated 43 million used and reconditioned tyres entered Brazil, which itself generated 46 million used tyres in 2002 (ABETRE, 2003). A group of importers has tried to persuade Congress to legalise this trade within Mercosur.

Hazardous waste

Brazil generates nearly 3 million tonnes of hazardous waste each year, mainly in the south and south-east. São Paulo state alone produced half a million tonnes of hazardous waste in 1997. Only about one-fifth of the hazardous waste generated is appropriately treated or stored at environmentally licensed sites. The rest, more than 2 million tonnes a year, is disposed of in open dumps or water bodies, or stored on site pending an affordable disposal option. SMEs account for much of the problem; about 90% of large producers properly treat their waste. The Brazilian Association of Waste Treatment Companies has estimated that Brazilian industry generated USD 2.7 billion (BRL 5 billion) in environmental liabilities related to hazardous waste in a single decade (Agora São Paulo, 2002). Many companies cannot afford proper disposal of hazardous waste. The number of landfills capable of handling special waste is insufficient, and the costs of incineration — the main alternative to land disposal — are high.

Diffusion of toxic waste is a problem that has proved difficult to tackle. Only 10% of the packaging for agrochemicals is disposed of properly. Waste from high-tech equipment such as computers and mobile-phone batteries is not segregated. Medical waste is believed to be another problem, but no statistics are available on how much of it is generated annually or how it is disposed of. The heterogeneity of the waste stream makes it difficult for incinerator operators to meet emission standards. The one bright spot has been used batteries, which are required by federal law to be returned to producers by battery retailers or mailed back by consumers. This initiative owes its success to public pressure via information campaigns.

In 2000, the German company Bayer and a Brazilian partner established a joint-venture company in Rio de Janeiro state to manage industrial wastewater and hazardous wastes. Named Tribel, it provides landfilling and incineration services for around 150 clients. It faces stiff competition, especially from waste storage and dumping sites that do not comply with environmental regulations (Gazeta Mercantil, 2003). Tribel's integrated facility has annual wastewater treatment capacity of 150 000 population-equivalent and waste incineration capacity of 4 500 tonnes. Its internationally certified environmental laboratory carries out many types of physical, chemical and biological analyses on its own operations and for clients. Tribel's income in 2002 was USD 6 million (BRL 17 million). Its costs rose 35% in 2003 because of increases in energy and water prices and in taxes. Nevertheless it began investing USD 1 million for a landfill site and process improvements.

Air pollution from transport[17]

Brazil suffers from considerable problems with air pollution, especially in metropolitan areas, which contain about 70% of the country's population and industry. The deterioration in air quality is attributed to rapid urban development and increasing numbers of motor vehicles, which account for 80-90% of all inventoried emissions in the São Paulo metropolitan area (population: 16 million). Public transport is inefficient, a consequence of weak urban planning and a consumer preference for private vehicles.

[17] As regards air pollution from industry, the main markets for traditional end-of-pipe air pollution control are the pulp and paper, cement, chemical and petrochemical, fertiliser, steel, mining and electricity subsectors. Power rationing during the 2001 electricity shortage resulted in a slow-down of industrial activity but also created opportunities for engineering companies in optimising energy efficiency at factories.

In 1986, a national programme to control air pollution from new vehicles, called PROCONVE, came into force. Since then, significant improvements in pollution abatement have been achieved. PROCONVE has been extended to use vehicles with an inspection and maintenance programme that took effect in São Paulo city in 2004. Private companies, selected through international bidding, carry out the inspections. Regulations and standards, similar to those in PROCONVE, are being considered for urban buses and other diesel vehicles. The government is also looking into (i) providing incentives for promoting technology facilitating a switch from diesel to natural gas, (ii) using hybrid diesel-electric buses in some urban corridors, (iii) promoting the use of reduced-sulphur diesel and (iv) developing a large fleet of flexible-fuel (alcohol-gasoline) passenger vehicles.

Motorbikes in Brazil generate up to ten times the amount of pollution produced by cars equipped with emission-control technology, according to Roberto Pereira of the Association of Vehicle Emission Control Equipment Producers. Brazil manufactured 635 000 motorbikes in 2000 and, with production expected to grow by 20% a year, will soon be producing a million a year. In São Paulo alone, 250 000 motorcycles are used for delivery services, each averaging 200 km of travel a day.[18] In 2003, the government approved the first phase 1 of a motorbike emission control program called PROMOT, which is based on the European Union Standard Limits (EURO 1 and 2). Regulations specific to various fuel and engine combinations are systematically being developed. In anticipation of a Free Trade Area of the Americas, The Brazilian and Mexican vehicle industries are deepening ties for the alignment of , emission control technologies, so that complementary vehicles and parts can be developed, assembled and produced in both countries.

Cleaner fuel, especially lower-sulphur diesel, natural gas and ethanol, is another important part of Brazil's strategy to improve its air quality. Most fuel sold in Brazil has high sulphur content. For diesel sold in metropolitan areas the sulphur limit is 2 000 ppm (compared with 3 500 ppm in the rest of the country). In 2005, the maximum concentration of sulphur in diesel for metropolitan use was limited to 500 ppm of sulphur (dropping to 50 ppm by 2009), and the limit for diesel sold elsewhere will be 2 000 ppm (500 ppm by 2009). The sulphur content of petrol is also being reduced, to 400 ppm by 2005 and 80 ppm by 2009.

Production of ethanol from sugarcane has led to significant reductions in atmospheric levels of sulphur, particulates and the most dangerous aldehydes. Recent legislation to phase out the burning of sugarcane fields during harvest by 2020 will reduce life-cycle emissions from ethanol production. Brazil is the world's leading producer of ethanol, with output of some 13 billion litres a year (54% of the world total), followed by the United States with 6 billion litres a year. Annual ethanol consumption in Brazil is equivalent to 200 000 barrels of petrol. Ethanol is distributed via 26 000 pumping stations to 2.8 million specially equipped vehicles and to blenders of gasohol (a 3:1 blend of gasoline and anhydrous ethanol), which fuels 15.5 million cars and trucks and 3.5 million motorcycles. With government price controls on ethanol having been dropped in February 1999 and production costs down considerably (Box 2), hydrated ethanol can now be sold for 60-70% of the retail price of gasohol.

Until 1985, Brazil was the largest ethanol exporter to the United States. Then measures to protect U.S. producers of ethanol from corn (maize) excluded the Brazilian product from that market. U.S. tariffs increased Brazilian ethanol prices by 72%, reducing exports by 87%. Caribbean countries and Costa Rica are subject to agreed preferential regimes, with tariff-rate quotas above their production levels. American producers of corn-based ethanol are supported by local subsidies and an import tax (2.5% plus an excise duty of USD 0.54 per gallon) as part of the US policy to replace MTBE with US-produced ethanol in transport fuel. Ethanol fuels were subject in 1999 to an *ad valorem* tax of 2.6% by the US, plus a

18 . Brazil produced 635 million motorbykes in 2000 and 1 200 million in 2005. *Source*: ABRACICLO Statistics, Brazilian Association of Motorcycle Manufacturers, www.abraciclo.com.br.

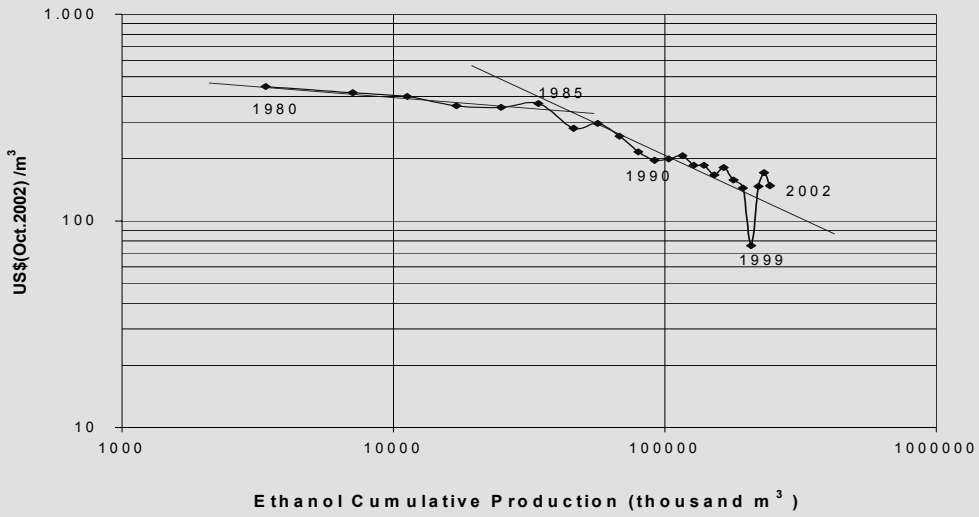
temporary specific-rate tax of USD 0.1427 per litre, which will remain effect through October 2007 (MDIC, 2003).

Box 2. Learning curves in ethanol production

The Brazilian Energy Initiative proposes a target of meeting at least 10% of global energy supply with renewables, with the possibility of trading in renewables certificates among countries. The aim is to push governments to introduce renewables even if they cost more at first. A mandatory target, it is thought, would act on the demand side of large markets in developed countries, reducing costs through the "learning-curve effect".

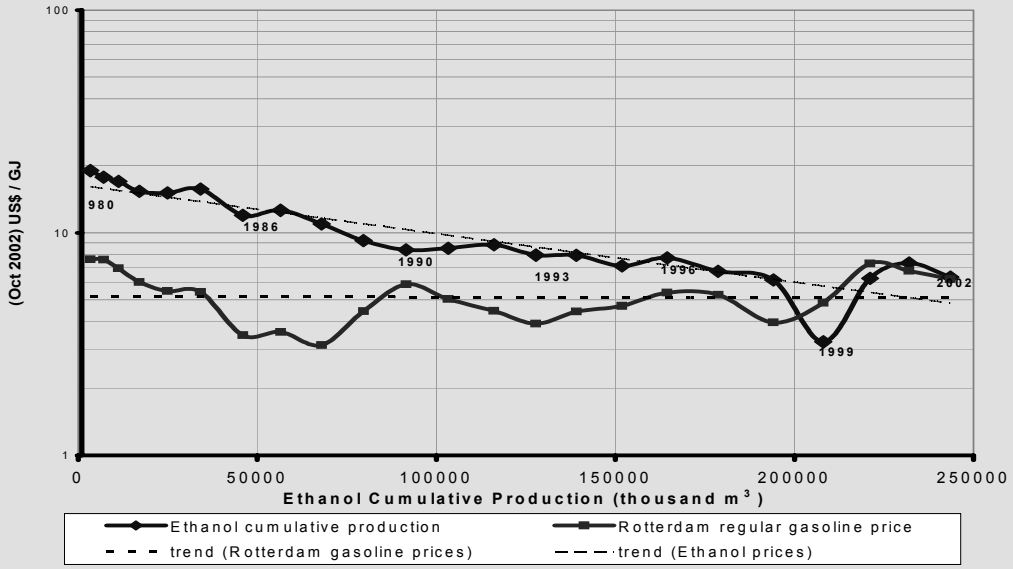
Figure A shows an example of a learning curve, drawn from the Brazilian alcohol programme, PROALCOOL. The programme was begun in 1975 to reduce oil imports by producing ethanol from sugarcane, which the government saw as yielding environmental, economic and social side benefits. It is now the world's largest biomass energy programme. Output grew from 0.6 million cubic metres in 1975 to 12.6 million m^3 in 2002, with an increasing productivity of sugarcane crops. Figure B shows ethanol as competitive with petrol over the long term.

Figure A. Ethanol learning curve: prices and trends



The price paid to producers (y axis) was converted to US dollars.

Figure B. Price paid to alcohol producers and Rotterdam petrol price



Prices were converted into USD per GJ of each fuel, assuming the low heating value of each one.

Source: Goldemberg *et al.* (2004).

Trends and recommendations

The major determinants of recent changes in national demand for EG&S derive, in the main, from pressures from residents of urban and industrial regions, from stricter enforcement actions and a change to periodic licensing (instead of a single permit for initial operation), and from companies' interest in meeting international standards such as ISO 14000. Municipalities are also becoming more active in environmental permitting and enforcement. Greater interest by communities in their environment has opened opportunities for services in monitoring and assessment. Foreign buyers of Brazilian products (especially in the chemical and petrochemical, metal-mechanical, textile and pulp and paper industries) are requiring changes as well.

Since 1990, trade liberalisation efforts have facilitated EG&S imports and exports. Brazilian companies, for example, are now managing landfill sites in Argentina. Industry can import pollution control equipment without significant problems other than those related to exchange rates. Technology transfer is not enough, however; technology must be adapted to local conditions,[19] which means capacity building and technical assistance. International development programmes and agencies such as the United Nations Development Programme, the U.S. Agency for International Development, GTZ (Germany), Environment Canada and JICA (Japan) have conducted projects in areas such as renewable energy sources, ozone protection, air-pollution monitoring, water-resource management, waste incineration, soil remediation and geographic information systems. Lessons learned in these projects have helped the private sector. For example, the cement industry now conducts comprehensive studies before using spent solvents in clinker ovens. Successful pilot projects on pollution prevention provided a leap in competitiveness in the

19 For example, Brazilian fuel tends to be heavier than its U.S. and E.U. equivalents.

textile, ceramic and metal-plating industries. Spent CFCs are now collected for recycling instead of being vented to the atmosphere.

In recent years, the Brazilian export industry has shown a dangerous trend of concentration in pollution-intensive activities. Such activities are vulnerable to disruption if importers impose restrictive measures, whether in the context of an agreed WTO framework or not (Young, 2002). Although the weight of environmental control in overall production value is relatively low, it can be significant for certain products, such as shoes. Trade liberalisation could result in the closure of obsolete polluting industries and investment in modernising equipment, thereby improving the economy's environmental profile as a whole. If growing investment remains in pollution-intensive sectors, however, the result could be an overall increase in emissions, even if average per-unit emissions are lower.

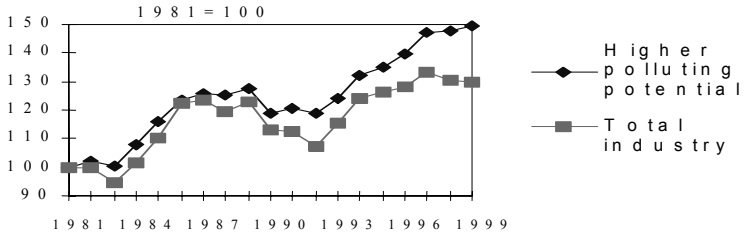
The fastest-growing industries in Brazil are precisely those that are the most emission-intensive (Young, 2002). Emission intensities calculated using the World Bank Industrial Pollution Projection System (Figure 4 and Table 6) show exports having a high concentration in emission-intensive industries. This is underlined by Table 7, which presents CO_2 emissions from fossil fuel burning in relation to production value.

Table 6. Emission intensities of the Brazilian industry (kg/USD million added value) associated to exports (E) and total production (T).

	Sector	1985	1990	1991	1992	1993	1994	1995	1996
Organic load - BOD	E	195	245	242	235	227	244	285	276
	T	252	265	268	265	253	246	248	253
Suspended Solids - SS	E	11726	14368	14973	13893	13786	13187	12976	13202
	T	6368	6091	6094	6216	6158	6131	5781	5792
Sulphur Dioxide - SO_2	E	3492	3817	3654	3498	3459	3538	3704	3678
	T	2389	2368	2356	2352	2322	2308	2244	2263
Nitrogen Dioxide - NO_2	E	1726	1663	1576	1536	1515	1543	1616	1562
	T	1287	1292	1283	1288	1259	1247	1213	1218
Carbon monoxide - CO	E	3152	3520	3520	3339	3329	3339	3388	3410
	T	2141	2114	2117	2118	2097	2102	2013	2037
Volatile Organic Compounds - VOCs	E	1176	1076	996	991	981	1008	1032	1002
	T	885	881	873	873	865	862	837	840
Fine Particulates - PM_{10}	E	546	610	584	568	578	565	585	584
	T	417	408	408	414	406	396	390	391
Total Particulates - PM	E	844	904	836	832	842	855	928	907
	T	649	638	637	647	634	623	618	619
Metallic solid residues	E	363	465	470	438	434	431	439	453
	T	219	213	212	211	211	212	203	206

Source: Young (2000)

Figure 4. Industrial production in Brazil, total and in emission intensive sectors, base year 1981.



Source: Young (2000)

Table 7. CO2 emission (from fossil fuels) intensities, Brazil, (kg CO2/BRL 1994).

	1990	1991	1992	1993	1994
E	0,634	0,702	0,637	0,607	0,635
T	0,302	0,324	0,325	0,32	0,326

E = exports; T = total production

Source: Young (2000)

EG&S trade liberalisation could lead either to the development of Brazil's environmental industry and "leapfrogging" into clean technology, or inhibit local environmental industry by extending the trajectory of end-of-pipe approaches. Lifting international barriers, moreover, will stimulate demand for EG&S in Brazil's steel industry, one of the world's major coal importers. In 1999, Brazil was the third-largest consumer of energy and the fourth-largest emitter of carbon in the western hemisphere.

The main barrier to development of EG&S is in terms of matching the break-even point between environmental enforcement and economic growth. To overcome this problem, key areas in need of attention are:

- capacity building and improvement of enforcement agencies as regards monitoring, impact assessment and knowledge about pollution prevention and control;
- more and better information to communities about EG&S;
- provision of "patient capital" and more access to financing;
- a better definition of EG&S so as to improve identification of trade barriers to be lifted;
- networking to improve the understanding of issues concerning EGS and to include them in the national regulatory frameworks;
- better statistics.

Brazil has a large potential market for EG&S, with particular promise in the air, water and waste sectors. The country has acquired significant experience in working towards sustainable development in areas such as cleaner energy and cleaner production, obtaining significant benefits from progressive trade liberalisation in EG&S.

REFERENCES

ABETRE (2003) www.abetre.com.br

ABIMAQ (2003) www.abimaq.org.br

AFEEVAS (2003) www.afeevas.org.br

Agora São Paulo 16/05/2002

AHKBRASIL (2002), Diagnóstico Ambiental das Empresas Associadas à Câmara Brasil-Alemanha http://www.ahkBrasil.com/diagnostico_amb_ahk.pdf

_____ (2002), O desenvolvimento do mercado ambiental na América Latina**,** http://www.ahkBrasil.com/mercado-ambiental2.shtml

BNDES (2003), http://www.bndes.gov.br

Borregaard, Nicola and Annie Duffey (2002), Environmental effects of foreign investment versus domestic investment in the mining sector in Latin-America. OECD-CIPMA, Paris http://www.oecd.org/dataoecd/45/21/1819617.pdf

Borregaard, Nicola, Annie Dufey, Zulma Guzmán, Ricardo Meléndez, Maurício López (2002), Bienes y servicios ambientales: una definición desde la perspectiva Latinoamericana. Rides, Santiago de Chile http://www.rides.cl/finalbienes.pdf

Brazilian Embassy - Washington D. C. (2001), U.S. Barriers to Brazilian Goods and Services. October 2001, http://www.brasilemb.org/barriers2001.pdf

CEC (1996), Assessing Latin American Markets for North American Environmental Goods and Services. The Commission for Environmental Cooperation, http://www.cec.org/files/pdf/ECONOMY/alame_EN.pdf

CETESB (2002), Inventário Estadual de Resíduos Sólidos Domiciliares, www.cetesb.sp.gov.br

Chaytor, Beatrice (2002), A Primer on Environmental Goods and Services: Definitional Challenges to the Negotiation of Further Liberalisation. Royal Society for the Protection of Birds (RSPB), UK http://www.field.org.uk/PDF/RSPB.pdf

CIA (2003), The World Factbook - Brazil

EBI (2000), The Global Environmental Market by Region. Environmental Business International, http://www.ebiusa.com

Fossil Energy International (2002), An Energy Overview of Brazil http://www3.fossil.energy.gov/international/brazover.html

Frickmann Young, Carlos Eduardo (2001), ALCA e Meio Ambiente: possíveis impactos sobre o Brasil. UFRJ-IE, www.fase.org.br/proposta/87/Carlos_Eduardo.PDF.

Claudio R. Gomes Conceição, Gazeta Mercantil - 25 Mar 2003

IBGE (2003), The Brazilian Institute of Geography and Statistics, www.ibge.gov.br

Industry Canada (2003), Brazil water and wastewater concession opportunities, http://strategis.ic.gc.ca/SSGF/dd73928f.html

Investe Brasil (2003), http://www.investeBrasil.org.br

Goldemberg, José, Suani Teixeira Coelho, Plinio Mario Nastari and Oswaldo Lucon (2004), "Ethanol learning curve, the Brazilian experience", *Biomass and Bioenergy*, Volume 26, Issue 3, March.

Latin Focus (2003), http://www.latin-focus.com/countries/brazil/braeisum.htm

Lucon, Oswaldo, João Wagner Alves, Sonia Manso Vieira, Tibor Kessler (2000), Barriers associated to the recovery of methane from landfills in Brazil. U. S. EPA 2nd International Methane Mitigation Conference, Novosibirsk, Russia.

Martins, Eliane Maria Octaviano (2002), Exame da políticas comercial do Brasil: Relatório OMC período 1999/2000. Magistra, 25 Nov 2002, http://www.tidona.com/pubblicazioni/novembre02_4.htm

MDIC (2003), Barreiras às exportações brasileiras, http://www.desenvolvimento.gov.br/comext/Deint/barreiraApresenta.html

Meio Ambiente Industrial Magazine (43) 42 May-Jun 2003.

MMA (2001), Comércio e meio ambiente: uma agenda positiva para o desenvolvimento sustentável. Documento preparado para a XIII Reunião do Fórum de Ministros do Meio Ambiente da América Latina e Caribe.

OECD (1999), *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis,* Paris.

OECD (1998*a*), "Future liberalisation of trade in environmental goods and services: ensuring environmental protection as well as economic benefits", COM/TD/ENV(98)37/FINAL. http://www.olis.oecd.org/olis/1998doc.nsf/LinkTo/COM-TD-env(98)37-final

OECD (1998*b*), *The Global Environmental Goods and Services Industry*, Paris.

OECD (2001), *Environmental Goods and Services, Benefits of Further Global Trade Liberalisation*, Paris.

Revista Gerenciamento Ambiental (2003) No. 40 - Investimentos em Saneamento: Muito Longe do Ideal
Revista Química e Derivados - N° 412 - Fevereiro de 2003 http://www.quimica.com.br/revista/qd412/efluentes3.htm

Togeiro de Almeida, Luciana (2002), "Comércio e Meio Ambiente nas Negociações Multilaterais", in *Comércio & Meio Ambiente: Uma agenda para a América Latina e Caribe*, MMA, Brasília.

TradePartnersUK (2001), http://www.tradepartners.gov.uk

U.S. DEPARTMENT OF COMMERCE (2002), Water and Wastewater Technologies Export Market Plan August 2002, International Trade Administration Washington, D.C.

U.S. DEPT. OF ENERGY DOE/EIA (2002), Brazil country analysis http://www.eia.doe.gov/emeu/international/brazil.html

UNCTAD (2002), Trade and Development Report 2002, Geneva.

UNCTAD (2003), Environmental goods and services in trade and sustainable development TD/B/COM.1/EM.21/2.

UNCTAD (1998), Strengthening capacities in developing countries to develop their environmental services sector. TD/B/COM.1/EM.7/2 12 May.

UNDP World Energy Assessment 2000**,** United Nations Development Programme, Washington, 2000

UNEP (2002) Final Report of the Seventh Meeting of the Inter-Sessional Committee of the Forum of Ministers of the Environment of Latin America and the Caribbean (Sao Paulo, Brazil, 15 to 17 May 2002) UNEP/LAC-IC.7/6

USATRADE (2002), Brazil Country Commercial Guide Vermulm, Roberto and Fábio Erber (2002), Estudo da competitividade de cadeias integradas no Brasil: impactos das zonas de livre comércio**,** Cadeia: Bens de Capital. UNICAMP-IE-NEIT, MDIC, MCT and FINEP.

World Bank (2002), The World Bank, World Development Indicators

WSSD (2002), Plan of Implementation, advanced unedited text. World Summit on Sustainable Development, Johannesburg, 5 September.

WTO (2000), Environmental goods and services: an assessment of the Environmental, economic and development benefits of further global trade liberalization, WT/CTE/W/172.

The authors acknowledge the valuable contributions of Ricardo Rose (AHKBRASIL), Paulo Massato, Edson Airudiand, Carlo Leonelli (SABESP) and Ernesto Araújo (MRE).

ANNEX 1
MAJOR MEAS SIGNED OR RATIFIED

MEAs and related agreements to which Brazil is a party [20]

- International Plant Protection Convention 6 December 1951 [1961]
- The Antarctic Treaty 1959 [1975]
- International Convention for the Protection of New Varieties of Plants (UPOV), (1961), as revised at Geneva, 1972, 1978 and 1991 [in 1999 ratified 1978 Act]
- International Convention for the Conservation of Atlantic Tunas 14 May 1966 [1969]
- International Convention on Civil Liability for Oil Pollution Damage London (as amended 19 November 1976 and 25 May 1984) 29 November 1969 [1977]
- Convention for the Conservation of Antarctic Seals 1 June 1972 [1991]
- Convention for the Protection of the World Cultural and Natural Heritage 23 November 1972 [1977]
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 29 December 1972 [1982]
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington), 1973 [1975]
  - Amendment to Article XI of the Convention (Bonn) 22 June 1979 [1987]
- Convention on the Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques 18 May 1977 [1984]
- Treaty for Amazonian Cooperation 3 July 1978 [1980]
- Convention on the Physical Protection of Nuclear Material 3 March 1980 [1987]
- Convention on the Conservation of Antarctic Marine Living Resources 20 May 1980 [1986]
- United Nations Convention on the Law of the Sea 10 December 1982 [ratified 1988; in force in 1994]
- Convention for the Protection of the Ozone Layer (Vienna), 1985 [1990]
  - Protocol on Substances that Deplete the Ozone Layer (Montreal) [1990]
  - London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (London), 1990 [1992]
  - Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (Copenhagen), 1992 [1997]
- Convention on Early Notification of a Nuclear Accident 26 September 1986 [1991]
- Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel), 1989 [1992]
- International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) (London), 1990 [1998]
- United Nations Framework Convention on Climate Change (New York), 1992 [1994]
- Convention on Biological Diversity (Rio de Janeiro), 1992 [1994]

20. The figure in brackets indicates the date at which the MEA entered into force in Brazil

- United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, (Paris) 1994 (1996).
- International Tropical Timber Agreement, (Geneva) 1994 [1997]

MEAS signed or ratified but not yet in force[21]

- Convention on the Regulation of Antarctic Mineral Resource Activities 2 June 1988 [signed 1988]
- Protocol to the Antarctic Treaty on Environmental Protection 4 October 1991 [signed 1992]
- The Kyoto Protocol to the United Nations Framework Convention on Climate Change (Kyoto), 1997 [ratified 2002]
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention on PIC), 1998 [signed 1999]
- Stockholm Convention on Persistent Organic Pollutants (POPs), 2001 [signed 2001]

21. The figure in brackets indicates the date at which the MEA was signed or ratified by Brazil