



**Sustainable consumption and production, mining, transport,
chemicals and waste management: the results, trends and
challenges of sustainable development in Latin America and
the Caribbean**

Draft



UNITED NATIONS



This is a preliminary document and has not been submitted for editorial revision. ECLAC is grateful for contributions by the focal points of transport, chemicals, mining, waste, and sustainable consumption and production of the United Nations Department of Economic and Social Affairs (DESA), the United Nations Environment Programme (UNEP), the Food and Agriculture Organisation (FAO), the United Nations Institute for Training and Research (UNITAR), the Organisation of American States (OAS), the Strategic Approach to International Chemicals Management (SAICM) and to the countries of the region, individually, through their national reports. Please send any comments, corrections or suggestions to Marianne Schaper (marianne.schaper@cepal.org).

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Sustainable consumption and production, mining, transport, chemicals and waste management: the results, trends and challenges of sustainable development in Latin America and the Caribbean

**Report for the Regional Implementation Forum on Sustainable Development (ALC)
In preparation for the eighteenth session of the United Nations Commission on Sustainable Development**

1. INTRODUCTION

This report is a contribution prepared by the Economic Commission for Latin America and the Caribbean (ECLAC), the purpose of which is to guide discussion during the Regional Implementation Forum on Sustainable Development to be held as a preamble to the eighteenth session of the United Nations Commission on Sustainable Development (CSD).

The top issues to be addressed during this eighteenth session will be: sustainable consumption and production as a guiding paradigm for development; mining, as an activity of great importance to many of the region's economies, with heavy impact on environmental sustainability; transport, which is undergoing significant change that has contradictory effects on sustainability, primarily in urban areas; chemicals, which due to Latin America's heavy agriculture production present a diffuse, albeit serious, problem; and, lastly, solid waste, a topic surrounding which many important activities are taking place in the region that need to be publicized and promoted while remaining conscious of the persistent and multifaceted problems related to social and environmental sustainability.

It is important to note that this report relies on sources that include data provided by national reports delivered to the CSD, which have been incorporated as they have come in. However, it is possible that many relevant experiences are not reflected in this preliminary version. Therefore, the report is still open to new inputs from countries.

This text has been prepared so as to emphasize advances by the countries, but it also points out persistent barriers that keep some of the most sustainable options for addressing the issues from being properly developed. There are many more challenges than full-fledged achievements, but the report seeks a vantage point from which to see some of the paths the countries of the region have taken, good

practices that might point to opportunities for others to move forward successfully on the road to sustainability.

Lastly, it should be noted that in many cases there are overlaps among the issues selected for examination during this biennial cycle of the CSD. As in prior occasions, the issue of sustainability not only presents areas where economic, social and environmental dimensions converge, but also within the issues there are areas that require integrated action. Once again, this calls for broader approaches that encompass more than the scope of any single sector.

2. SUSTAINABLE CONSUMPTION AND PRODUCTION

*Sustainable consumption and production (SCP)¹ is defined as
"production and the use of goods and services
that meet basic needs
and improve quality of life
minimizing the use of natural resources,
toxic materials, as well as the generation of waste and pollutants
over the life cycle of goods and services,
without undermining the capability of
future generations to satisfy their own needs"*

A. Priorities of Latin America and the Caribbean in the ten-year framework of programmes on sustainable consumption and production patterns

1. Introduction

During the Rio Summit in 1992, the issue of sustainable consumption and production (SCP) took shape as Agenda 21. Ten years later, at the World Summit on Sustainable Development in Johannesburg (2002), all countries agreed that the eradication of poverty, the change to sustainable production and consumption patterns and the protection and management of natural resources are fundamental objectives of sustainable development. In this context, the Johannesburg Plan of Implementation Plan (JPI) establishes, in Chapter III, the commitment to develop a ten-year framework of programmes (10YFP) to support regional and national projects and to accelerate change toward sustainable consumption and production patterns, for the purpose of fostering social and economic development while sustaining the capacity of ecosystems.

In response to this commitment, and to fulfil chapter II of the JPI, the Marrakesh Process² was initiated, coordinated by the United Nations Environment Programme (UNEP) and the United Nations Department of Economic and Social Affairs (UNDESA). This is a worldwide, informal process that engages the experts of multiple stakeholders (Governments, development agencies, private sector, civil society and others) for the purpose of accelerating the change to sustainable consumption and production patterns and for developing a "global action framework on SCP", known as the Ten-year Framework of Programmes Contributions arising out of the Marrakesh Process are to be presented to the

¹ See the final report on the V Meeting of the Council of Government Experts on Sustainable Consumption and Production for Latin America and the Caribbean, 16 to 18 September 2009, Cartagena de Indias, Colombia, <http://www.redpypcs.net>

² The first international meeting on development and the 10YFP was held in Marrakesh, Morocco, in June 2003, which is why it is called the "Marrakesh Process"

Comission on Sustainable Development (CSD), for addition to Agenda 21 and the JPI. The CSD will revise the 10YFP proposal during 2010-2011.

Following several regional and international consultations, the first draft of the 10YFP has been prepared, with the following issues considered most in need of worldwide attention:

- a. Political and institutional framework and integration of SCP into national development plans
- b. Inter-sectoral opportunities (small and medium-size enterprises (SMEs), corporate social responsibility (CSR), sustainable procurement, education)
- c. Sectoral approach: Mobility and transport; building and construction; food and agriculture; sustainable tourism
- d. Efficient resource management: energy, water and waste.

2. The political response of Latin America and the Caribbean to the commitment on SCP

In response to the international commitment on SCP, the region of Latin America and the Caribbean has engaged a series of actions that seek to bolster the region's sustainability strategy through changes in the way it consumes and produces. In 2003, at the Forum of Ministers of Latin America and the Caribbean, the Council of Government Experts on SCP was formed for the specific purpose of monitoring national environmental agencies, advising the forum of Ministers of Environment and to extend involvement to the private sector, academia, NGOs and other civil society organisations.

Based on subsequent recommendations made by the Council, the Ministers of Environment decided, in 2008, to include SCP as one of the specific priority areas of the Latin American and Caribbean Initiative on Sustainable Development and its Regional Implementation Plan, to show that SCP had become important to the regional political agenda.

Sub-regional agencies have also made strides along the same lines. In 2007 the countries of MERCOSUR approved a common policy for cooperation and promotion of sustainable production and consumption; the Andean Community decided the issue should be a core item on its Andean environmental agenda for 2006 – 2010. The Central American Comission on the Environment and Development (CCAD) passed a decision to develop a Regional Policy for Sustainable Public Procurement.

The priority areas for SCP, shared in common by all countries in the region, as defined through Council meetings and by decisions taken in the Forum of Ministers, and are as follows:

- a. Open roundtable dialogues and participative processes
- b. National SCP policies and strategies
- c. SCP in small and medium enterprises
- d. Sustainable public procurement
- e. Regional information network for SCP

The Marrakesh Process has made suggestions to the CSD aimed at advancing the agenda and are now part of Agenda 21 and the JPI. Given the multidisciplinary nature of the SCP concept and of the 10YFP, these could lend a supportive role to other United Nations objectives, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Millennium Development Goals (MDGs). The 10YFP can also be seen as an important implementation tool to help execute public policies, environmental management practices, investments, technologies and capacity building activities needed to build a "green economy"³.

Therefore, it is of vital importance that common principles and key priority areas be defined that respond to international, regional and national needs, focusing collaborative efforts on these specific activities (based on priorities, needs and regional and national programmes. The ten-year framework of programmes should also provide incentives that encourage all stakeholders to make specific commitments to SCP, and then to support them (UNDESA, UNEP, 2009).

In this context, the 10YFP proposal presented to the CSD in 2010 will include national and regional priorities for Latin America and the Caribbean, which will cover achievements, international commitments and challenges yet to be faced.

The ECLAC Regional Implementation Meeting, along with support from the Government of Guatemala, will be an important event for defining contributions the region will present to the CSD for inclusion in the 10YFP. The main challenge will be to communicate to decision-makers the economic, social and environmental benefits of SCP practices, especially in sectors that rely heavily on natural and environmental resources. This will earn the political support needed to develop the 10YFP and to actively engage Governments, the private sector and civil society in the process.

3. Advances on the life cycle perspective⁴

The perspective of economic systems having a life cycle is being applied as a tool that enables a structured and integrated conceptualization of SCP, which is quite broad. The application of a life cycle perspective to the economic system, provides a means for structuring and developing a general approach for the ten-year framework of programmes, and also identifies clear entry points for actions and actors. It allows for focusing on production or consumption separately or as integrated parts, with consideration given to the economic, social and environmental impacts of products and services throughout their life cycle.

The life cycle perspective is based on the total use of resources that come into play in the production of goods and the provision of services, as well as their resulting emissions and waste. The phases of the life cycle of products and services can be seen in the center of Diagram 1.

³ UNDESA and UNEP (September 2009), contributions proposed for CSD 18 and 19 in a ten-year framework of programmes on sustainable consumption and productions (third public draft).

⁴ Based on UNDESA and UNEP, 2009

The use of resources and emissions during each phase of the life cycle depends to a large measure on the overall political context affecting the whole system, and on specific regulations that affect each phase. It also depends on social values and preferences, as well as on technological innovation, which itself is influenced by the legislative and regulatory environment.

A study by UNEP and The Society of Environmental Toxicology and Chemistry (SETAC)⁵ on the progress of some countries in implementing the life cycle perspective to the economic system casts some light on the advances some countries in the region have made. These advances, through October 2008, are summarized in the table below:

Table 2.1
Advances in implementation of the life cycle

Country	Regulations in place that use the life cycle perspective	Sectoral assessments in place on life cycle	Number of experts identified in each country
Argentina	No	No	12
Brazil	Yes	Yes, there are assessments on 8 refinery products	42 (probably underestimated)
Chile	No	No	8
Colombia	Yes	No	12
Costa Rica	Being developed	Yes, assessments on energy	8
Cuba	No	Yes, assessments on the sugar industry	10
Ecuador	No	No	1
Mexico	Yes	Yes, for fuels, chemicals, construction materials, waste treatment, paper and agribusiness	20
Peru	No	No	8
Uruguay	No	No	3

Source: UNEP/SETAC (2009)

B. Trends in sustainable consumption and production patterns in selected sectors⁶

In Latin America and the Caribbean over 77 per cent of the population lives in urban areas, with estimates that this figure will be 90 per cent by 2050. This will have serious implications

⁵ Valdivia, S., Sonnemann, G.(2009) Evolution of Life Cycle Thinking in Latin America – An analysis conducted in October 2008 by the UNEP/SETAC Life Cycle Initiative

⁶ Based on UNEP/CEGESTI, 2009

on sustainability, including pressure on urban infrastructure, waste management, transport, etc.

Private consumption in Latin America and the Caribbean, whose total population represents 8.5 per cent of world population, accounts for 6.7 per cent of total world private consumption⁷. Compare this with, for example, the United States, which with only 5.2 of the world's total population, accounts for 31.5 per cent of private consumption; or East Asia and the Pacific Region, whose 32.9 per cent of world population accounts for 21.4 per cent of worldwide private consumption. It is important to point out that, although private consumption in the region is low compared to world levels, the rates of consumption for the region have grown significantly in recent years and have not been accompanied by a substantive decline in poverty levels.

The challenge is to reduce poverty and improve the quality of life by decoupling economic growth from environmental degradation, using new ways of production and consumption and modifying the growth path of economies.

1. Agriculture

The agriculture sector is strategic for the region's development, not only because it produces food, but also because of its contribution to export revenues and employment.

However, agriculture is also the primary consumer of natural resources and contributes to the depletion of subterranean water sources, pollution by agrochemicals, soil degradation and world climate change. The environmental impacts attributable to agriculture are:

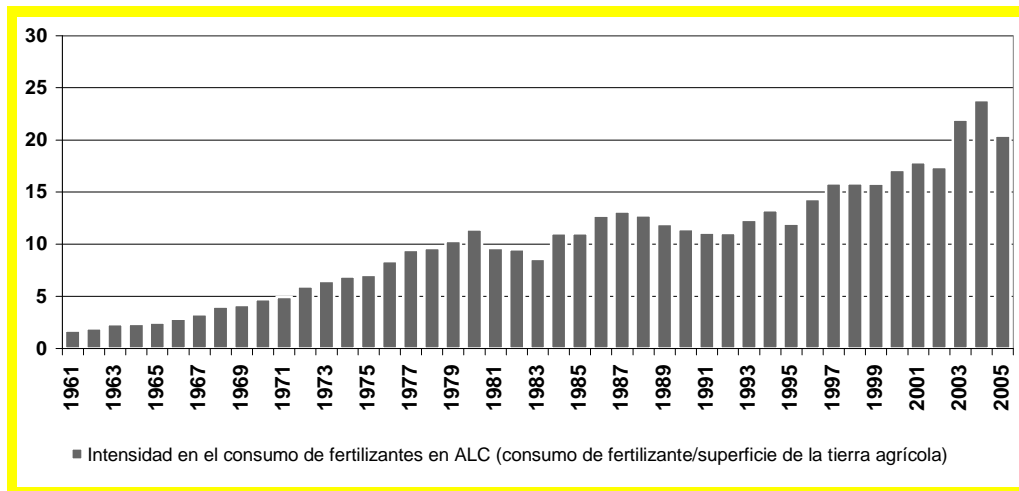
- Air, water and soil pollution (from the use of fertilizers and agrichemicals)
- Elimination of solid waste
- Resource consumption (primarily water)
- Changes to land use
- Desertification and the loss of biodiversity

Farming activities account for 70 to 80 per cent of total water consumption. Experience shows that there are a limited number of countries that practice precision monitoring of water used for farming.

It is estimated that 15 to 35 per cent of water drawn for irrigation is not being used sustainably, because it exceeds renewable supply; in other words, aquifers are being refilled at rates that are less than what is required to supply enough water to sustain the viability of ecosystems (World Bank, 2008).

Another important aspect to consider is the chemical pollution of soils due to the aggressive use of fertilizers, pesticides and herbicides. Fertilizer consumption for farming purposes can be seen in the table below:

LATIN AMERICA AND THE CARIBBEAN: FERTILIZER CONSUMPTION 1961 - 2005
(In tons per 1,000 hectares)



Source: ECLAC, 2008

The figure depicts the heavy increase in the consumption of fertilizers over the past 60 years, mostly in recent years. This growing trend of the use of chemicals in treating soils and crops creates an accelerated process of pollution of soils and aquifers.

2. Tourism

The tourism sector is very important to many Latin American countries, especially those in the Caribbean and some in Central America. Tourism represents as much as 20 per cent of GDP for the Caribbean, less than 5 per cent in most countries of Latin America (though almost 10 per cent in the Dominican Republic, Panama and Costa Rica).

Development of this industry can also be combined with conservation of the natural resources that feed it. However, tourism can also have many negative impacts related to the direct production of solid and liquid waste and indirect production of air pollution, as well as the indiscriminate consumption of electricity, fuel and water.

The supply of tourism, which is differentiated in some areas of the region, mainly in the Caribbean and Central America, includes the following types:

- Rural community tourism: Small rural hostels are not found in the tourist centers with heaviest traffic, but in small rural communities, natural reserves or indigenous lands where lifestyles have not changed to adapt to the tastes and needs of tourists. This type of tourism is being most heavily developed in Peru and Costa Rica.
- Ecotourism: "Environmentally responsible trips to natural areas, for the purpose of enjoying and appreciating nature (and any cultural element, either past or present), which promotes conservation, produces low impact by visitors and provides for the active socioeconomic participation of the local population."

- Agritourism: Is a form of rural community tourism. This includes visits to dairies, coffee plantations, farms, river fishing and other activities.
- Cruise ships: Since the cruise ship industry began, the Caribbean region has been the destination of preference for tourists (41.6 per cent of worldwide cruise tourism in 2008). There is no question that, as is the case with other modes of maritime traffic, cruise ships represent a threat to the environment. One of the major challenges is to blend cruise ship activities with the development of sustainable tourism that seeks to minimize adverse impacts on the environment, culture and the everyday life of citizens.

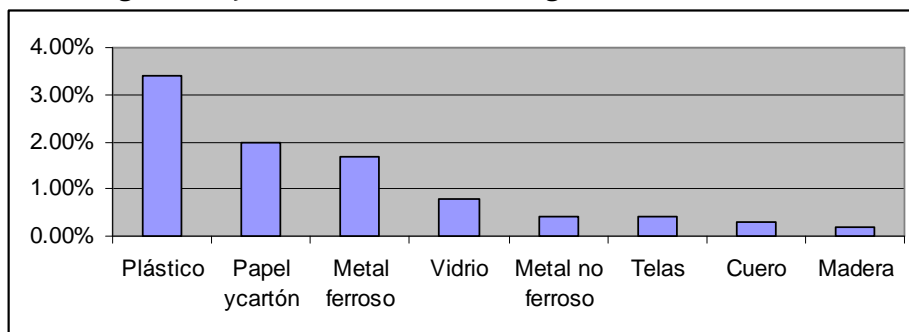
Because of the wide range of terms used (ecotourism, rural tourism, agritourism, safari tourism and others), there are no reliable data on how much is spent on ecotourism (which would be needed in order to gather statistics on its weight vis-a-vis "traditional sun-worshipping" tourism; as such, statistics of annual growth in this type of tourism vary between 10 and 30 per cent.

3. Waste

Integrated solid waste management is one of the greatest challenges for the region's central and local Governments, health and environmental authorities and society in general. This issue is directly linked to a population's consumption style and to the production methods used by industries, because both account for the growth in volume (and type) of waste, the collection, transport, treatment and disposal of which demand solutions. Here is one statistic: only 23 per cent of municipal waste produced in the region is disposed of in a proper sanitary manner.

The average waste produced in the region is 0.91 Kg/pers/day (less than the average for industrialized countries, such as the United States, 2.02 Kg/pers/day; France, 1.29 Kg/pers/day; or Japan, 1.12 Kg/pers/day) (PAHO, 2005). In addition to the potential that exists for programmes that influence consumption habits, there is also much potential for improving practices of ultimate waste disposal, with recycling programmes still nascent in many cities, a fact borne out by the region's low percentage of recycled materials.

Percentage of recycled materials in the region



Source: PAHO

With its low purchasing power, 56 per cent of the region's waste is of putrescent organic origin, on average (compared to, for example, 24 per cent in the United

States). Likewise, within the region, in cities that have the highest economic strata, the percentage of waste materials such as paper, plastic and cardboard is higher (for example, in Mexico City the percentage of putrescent organic waste drops to 44 per cent). (PAHO, 2005).

C. National and regional programmes aimed at changing unsustainable consumption and production patterns

1. National advances in SCP

SCP issues must be integrated into various policies that guide a country's development – social, economic, productive, transport-related, energy-related, etc., given that each of these policy areas is affected by the "cause" or the "effect" of consumption and production patterns. Barely 40 per cent of countries that have SCP-promoting instruments have managed to see these integrated into their National Development Plans, and another few have handed over the design and/or execution to other agencies of the public sector, such as those involved in the economy, transport, etc., which is a truly positive step. Only 14 per cent have kept their SCP mechanisms or instruments within the confines of the environmental authorities.

A recent study on the progress in SCP for the region (UNEP/CEGESTI, 2009), reveals some interesting outcomes related to national policies and programmes to encourage sustainable consumption and production.

Fourteen of 20 countries indicated that they have some sort of mechanism for accelerating a changeover to sustainable consumption and production in their countries; these mechanisms were identified to be: policies (35 per cent), programmes (20 per cent), projects (10 per cent) and plans (5 per cent). SCP issues must be integrated into various policies that guide a country's development – social, economic, productive, transport-related, energy-related, etc., given that each of these policy areas is affected by the "cause" or the "effect" of consumption and production patterns.

Half of these areas have seen some sort of formal measure implemented, either a law, a decree, or some other instrument including ministerial agreements, resolutions or some other type of administrative approval, which is very positive considering the degree of integration and participation seen by the public sector as it promotes sustainable consumption and production.

Despite this advance in the formal definitions of mechanisms, progress in terms of implementation of specific actions with measurable outcomes is not as auspicious. Over 80 per cent of countries said they had made no major advances, which is understandable given that most of these mechanisms have only existed since 2004, which means that they have not yet been integrated fully into the national agendas of the countries.

1.1 Argentina:

Sustainable Production and Consumption Policies

The SCP programme is currently being prepared. In 2003 the National Policy on Clean Production was approved, whereas in 2005 the Sustainable Consumption Programme was launched. A consultancy process with the various stakeholders is currently underway to establish a Consumption Policy, which will then become part of the joint Policy on Sustainable Consumption and Production. The programme is still going through the consensus-building process.

This SCP programme was designed to change industry's long-term perception of sustainable development and to promote the creation of sustainable markets by building models of sustainable consumption.

The SCP programme has a specific geographical and sectoral focus, targeting eight provinces that have the greatest potential for economic growth and the sectors that have the greatest potential for environmental impact, including paper factories, tanneries, electroplating plants, slaughterhouses, chemical plants and citrus fruit and sugar processing plants.

1.2 Barbados:

Modification of consumption patterns in Barbados, through the National Sustainable Development Action Plan

"Consumption patterns" are entered as a priority under the National Sustainable Development Action Plan. Barbados is performing a situation assessment to identify all currently active actions and programmes having to do with sustainable consumption and production.

The Action Plan establishes that use of ecological labelling so that, by educating consumers, they can become active participants in changing consumption patterns.

1.3 Brazil

National Action Plan on Sustainable Production and Consumption

This plan was approved by Ministerial Decree 44, of 13 February 2008. Its organisational structure is made up of a National Management Committee for Sustainable Production and Consumption, the Ministry of the Environment, state boards for cleaner production (with representation by stakeholders in each state) and a network of state boards for cleaner production. The defined priorities are:

- Integrate production, consumption, environmental and social policies
- Promote dialogue and cooperation among the productive sector, governments and civil society for practicing SCP
- Innovate SCP technologies
- Develop SCP indicators

- Awareness and training in SCP
- Promote voluntary SCP initiatives
- Implement of international SCP-related conventions

1.4 Costa Rica:

National policy for cleaner production and sustainable consumption

The SCP issues included under chapter 4 of the National Development Plan (2006-2010), titled: Directive for Environment, Energy and Political Telecommunications, are being considered. In October 2007 a six-month Volunteer Project on the cleaner production agreements was launched.

To improve competitiveness in the productive sector, including environmental issues in manufacturing processes, the policy will be in force for a five-year period. The time frames for the Cleaner Production voluntary agreement projects will vary according to issue.

The priorities are: institutional capacity building and updating environmental regulations (compliance and preventing noncompliance).

1.5 Colombia

National policy for cleaner production

Colombia has made a big effort to include the concept of sustainable development in its National Development Plan, and in 2007 demonstrated its commitment through the creation of government agencies to address sustainability.

An example of this commitment was the creation of the Environmental Programme for Corporations and Industries, which targets manufacturing and seeks to build awareness and behaviour that are consonant with sustainability.

As for the country's production patterns, the 1997 National Policy for Cleaner Production and subsequent agreements with the private sector demonstrate the Government's commitment to fostering more sustainable production. Current analysis of the policy and a progress assessment will increase awareness of opportunities and fundamental issues related to sustainable production. The Government, along with UNEP, is redefining an integrated SCP policy. Although the policy addresses energy efficiency and the sustainable use of natural resources, there is not yet a specific programme or policy for SCP (UNEP, 2008).

1.6 Chile

Country programme for energy efficiency

Chile places special emphasis on energy-related issues: Chile has a country programme for energy efficiency, as well as a clean production policy that focuses on innovative and sustainable energy solutions. Recently this issue has grown in importance on the national agenda because Chile has been facing crisis-level energy shortages since 2008 (UNEP, 2008).

1.7 Jamaica:

National policy for cleaner production and sustainable consumption

The strategy was approved in 2004, by the central Government. Policies for SCP have been included in Jamaica's National Environmental Action Plan (JaNEAP) 2006-2009. The JaNEAP has clear and concrete objectives, with measurable progress indicators. The National Development Strategy takes a broader perspective in achieving a "vision for sustainable development".

The JaNEAP was initially approved by the Cabinet in 1995. The plan underwent major revisions in 1999 and 2006. A specific section of the JaNEAP is dedicated to SCP and includes a number of policy mitigation initiatives. Continued work is expected on SCP issues.

The JaNEAP focuses on the environment and has 16 issue areas, many of which are related to SCP, such as green consumption, demand management and environmental systems management. It also tracks external effects, such as biosecurity issues and transboundary movements of hazardous waste.

The JaNEAP 2006-2009 has a set of indicators that will be monitored. Follow-up will take place in NEPA with support from the consultative committee. Situational reports on the measures will be presented annually. The criteria are, to a great extent, being established based on the amount of available financial resources and institutional capacity. These quantitative indicators are, to a great extent, related to the MGDs and are also tied to other regional and national information systems. It is expected that JaNEAP and its outcomes will become part of the National Sustainable Development Plan that is currently being implemented by the Jamaica Planning Institute.

1.8 Mexico:

Sustainable public procurement

Mexico has been working on the issue of sustainable public procurement since 1999. Since then, it has achieved important outcomes regarding regulation, as, for instance:

- General law on ecological equilibrium and environmental protection (LGEEPA – DOF 13 jun 2003): includes an article that obligates all agencies and departments of the three branches of Government to develop manuals for environmental systems management and with it to put into place a series of beneficial measures, not only on matters related to procurement.
- Law for building competitiveness of micro, small and medium enterprises (DOF 30 December 2002, latest reform on 6 June 2006), which includes the order that the Government implement procurement planning for goods, services and public works in order to gradually channel those opportunities to SMEs until they account for a minimum of 35 per cent.

- Decree that reforms and adds to several provisions of the law on procurement, leases and public sector services; the law on public works and related services; the federal law of administrative responsibilities of public servants; an of the federal penal code (DOF 28 May 2009). This law indicates that when it comes to procurement of wood, furniture and office supplies made of wood, third-party certificates must be required, registered in advance with the SEMARNAT and guaranteeing the origin and sustainable management of the forests from which the wood was taken.

1.9 Panama⁸:

National policy for cleaner production (approved in 2007)

Specific objective 1, regarding environmental management: To design, execute and stimulate cleaner production strategies that prevent negative environmental impacts stemming from productive activities.

Specific objective 2, regarding training, research and productive efficiency: Support the development of research and training programmes in cleaner production and generate relevant environmental data that will allow for the determination of the best cost/efficiency options for investment decision-making. Strengthen technological innovation aimed at improving efficiency of productive processes and seeking to minimize waste while optimizing the use of inputs.

Specific objective 3, regarding the development of markets and management instruments: Create conditions for market development for cleaner production goods and services, seeking to build supply and demand for instruments that drive improved environmental behavior within the productive sector.

Specific objective 4, regarding institutional matters: Build management and inter-institutional coordinating capacities of the public sector and its joint efforts with the private sector to develop and implement cleaner production strategies, plans and programs.

Specific objective 5, regarding citizen involvement: To promote the involvement, integration and responsibility of all sectors of society, taking into account gender equality, in the development of cleaner production.

⁸ Source: http://www.anam.gob.pa/joomla/images/stories/ena/DECRETO_EJECUTIVO_No_36.pdf.

2. Sub-regional advances in SCP⁹

2.1 Caribbean sub-region

The region has signed several conventions, among which is chapter 14 of the Mauritius Implementation Strategy (MIS) and the Revised Treaty of Chaguaramas development strategy, which are in line with the SCP strategy. Challenges include the integration of (1) financial mechanisms, (2) the definition of SCP, (3) policy analysis and development, (4) coordination and integration of the revised treaty, multilateral agreements on the environment, trade agreements, national assessments and (5) the lack of a governing mechanism.

Low levels of awareness and the lack of consumer responsibility are also evident in the region. Countries encounter internal competition for the attention on environmental issues; for example SCP and climate change. There is a shortage of information about SCP implementation policies. But countries are focused on renewable energy, ecotourism, waste management, green purchasing, environmental management systems and energy supply and demand management. Sub-regional implementation mechanisms include the Caribbean Assistance Service, a programme for consumers about sustainable ways of living.

The region needs support to:

Consider life cycle approaches

offer a knowledge hub about SCP for the Caribbean

Develop capacity at national and subregional levels, in coordination with priorities for SMEs, ecoefficiency, SCP policy assessments and participation of developing countries in the Marrakesh Process.

2.2 Andean sub-region

The region's Andean Environment Agenda 2006-2010 has the following priorities: cleaner production, national policy capacity building, including several sectors not very focused on consumption.

An agreement with UNEP provides assistance in capacity building for policy implementation. For the purpose of developing an SCP strategy for the region, a Group of Andean Consumers was formed in 2003. The group focuses on responsible investment and capacity building. Activities include subregional technical standards to improve national standards for evaluating the life cycle of batteries, as well as a consumer awareness campaign.

2.3 Mesoamerica sub-region

⁹ See the final report on the V Meeting of the Council of Government Experts on Sustainable Consumption and Production for Latin America and the Caribbean, 16 to 18 September 2009, Cartagena de Indias, Colombia, <http://www.redpys.net>

Cleaner production activities have been approved in El Salvador, Nicaragua, Panama and Honduras. In Nicaragua, Costa Rica, Guatemala and Honduras, both the Governments and the private sector recognize the need for cleaner production initiatives. The region is working on the development of a national price for environmental, energy and materials management. Sectoral priorities are being developed, as well as technical standards for energy efficiency.

The region's sustainable development alliance includes a cleaner production plan for 2005-2010. Inventory was taken of waste with potential market value for the purpose of supporting an electronics waste aftermarket (for Guatemala, El Salvador, Honduras and Panama). Sustainable public procurement was added to the Inter-American Government Procurement Network (IGPN).

A regional environmental strategy was approved at the presidential summit of 2008. The objectives are to increase competition by promoting trade in environmentally friendly agriculture, products and services, as well as traditional products of SMEs, and to increase local and national demand. The region also has a regional policy for sustainable procurement.

2.4 Southern Cone sub-region

Certification has been debated in the sector since 2002. Since 2007 the German Technical Cooperation (GTZ) was implemented as an approach toward cleaner production in the MERCOSUR countries. Unfortunately, the project came to an end with all related tasks unfulfilled. MERCOSUR has had an SCP policy since 2007 and an action plan that covers seven areas:

- Dialogue and cooperation
- Consumption and production practices
- Technological innovation
- SCP inclusion in formal and informal education
- Capacity building and information sharing
- Role of SMEs
- Sustainable procurement

The European Community backed an eco-standards project and several other projects such as cleaner production to reduce desertification, eco-labelling and the creation of a fund to support best practices focused on poverty reduction. The most important sectors include construction, tourism and corporate social responsibility. The retail and services sector, which includes the informal sector (49 per cent), is very important to the region, followed by the manufacturing industry and the primary sector.

The issues in which countries are involved in bodies or international/regional programmes related to SCP are:

Bodies and issues in which countries are involved in SCP

Instancia	Issue in which they are involved
CCAD	Tourism and production
	Regional Inter-institutional Committee for Cleaner Production
	SCP
	Green purchasing
Forum of Ministers	Consumption, production
	Sustainable housing
Andean Community	Andean Environmental Agenda (SCP is a crosscutting item)
UNEP	APELL program
	UNEP Hg Programme – National Hg emissions inventory
	Reports to the United Nations Commission for Sustainable Development
	Meetings of SCP experts from Latin America (one country mentioned this)
MERCOSUR	Cleaner production
	SCP
	SGT6-Environment working sub-group
	Forum of Ministers of the Environment (MERCOSUR)
Marrakesh Process task Task	SCP
	Sustainable lifestyles
	Sustainable tourism (green passport)
United Nations Framework Convention on Climate Change (UNFCCC) – Forum of national authorities appointed for MDGs	MDG
CARICOM	Council for trade and economic development (Ministers of Environment Forum)
	Reducing pesticide runoff to the Caribbean Sea
Stockholm Convention	Chemicals management
Basel Convention	Chemicals management
Strategic Approach to International Chemicals Management (SAICM)	Chemicals management
Commission for Environmental Cooperation	North American Green Purchasing Initiative (NAGPI); a collection of data tools on environmental procurement; examination of possible environmental goods (“ecological palm” and “shade grown coffee”) for development for markets; sustainable construction; training
Organisation for Economic Co-Operation and Development (OECD)	Sustainable transport, environmentally friendly homes

Source: UNEP/CEGESTI 2009

D. Advances, barriers, opportunities and best practices

If the SCP concept is to be viable in Latin America and the Caribbean, the path to economic growth must change so as to integrate new ways of producing and consuming that improve the quality of life for the people, decoupling economic growth from the use of natural and environmental resources. This also means changing the investment flows in the productive sector: today's investments define tomorrow's production and consumption. If foreign direct investments continue to focus on traditional sectors that are largely tied to exploiting natural resources and environmentally sensitive industries (ESI)¹⁰ and on increasing the competitiveness of those sectors, then sustainable consumption and production in the region will be a difficult challenge to meet.

There is a growing awareness that the State has a very particular regulatory responsibility, as well as the responsibility to engage the various productive, community and social sectors, for providing public services and to coordinate the commitments of the various economic, environmental, commercial, social and sustainable development arenas.

On average, the region is in a critical situation as regards forest canopy. Deforestation is on the increase, motivated by expanding economic activity that produces higher revenue than other activities that would be more compatible with forest conservation. The highest rates of deforestation are found in Central America. The largest deforested land areas are in South America, mostly in the Amazon region. Too often the same public policies that aim to foster growth in the various sectors, also encourage deforestation of native forests.

Emissions of CO₂ in the region have increased, in absolute terms, but have remained stable relative to GDP. Regional CO₂ emissions equal only a small fraction of the emissions of developed countries, in absolute terms, relative to GDP and per capita. There have been no substantive changes to the supply of renewable energy. The lack of incentives or pricing structures prevents social benefits from being reflected, and the high cost of technology contrasts with a mature industry linked to the fossil fuels markets.

The amount of energy consumed, despite showing a downward trend, is very light when compared to developed countries, which widens the gap. The region's motorization rate, which is the number of automobiles per person, has shown sustained growth, applying heavy pressure on this energy consumption indicator.

Though the area assigned for protected marine and land reserves is growing, there is a lack of capacity or adequate management and control of these areas, which highlights the fact that just naming of a protected zone is not enough to safeguard its ecosystem.

One piece of data that can be used to analyse the challenges the region faces in the arena of sustainable consumption and production is the high concentration of exports in environmentally sensitive sectors (ESI), which in some countries accounts for 50 per cent of total exports, as is the case in Trinidad and Tobago and Chile.

¹⁰ IAS: Iron and steel, non-ferrous metals, industrial chemicals, pulp and paper, non-metallic minerals.

Another important indicator is the official assistance flows for development. Of the total committed to Latin America between 1990 and 2007, only 4 per cent was earmarked for general environmental issues, and 6 per cent for projects having to do with water and sanitation. The remaining 90 per cent went towards the financing of other types of activities.

As for measures that countries of the region have announced, which aim to reactivate the economies in response to the international financial crisis, there is disparity on matters of environmental sustainability and some measures will even have negative impacts. For example, the largest expenditures will be on roadways and highways and subsidies for consumption of fossil fuels and electricity, credits for the purchase of automobiles, the liquidation of railway companies, increases in the production of hydrocarbons, increased spending on construction (housing and hospitals) using traditional systems.

However, there are some sectors in which measures will have positive impacts, such as: Investment to expand water and sanitation coverage, national subsidies for mass transportation, subsidies for substitution of electrical appliances and subsidies for expanding the forest canopy (for plantations). On the other hand, there have been no major measures taken related to renewable energy, energy efficiency, waste management, wastewater treatment, lower-impact farming or building materials that produce lower emissions.

The main conclusions for public policies are:

- Utilize medium- and long-term strategy instruments
- Correct resource allocations, changing relative prices
- Reduce economic incentives for activities that damage the environment (creating waste, fossil energy, deforestation)
- Increase incentives for activities that benefit the environment (recycling, energy efficiency, organic farming)
- Invest in environmentally and socially efficient infrastructure
- Promote the life-cycle concept for economic systems

3.1 Examples¹¹ of SCP experiences in the region: economic and social benefits resulting from application of SCP policies

3.1.1 Peru Integrated solid waste management

With the support of UNEP, a project was executed in the Region of Lima, Peru to help municipalities of the area to integrate the life cycle development approach with their Integrated Environmental and Solid Waste Management Plans, both at the policy and implementation levels, within the local and regional system.

The following were the objectives of the project:

¹¹

http://www.redpycs.net/MD_upload/redpycs_net/File/Produccion_Sostenible/guia_de_pl_para_el_sector_de_sgbp.pdf

- Improve the base data on the characteristics of solid waste generation and treatment in the coastal districts of the Norte Chico in the Region of Lima.
- Build the capacities of local and society institutions to adopt approaches of prevention and life cycle assessment in the design and implementation of Integrated Environmental and Solid Waste Plans.
- Use a demonstrative project to show the advantages of implementing integrated SCP strategies to waste management.

Creation of the basic information about solid waste has provided an important instrument for building awareness and communicating with the public about household solid waste. Furthermore, it is an important instrument that municipal authorities can use to develop viable projects for the National Public Investment System. Among the important requirements for estimating demand and investment, is the availability of primary quantitative and qualitative data.

Through a variety of information dissemination and training activities, both for municipal technical staff and for employees who work in waste collection and cleaning, as well as for the public in general, the life cycle approach is being conveyed and positioned as an important issue in the media and in educational institutions.

3.1.2 Bolivia Curma tannery company

The Curma tannery company, located in the city of Cochabamba, Plurinational State of Bolivia, was causing an environmental problem, discharging effluents with pH-unstable vapors, high concentrations of sulphur, chrome and solids directly into the sewage system, without any treatment whatsoever. Furthermore, there was no strict control of inputs, which led to production cost overages and added to costs of waste treatment and disposal.

To control pH levels and reduce the solid content of effluents, the company implemented an effluent pretreatment system to separate solids, precipitate dissolved solids, reduce sulphurs and neutralize effluents that were overly acidic or basic. For water used in steeping and hair-related processes, a system was implemented that recycles water for washing hair or fur which, together with rainwater capture measures, reduced total water consumption for the process (see table).

Lastly, the company installed a computerized system that allows it to keep up-to-date control of its inventories which, along with good operating and recycling practices, has allowed for an overall reduction in consumption of chemical reagents.

Economic results	Environmental results
Investment US\$ 9000	Savings in water (riverside process): 850 m ³ /year (25%)
Reduced costs: US\$ 16,200	Reduced chrome salts: 13,800 kg/year (30%)
Return on investment: 180 %	Reduced common salt: 30,000 kg/year (47%)
	Reduced sodium sulphide: 2,700 kg/year (17.5%)

Source: http://www.redpycs.net/MD_upload/redpycs_net/File/Produccion_Sostenible/guias_sector_tenerias.pdf

3.1.3 Colombia Guadalupe meat processing plant

Frigorífico Guadalupe, a meat processing plant located in the city of Bogotá, Colombia, was closed to being shut down by local environmental authorities because of its noncompliance with existing regulations on waste and other environmental problems, such as water usage. A composting system was implemented for handling solid organic waste from the plant, including sludge from the water treatment plant, with the following results:

Economic results	Environmental results
Return on investment of US\$ 4,300 due to reduced costs over 2.17 months	Waste sent to trash dump was reduced by 76 per cent, extending its life cycle
Job creation	Organic matter returned to soils
Reduced costs of final waste disposal, by US\$ 2,000 per month	
Added value to waste that generates an average US\$ 1,950 per month	The organic conditioners produced are used in a project that sows native vegetation and for building a garden, both of which improve air quality

As regards collection and rendering of blood, 80 per cent is kept in sterile condition to be used in preparing canned meats and processed foods, a measure that produces income of US\$ 1.3 million per year, including exports.

Water-saving activities included: recirculation of treated water, a staff awareness programme and optimization systems at high-consumption points. These measures reduced water consumption by 8,800 m³, an annualized savings of US\$ 1,700. With the implementation of the wastewater recirculation plant, an additional estimated 6 per cent of water is saved, which represents annual savings of US\$ 12,500.

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3. MINING

Mining, minerals and metals are important for the economic development of many countries.

Minerals are essential to modern life. To increase the contribution of mining, minerals and metals to sustainable development, measures must be adopted at all levels to:

- a) Support efforts to address the environmental, economic, health and social impacts and benefits of mining, minerals and metals throughout their life cycle, including workers' health and safety, and use a range of partnerships, furthering existing activities at the national and international levels among interested Governments, intergovernmental organisations, mining companies and workers and other stakeholders to promote transparency and accountability for sustainable mining and minerals development;*
- b) Enhance the participation of stakeholders, including local and indigenous communities and women, to play an active role in minerals, metals and mining development throughout the life cycles of mining operations, including after closure for rehabilitation purposes, in accordance with national regulations and taking into account significant transboundary impacts;*
- c) Foster sustainable mining practices through the provision of financial, technical and capacity-building support to developing countries and countries with economies in transition for the mining and processing of minerals, including small-scale mining, and, where possible and appropriate, improve value-added processing, upgrade scientific and technological information and reclaim and rehabilitate degraded sites.*

[United Nations, 2002, paragraph 46, Johannesburg Plan of Implementation]

A. Introduction

The Johannesburg Plan of Implementation, in paragraph 46, provides some of the specific action points for the mining sector. The words and phrases cast in the previous paragraph point to issues that could shape, to a large extent, an agenda of sustainable development for this sector. This paragraph inspires the workings of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IFMMMSD)¹², which seeks to achieve concrete progress in implementing the mandate of the Johannesburg Summit. It is worth mentioning that not all countries in the region to which mining is an important activity are members of the forum; Chile, Colombia, Venezuela, Cuba, and Trinidad and Tobago are not members.

This document seeks to provide an overview of the major issues related to mining and sustainable development in the region. Despite making some mention of non-metals and hydrocarbon mining, this document focuses primarily on metals mining because of its importance to the region economically, environmentally and socially. To this end, the document relies heavily on data and the experience of those countries in the region that are most heavily involved in mining. Given its focus and the relatively current data it can provide,

¹² The forum is run by the Governments themselves. Canada is Secretary for the Forum until 2010. UNCTAD and UNDES, among others, have helped with managing the forum. For further information, see: <http://www.cepal.org/deype/statambiental>.

the South American version of the Mining, Minerals, Metals and Sustainable Development initiative has been consulted extensively. Additionally, the document relies on the review of national reports delivered in preparation for the RIM¹³ and other relevant programmes of United Nations agencies in the region.

B. The importance of mining in Latin America and the Caribbean

Countries as varied and diverse as Argentina, Brazil, the Plurinational State of Bolivia, Chile, Colombia, Cuba, Ecuador, Guatemala, Honduras, Jamaica, Mexico, Peru, the Dominican Republic, and the Bolivarian Republic of Venezuela have long histories of deep involvement with the mining industry. For these countries, the mining industry represents an important engine of economic activity. The economic currents that surround the industry carry significant weight in the daily lives of communities and regions in these countries, in terms of their contribution to GDP and to exports (figure 3.1).

Employment figures on mining-related jobs are usually limited to jobs directly created by the companies. In these terms, employment figures represent, at most, about 1.5 per cent of the labor force in countries where mining is an important industry. In absolute terms, the industry employs between 8,000 and 200,000 people (Argentina and Mexico, respectively, CIPMA and IIPM, 2002). As a reference, estimates have it that the copper industry in Chile, during the 1990s, created just over three direct jobs and 7.2 indirect jobs for every US\$ 1 million invested (Lagos, 1999).¹⁴

Silver and copper are the two metals for which the region is the top producer worldwide (about 50 per cent, figure 3.2). At the end of the 1990s, the total value of mining production in the region was estimated to be US\$ 30 billion (CIPMA and IIPM, 2002).

Between 1990-2001, four of the 10 countries most heavily invested in mining were located in Latin America: Chile (1st), Peru (6th), Argentina (9th) and Mexico (10th). Since the mid-1990s, 25 per cent of the world's mining investment is captured by Latin America.

¹³ At the time this document was written, reports had been received by Costa Rica, Mexico, Barbados, Cuba and Colombia.

¹⁴ Recent studies by COCHILCO in Chile point to a relationship between direct and indirect employment generated by mining, which is greater than 6 (COCHILO, 2008).

Table 3.1
IMPORTANCE OF MINING IN SELECT COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN
(2007)

Countries	Land area (Km ²).	Population (ooo's)	Economically active population (ooo's)	Unemployment rate (percentage)	National GDP (US\$ in millions)	GDP mining and quarries (US\$ in millions)	Exports of goods and services (US\$ in millions)	Exports from the mining and quarries sector (US\$ in millions)
Antigua and Barbuda	440	85	...	...	1 155	23	581	...
Argentina	2 736 690	39 356	19 174	8,5	262 451	11 486	64 633	4 058
Bahamas	10 010	331	161	7,9	7 498	35	3 278	...
Barbados	430	294	157	7,4	3 433	23	2 238	...
Belize	22 810	288	115	8,5	1 277	6	765	...
Bolivia (Plurinational State of)	1 084 380	9 828	4 414	...	13 120	1 612	5 214	3 293
Brazil	8 459 420	192 645	94 207	9,3	1 300 312	24 297	184 054	21 600
Chile	748 800	16 604	6 682	7,1	163 879	37 200	77 154	17 249
Colombia	1 109 500	46 116	23 498	11,4	207 786	13 331	35 012	9 003
Costa Rica	51 060	4 475	2 088	4,8	26 267	61	12 861	5
Cuba	109 820	11 248	5 430	1,8	58 604	1 102	11 918	2
Dominica	750	67	...	...	341	3	140	...
Ecuador	276 840	13 601	6 723	7,3	45 789	10 671	16 088	7 430
El Salvador	20 720	7 108	2 893	5,8	20 373	123	5 410	10
Grenada	340	106	...	...	608	3	196	...
Guatemala	108 430	13 344	4 325	...	34 031	537	8 604	322
Guyana	196 850	738	335	...	1 075	95	...	...
Haiti	27 560	9 602	3 860	...	6 225	...	739	...
Honduras	111 890	7 176	3 398	3,9	12 417	146	6 344	250
Jamaica	10 830	2 714	1 177	9,8	12 909	470	...	...
Mexico	1 943 950	106 448	45 353	4,8	1 018 221	79 124	289 558	39 719
Nicaragua	121 400	5 603	2 174	6,9	5 691	62	1 902	3
Panama	74 430	3 337	1 542	7,8	19 485	...	15 587	...
Paraguay	397 300	6 120	3 080	7,2	12 222	14	6 224	...
Peru	1 280 000	27 894	14 125	8,5	107 329	12 280	30 986	9 778
Dominican Republic	48 380	9 749	4 050	15,6	41 013	279	11 939	...
Saint Kitts and Nevis	260	50	...	...	512	1	218	...
St. Vincent and the Grenadines	390	120	59	...	555	1	232	...
Saint Lucia	610	165	79	...	955	3	447	...
Suriname	156 000	458	157	5,5	1 867	...	...	...
Trinidad and Tobago	5 130	1 333	640	9,6	21 717	9 939	...	...
Uruguay	175 020	3 332	1 804	8,4	24 254	...	5 799	6
Venezuela (Bolivarian Republic of)	882 050	27 460	13 836	8,1	228 071	...	70 764	...

Sources: Area: ECLAC Statistical Yearbook; Population: CELADE; Economically active population: ILO; Unemployment rate: ECLAC; GDP: ECLAC; Exports: ECLAC.

Table 3.2
REGION'S GLOBAL SHARE OF MINING PRODUCTION

MINERAL	% Global Share in 2008	Major producing countries
Bauxite	23.7	Brazil, Jamaica, Venezuela
Copper	46.4	Chile, Peru, Mexico
Zinc	22.2.	Peru, Mexico, Bolivia
Molybdenum	26.6	Chile, Peru
Silver	50.2	Peru, Mexico, Chile, Bolivia
Tin	21.1	Peru, Bolivia
Gold	21.4	Peru, Mexico, Chile, Colombia, Argentina
Nickel	22.0 *	Colombia, Cuba
Coal	4 th Place	Colombia

*Estimate

Source: ECLAC, DRNI (personal communiqué, Eduardo Chaparro, 2009), modified from Salas, A. National Mining Society of Chile, XXVIII Mexican Mining Convention, Veracruz, October 2009.

C. Mining and sustainable development

Mining in the region generates significant economic, productive, and social dynamism. At the same time, mining activity causes significant impacts on the sustainability of development and on the environment. These effects and the problems associated with them are tied to a number of variables. One such variable is the scale of operations, which can create very different situations. This section identifies and briefly addresses the major mining and sustainable development issues in the region, describing the current situation for each issue and pointing out current and future challenges. To the extent possible, some experiences and good practices are also presented.

1. Small-scale mining

Small-scale mining¹⁵ in the region is defined by: how much manpower is involved; its low level of technology; its contribution to environmental degradation; precarious safety and hygiene conditions; its role as a major job alternative for poor segments of society; its low production costs; its role in exploring the potential for larger projects; and the potential generation of local production chains. In the mid-1990s, it was estimated that between 11 and 12.5 million people were employed by or depended on small-scale mining¹⁶ - mainly copper mining in Chile and gold mining in Brazil and Peru – in Latin America (Chaparro, 2000). Worldwide, mining has shown sustained growth over the past two decades, growing at an annual rate of between 10 and 20 per cent in 21 of 35 developing countries of Africa, Asia and Latin America.

¹⁵ There are a number of ways to speak of small-scale mining. In the region, the term “artisanal mining” and “small-scale mining” are used. The distinguishing features of these two concepts are: The nature of the workforce and equipment involved (artisanal mining works with bare hands on a small scale, whereas small-scale mining may use machinery); and the nature of land rights of the miners (in small-scale mining the miners usually have land rights, which is not usually the case in artisanal mining). (Valdivia, 2009). Reflecting the diversity of terms and classifications given to artisanal and small-scale mining, ECLAC has coined the phrase “so-called small mining”.

¹⁶ A recent estimate by Valdivia (2009) suggests that around one million workers are directly tied to small-scale mining in the region.

17 The World Bank's consultation process to evaluate the extractive industries determined that the Bank should support small-scale mining in issues of formalization, government administration, environmental and social enhancements, and evaluation and monitoring (EIR, 2002). During the 1980s and 1990s, Argentina, the Plurinational State of Bolivia, Brazil, Chile, Ecuador, Mexico and Peru, among others, had support programs for the sector, which have tended to ceased to exist. ENAMI in Chile, FIFOME in Mexico, and the Colombian Government are currently engaged in notable efforts to support small-scale mining.

1.1 Safety, health and the environment

Small-scale mining in the region has traditionally been associated with precarious safety and health conditions¹⁸ due to contamination by mercury used for processing gold,¹⁹ and with excessive land degradation due to the migratory nature and multiplicity of small operations attracted to veins of minerals.²⁰

The social and environmental effects are particularly exacerbated when child labor is involved, cases of which have been reported in the Plurinational State of Bolivia and Peru (CIPMA and IIPM, 2002, and ILO, 1999). Rudimentary technology contributes the most direct impact on environmental degradation and safety. To a great extent, this occurs due to a lack of proper and sustainable financing mechanisms. The most acute socioenvironmental conflicts have to do with air pollution caused by burning mercury and water polluted with cyanide (though this is becoming less common), heavy metals and metalloids. In the case of the former, common practices of mercury amalgamation pose health and environmental hazards to the surroundings. Mercury is a highly toxic element often used to separate metal from mineral, chosen for its effectiveness, ease of use, abundance and cheap cost. However, the long-term consequences for the environment and the population that lives around, downstream, or downwind of the mines are serious. The World Health Organisation (WHO) has estimated the rate of slight mental retardation to be 17.4 per 1,000 for children born into subsistence fishing communities near gold mines in the Amazon region (WHO, 2008). In one mine that is part of the World Mercury Project of the United Nations Industrial Development Organisation (UNIDO)²¹, almost 50 per cent of miners suffered from involuntary tremors. Informal and small-scale gold-mining are significant contributors to the world's mercury pollution problem.

The Governing Council of UNEP, in its twenty-fifth period of sessions held between 16 and 20 February 2009, in its Decision 25 /5 III on chemicals management, including mercury, "Agrees to further international action consisting of the elaboration of a legally binding instrument on

¹⁷ A recent estimate by Valdivia (2009) suggests that around one million workers are directly tied to small-scale mining in the region.

¹⁸ When carried out under precarious conditions, mining work can be a vector for transmission of diseases such as malaria, especially in Brazil (CIPMA and IIPM, 2002, and Hilson, 2002).

¹⁹ For example, in Brazil nearly 200 tons of mercury are released into the environment each year. As a result, the Amazon river has accumulated between 1,000 and 2,000 tons of mercury (Hilson, 2002). A recent study requested by UNEP (Valdivia, 2009) addresses in detail the problem of mercury released from small-scale mining in the region.

²⁰ Several regions of Brazil and Colombia have been victims of heavy alterations due to multiple excavations (Hilson, 2002).

²¹ In the context of this project, UNEP has worked with Suriname on a capacity building project for health assessments. Similar initiatives are beginning in the Plurinational State of Bolivia, Colombia, Ecuador and Peru to develop plans for better management of mercury in small-scale mining.

mercury, which could include both binding and voluntary approaches, together with interim activities, to reduce risks to human health and the environment.” These negotiations will begin next year and are expected to conclude in 2013.

The informal nature of the sector, among other factors, influences the solutions to problems mentioned here. Regarding mercury pollution of the environment, there are systems available to minimize emissions and discharges. The Plurinational State of Bolivia, in particular, has made considerable progress in utilizing technology to capture by "retort and gravity", which helps to reduce mercury emissions by 90 per cent. One barrier to sustained progress in the use of this technology is the lack of permanent financing mechanisms. In Mexico, the North American Agreement on Environmental Cooperation, a side-treaty to the North American Free Trade Agreement, allows for the Mexican mining industry to provide data to be integrated into the "diagnostics of mercury in Mexico"²².

In more general terms, Governments should develop specific regulations (laws, regulations, guidelines) for small-scale mining and, especially, move forward towards their effective implementation and oversight. It is important to keep in mind that sustainable support for small-scale mining should take a long-term view and the substance of this support should be to build the civic values and capacities of the entrepreneurs. In other words, support programmes for small-scale mining should not focus primarily on providing welfare assistance.

1.2 The informal nature of the sector

At the root of the problems related to small-scale mining, are the sector's informal nature and the illegality of its activities. States must address the sector with specific measures, recognizing the entrepreneurial nature (in an SME context) of the activity. This recognition could spring from an acknowledgement of the sector's socioeconomic importance and the prospect that it is likely to grow in the future.²³ As is the case in large-scale mining, for which there have been situations of public-private cooperation aimed at satisfying the needs and living conditions of workers, small-scale mining needs the same types of programmes. The emphasis should be on providing basic services to workers and to the communities on which small-scale mining depends. For example, in cases where operations are far from urban centres, it will be necessary to establish health centres, housing solutions and transport services.

Furthermore, in order to address the sector's informal nature, measures will be needed that provide education and training to miners, including enhancing their technical and business skills, and helping them to form cooperatives. Programmes must be sensitive to the social impacts of small-scale mining, especially in terms of gender issues and child labor (where these are relevant).

²² In response to Resolution 95-5 of the Working Group on Chemicals Management (information provide by Mexico's national report for the RIM; Federal Government, 2009).

²³ This task has been made more difficult by the lack of formality in the sector and the absence of public management (expressed, for example, in the lack of tax and customs oversight) which sometimes turns a blind eye to the sector.

2. Large-scale mining

2.1 Mining regulation

All of the countries covered by the Mining, Metals and Sustainable Development (MMSD) initiative—the Plurinational State of Bolivia, Brazil, Chile, Ecuador and Peru—have legislation in place giving the State absolute, inalienable and imprescriptible dominion over the soil, the subsoil and the mineral resources they contain, and defining mining as an activity of public and social interest. None has legislation precluding the State from commercial exploitation of mineral resources. Most of the countries do not exclude private foreign capital from investing in operations to explore for or exploit resources, and guarantee that such operations will receive neutral treatment—i.e., treatment equivalent to that accorded to domestic capital operations. Each country has a number of exceptions, however. Colombia, for example, considers areas in which indigenous populations hold preferential rights to be reserved mining areas, while the Plurinational State of Bolivia and Uruguay prohibit foreign mining in border areas (CIPMA and IIPM, 2002).

These provisions seem appropriate. However, exploiting and exporting non-renewable resources without any significant value added through processing,²⁴ and making intensive use of energy and water resources with potentially significant environmental consequences, while there are limited mechanisms to ensure that the profits generated will remain in the producing regions, pose major questions in terms of sustainability. Thus, it is not surprising that some stakeholders—especially in civil society—do not regard mining as a sustainable activity.²⁵

One question, here, that remains open to debate is the degree to which regulation (regarding ownership, taxation, access to and use of resources, oversight and monitoring, etc.) promotes sustainable mining development. There has been significant progress in the region in this regard, though major challenges remain. On the positive side, the formulation of mining and environmental regulations in most of the countries occurred during the 1990s (though Chile developed a regulatory framework for mining and foreign investment as early as the late 1970s²⁶). Among the challenges is the fact that the region's countries still lack coordinated policy frameworks to provide a basis for sustainable mining, i.e., national policy for sustainable mining that takes account of a country's major thematic priorities. Such policy would send a clear message to investors, as well as providing a frame of reference for plans, programmes and projects.²⁷ Notable in this regard is Cuba, whose Council of State recently (July 2008) approved a mining policy that sets forth principles designed to support mining by

²⁴ The activity does generate “backwards” value added, i.e., in the productive chains that make the mining possible.

²⁵ Of note in this respect is, for example, the International Union for Conservation of Nature statement rejecting the idea of open-pit mining in Costa Rica (<http://www.informatico.com/index.php?scc=articulo&edicion=20091102&ref=02-11-090003>, consulted November 2009).

²⁶ Notably, Decree Law 600, a law promoting foreign investment under a regulatory and tax regime that provided multiple benefits and guarantees.

²⁷ The discussions that have taken place in the Plurinational State of Bolivia in the context of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development have generated a set of major priorities, such as support for cooperative mining ventures, a women-and-mining partnership, measures regarding mining and protected areas, and actions regarding research, science and technology. (www.globaldialogue.info, consulted November 2009).

implementing wide-ranging quality control systems, instituting environmental protections, closing mines and carrying out recovery of environmental liabilities, etc.

A related issue is that of coordinating regulatory frameworks for mining-related permitting processes across different sectors. In Mexico, the absence of a mining code poses a serious problem, making for a fragmented regulatory process distributed among different agencies. Similarly, one of the obstacles to sustainable mining development in Barbados is the fact that no legislation has been passed to encourage it. Thus, the Natural Resources Department (NRD) can only make recommendations regarding good practices and assume that companies will act in good faith.

2.2 Distribution of benefits and local development

Mining has a very well defined production cycle, including lead-time, exploration, development, production and closure (of mines). The final stage (closure) is inevitable, once the quality or quantity of the mineral(s) being extracted has declined to a level that makes the operation economically unviable. This cycle is based in part on the non-renewable nature of the resources involved. A central priority in mining—especially from the perspective of government and communities—is to ensure the sustainability of the wealth generated during production or exploitation. In this sense, the sustainability of any local development is measured by its impact after the mine and its facilities are closed or abandoned.

In legal terms, the distribution of mining profits depends on taxes that: (i) affect fixed costs (transaction taxes, mining royalties, patents for exploration, exploitation rights, etc.); (ii) affect operating costs (royalties, taxes on interest payments, etc.); and (iii) are based on the annual bottom line (the tax regime applicable to profits). However, the mere existence of such instruments by no means guarantees reasonable, effective, efficient and decentralized distribution of the resources generated. In fact, recent experience in a number of the region's countries shows that even where instruments may exist, constraints, such as weak public management capacities at the local level, make it difficult to ensure that mining profits are invested in the areas where the activity takes place.²⁸

It is necessary, therefore, to build capacity in government (especially at the subnational and municipal levels), in order to effectively manage the resources generated by mining activity. Creating local (subnational) development agencies could be one means of providing an institutional framework capable of handling the wealth generated by mining activity.²⁹ Such institutions should de-bureaucratize and professionalize resource allocation and execution. The public sector can also help by facilitating training for stable, professional working groups that serve as neutral venues for dialogue³⁰ when conflicts arise. Effective distribution of

²⁸ There are numerous promising public-private initiatives in the region that take account of the present realities and the lessons learned in the recent past. One interesting example is the work being carried out by the Los Andes de Cajamarca Association (Asociación Los Andes de Cajamarca, or ALAC) in Peru. ALAC is a corporate organization that emerged as part of the Yanacocha social responsibility programme to promote sustainable human development in the region.

²⁹ Under President Michele Bachelet, Chile created such agencies in 2006. In 2008, the country's regional development agencies had a total budget of nearly US\$ 10 million (www.ardp.cl, consulted November 2009).

³⁰ Recent experience in Peru with the Mining and Sustainable Development Dialogue Group is an example (<http://www.grupodialogo.org.pe/>, consulted November 2009).

profits from mining would benefit from labour union agreements on tax compliance, in an effort to prevent unfair competition. In this regard, there is a vital need for the provision of timely information, through investment project banks, citizen participation fora and tax control bodies.

Another important related issue is that of transparency in handling information on the payments generated by the mining industry. A new development in this area is the Extractive Industries Transparency Initiative—whose current members and candidate countries are primarily in Africa and Asia. Despite recent official support for the initiative on the part of the Inter-American Development Bank, Peru is the only country in the region that is currently a candidate.³¹

With regard to voluntary action, various methods exist for distributing benefits and promoting local development. Most are associated with companies' social responsibility policies and practices. A major underlying issue is how effectively companies contribute, in coordination with other major stakeholders (the public sector, in particular), to creating and strengthening the social and human capital of an area. Box 3.1 describes a recent initiative by mining companies in Peru that have joined to provide a platform of commercial services for small entrepreneurs.

Box 3.1

STIMULATING ECONOMIC GROWTH IN REGIONS OF RURAL PERU

Poverty in Peru is particularly acute in remote rural areas, where millions of people struggle to survive by exploiting the scarce economic opportunities available to them. As a means of addressing this problem, the Clinton Giustra Sustainable Growth Initiative (CGSGI), serving as a catalyst, brought the two mining companies Yanacocha and Gold Fields together in a unique partnership that is expanding possibilities for economic development, through the opening of an economic services centre in the remote region of Cajamarca. Inaugurated in April 2009, the centre provides commercial services for small entrepreneurs, and promotes the development of sustainable economic corridors by linking producers with markets for their products. As with two other economic services centres, the Cajamarca operation will have a modest number of staff to provide assistance to small producers. CGSGI is also introducing new monitoring and evaluation criteria to ensure that the project is achieving the goal of reducing poverty in Cajamarca.

Source: Clinton Foundation, www.clintonfoundation.org, consulted November 2009.

Foundations created by companies are another example of such action. These are generally legal entities (corporations, foundations, etc.) independent of the mining companies that establish them, and their active board members usually include local stakeholders from various sectors. They develop long-range plans for working on issues that are important to the communities (health, education environment, etc.). The endowments of these

³¹ The Inter-American Development Bank (IDB) statement supporting the initiative may be found at <http://www.iadb.org/nEWS/detail.cfm?language=SP&id=5544> (consulted November 2009). The initiative's website is at: www.eitransparency.org.

institutions can be expected to enable them to continue operating after the termination of the mining operations that funded them.³²

Efforts involving voluntary action present various challenges. It is essential to clearly differentiate different types of activities, such as purely philanthropic activities (which are unrelated to the sponsoring company's long-range production objectives), compensation initiatives (which may be confused with covert attempts to coerce) and strategic social responsibility activities (which benefit both the business and the community)—with the last of these meriting the greatest emphasis. Developing and adopting the guidelines slated to enter into force in the near future, in the form of ISO 26000, could help in systematizing and increasing the effectiveness of the social responsibility efforts of companies.

2.3 Environmentally sustainable mining

The environmental impacts of mining in the LAC countries vary dramatically, as is evident from a brief comparison of the situations in five South American mining countries.³³ Brazil produces a far greater range, in type and quantity of minerals, than do the other countries, and its mining operations are distributed in regions with climates varying from tropical to relatively arid, though it does not include any desert areas. Many of the country's mining operations are located close to populated and agricultural areas. Thus, the types of environmental impacts generated include the entire gamut of known effects. While the task of prioritizing these is difficult, the closure of mines and the rehabilitation of land and water resources have been recognized as one of the principal environmental issues associated with mining in Brazil.

The situation of Chile is, in very basic ways, opposite to that of Brazil. A major portion of Chile's mines are in desert or semi-desert areas located far from population centres. In these settings, it is simpler and less costly to handle liquid effluents and solid wastes. One of the major concerns is to minimize evaporation of water, in order to reduce consumption of this scarce resource. A significant proportion of Chile's mines do not dispose of water at all, but rather recycle whatever water does not evaporate. Moreover, since most of Chile's mining occurs on land that is low in value, the cost of closing mines and rehabilitating land can be expected to be lower than in areas located close to population or agriculture. In contrast, a large proportion of mines in the Plurinational State of Bolivia, Ecuador and Peru are in areas of high rainfall and in populated zones. Thus, the most significant impacts in these countries relate to how effluents and solid wastes are managed and how soil use and human health are affected.

Mexico, whose situation is similar to that of Brazil, reports significant clean-production progress in the mining sector. Approximately 80% of the mining companies affiliated with the Mexican Mining Chamber (Cámara Minera de México, or CAMIMEX) have already been given "clean industry" certification by the Federal Environmental Protection Agency (Procuraduría Federal de Protección al Ambiente, or PROFEPA), as well as being certified under ISO 14001,

³² There are various examples of foundations in the region that have been carrying out work that is valued and appreciated by a variety of stakeholders, e.g., the Fundación San Isidro, in Colombia, and the Fundación Minera Escondida, in Chile.

³³ See CIPMA and IIPM, 2002.

which sets standards for environmental performance. In addition, the Mexican government, through the Secretariat of Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales, or SEMARNAT) has created a National Programme for the Prevention and Integral Management of Waste 2008-2012. This initiative is designed to reduce waste generation in the mining industry.

Large-scale mining in the region is recognized for having pioneered the adoption of environmental practices in advance of national regulations. Mining development in the 1990s served as a catalyst for the development of national environmental regulation, especially in the area of environmental impact assessment systems (CIPMA and IIPM, 2002). Currently, the large mining firms publish regular reports on sustainability and social responsibility, generally in accordance with international guidelines set forth in the mining version of the Global Reporting Initiative (GRI).

An exhaustive review of the range of environmental issues associated with mining in the region lies well beyond the scope of the present document. Below, however, is a brief discussion of the regional situation, and some experiences and recommendations with regard to two main sets of issues: access to and use and management of water resources; and the closing of mines and rehabilitation of environmental liabilities.

Water resources

Mining is a water-intensive operation. It either takes place in areas where water is scarce and where competition for this resource is intense (in the form of agricultural or drinking-water needs), or it can affect other sectors or users through specific incidents of contamination. The situation tends to be more complex where mining activity occurs in or near ecologically or socially sensitive areas. The former are sometimes protected areas where an alteration of the hydrologic cycle can have negative effects on the quality and quantity of goods and services provided by the ecosystem. The latter—socially sensitive areas—often involve indigenous communities. Although International Labour Organization (ILO) Convention No. 169 gives indigenous communities the right to participate in decisions on projects in their areas, the historical reality and asymmetrical position of these communities vis-à-vis the large companies, and constraints on complete implementation of the convention, can lead to situations harmful to communities.

It is in the companies' interest to use water efficiently, and there have been significant ongoing improvements, in recent years, in water use by mining operations.³⁴

With regard to waste water, companies must, of course, meet legal requirements set, for example, by standards and regulations on discharges. Authorities must implement laws and regulations, as well as monitor compliance. In addition, they face the challenge of overseeing the range of activities taking place in a particular geographical area, in order to ensure that cumulative impacts do not exceed the ecosystem's carrying capacity. Instruments that can

³⁴ A recent study in Chile found reductions of more than 30% in concentration processes, and reductions of over 50% in hydrometallurgy between 2000 and 2006 (DGA and Proust Consultores, 2008). Specifically, Chile's National Copper Corporation (Corporación Nacional del Cobre, or CODELCO) recycles its water 11 times in the course of using it. In Mexico, Peñoles reports a major reduction in capture of freshwater since the late 1990s, and a significant increase in reuse of treated waste water (Chaparro, 2009).

be useful for this purpose include land use regulations and strategic environmental assessments.

Closing of mines and environmental liabilities

As reflected in the work agenda of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IFMMMSD), “Many stakeholders resist mineral investments based on a concern that they will be left with an environmental mess at the end of the operations. Local citizens are concerned that mining companies will simply walk away from the site once production stops or that insufficient financial resources will have been set aside to fully implement mine-site rehabilitation.”

The MMSD initiative in South America indicated that the Plurinational State of Bolivia, Brazil, Chile, Ecuador and Peru have developed different regulatory structures governing the closing or abandonment of mines. In all of these, current regulations include references to mine closures as a stage of the mining process that is subject to environmental impact assessment, although, in many cases, related provisions have not been enforced. Bolivia has the most advanced system in terms of requiring planning. It specifies parameters for the objectives and content of plans, as well as stipulating time periods. However, it does not provide for financial performance guarantees, which are essential to ensure the effectiveness of such a system (CIPMA and IIPM, 2002). Under Mexico’s current legal framework, the provisions on environmental impact do not explicitly require restoration of mines as a post-operational activity, and although this may normally be considered to fall within the scope of mitigation measures, it is ultimately left to the judgment of the entity carrying out the assessment.

Peru’s recently published Law 28.090 contains regulations on mine closures, and Chile is in the final stages of developing such legislation. This is a relatively new legislative realm for the countries, as well as for industry practice, and is an area that is the object of considerable activity and innovation in the region.³⁵

Environmental liabilities pose a major challenge for the region’s governments.³⁶ This issue relates to environmental problems created by old mining operations that were abandoned, where there are no identifiable parties to hold accountable. Environmental liabilities in the region can have acute impact on ecosystems and human health.³⁷ At the global level, the MMSD initiative suggests that the first priority should be for authorities to identify and inventory abandoned mining sites and assess the risks they pose to populations and ecosystems. Given budgetary limitations, priorities will have to be set. Clearly, available resources should be used for the most dangerous situations, and for cases in which rehabilitation will provide the greatest benefits. The second priority is to develop new funding mechanisms that are sufficiently robust and sustainable to deal with the problems

³⁵ One interesting case that has been publicized as a model for the industry is the closing of the El Indio mine in Chile (more information at: <http://www.aminera.com/contenido-revista/cierre-de-el-indio-un-precedente-para-la-industria-minera.html>, consulted November 2009).

³⁶ A recent paper by ECLAC examines this issue, comparing the legal situations in Bolivia, Chile, Peru and the United States (Oblasser and Chaparro, 2008). ECLAC has also held three regional seminars in the last several years on environmental liabilities, and has advised Ecuador, Chile and Colombia on the issue.

³⁷ The case of La Oroya, in Peru, is an example of extreme lead contamination affecting the area’s inhabitants (CIDSE, 2009).

that future generations will face. As a general strategy, there should be emphasis on the fact that postponing solutions to the most urgent problems is likely to be extremely costly in the future.

Mexico's environmental authorities are addressing this issue by creating a National Programme for the Remediation of Contaminated Sites. The programme is now being designed, and will specifically address the situation of the country's environmental liabilities, including those associated with extractive activities such as mining and oil wells.³⁸ Colombia's Ministry of Environment, Housing and Territorial Development has worked on a general conceptual approach to environmental liabilities. As of 2009, the Ministry of Mining and Energy has been at the forefront of efforts to further develop and improve the conceptual approach to environmental liabilities resulting from mining, based on assessments in pilot areas where gold and coal extraction has occurred.

A related issue is that of safety, health and accidents. Mining companies today are recognized for their concern and action on these issues. Most of their internal management systems, which generally emanate from central headquarters, give these matters the same level of attention as environmental and community issues. A major concern on environmental liabilities relates to the possibility of accidents (e.g., the possibility of failure of tailings dams). UNEP has a systematic Awareness and Preparedness for Emergencies at Local Level (APELL) programme, an important element of which is a focus on dialogue, information and training to bring together different interested parties (communities, businesses and governmental authorities). The programme has been active in Peru, and will soon initiate projects in Argentina and Chile.³⁹

2.4 Production clusters

Clusters represent a concentration and coordination of productive resources and specialized businesses to satisfy special needs for goods and services that are essential for mining. Conceptually, there are two types of clusters: those involving forward linkages and those involving backward linkages. The former relate to mining activity itself, providing related goods and services. The latter consist of clusters that use the minerals extracted to produce value-added goods and services. In Latin America and the Caribbean, the clusters that have been developed are largely of the backward type. There is a perceived need in the region to develop and enable backward linkages capable of adding value to minerals before they are exported.

To be effective, clusters must be supported by public and/or private institutions. Firms that form part of these clusters can achieve greater growth, reduce costs, be more profitable, acquire greater capacity to innovate and be less vulnerable to external factors. This is primarily due to the fact that they benefit from specialized resources, information, economies of scale, lower transaction costs and the dissemination of knowledge, and because they are in a position to learn through exchanges.

³⁸ A number of Mexican mining firms have worked on restoring sites where some of their mining operations were located. These companies include Peñoles, Materias Primas, Luismin (now Goldcorp) and Minera Carbonífera Río Escondido (Government of Mexico, 2009).

³⁹ The APELL document for the mining sector can be found at: http://commdev.org/files/722_file_UNEP_APELLMining.pdf (consulted November 2009).

The reality in the region indicates that production clusters are far from being an established phenomenon. At the beginning of the decade in Peru, the following specific obstacles were evident: Providers could not meet the standards demanded by mining companies; the mining companies were not familiar with the technological capacities of the domestic providers; the small and medium-sized enterprises (SMEs) lacked marketing instruments and outlets; and mining services were generally outsourced abroad (Buitelaar, 2001). Efforts are now being made to overcome these barriers in the region. This is reflected in the fact that the majority of providers of goods and services at national mining trade shows today are domestic companies. In Chile, the country's clusters—e.g., in the Antofagasta region—are of the backward type, and principally involve medium and large suppliers, rather than SMEs that provide small-scale commercial services, such as restaurants, etc. (Culverwell, 2001).

Clusters are fundamental for sustainable development. They are an expression of local development, while, under certain conditions, they also can serve as vehicles for transmitting best practices, from mining companies to SMEs. This can be facilitated by collaboration between businesses and the public sector to provide SMEs with opportunities for improvement. For example, there are interesting cases of mining companies that have supported SME providers in their efforts to obtain ISO 9000 and/or ISO 14001 certification.⁴⁰ The public sector has an important role in coordinating efforts of multiple agencies and providing conditions (capacities, infrastructure, goods and services, etc.) conducive to establishing clusters.

2.5 Relations between companies and communities: preventing and managing conflict

Because of its social aspects (the isolation of miners, operations in indigenous areas, etc.), environmental issues (intensive demand for resources such as water and energy, and situations of environmental contamination) and economic issues (distribution of profits and benefits), mining activities generate acute conflicts with local, national and even international communities.⁴¹ For the same reason, public and private enterprises must devote major efforts to building and maintaining fluid and constructive relations with related interest groups. As the proposed work programme of IFMMMDS recognizes, citizens want more open and transparent processes in decision-making capable of affecting their lives and families and the communities in which they live.

Some mining firms have even assumed that a constructive relationship with surrounding communities functions largely as a “social license” to operate. One of the seven principal areas for action specified in ISO social responsibility standard 26000—a non-certifiable guideline that is expected to be available in 2010—is that of community relations.

A major challenge facing mining companies is the need to make advance efforts to understand and familiarize themselves with the social and human realities of the areas in which they operate. Even when their operations are located in unpopulated areas, the

⁴⁰ The Chilean firm Minera Escondida conducted an ISO 14001 certification project with its providers (cf. Blanco, 2003).

⁴¹ The Observatory of Mining Conflicts in Latin America maintains a complete registry of mining activities in the region associated with social and environmental conflicts (www.conflictosmineros.net, consulted November 2009).

potential environmental, social and economic consequences of their activity mean that they must not neglect social factors and relationships. Just as a company invests time and resources in exploring an area's soil, it should devote time and professional resources to exploring its social realities. Such efforts make it possible to plan properly for later activities, building relationships based on trust and mutual benefit.⁴² At a minimum, this will help the different stakeholders in preparing to face possible conflicts that may arise. Mineral exploration makes these challenges greater for this sector than for other sectors. Prospecting activity can generate disproportionate expectations (both positive and negative) in communities, partly because of the relatively low probability that a prospecting site will develop into an actual mining operation.⁴³

The public sector plays a decisive role in facilitating relations between companies and communities. Although regulations and standards provide important consultation mechanisms (e.g., in the context of environmental impact assessment), experience shows that formal venues for participation and conflict management are inadequate, often even exacerbating conflicts rather than preventing them or managing them appropriately. Authorities, along with companies and communities, should seek alternative ad hoc approaches that provide for early, informed, organized dialogue. Creating guidelines or best practices in this connection, or adapting those developed by international institutions, can be a useful addition. One promising practice is community validation or monitoring of a mining operation's environmental effects (box 3.2).

Box 3.2

COMMUNITY ENVIRONMENTAL MONITORING IN GUATEMALA

The silver mining project of Montana Exploradora, S.A., near the Mexican border, which began in 2006, is the largest in Guatemala. In submitting to an environmental impact study, it was required to create a community monitoring group. The group began by discussing terms of reference for its functioning. The task consisted of the parallel monitoring of samplings from two laboratories. The result of the community process was an understanding and acceptance of the mining project on the part of the community—a relatively new phenomenon in Guatemala.

Source: Revista Área Minera, available at: <http://www.aminera.com/contenido/mineria-y-comunidades-en-olami.html>, consulted November 2009.

2.6 Climate change

Mining is a highly energy-intensive sector. The relation between mining and energy consumption is a function of the fact that: (i) mining operations move and process large volumes of material; (ii) products that depend on their output (i.e., on minerals), such as

⁴² The International Council on Mining and Metals (ICMM) recently developed a guide to facilitate relations between companies and communities, with an emphasis on local development and mutual benefits. This could be useful for government agencies and regulators, as well as for firms and the broader community.

⁴³ An interesting case of environmentally and socially responsible work in the exploration stage is that of Consolidada de Hualgayoc, S.A. This joint venture involving a South African company and a Peruvian firm is dedicated exclusively to mining exploration.

electrical goods and motors, use considerable quantities of energy; (iii) because of its requirements, mining can influence decisions on investment in energy sources; and (iv) various minerals, particularly coal, are used directly as fuels.⁴⁴ Globally, mining is estimated to account for between approximately 4% and 7% of all energy consumed (IIED and WBCSD, 2002)⁴⁵.

Energy is a significant cost of mining activity. Fully one quarter of the total cost of processes that involve flotation are estimated to be energy costs. In recent decades, the sector has made significant progress in energy efficiency. It is estimated, for example, that at the global level, over the last 50 years, the amount of energy needed to produce a ton of aluminium has fallen 40% (IIED and WBCSD, 2002). Given the magnitude and seriousness of climate change today, energy costs will probably continue rising—the result either of using alternative low-carbon sources, or of the cost of paying carbon taxes or buying emissions permits.

Central to this overall issue is the reduction of direct and indirect emissions of greenhouse gases (GHGs). Mitigation options vary from sector to sector within the industry. Technology will certainly continue to play a central role. In Mexico, one of the most recent changes in the Mining Act (2006) was to permit degasification of coal mines to make use of an energy resource that is currently wasted, while reducing the environmental impact of the atmospheric release of grisú gas, which contains large quantities of methane.

It is essential that the region implement public-private initiatives to: (i) address the lack of relevant, consistent and regular data on the mining sector's energy consumption (taking account of the role of recycling); and (ii) study the implications of climate change (e.g., for the hydrologic cycle and for underground water reserves and mining), in order to identify the best ways of adapting to the current realities and providing for mitigation measures. Box 3.3 describes recent initiatives in Chile to measure GHGs.

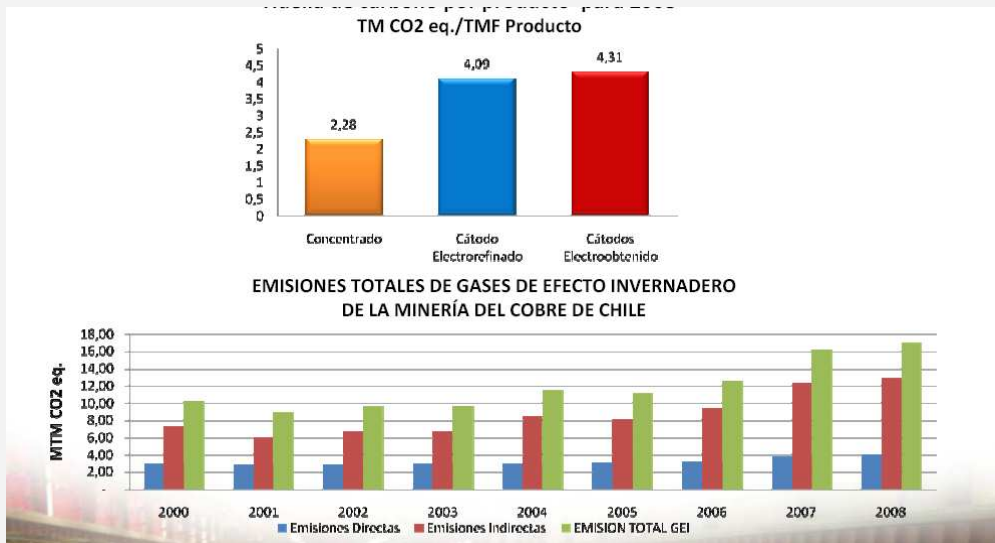
Box 3.3

GREENHOUSE GASES IN THE CHILEAN MINING SECTOR

The Chilean Copper Commission (Comisión Chilena del Cobre, or COCHILCO) provides a comprehensive estimate of the greenhouse gases emitted by copper mining operations in the country. The data it uses on energy consumption cover approximately 99% of Chile's copper production. The calculation takes account of: (i) the methodology proposed by the Intergovernmental Panel on Climate Change (IPCC); (ii) standardized conversion factors according to the different types of fuel consumed by electrical generation and distribution systems; and (iii) the energy consumption of individual mines. The results are shown in the following graphs.

⁴⁴ Coal generates 25% of the greenhouse gases produced by fossil fuels and other sources. Methane emissions from all coal mining activity (extraction, transport and storage) totalled 7.4% of all gas from human sources (<http://www.worldcoal.org/coal-the-environment/climate-change/>, consulted November 2009).

⁴⁵ In Chile, however, according to estimates of the National Energy Commission, mining accounted for 13% of the nation's energy consumption (with copper mining accounting for 32% of national electrical consumption). Electricity is the most significant energy source for the sector (50% of the total), while oil derivatives represent 46% of its energy consumption. Today, there is an Energy Efficiency Mining Roundtable, whose objective is to promote more efficient and environmentally friendly measures, initiatives and processes (www.cne.cl, consulted November 2009).



Translation:

MT CO₂ eqiv./FMT production

Concentrate

Electrorefined cathode

Electro-obtained cathodes

TOTAL GREENHOUSE GAS EMISSIONS FROM CHILEAN COPPER MINING

MMT CO₂ eqiv.

Direct emissions

Indirect emissions

TOTAL GHG EMISSIONS

By way of conclusion, COCHILCO states: Considering that copper mining is a fundamental element in Chile's economy, and that the country is a world leader in this area, it is of the greatest importance to have full information on this sector's energy consumption and GHG emissions.

- There is increasing impact from emissions patterns by generation systems, in terms of the emissions from various stages of the process, as well as from commercial production processes.
- Climate change and issues related to GHG emissions are a direct challenge for the mining sector, particularly considering the sector's portfolio of investment projects and the positive outlook for growth in production.
- The mining sector, which has been proactive, and has at times been a pioneer, in the area of environmental management in Chile, faces the possibility of making step-wise advances and contributing positively in this area.

The institution is now working on projections for future emissions.

Source: Zuñiga, 2009.

One interesting case, in terms of mining and climate change—though it involves hydrocarbons—is that of Yasuni, in Ecuador. The Ecuadorian government has offered to refrain from exploiting these crude oil reserves—which total nearly one billion barrels, or 20% of the country’s reserves, and which would emit 410 million tons of CO₂—in exchange for international economic compensation on the order of US\$ 7 billion (with a trust fund to be endowed over 10 years). The offer has met with positive response from several European governments and is expected to be finalized in the near future.

2.7 Local/national research and development

Each of the issues addressed in this document merits significant research and development in the region’s mining countries. In reality, however, budgets and research and development capacities at the local level, at least in the public sector, are extremely limited. Governments should seek opportunities to collaborate and cooperate with the private sector. The primary justification for joint initiatives is the simple fact that sustainable development is in the interest of all stakeholders, especially those whose development relies on mining. Through a process of research and participation, the MMSD initiative has defined a complete agenda for research and training in the region. It includes concrete proposals for the public sector, the business sector and civil society, as well as specific themes for small-scale mining (SSM) (see CIPMA and IIPM, 2002). The greatest challenge is to ensure that there are appropriate long-term funding mechanisms for research and development initiatives.

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4. TRANSPORTATION

“Promote an integrated approach to policy-making at the national, regional and local levels for transport services and systems to promote sustainable development, including policies and planning for land use, infrastructure, public transport systems and goods delivery networks, with a view to providing safe, affordable and efficient transportation, increasing energy efficiency, reducing pollution, congestion, and adverse health effects and limiting urban sprawl, taking into account national priorities and circumstances. This would include actions at all levels to: (a) Implement transport strategies for sustainable development, reflecting specific regional, national and local conditions, to improve the affordability, efficiency and convenience of transportation as well as urban air quality and health and reduce greenhouse gas emissions, including through the development of better vehicle technologies that are more environmentally sound, affordable and socially acceptable; (b) Promote investment and partnerships for the development of sustainable, energy efficient multi-modal transportation systems, including public mass transportation systems and better transportation systems in rural areas, with technical and financial assistance for developing countries and countries with economies in transition.” United Nations, 2002, Johannesburg Plan of Implementation, paragraph 21 of Chapter III: Changing Unsustainable Patterns of Consumption and Production.

“Reduce respiratory diseases and other health impacts resulting from air pollution, with particular attention to women and children, by: (a) Strengthening regional and national programmes, including through public-private partnerships, with technical and financial assistance to developing countries; (b) Supporting the phasing out of lead in gasoline; (c) Strengthening and supporting efforts for the reduction of emissions through the use of cleaner fuels and modern pollution control techniques; (d) Assisting developing countries in providing affordable energy to rural communities, particularly to reduce dependence on traditional fuel sources for cooking and heating, which affect the health of women and children.” United Nations, 2002, paragraph 56 of Chapter VI: Health and Sustainable Development.

A. Introduction

As explained both in Agenda 21⁴⁶ and in the Johannesburg Plan of Implementation, transportation plays a key role in the economic and social development of countries.

The transportation sector is a complex one. It includes passenger and freight transportation by water, air and land (roads, railroads)—and combinations of these modes—at the international, regional, national (inter-city and rural-urban) and local levels.

Although there has traditionally been a tendency to approach transportation based on individual modes of transport, the concept of “mobility” has recently gained currency as a means of emphasizing the issue of moving people and goods in a sustainable fashion. This shift is an attempt to focus on the many different facets of the subject, including but not

⁴⁶ Paragraph 9.13 (Basis for Action), section 2, Transportation, Chapter 9: Protection of the Atmosphere. Agenda 21, Rio de Janeiro, 1992.

limited to: modal options, transportation infrastructure, and integrating transportation policy with policies in other areas (urban development, environment, energy efficiency, poverty reduction, etc.).

In a global context of climate crisis and volatile fuel prices, the current challenge facing the countries of Latin America and the Caribbean (LAC) is to develop efficient and less polluting transportation systems for both passenger transport and freight.

Moreover, the global economic and financial crisis that occurred in mid-2008 is creating additional challenges in the attempt to move towards sustainable mobility systems in both the short and medium term, including the challenge posed by increasing poverty in the region. However, it also creates an opportunity to lay the foundation for a more equitable and sustainable development model—one that includes a focus on transportation infrastructure based on moving people and goods efficiently, economically and in an environmentally friendly manner, while respecting the dignity of users.⁴⁷

B. Description of the sector

Transportation is one of the largest sectors in the global economy, both financially and in terms of jobs and resource consumption. As table 4.1 shows, it is directly responsible for 5% to 9% of the region’s urban jobs.

Table 4.1

SELECTED COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN: TRANSPORTATION SECTOR EMPLOYMENT AS A SHARE OF ALL URBAN EMPLOYMENT

Country	1990	2000	2002	2004	2006	2007
Argentina	6.8	8.1	7.2	7.8	7.7	...
Bolivia (Plurinational State of)	7.5	7.0	7.7	7.7	...	9.1
Brazil	4.9	...	5.5	5.5	5.3	5.6
Chile	7.5	8.1	...	...	8.2	...
Colombia	6.6	6.9	7.7	8.2	...	9.6
Costa Rica	5.4	7.4	6.7	6.5	7.6	7.4
Ecuador	5.8	5.0	6.5	7.7	7.3	7.6
El Salvador	5.5	5.8	5.3	6.3	5.5	...
Guatemala	5.3	3.2	2.8	4.3	4.1	...
Honduras	4.5	...	5.4	5.5	5.2	6.0
Mexico	...	4.9	5.4	4.9	5.3	...

⁴⁷ Notable in this context is the Green Economy Initiative (GEI) of the United Nations Environment Programme (UNEP), which seeks to accelerate the transition to an environmentally sustainable economy. In the framework of this initiative, a group of international agencies, under the leadership of UNEP, launched the “Global Green New Deal”. This aims to promote a green approach to the short-range fiscal measures announced by governments in response to the crisis. The initiative is based on the possibility of creating a combination of policy actions capable of stimulating economic growth while improving the environmental sustainability of the world economy. Among other things, it has proposed that governments use most of the incentives packages and funding provided by the international financial institutions to develop transportation modalities and infrastructure that are more energy efficient and less polluting, improve public transportation and encourage the use of more environmentally friendly vehicles (United Nations, 2009, forthcoming).

Panama	...	9.1	9.7	9.7	9.1	8.7
Paraguay	5.9	5.3	5.2	5.6	...	5.3
Peru	...	8.5	8.0	...	...	...
Dominican Republic	...	6.7	7.8	8.2	7.5	7.7
Uruguay	5.8	6.0	6.0	5.8	...	6.0
Venezuela (Bolivarian Republic of)	6.6	6.8	7.3	8.2	8.2	8.7

Source: ECLAC/CEPALSTAT databases. Based on official information.

Thus, there is a positive relationship between economic growth and high-quality transportation infrastructure. Efficient and effective transportation infrastructure and services play a central role in a region's productivity and competitiveness, and are therefore key factors in its economic growth (Sánchez and Wilsmeier, 2005).

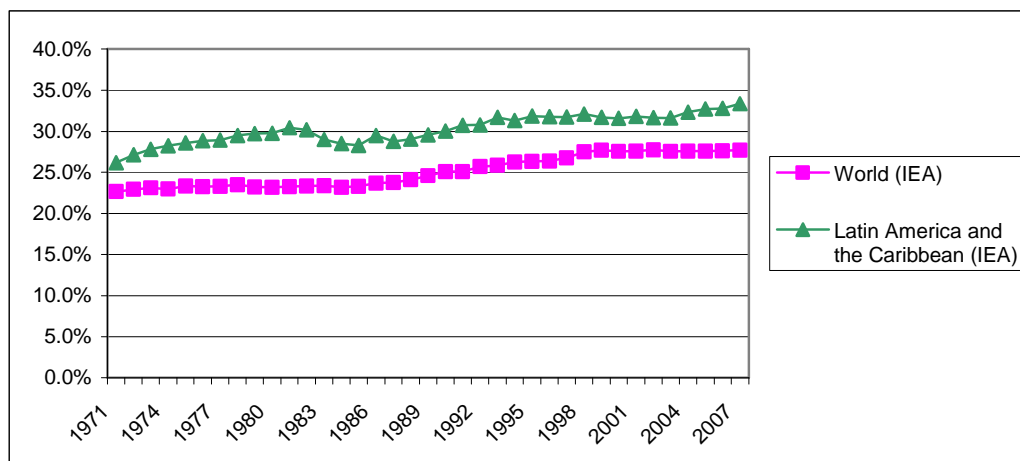
Although the Millennium Development Goals (MDGs) do not refer explicitly to transportation services, the sector plays a crucial role in advancing towards these goals and also, therefore, in overcoming poverty in the region. For example, improvement in the design, regulation and operation of transportation systems facilitates access to centres of production at lower economic and social cost (cf. MDG 1) and provides/improves connectivity and mobility, which are essential for access to basic educational and health care services for the entire population, especially among the poorest population and in rural areas (MDGs 2-6). Redesigning the policies that govern the provision and operation of transportation systems can lead to low-carbon infrastructures and sustainable transportation, thus improving the chance of meeting MDG 7. Effective analysis of the problems involved in streamlining transportation and improving its competitiveness directly benefit small island nations and countries without seacoasts, relating directly to MDG 8 (Pérez, G. and others, 2009).

As in other regions of the world, passenger and freight transport in Latin America and the Caribbean has increased steadily in the last few decades, and trends point to continued growth. This is due largely to increasing population, globalization and a rising standard of living, which, among other things, has increased the frequency of personal travel and the volume of goods transported.

The increased demand for transportation services creates a variety of serious environmental problems, principally due to the fact that it generates a need for more physical infrastructure and requires greater consumption of energy. Notably, the transportation sector is the principal source of growing energy demand, and this upward curve is expected to continue (see Figure 4.1).

Figure 4.1

TRANSPORTATION SECTOR ENERGY CONSUMPTION AS A PROPORTION OF ALL ENERGY CONSUMPTION



Source: Economic Commission for Latin America and the Caribbean (ECLAC), with data from the International Energy Agency (IEA).

According to the International Energy Agency (IEA), oil is the fuel used for nearly 95% of the world’s transportation needs. Latin America fits this pattern, with oil representing 95.5% of the sector’s energy consumption in 2006 (OLADE, 2006).

The transportation sector is also responsible for atmospheric emissions that impact the environment at the global, regional and local levels. Among the substances involved are greenhouse gases—carbon dioxide (CO₂), in particular—which have global environmental repercussions. The transportation sector is also responsible for particulate material, such as lead, nitrogen oxides (NO_x), sulphur oxides (SO_x) and volatile organic compounds (VOCs), which create environmental and health problems at the local, and often at the regional, level.

According to emissions estimates, mobile sources account for most of the air pollution in the region’s urban areas. In addition to generating particulates, automobiles are a major source of nitrogen oxides, sulphur oxides and carbon monoxide, which have serious consequences for the population’s health (see box 4.1).

Box 4.1
PRINCIPAL POLLUTANTS ATTRIBUTABLE TO MOTOR VEHICLES, AND RELATED HEALTH IMPACTS

Pollutant	Health impacts	Additional problems
Particulate matter (PM)	<ul style="list-style-type: none"> - Aggravation of asthma. - Reduced pulmonary function. - Heart attack. - Premature death. - Diesel PM is most likely a human carcinogen. 	Fine particulates (PM _{2.5}) produced directly by combustion sources are the secondary product of precursor gases such as sulphur dioxides, nitrogen oxides and organic compounds. PM _{2.5} are a serious concern, given that they are capable of penetrating deep within the lungs. These particles can remain in the atmosphere for days or weeks, and can travel hundreds or thousands of

		miles.
Hydrocarbons (HC)	- Many toxic components of hydrocarbons cause cancer and have other detrimental health effects.	Hydrocarbons can also react with nitrogen oxides in the presence of sunlight to produce ozone. In urban areas, mobile sources are typically responsible for a significant portion of the pollution.
Nitrogen oxides (NO _x)	- React with hydrocarbons to form ozone, which can create serious respiratory problems. - React to form nitrate particles and acid aerosols such as NO ₂ , causing respiratory problems.	This category includes various components and derivatives of the nitrogen oxides, including nitrogen dioxide, nitric acid, nitrous oxide, nitrates and nitric oxide. The latter is one of the principal ingredients in the formation of ozone at ground level. It reacts in the atmosphere to form nitrate particles and acid aerosols. The nitrogen oxides and pollutants that it forms are capable of traveling long distances.
Sulphur oxides (SO _x)	- Factors in respiratory illness, particularly in children and older people. - Aggravating factors in cardiac and pulmonary diseases.	These compounds contribute to the formation of atmospheric particles that reduce visibility. They can travel long distances and be deposited far from their point of origin.
Ozone (O ₃)	- Creates serious health problems, even at very low concentrations. Prolonged exposure can cause permanent lung damage, and premature death can result.	Ozone at ground level is not emitted directly by vehicles, but, rather, is a product of reactions involving hydrocarbons and nitrogen oxides in the presence of sunlight.
Carbon monoxide (CO)	- Toxic at high atmospheric concentrations, even for individuals in good health. At low levels, CO can affect people with heart disease. It can also affect the central nervous system, cause premature death and reduce the weight of newborns.	Motor vehicles are the major source of CO levels in cities.

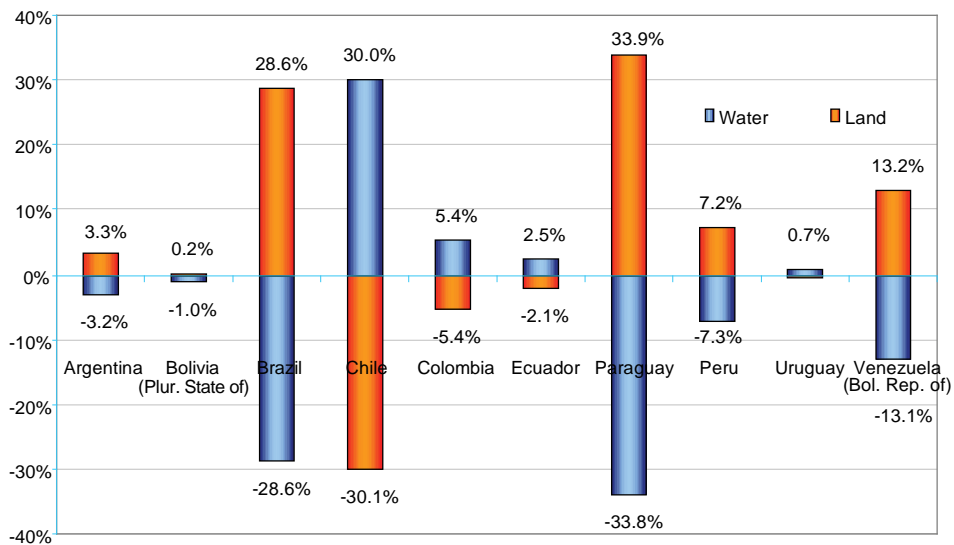
Source: "Opening the Door to Cleaner Vehicles in Developing and Transition Countries: The Role of Lower Sulphur Fuels." Report of the Working Group on Sulphur of the Partnership for Clean Fuels and Vehicles (PCFV), UNEP, 2007.

Despite significant impact on local, regional and global environments, as well as on health, transportation policy in the region has generally failed to take the environmental variable into account when planning investments in freight and passenger transportation.

For example, the increased volume of freight transported within the region between 2000 and 2007, particularly in South America, was biased towards land transport, as opposed to the less polluting water-borne modes of transport (maritime, river, lake) (see figure 4.2).

The current modal mix reflects the structure of logistical chains and political and legal obstacles to transporting merchandise by water. This inefficiency in the transportation and logistics system has economic consequences (higher transportation costs, leading to higher end prices), as well as environmental consequences (associated with higher emissions levels). Redesigning transportation infrastructure, and systems to create low-carbon infrastructure and less polluting and more energy-efficient means of transportation, would reduce the sector’s environmental impact and improve economic competitiveness and productivity, provided that the redesign includes a strategy to integrate transportation policy with economic and social development policy, replacing the traditional disjointed, modal approach.

Figure 4.2
DIFFERENCES IN THE MODAL COMPOSITION OF TRANSPORTATION FOR IMPORTS WITHIN SOUTH AMERICA, 2000-2007



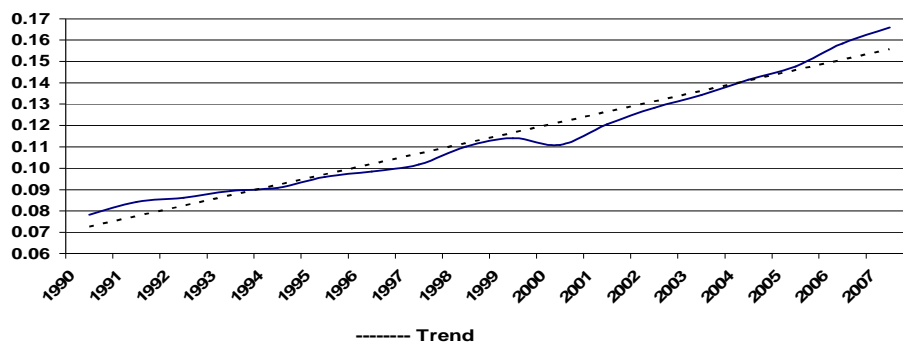
Source: International Transport Database (BTI), Economic Commission for Latin America and the Caribbean (ECLAC), 2009.

With regard to passenger mobility, despite the extensive literature supporting the importance of emphasizing public over private transportation, mass urban transport continues to be largely inefficient in many cities, while the region’s private automotive fleet is on the increase, with the number of automobiles per capita having risen from 0.08% in 1990 to 0.17% in 2007 (see figure 4.3). The growing use of automobiles in the region’s cities has had

major effects on pollution, as well as creating increasingly severe traffic congestion, which affects travel time and quality of life in large cities. There has also been an increase in safety problems on the roads. Indeed, the region's rates of injury and death from automobile accidents are among the highest in the world (see box 4.2).

Most of the region's cities have seen a dramatic rise in motorcycle use. This has not only aggravated congestion, given the lack of infrastructure and education needed to ensure that these vehicles are properly operated, but has also increased the accident rate. In fact, among different forms of transportation in Latin America and the Caribbean, motorcycles constitute the segment with the highest death rate (United Nations, 2009, forthcoming).

Figure 4.3
SELECTED COUNTRIES:¹ CHANGES IN SIZE OF AUTOMOTIVE FLEET, 1990-2007
(Number of automobiles per person)



¹ Includes statistics for the Bolivarian Republic of Venezuela, Peru, Panama, Mexico, Guatemala, Colombia, Chile, Brazil, Belize, the Plurinational State of Bolivia, Costa Rica, El Salvador, Honduras, the Dominican Republic, Paraguay and Argentina.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), with automotive fleet statistics from the Statistical Database of Social, Economic and Environmental Indicators for Latin America and the Caribbean (CEPALSTAT). Online, as of October 2009, at: <http://websie.eclac.cl/sisgen/ConsultaIntegrada.asp>.

Note: Annual rate of change, 1990-2007: 6.59%.

Box 4.2

CHALLENGES FOR THE REGION'S ROAD SECURITY

Traffic accidents constitute a serious public health problem and a major cause of death, injury and disability worldwide. Each year, over 1.2 million people die as a result of vehicle accidents, and nearly 50 million people are injured. Over 90% of these deaths occur in low- and medium-income countries, and the LAC region has the highest death rate from automobile accidents (26.1 deaths per 100,000 inhabitants). Predictions suggest that unless urgent measures are taken, this figure will increase to 31 deaths per 100,000 by 2020.

Predicciones del número (en miles) de víctimas mortales del tránsito, por regiones, una vez corregida la subnotificación, 1990–2020

Región ^a	Número de países	Número de víctimas mortales				Variación (%) 2000–2020	Tasa de letalidad (defunciones/100 000 personas)	
		1990	2000	2010	2020		2000	2020
África subsahariana	46	59	80	109	144	80	12,3	14,9
América Latina y el Caribe	31	90	122	154	180	48	26,1	31,0
Asia meridional	7	87	135	212	330	144	10,2	18,9
Asia oriental y el Pacífico	15	112	188	278	337	79	10,9	16,8
Europa oriental y Asia central	9	30	32	36	38	19	19,0	21,2
Oriente Medio y África septentrional	13	41	56	73	94	68	19,2	22,3
Subtotal	121	419	613	862	1 124	83	13,3	19,0
Países de ingresos altos	35	123	110	95	80	-27	11,8	7,8
Total	156	542	723	957	1 204	67	13,0	17,4

^a Los datos se presentan con arreglo a las clasificaciones regionales del Banco Mundial.
Fuente: reproducido de la referencia 48 (con pequeñas modificaciones), con permiso de los autores.

Source: Global Status Report on Road Safety, WHO, 2008.

Translation:

Predictions of number (in thousands) of traffic fatalities, by region, after correcting for under-reporting, 1990-2020

Region; Number of countries; Change (%); Fatality rate (deaths/100,000 persons)

Sub-Saharan Africa

Latin America and the Caribbean

South Asia

East Asia and the Pacific

Eastern Europe and Central Asia

Middle East and North Africa

Subtotal

High-income countries

Total

* Data are categorized according to World Bank regional classifications

Source: Reproduced from reference 48 (with minor modifications), with the authors' permission.

Historically, measures to reduce injury and mortality from traffic accidents have focused on protecting the occupants of vehicles. However, nearly half of those who die in accidents each year around the world are pedestrians, motorcyclists, bicyclists and persons using public transportation. This figure is even higher in the world's poorest countries and communities. The United Nations system—including WHO and the regional commissions—has underscored the importance of addressing the needs of all road users when establishing road safety, land use and urban traffic policies. Those belonging to the most vulnerable groups must not be neglected. There is an awareness that prevention is by far the best approach. In addition to strengthening interventions that have proven effective around the

world, such as the use of seatbelts and child restraint systems, greater attention must be given to the needs of specific groups of road users when planning transportation policy. This is particularly true in Latin America and the Caribbean, where more than 70% of such deaths occur among members of vulnerable groups using roads (e.g., in Colombia, Guatemala and Peru). WHO has suggested strengthening initiatives such as reducing vehicle speeds in urban areas and controlling alcohol consumption among drivers, since both affect not only vehicle occupants but vulnerable road users. Prioritizing the needs of vulnerable road users also involves recognizing the importance of the environment when designing policy and making planning decisions. In this respect, it is clear that infrastructure has a major effect on safety. As a specific example of how land use and transportation infrastructure planning that takes account of the needs of vulnerable road users can help prevent traffic accidents, there is the case of the Colombian capital of Bogotá. Between 1995 and 2001, the city implemented a number of land use and transportation infrastructure measures to address the needs of vulnerable road users. These measures included creating dedicated routes for cyclists and pedestrians, including automobile-free paths, and excluding automobiles from the downtown area during morning and evening rush hours. These measures helped reduce the number of deaths from traffic accidents from 1,387 in 1995 to 697 in 2002. For many of the region's people—particularly the most deprived—non-motorized means of transport (such as walking and bicycling) and public transportation are the only viable option for getting from one place to another. However, despite the obvious environmental benefits of improving infrastructure for non-motorized transportation, there continues to be a deficit in this area, with non-motorized transportation becoming increasingly unsafe. ECLAC has emphasized the importance of considering measures to ameliorate this situation and protect the most vulnerable road users, such as pedestrians and motorcyclists, by including pedestrian overpasses and underpasses, signage and proper partitions when designing infrastructure. In addition, however, such measures should be supplemented and strengthened by coordinated and integrated action in other areas, such as education, legislation and health, within a multidisciplinary framework. Of particular interest in this context is the initiative “Share the Road: Minimum 10% Finance for Safety, Sustainability and Accessibility”, led by the United Nations Environment Programme (UNEP), the FIA Foundation for the Automobile and Society and other associated organizations, in an effort to promote safe, sustainable transportation by encouraging the funding and design of roads to accommodate all users.

Global status report on road safety: time for action, WHO, 2009; Share the Road: Minimum 10% Finance for Safety, Sustainability and Accessibility, UNEP-FIA Foundation; Global Status Report on Road Safety, WHO, 2008.

C. Transportation and Sustainable Development

The following is a brief introduction to the principal issues surrounding the subject of transportation and sustainable development in the region. For each of the issues, a description of the current situation is given, along with an indication of present and future challenges. Wherever possible, examples of best practices are also provided.

1. The need for integrated policy on infrastructure, transportation and logistics

Traditionally, in Latin America and the Caribbean, infrastructure and transportation have been two rather separate policy areas. This poses problems in attempts to efficiently provide both common and scarce public goods. Transportation and transportation policy in the region are often analyzed and acted upon in terms of a single mode of transportation, and logistical considerations are often neglected entirely in planning transportation and infrastructure.

The focus of transportation policy needs to move from a unimodal orientation towards an integrated approach. Planning must integrate infrastructure development, transportation services, logistical considerations, and the need to facilitate trade and transportation within a context of sustainable development.

Where freight transportation is concerned, for example, policy planning and execution must focus on the competitiveness and productivity of the goods and services that the country exports or imports, rather than on its modes of transport. Thus, rather than debating the need for national maritime or rail policy, attention should centre on creating a national transportation policy designed to promote the productivity and competitiveness of the national economy (Pérez, G., 2008).

Regional experiences are of particular interest in this respect. The Colombian case is perhaps the best example, to date, of national logistical policy in Latin America. As part of a set of initiatives undertaken in the framework of the National Competitiveness System (Sistema Nacional de Competitividad, or SNC), which was established in 2006, Colombia established a national logistics policy in 2008. This effort had several objectives, including: consolidating a national logistical system to optimize the cost structure of the physical distribution of goods; integrate supply chains through efficient use of high-quality transportation infrastructure designed to encourage intermodality; and supporting information and communications technologies (ICT) to promote trade and ongoing adoption of improved business, logistics and transportation practices (Cipoletta, G. and others, 2009).

Although it is still too early to evaluate the implementation of this policy, the attempt to coordinate efforts and improve the efficiency of the country's logistical and transportation system is noteworthy. The policy does have certain shortcomings, such as a failure to incorporate efficient training of human resources, a low level of support for ongoing public-private collaboration, and the fact that there is not, as yet, any single legal entity to oversee the entire policy. Moreover, there is uncertainty as to how environmental issues will be incorporated. Nevertheless, the effort is an interesting attempt at establishing an integrated

transportation policy that takes account of social and environmental, as well as strictly economic, factors.

Other Latin American countries have begun to devote attention to these issues, although no comprehensive national policies have yet emerged.

Peru has adopted various measures to improve its logistical, infrastructure and transportation system, but these measures have not yet been unified under a single policy.

Ecuador is beginning to take actions to address the issue through its National Council for the Revitalization of Production and Competitiveness, but private-sector involvement remains to be incorporated, and there needs to be better organization of the working groups on logistics and facilitation.

Paraguay and Chile are currently studying the issue, and preliminary discussions are in progress. Brazil has created a logistics and transportation plan, but the plan has been focused more on infrastructure than on developing a logistics policy.

In summary, some of the major obstacles frequently encountered in implementing policies of this type in Latin America and the Caribbean include lack of knowledge of the subject and excessively simplified long-range approaches and planning. Thus, the challenge is to provide for effective training of human resources, adopt a comprehensive perspective in designing plans and establish a legal frame of reference capable of supporting a long-term sustainable model (Cipoletta, G. and others, 2009).

2. Urban transportation

Approximately 75% of the population of Latin American and the Caribbean lives in cities, and the figure projected for 2020 is 80.4% (United Nations, 2009, forthcoming). Against this backdrop, developing sustainable urban transportation systems remains a priority for the region.

Both large and medium-sized cities in the region currently face heightened automobile traffic and private automobile use. The resulting increase in air pollution (with significant health effects on the population), high noise levels, heavy traffic congestion, damage to architectural patrimony and degradation of green areas, as well as higher accident rates, create a range of dilemmas for governments as they attempt to prioritize infrastructure investments in urban mobility.

Faced with these circumstances, urban transportation policy in most of the region's large cities has attempted to simultaneously achieve two objectives: (i) increase capacity for private automobiles by building urban freeways and widening streets to handle more cars; and (ii) extend, enlarge and improve mass transportation systems such as subways and bus systems, including the creation of integrated mass transport systems, such as the "Transmilenio" in Bogotá, Colombia (Lupano and Sánchez, 2008) (see box 4.3).

These priorities are evident in most of the region's capital cities, such as Buenos Aires and Santiago (Chile). The phenomenon reflects not only a lack of uniformity in urban mobility

policy, but also the contradictory pressures affecting authorities faced with making decisions. On the one hand, mass transportation is a priority, while, on the other, efforts are being made to reduce congestion by creating greater capacity for individual modes of transportation. As has been described extensively in the literature, expanding the capacity of streets and freeways, though it helps alleviate the problem of traffic congestion in the short term, creates greater incentives for automobile use, which in the medium term generates greater congestion (Lupano and Sánchez, 2008).

Thus, although there is an awareness of the benefits of public transportation over private automobiles, and a record of interesting experiments in the region (see box 4.3), there continue to be contradictions at the policy level. In order to advance in this area, two specific obstacles need to be overcome.

One such obstacle is the lack of cohesion between policies on sustainable mobility, on the one hand, and land use and urban development policies on the other. The need to set aside common public-use routes for mobility and transport, and to distribute them effectively among the various modes of transportation, is an integral part of urban development planning. The challenge facing planners is how to limit urban expansion and strengthen neighbourhoods and urban centres of activity. The aim of such efforts is to establish areas, relatively separate from traditional downtowns, that would be occupied and used in a variety of ways, organized on a scale to promote foot and bicycle transportation, while at the same time providing attractive, efficient and environmentally friendly public transportation.

International experience has shown that the availability of efficient public transportation is not, in itself, sufficient to discourage automobile use. As in most of the world's countries, automobiles in Latin America and the Caribbean are not only a means of transportation, but also a status symbol. Thus, as incomes increase, interest in owning a vehicle intensifies. Given this dynamic, policies to discourage automobile use must take account of three complementary elements: (i) high-quality public transportation whose attraction will not be limited to the lower-income population; (ii) economic instruments designed to discourage the use of private vehicles (road use fees, tolls to enter city centres, etc.); and (iii) educational initiatives and campaigns to increase awareness of the impact of transportation on air pollution and climate change and enhance people's appreciation of the benefits associated with specific modes of transport (e.g., the health benefits of walking or bicycling).

Box 4.3

INITIATIVES TO IMPROVE PUBLIC TRANSPORTATION IN THE REGION

In order to improve air quality and reduce traffic congestion, reforms of urban public transportation systems have been undertaken in a number of the region's cities during the last several decades, with differing results. The following are some examples of such efforts.

Curitiba: The Curitiba rapid transit bus (RTB) system was initially implemented in 1972 as part of a more general urban planning policy. The system includes 64.6 kilometres of trunk roads and accommodates 560,000 trips per day. The system employs dedicated lanes, a payment system at stations, and high-capacity vehicles.

Quito: Based on the experiment in Curitiba, Quito developed a similar system, but on a smaller scale. Since 1995, a network of trunk roads has been under construction for the city's RTB systems, with three currently in operation. The overall system has 37 kilometres of trunk roads, and moves 400,000 passengers per day. Two operators—one private-sector and one public—are involved. One of the system's shortcomings is its lack of integration, both physically and in terms of how payment is handled in the three subsystems.

Bogotá: Bogotá's RTB system, TransMilenio, which was launched in 2000, has 84 kilometres currently in operation and transports some 1.4 million passengers per day. Its planning incorporates major innovations, which have made it the strongest RTB system in the world. Among its distinctive features are express service (buses that do not stop at all stations). It has reduced travel times and increased per-hour capacity in each direction. Another feature of the system is its recent integration with non-motorized transportation (bicycle parking at points of entry to the system). This has increased the system's passenger numbers considerably, and has reduced the burden on feeder lines. It is estimated that TransMilenio has reduced greenhouse gas emissions (GGEs) in the city by approximately 134,000 tons per year (UNEP, 2009, forthcoming). The success of Bogotá's TransMilenio has led to implementation of a plan to create RTB systems in seven Colombian cities.

Mexico City: Mexico's capital city has also created a system, the "Metrobus", which was built to complement the city's extensive subway system. Trunk roads totalling 20 kilometres have been built, and the system supports 260,000 trips per day. Although the project was not explicitly aimed at reducing CO₂ emissions, it has reduced emissions associated with vehicle traffic on the order of 10%, or 50,000 tons per year. This represents roughly 0.25% of all emissions from transportation in the city, a significant achievement for a small project (Shipper, L. and others, 2009).

Santiago, Chile: The "Transantiago" system was developed by the Chilean government in order to: improve the coverage of public transportation in Santiago and reduce the number of transfers from one line to another; improve wait times and increase the routes available; and redesign the system to integrate—physically and in terms of the payment system—the city's bus and metro services. Despite the problems attending its launch in 2007, major improvements have been achieved in the system's functioning, principally through increasing the fleet and creating a greater number of dedicated lanes, bus stops and infrastructure for modal (metro/bicycle) integration. This, along with redesigning the route network to better serve the population's needs, has significantly reduced wait and travel times. The system's primary impact on the population has been to increase safety and reduce noise levels. Remaining challenges include continuing to reduce particulate emissions and improving the system's energy efficiency, along with finding a form of financing that will make it sustainable and attractive for the city's population.

Source: Pardo, Felipe (2009). Los cambios en los sistemas integrados de transporte masivo en las principales ciudades de América Latina. ECLAC: Infrastructure Services Unit; UNEP (2009, forthcoming), GEOALC, 2009; Schipper, L. and others, (2009), Considering climate change in Latin American and Caribbean urban transportation: Concepts, applications, and cases. Final report. 5 June 2009. Centre for Global Metropolitan Studies, University of California, Berkeley.

3. Limitations in existing transportation infrastructure

3.1 Freight transportation infrastructure

The region today has limited freight transportation infrastructure. Unless this is addressed, it could affect growth and poverty reduction strategy (see box 4.4). Exports have become the engine of the region's development. However, the growth in export volumes, particularly with the explosion of demand in the Asian economies (especially China), has not been matched by expansion and improvement in the region's transportation infrastructure, resulting in bottlenecks. The divergence between the dynamics of the growth in transportation infrastructure supply and increased demand calls for prompt action and policy decisions at the national and regional levels, in order to ensure that development is not held back by insufficient transportation infrastructure and services.

Box 4.4

LACK OF CAPACITY AND THE STATE OF TRANSPORTATION INFRASTRUCTURE IN LATIN AMERICA AND THE CARIBBEAN

The Americas, as a region, have an extensive transportation infrastructure network stretching from the United States–Mexico border to the southern tip of Panama, with another from Venezuela through Colombia and west of the Andes, and a third linking central Chile with Argentina and southern Brazil. Other parts of the region have smaller networks or series of links, but not what could be considered actual networks, consisting mostly of unpaved roads that are difficult to traverse. The region's highways, overall, are old, except for those built by concessionaires during the last decade, which represent no more than 3% of the total in the region. Most of the transportation network consists of roads, since railroads function primarily as links between mining or agricultural areas and ports on the seacoast (or, in some cases, on rivers). General railroad freight transportation is limited principally to central and northern Mexico, central and northern South America (iron and coal) and certain parts of the Southern Common Market (MERCOSUR) area. The integrity of the rail network is compromised by differences in rail gauges from one country to another. Moreover, there is markedly less road infrastructure in Latin America and the Caribbean than in other regions of the world. The region's paved roads account for only 15.4% of its total road infrastructure, compared with figures of between 54% and 59% for the United States and Central European countries, and over 95% in Western Europe.

The Western European countries have over 1,000 metres of highway for each square kilometre of territory, while the United States has 658. The average for Latin America is 147 metres.

The amount of rail per unit of area is also considerably lower in Latin America than in the United States, Europe or Asia. On average, Latin America and the Caribbean have eight times less road per square kilometre of territory than do the European countries.

The potential of water transport is of great interest, since the region has a vast amount of navigable waterways. Although the average length of river waterways per square kilometre of territory is greater than in the United States (6.06 vs. 4.26), the United States moved more

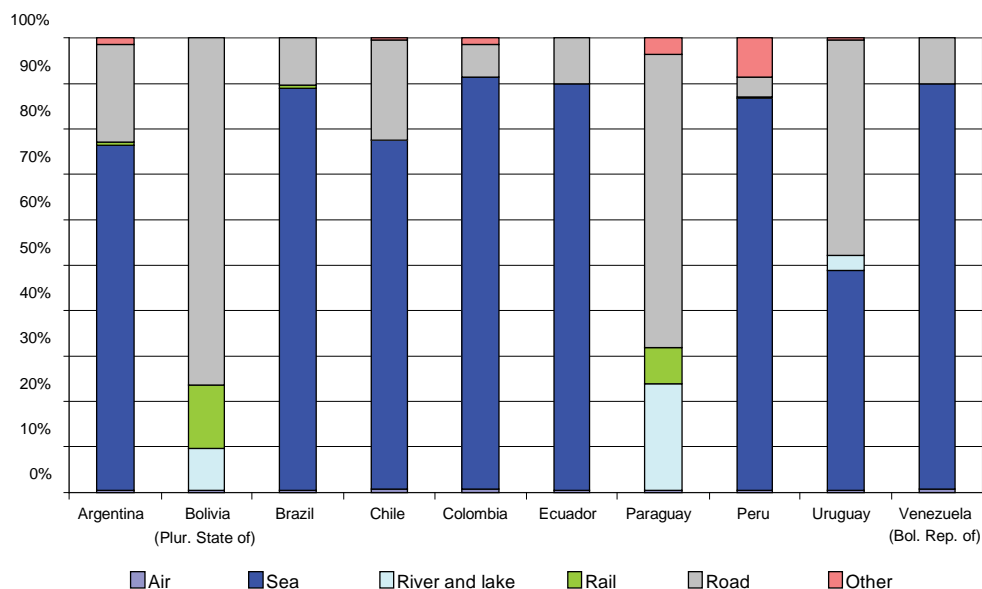
than 14% of total volume on waterways in 2000, while the Latin American figure is under 3%, suggesting that there is major untapped potential in this area.

Source: Sanchez, R. and G. Wilmsmeier (2005), Provision of Transport Infrastructure in Latin America: recent experience and problems observed. Series 94, Economic Commission for Latin America and the Caribbean (ECLAC) Division of Natural Resources and Infrastructure.

Given these realities, the challenge is to develop integrated infrastructure, transportation and logistics policy based on a new economic and social development model—a model designed with a view to economic productivity and competitiveness at the national level, while also taking account of social well-being and respect for the environment. Considering all of these factors, governments should emphasize low-carbon infrastructure, favouring those transportation modes or combinations of modes that provide greater competitiveness for export products without endangering the population’s economic, social or environmental welfare.

As shown in figure 4.4, the modal distribution of the South American countries’ transportation systems favours maritime transport, except in the countries that have no coastline (Bolivia and Paraguay). Given the impossibility of directly accessing international maritime transport, landlocked countries have emphasized highways, often at increased cost, and with the consequent negative externalities entailed by this type of transportation (including a need for more infrastructure, maintenance of existing infrastructure, congestion, pollution, traffic accidents, deforestation and relocation of populations necessitated by creating new infrastructure) (Pérez, G. and others, 2009).

Figure 4.4
SOUTH AMERICAN COUNTRIES: TOTAL TONS IMPORTED, BY MODE OF TRANSPORT, 2007



Source: Economic Commission for Latin America and the Caribbean (ECLAC), International Transport Database (Base de Datos de Transporte Internacional, or BTI) 2009.

Note: Information on Paraguay is for 2006.

Among the different forms of freight transport, rail transport in South America continues to be the least important at the national and subregional levels. However, the export boom, and a renewal of interest in developing infrastructure, are favouring the emergence of new approaches that are not only unimodal, but multimodal and intermodal. In this connection, ECLAC has emphasized the potential of rail transport for connecting isolated regions with riverways, providing better access to seaports downstream, with less environmental impact (Wilmsmeir, 2007).

In short, multimodal transportation (not limited to rail and river) should be a key component in a sustainable regional transportation policy. Advancing such policy, however, requires coordination among the region's governments, in order to organize resources and actions with reference to multimodal options that offer the greatest economic, environmental and social benefits for the region as a whole.

Given the circumstances, it is important to support and strengthen initiatives designed to improve transportation infrastructure in the regional context. Of note in this connection are the South American Regional Infrastructure Integration Initiative (IIRSA) and the Mesoamerica Project (formerly the Puebla-Panama Plan). Although the environmental issues have been given only marginal consideration in both cases, these projects represent an opportunity to address the challenges of developing sustainable transportation systems in a coordinated fashion (see box 4.5).

Box 4.5

REGIONAL COOPERATION INITIATIVES

The **South American Regional Infrastructure Integration Initiative (IIRSA)** is a forum for dialogue among the agencies responsible for transportation, energy and communications infrastructure in the 12 South American countries. It seeks to promote the development of infrastructure in the subregion, improving interconnection between countries. Although the initiative has been criticized for being conceived without due regard for environmental and social impact, especially in highly sensitive regions such as the Amazon, its institutions have gradually been incorporating mechanisms and instruments related to environmental sustainability, such as the so-called Strategic Environmental and Social Assessment mechanisms. The **Mesoamerica Project (formerly the Puebla-Panama Plan)** has made evident progress. It established a Mesoamerican Environmental Sustainability Strategy that provides for regional action in areas strategic for biodiversity and forests. Addressing climate change, it is designed to promote sustainable competitiveness (cleaner-production interventions, strategic assessment of environmental impact for projects in infrastructure, mining and other economic areas). Although the effects of these measures are not yet apparent, the two initiatives represent concrete efforts to address multimodal transportation options that promote sustainable freight and passenger mobility in the region.

Source: United Nations (2009, forthcoming), Millennium Development Goal 7 in Latin America and the Caribbean: Environmental Sustainability of Development. ECLAC: Santiago.

3.2 Transportation infrastructure in rural and isolated areas

The limited availability of transportation infrastructure has serious consequences for the population in rural and isolated areas, given the particular territorial distribution of the region's population. The amount of area in Latin America—particularly in South America—is vast, with low population densities and large distances between population centres and principal centres of production, due to the nature of the productive activities (mining, agriculture and forestry, among others) that characterize the region. The region has some of the highest urban-population concentrations in the world, with cities such as Mexico City, São Paulo, Buenos Aires and Rio de Janeiro—all of which are among the most overpopulated cities in the world, each with over 12 million inhabitants— while the enormous interior areas of the countries generally are sparsely populated.⁴⁸

Because of the low population density in remote rural areas, infrastructure investment in such regions continues to be a challenge for the region's governments. However, such investment is indispensable in order to ensure that rural, isolated populations have access to education, health care and basic services.

Mexico is advancing in this area, developing methods of assessment to measure how the construction of rural roads affects the population's welfare (tracking parameters such as marginalization, access to health services, education and jobs, income and spending). As a result of this initiative, and with increasing awareness of the importance of rural mobility in low-income areas, the government has invested in rural roads (Federal Government of Mexico, 2009).

At the same time, Barbados is studying the possibility of promoting the use of taxis between main roads and a number of small villages, in order to supplement the services provided by its main transportation system. Among the challenges that the country must face is the difficulty of providing bus service in certain areas of the country, given the poor conditions of the roads there and the fact that some residential areas have been developed with streets too narrow for standard-size buses (Environment Division, Barbados Ministry of the Environment, Water Resources and Drainage, 2009).

4. Transportation and climate change

Although the region's CO₂ emissions represent only a small fraction of emissions in developed countries, the region's level of emissions associated with land transport is high in relation to its income levels. This is due largely to the relatively high number of vehicles per

⁴⁸ For example, one of the largest and most populous countries is Brazil, over 90% of whose population is located in the Atlantic states, while 55% of Argentina's population lives in a radius of 450 kilometres from the city of Buenos Aires—within which nearly 70% of the country's economic activity takes place. (Sánchez, R. and G. Wilsmeier, 2005).

person. Cars and light trucks are responsible for nearly two thirds of CO₂ emissions in the region's metropolitan areas, despite the fact that these modes of transportation account for only a small proportion of total urban trips (Schipper, L. and others, 2009).

If current trends continue, emissions from highway transportation in Latin America and the Caribbean are expected to increase markedly in the coming decades. Considering projections for both freight and passenger transportation, as well as vehicle use and corresponding CO₂ emissions, it is estimated that growing automobile use will triple the region's total CO₂ emissions by 2030, even with improvements in fuel efficiency (Schipper, L. and others, 2009).

However, the increase in the automobile fleet is not the only factor influencing vehicle emissions in LAC. Other significant factors are the age of the fleet, inadequate maintenance, lack of emissions control technology and problems of fuel quality. In some countries, the practice of importing inefficient used vehicles also affects the age of the fleet. A study in Lima in 2003, for example, found that the average age of the city's automobiles was 11 years, as compared with 6.4 years in Santiago (2002) and 7.4 in São Paulo (2004) for the same types of vehicles. Buses and trucks were found to represent only 10% of the fleet in San Salvador, but to be responsible for 75% of the PM₁₀ emissions from transportation (UNEP, 2009, forthcoming).

Given these realities, the region must progress on various parallel fronts: (i) creating policies that contribute to reducing the demand for transportation (e.g., by creating diversified urban centres and encouraging telework); (ii) promoting less polluting and more energy efficient modes of transport (see box 4.3); and (iii) reducing the impact of transportation through the development of new technologies, such as low-carbon fuels and intelligent transportation systems to optimize routes.

The region also has major opportunities to implement simple operational improvements in areas such as energy-efficient driving. Operational changes of this type will bring immediate reductions in the cost of transportation, and will have a positive impact on safety. However, they require an investment in installed capacity and in training.

Of note at the international level, and with implications for the region, is the Global Fuel Economy Initiative (GFEI) led by the United Nations Environment Programme (UNEP), the International Energy Agency (IEA), the International Transportation Forum (ITF) and the FIA Foundation. In March of this year, the initiative launched its "50 by 50" campaign, which seeks to reduce the size of the global fuel economy by 50%. Projects in the framework of this initiative include pilot projects in two of the region's countries, Chile and Costa Rica, aimed at developing national fuel policies.⁴⁹

Also of note is the Central American Sustainable Energy Strategy 2020, which was approved in 2007 at the Third Meeting of Ministers of Energy of the countries in the Central American Integration System (CAIS). This strategy includes goals for five major components, one of which involves using biofuels for improvements in the areas of transportation and climate change (Ministry of Environment, Energy and Telecommunications of Costa Rica, 2009).

⁴⁹ More information at: www.50by50campaign.org.

5. Technological innovation and more efficient fuels

The region has made major advances in technological innovation. The most important of these is the plan for follow-up to the Johannesburg agreements, with the total elimination of leaded gasoline in all of the region's countries. In addition, most of the region's countries, including Brazil, Colombia, Cuba, Chile and Mexico, have adopted vehicle emissions standards. These standards, however, vary from country to country.

One challenge still to be addressed in efforts to reduce vehicle emissions in the region is that of reducing the sulphur levels in automobile fuels. This would produce immediate reductions of emissions from existing vehicles, and is a necessary step in facilitating the use of improved catalytic converters, filters and other technologies to eliminate most of the pollution produced by today's gasoline and diesel vehicles (UNEP, 2007). The sulphur content of fuels in Latin America and the Caribbean varies from country to country.⁵⁰

Of note in this connection is the decision, adopted at the Sixteenth Meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean, to work with regional organizations and collaborators to reduce the sulphur content of fuels, with a view to reaching a goal of 50 parts per million. This initiative is targeted to countries with air quality problems in their metropolitan areas.⁵¹

The region has benefited significantly from the exchange of information and experience concerning global initiatives such as the Partnership for Clean Fuels and Vehicles,⁵² which was established at the 2002 World Summit on Sustainable Development in order to help developing countries reduce air pollution from vehicles, through improvements in fuels and vehicles. The Partnership focuses on promoting best practices and on facilitating knowledge and technology transfer. Regional initiatives such as this should be encouraged.

The region has also been a leader in using alternative fuels to replace oil. Brazil stands out in this respect (see box 4.6). A number of the region's countries are also exploring the use of electric vehicles, hybrid vehicles and vehicles running on natural gas or liquefied petroleum gas (e.g., Colombia and Barbados).

⁵⁰ The Partnership for Clean Fuels and Vehicles website (www.unep.org/pcf) provides information on the specific situation of each country.

⁵¹ Online at: <http://www.unep.org/pcf/PDF/FinalXVIReuniondelForoo8feb2008.pdf>.

⁵² More information online at: <http://www.unep.org/pcf>.

Box 4.6**THE BRAZILIAN EXPERIENCE WITH BIOFUELS**

During the first global oil crisis, in 1975, Brazil undertook a national biofuels programme in which it produced ethanol on a large scale, drawing on the nation's supply of sugar cane. Today, over 90% of the automobiles manufactured and sold in Brazil are flex-fuel vehicles, i.e., they can function on bioethanol, gasoline or a mixture of the two. Brazil recently launched a global campaign to promote biofuels as a viable alternative to fossil fuels in transportation.

The success of biofuels in Brazil is due in large part to the high levels of sugar cane production and its suitability as a raw material that can be efficiently converted into ethanol. Each year, approximately 190,000 hectares of sugar cane are planted in Brazil, mostly in the southern part of the country. Brazil is expected to remain the world's largest biofuels exporter.

Source: Forests and Energy—Key Issues. Study by the Food and Agriculture Organization of the United Nations (FAO): MONTES 154. FAO. Rome, 2008.

In short, although the region has progressed in introducing technological solutions to reduce pollution from cars, buses, trucks, trains, ships and airplanes, these measures are not sufficient, and must be complemented by a restructuring of current transportation patterns. Although it is important to promote these initiatives, the focus of attention should be less on particular modes of transport, and more on an integral view of sustainable mobility for persons and goods that provides for dignity, efficiency and environmental friendliness.

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5. CHEMICALS

In the Johannesburg Plan of Implementation (2002), paragraph 23, the United Nations member countries: “Renew the commitment, as advanced in Agenda 21, to sound management of chemicals throughout their life cycle and of hazardous wastes for sustainable development as well as for the protection of human health and the environment, inter alia, aiming to achieve, by 2020, that chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment, using transparent science-based risk assessment procedures and science-based risk management procedures, taking into account the precautionary approach, as set out in principle 15 of the Rio Declaration on Environment and Development, and support developing countries in strengthening their capacity for the sound management of chemicals and hazardous wastes by providing technical and financial assistance.” This would include actions at all levels to: (a) Develop a strategic approach to chemicals management at the international level; (b) Ratify and enforce international instruments on chemicals, hazardous waste, and the illicit traffic in these (Basel, Rotterdam and Stockholm Conventions); (c) Develop consistent, comprehensive data on chemicals, for example by means of national registries on emissions and transfer of pollutants; (d) Enforce the new Globally Harmonized System of Classification and Labelling of Chemicals; (e) Foster collaborative partnerships to promote activities aimed at improving ecologically rational management of chemicals and hazardous waste; and (f) Reduce the risks from heavy metals.

The Johannesburg Plan of Implementation also commits the countries to dedicate themselves to reducing ozone depleting substances (ODSs), pursuant to the Vienna Convention and the Montreal Protocol.

The present chapter addresses the situation of the Latin American and Caribbean countries with regard to these issues.

A. Introduction

The production and use of chemicals have important economic and social benefits. In Latin America and the Caribbean, chemical products are particularly important in agriculture as a means of controlling insect-borne diseases and pests, and as a source of fertilizers for agriculture. They also play key roles in pharmaceutical production, food production, production of cleaning and hygiene products, water treatment, construction and many industrial processes. In some countries, the chemical industry plays a highly significant economic role.

In the absence of appropriate management and monitoring of these substances, however, water, air and soils are susceptible to contamination by toxic chemicals, entailing high social and economic costs. Exposure to contaminants disproportionately affects the poor. While

LAC has made progress in this respect in recent years, there continue to be serious problems.⁵³

- Until 2002, toxic pesticides such as DDT, lindane, endosulfan, aldrin and dieldrin were still used. There have been considerable efforts in the region to prohibit or restrict the use of chemicals such as DDT, aldrin, dieldrin, lindane, paraquat and metamidofos. Use of aldrin and dieldrin are now prohibited. Nearly all of the countries have prohibited the agricultural use of lindane, although some countries still allow its use as a drug. Though there is insufficient information on DDT use, it is clear that limited use still occurs in some countries as a component of public health measures to control vector-borne diseases, under the guidelines of the World Health Organization (WHO) and the Conference of the Parties to the Stockholm Convention (UNEP/Conference of the Parties to the Stockholm Convention, 2009). The disposal of obsolete pesticides and other hazardous substances remains a challenge, since there is insufficient capacity to dispose of them in environmentally appropriate ways
- Major progress has been made in eliminating toxic substances from industrial production, but a number of significant problems remain.
 - There is no production of PCBs or dielectric oils (used in transformers and condensers), and many of the region's countries have made preliminary inventories of these products. However, much equipment containing PCBs is still being used.⁵⁴
 - In some parts of the region where persistent toxic substances were produced in the past, there are critical levels of contamination. The effects of this on nearby populations are not yet clear.
 - Certain toxic industrial by-products (dioxins and furanes) are still being produced. Uncontrolled burning of residues is one of the principal sources of emissions of these contaminants.
- In many cases, workers in sensitive agricultural and industrial sectors are not adequately protected, and exposure to contaminants jeopardizes their health.
- The use of mercury to extract gold has generated high concentrations of the substance, particularly in the Amazon basin, impacting human health through mercury ingested in fish (see chapter 3 on other environmental aspects of mining).
- Leaded gasoline has been eliminated, but there are other sources of this metal that still have not been adequately controlled, such as paints and batteries. Exposure to lead is associated with cardiac and cerebro-vascular disease, lung cancer, and other diseases.

⁵³ For a review of the situation as of 2002, see UNEP (2002), "Regionally Based Assessment of Persistent Toxic Substances—Regional Report, Eastern and Western South America", <http://www.chem.unep.ch/pts/regreports/Translated%20reports/Eastern%20and%20Western%20South%20America%20sp.pdf>; <http://www.chem.unep.ch/pts/regreports/Translated%20reports/Central%20America%20&%20Caribbean%20sp.pdf>; and IOMC/UNEP(2002), "World Evaluation of Mercury", <http://www.chem.unep.ch/mercury/GMA%20in%20F%20and%20S/final-assessment-report-Nov05-Spanish.pdf>. Some of the problems identified at that time persist today.

⁵⁴ Under the Stockholm Convention, the deadline for eliminating these is 2025.

- Inadequate or inappropriate management of hazardous wastes leads to contamination of soil, water and air by pesticides, metals and other substances (see chapter 3 on waste management). Inadequate incineration of household, industrial and agricultural wastes and the practice of burning to clear land are potential sources of dioxins, furanes, hexachlorocyclohexane (HCH) and polycyclic aromatic hydrocarbons (PAHs). Oils from waste matter add to PAH contamination. Hospitals, which commonly incinerate waste, represent an additional contributing factor.
- Levels of preparedness for accidents among workers handling hazardous chemicals are inadequate.

B. The Strategic Approach to International Chemicals Management

In order to meet the goals of the Johannesburg Plan of Implementation, the Strategic Approach to International Chemicals Management (SAICM) was approved by the first session of the International Conference on Chemicals Management (ICCM) (Dubai, February 2006). Three basic texts define SAICM: The Dubai Declaration on International Chemicals Management; the Global Policy Strategy; and the World Plan of Action. A “Quick Start Programme” has been established as a mechanism to spur implementation (see attached Information Note, prepared by the SAICM Secretariat).⁵⁵

To date, 28 of the 33 Latin American and Caribbean countries have participated in sessions of the International Conference on Chemicals Management (ICCM). Before the Strategic Approach was adopted, rational management of chemical products was dealt with regionally, through a declaration of the Ministers of Health and the Environment of the Americas adopted at Mar del Plata on 17 June 2005. The importance of an agenda for cooperation to prevent and reduce the impact of obsolete and potentially hazardous chemical products was also emphasized at the Summits of the Americas, held in Quebec City (Canada) in 2001 and in Monterrey (Mexico) in 2004. The region’s commitment to effective application of SAICM was reiterated by the Heads of States in the Declaration of Lima, adopted at the Summit of Heads of State and Government of the European Union, Latin America and the Caribbean in Lima, on 16 May 2006.

ICCM has given special emphasis to the importance of regional fora designed to promote application of SAICM, since they are a useful mechanism for countries to share information and experience, and serve as catalysts for national and regional measures (SAICM Secretariat, 2009). The following are events that have taken place in this context:

- The first regional meeting on SAICM was held in Panama City in February 2008, when the Regional Coordination Committee was established.⁵⁶

⁵⁵ “Information Note prepared by the Secretariat for the Regional Implementation Meeting for Latin America and the Caribbean in preparation for the eighteenth session of the Commission on Sustainable Development.” SAICM Secretariat, 14 October 2009.

⁵⁶ The current regional coordinator of SAICM is Ms. Gillian Guthrie (Jamaica). The region is represented by the governments of Barbados and Venezuela on the Executive Board of the Strategic Approach Quick Start

- The Committee met for the first time in Port of Spain, Trinidad and Tobago, in June 2008, and for a second time in Santiago, Chile, in November 2009. The purpose of this second meeting was to review the results of the second session of ICCM2, to define priorities and take the measures necessary for the process to continue smoothly, and to prepare for the second Latin American and Caribbean Region meeting in March of 2010. [To be updated following the meeting]
- In December 2008, there was a Regional Consultation Meeting in Viña del Mar, Chile, where issues relating to ICCM2 were discussed.
- In March 2009, Bridgetown, Barbados, was the site of a workshop that discussed the SAICM and instruments for dealing with potentially hazardous chemical wastes in the Caribbean subregion.⁵⁷

Most of the region's countries have appointed national focal points for implementation of SAICM. These are generally government personnel working in areas of the environmental or foreign relations. Mechanisms have also been established for interinstitutional coordination between relevant staff in different areas of government. National meetings of stakeholders have also been held, and collaborative structures have been organized.

A number of countries have begun to develop national implementation plans. In Chile, the National Chemical Security Policy (Política Nacional de Seguridad Química, or PNSQ), approved in 2008, incorporates most of the specific SAICM measures. Costa Rica developed a short- and medium-term National Action Plan that includes measures in priority thematic areas of SAICM.⁵⁸ In Colombia, an SAICM Quick Start Programme ("Strengthening National Governance for SAICM Implementation in Colombia") was approved. Panama has developed an integrated national programme for the rational management of chemicals and for implementation of SAICM. Honduras, Guyana, Nicaragua and Paraguay are developing their individual implementation plans. Other countries are in the process of incorporating SAICM priorities in their national policies, updating national profiles and conducting capacity-building programmes (the Plurinational State of Bolivia, Guatemala, Nicaragua and Paraguay, among others). Some of these activities have been carried out with the collaboration of the United Nations Institute for Training and Research (UNITAR) and funding from the SAICM Quick Start Programme. Through Quick Start Programme projects, and with support from UNITAR, Barbados, the Plurinational State of Bolivia, Chile, Costa Rica, Guatemala, Haiti and Honduras have developed or updated their national profiles and capacities assessments, and have established priority areas of concern and activities for chemicals management.

At the subregional level, the MERCOSUR Plan of Action on Chemical Substances and Products was approved in 2006 and revised in 2008. This plan places priority on pesticides,

Programme. Mr. Carlos Portales, of Chile, is the current Latin American and Caribbean representative on the Board of the International Conference on Chemicals Management.

⁵⁷ The Information Note of the SAICM Secretariat summarizes the content of the discussions and the needs for assistance on these issues in the Caribbean, emphasizing that the financial considerations involved in applying the Strategic Approach are of a recurring nature.

⁵⁸ According to questionnaire responses given by the governments regarding application of the Strategic Approach for ICCM2, information available at: <http://www.saicm.org/index.php?menuid=9&pageid=327&submenuheader=>.

mercury, the management of contaminated sites and the implementation of the Globally Harmonized System of Classification and Labelling of Chemicals, or GHS (see below). The member countries of the Central American Integration System, through the Central American Commission for Environment and Development (Comisión Centroamericana de Ambiente y Desarrollo, or CCAD), with support from the United States Environmental Protection Agency and UNITAR, are conducting an analysis of their capacities and of existing initiatives, with a view to implementing SAICM. Based on the analysis, they will develop a regional implementation plan, along with a Regional Policy of Chemical Security, Customs Union and harmonized labelling procedures (OAS, 2007).

The Organization of American States (OAS) is conducting consultations to develop a regional plan of action for implementation of SAICM. A consultation document identifies areas in which intraregional cooperation, through a regional plan of action, could benefit the region's countries (OAS, 2009).

C. Ratification and implementation of the international instruments: the Basel, Rotterdam and Stockholm Conventions

Most of the countries of LAC have ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and—primarily since 2002—the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and the Stockholm Convention on Persistent Organic Pollutants (see table 5.1). The Basel Convention entered into force in 1992, the latter two agreements in 2004.

Table 5.1
PARTICIPATION OF LATIN AMERICAN AND CARIBBEAN COUNTRIES IN THE BASEL, ROTTERDAM AND STOCKHOLM CONVENTIONS (YEARS WHEN COUNTRIES BECAME PARTIES THROUGH RATIFICATION, ACCEPTANCE, APPROVAL OR MEMBERSHIP)

Country	Basel Convention 1989	Rotterdam Convention 1998	Stockholm Convention 2001
Antigua and Barbuda	1993	...	2003
Argentina	1991	2004	2005
Bahamas	1992	...	2005
Barbados	1995	...	2004
Belize	1997	2005	...
Bolivia (Plurinational State of)	1996	2003	2003
Brazil	1992	2004	2004
Chile	1992	2005	2005
Colombia	1996	...	2008
Costa Rica	1995	...	2007
Cuba	1994	2008	2007
Dominica	1998	2005	2003
Ecuador	1993	2004	2004

El Salvador	1991	1999	2008
Granada	...	...	...
Guatemala	1995	...	2008
Guyana	2001	2007	2007
Haiti	...	...	...
Honduras	1995	...	2005
Jamaica	2003	2002	2007
Mexico	1991	2005	2003
Nicaragua	1997	2008	2005
Panama	1991	2000	2003
Paraguay	1995	2003	2004
Peru	1993	2005	2005
Dominican Republic	1999	2006	2007
Saint Kitts and Nevis	1994	...	2004
San Vicente and the Grenadines	1996	...	2005
Saint Lucia	1993	...	2002
Suriname	...	2000	...
Trinidad and Tobago	1994	...	2002
Uruguay	1991	2003	2004
Venezuela (Bolivarian Republic of)	1998	2005	2005

Note: Dates indicate year of ratification, acceptance, approval or membership.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), "Statistical Yearbook for Latin America and the Caribbean, 2008", Chile, February 2009.

Current global efforts to take advantage of synergies in implementing the three agreements—the Basel, Rotterdam and Stockholm Conventions—defined at the Conference of Parties in 2009, which will be taken up again at a joint meeting in 2010,⁵⁹ could benefit the region by coordinating and improving the efficiency of national implementation measures. The technical assistance programmes associated with the three agreements are designed to draw on these synergies. A South American meeting will be held in Uruguay in November 2009 to promote coordination and cooperation among stakeholders within individual countries, share success stories, and identify opportunities for the region. [To be updated following the meeting]

1. Implementation of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

The objective of the Basel Convention is to protect the environment and human health from adverse effects due to the generation, manipulation, cross-border transportation and disposal of hazardous and other wastes. The measures needed to fulfill the commitments of the Basel Convention include national definitions of hazardous wastes, restrictions on the exportation, importation and transport of hazardous wastes, measures to reduce or eliminate hazardous wastes and cross-border movements of these substances, and actions to develop facilities for training and for the recovery and final disposal of these wastes.

⁵⁹ Information at: <http://www.basel.int/meetings/bureau/bureau%201%20cop%209/docs/02e.doc>.

These measures have been implemented, in varying degrees, by the region's countries, according to their capacities, characteristics and needs. Seventeen of the 30 countries in the region that ratified the Convention have implemented import and/or export restrictions for hazardous wastes.⁶⁰ There are variations in the degree to which the region's countries have fulfilled the obligation to present national reports on compliance with the Convention.

In 1994, an agreement was reached to prohibit export of hazardous wastes from the developed countries to the developing countries for final disposal, recovery or recycling. In 1995, a proposal was put forth to amend the Convention, but this has not yet been approved. In Latin America and the Caribbean, only the Plurinational State of Bolivia, Ecuador, Panama, Paraguay, Saint Lucia, Trinidad and Tobago and Uruguay ratified the Convention (a total of 65 countries worldwide did so). Meanwhile, among LAC nations, the Basel Protocol on liability and compensation for damage resulting from transboundary movements of hazardous wastes and their disposal was signed only by Chile, Colombia and Costa Rica (out of a total of 13 countries worldwide), and the only country in the region to ratify it was Colombia (9 countries worldwide).

According to the Secretariat of the Basel Convention (Secretariat of the Basel Convention, undated), effective national implementation of the Convention would require: monitoring of hazardous waste shipments; technical visits to companies and other relevant sites; transportation monitoring and inspection; collection and examination of samples; and sharing of information. These matters require: appropriate regulation and a capacity to enforce standards; facilities with the technology and resources to treat wastes appropriately; monitoring of the sites and of the consequences of the transfer and disposal of wastes; capacity to react to accidental spills or irregular emissions; and personnel trained in waste management operations and in monitoring. With respect to these criteria, there has been regulatory progress, in Latin America and the Caribbean, in prohibiting the import of hazardous wastes and in establishing notification procedures prior to the cross-border movement of wastes. In terms of management and handling of such wastes, progress has varied.

In the area of the secure recovery and recycling of hazardous wastes, ten countries report that they have policies on implementation, seven report that they are developing such policies, and four report having no policies in place. It is probable that countries that have not reported at all have no policies in place. Only Mexico reported having adequate facilities for the treatment of residual oils. Most of the countries have no facilities for the treatment, disposal and recycling of these products (OAS, 2009).

There are also problems with regard to information. Of the 19 countries in the region, only Brazil—which implemented an inventory in 12 of its 26 states—indicated, in reporting to the Convention in 2005, the quantity of domestic hazardous wastes generated. Seven countries are conducting inventories, but these initiatives need to be accelerated. Another eleven countries have indicated that they have no systematic information or reporting systems (OAS, 2009).

⁶⁰ According to national information available on the website of the Convention Secretariat (Country Fact Sheets), available at: <http://www.basel.int/natreporting/cfs.html>.

The regional centres of the Basel Convention, serving the needs for technical assistance, technology transfer and capacity building, are located in Argentina (for South America), El Salvador (for Central America) and Trinidad and Tobago (for the Caribbean), with the region's Coordinating Centre located in Uruguay.

2. Implementation of the Rotterdam Convention (prior informed consent)

The Rotterdam Convention, which has been in force since 2004, establishes a procedure for prior informed consent (PIC) for the importation of hazardous chemicals. (The 40 products on the list include 25 pesticides, 4 extremely hazardous pesticides and 11 industrial chemicals; other products may be added in the future.) Whenever the Conference of Parties to the Convention decides that a given product is to be subject to prior informed consent, the Secretariat circulates a document to the countries containing information on the product, and the countries send back responses indicating their positions on importing it. The Convention also requires exchange of information between the parties: they are to notify the others of any regulatory action taken with respect to the products listed in Annex III to the Convention, which are subject to PIC, as well as with respect to other chemicals. Table 5.2 summarizes the state of implementation of the instruments through which these two functions of the Convention are carried out in the region—i.e., the response to importation questions and notifications of regulatory action.

Table 5.2
IMPLEMENTATION OF THE ROTTERDAM CONVENTION IN LATIN AMERICA AND THE CARIBBEAN

	Import responses, to 2009		Complete notifications, to 2009	
	Pesticides	Industrial chemicals	Chemical products not included in Annex III	Chemical products included in Annex III
Argentina	28	11	0	0
Belize	28	0	0	0
Bolivia (Plurinational State of)	11	0	0	0
Brazil	28	11	2	35
Chile	28	11	2	0
Colombia	17	0	0	0
Cuba	27	11	2	0
Dominica	11	0	0	0
Ecuador	27	5	1	5
El Salvador	19	2	5	3
Guyana	28	11	3	19
Jamaica	28	11	1	0
Mexico	28	11	2	0
Nicaragua	11	0	0	0
Panama	16	0	2	24
Paraguay	18	0	0	3
Peru	28	11	1	1
Dominican Republic	14	6	0	14
Suriname	23	1	0	2
Uruguay	28	11	3	9
Venezuela	12	6	0	15

(Bolivarian Republic of)				
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Source: Overview of the Rotterdam Convention, a presentation given by the Secretariat in Barbados in March 2009, during the [Caribbean workshop on SAICM and related chemicals and hazardous waste instruments](http://www.saicm.org/index.php?content=meeting&mid=61&def=4&menuid=), Bridgetown, Barbados, 10-13 March 2009, <http://www.saicm.org/index.php?content=meeting&mid=61&def=4&menuid=>.

Regional challenges identified in implementing the Rotterdam Convention include: lack of administrative capacity to meet the obligations; the absence of structures to promote harmonization and create incentives for synergy between the Basel, Rotterdam and Stockholm agreements; and lack of intersectoral coordination. Steps proposed to solve these problems include training in toxicology and risk assessment; dissemination of information and establishment of mechanisms to ensure the participation and commitment of all stakeholders in implementing the Convention; the need to more actively involve customs services and obtain commitments from the industry; and the creation of incentives for information sharing and collaboration between relevant national authorities (Montreal, July 2007). Mexico's national report on challenges encountered specifies several needs: better coordination among different stakeholders; training; development of information systems to track incidents; and registration and notification in cases of pesticide poisoning and environmental exposure to hazardous substances (Federal Government of Mexico, 2009). These challenges are similar to those facing other countries in the region.

Under the Convention's technical assistance programme, and with collaboration from the Food and Agriculture Organization of the United Nations (FAO), training programmes have been conducted in the region to promote progress in developing National Action Plans, and to increase awareness of, and national support for, these initiatives. There have also been meetings of relevant national authorities on dealing with the issue of trade in pesticides. The work agenda of the Rotterdam Convention for providing technical assistance in 2009-2011 emphasizes regional cooperation and better use of existing capacities and regional networks, such as the regional offices of FAO and UNEP and the regional centres of the Basel and Stockholm Conventions. (The Rotterdam Convention has no regional centres.)

Box 5.1

REDUCING RISKS ASSOCIATED WITH PESTICIDES

The use of polluting pesticides in agriculture is one of the main sources of chemical contamination in the region. A number of these products are the object of the international conventions discussed in this section. The serious consequences of pesticide pollution have led various countries in the region to ratify the international conventions and, in the framework of these agreements and of national priorities, to implement legislation to eliminate the production, importation and use of hazardous pesticides and to eliminate stocks of prohibited products, among other measures. Colombia's national report, for example, describes measures adopted in the framework of its Environmental Policy Guidelines (Ministry of Foreign Relations of the Republic of Colombia, 2009).

The FAO International Code of Conduct for the Distribution and Use of Pesticides, which has been signed by a majority of the region's countries, provides a frame of reference for

pesticide management.¹ It sets voluntary standards for the conduct of public- and private-sector organizations that play a role in distributing or using pesticides, or that have some other connection with these products. The Code was adopted in 1985, and later revised, with a new version published in 2002, including provisions relating to the prior informed consent procedure of the Rotterdam Convention, and responding to other developments in international standards and to the persistence of a number of problems in pesticide management. The revision also incorporated the concept of “lifecycle” management of pesticides. There has been progress in the region in terms of the Code’s parameters. Standards on pesticides are more advanced than they are for other toxic chemicals. As in other developing regions, however, many countries do not fully enforce their national pesticide legislation, due to lack of funding and technical capacity.

Some particularly important issues in pesticide management for the region include:

i. The management of cross-border impact. The use of hazardous pesticides can have cross-border impacts, highlighting the need for regional measures. In this connection, the Central American countries are developing a Regional Pollution Prevention and Abatement Strategy, which includes a number of components related to pesticides (CCAD, undated). A project is also in progress to reduce pollution in the Caribbean Sea from pesticides used in agriculture on the Caribbean slopes of Nicaragua, Costa Rica and Colombia. Water quality is being monitored, and demonstration projects are being conducted to test technological solutions for more rational pesticide use for key crops. Firms and research firms play an important role in this process (UNEP, CEP, GEF, undated).

ii. The need to manage hazards related to deposits of obsolete pesticides:² Pesticides are often inadequately stored, exposing people to their harmful effects. When they enter the soil and water, they turn these resources into hazardous wastes. The following table provides an estimate of the stocks of obsolete pesticides in the region, in comparison with other regions.

Latin America and the Caribbean: Stocks of obsolete pesticides

Region	Stocks (kg)
Latin America and the Caribbean	11,283,594
Eastern Europe	240,998,000
Middle East	4,528,211
Asia	6,462,655
Africa	27,394,660

Source: Food and Agriculture Organization of the United Nations (FAO): <http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/en/49274/103415/index.html>

Many of the region’s countries have passed specific legislation and created institutions to implement it, but there are major deficiencies in funding for the purpose, as well as a lack of technical capacity and infrastructure. In this respect, challenges facing the Caribbean are representative of broader regional challenges (Williams, 2007). Due to problems of

institutional capacity and infrastructure, substances prohibited by international agreements have accumulated in deposits, many of which have not yet been identified. In addition, most of the countries do not provide for any regulation of these deposits. There are few inventories of deposits, and those that do exist have been produced by private entities in a decentralized fashion. Another challenge in the Caribbean is the lack of infrastructure. There is a serious lack of storage facilities designed to store pesticides and other obsolete chemicals, and the inspection of existing facilities is inadequate. Trinidad and Tobago's National Hazardous Waste Inventory (2003), which was produced by the Caribbean Environmental Health Institute (CEHI), showed that obsolete pesticides are stored in places such as private laboratories, agrochemical laboratories and sugar cane-growing establishments, in containers that are often seriously compromised. The FAO Programme for the Prevention and Elimination of Obsolete Pesticides provides assistance for addressing the problem of containers of toxic wastes, in the context of the management of contaminated soil.

iii. Pesticide residues in foods: Pesticide residues in foods represent a threat to consumers. The Codex Alimentarius sets caps on residues of specific types of pesticides in food, following the recommendations of the FAO Panel of Experts and a designated group at the World Health Organization (WHO). Thirty-three of the region's countries are members of the Codex Commission. As in other aspects of chemicals management, the implementation of these systems is constrained by developing countries' lack of capacity to monitor residues, primarily due to a lack of adequate laboratories. Although progress has been made in controlling residues in exported products, there is, as yet, no satisfactory monitoring of production for the domestic market. This has created double standards, a situation that is unacceptable from the perspective of food safety.

¹ The text of the Codex is available at:

http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Spanish.doc

² For more information, see:

<http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/es/what/index.html>

3. Implementation of the Stockholm Convention on Persistent Organic Contaminants

The Stockholm Convention on Persistent Organic Contaminants promotes coordinated international action to eliminate or reduce the emission of persistent organic contaminants (POCs) in the environment, and provides for aid to developing countries and transition economies for progressively eliminating the use of these substances, and the stocks of certain products. The Convention initially covered 12 substances or groups of substances considered to be POCs. Nine additional substances were added in May of 2009.

Of the 30 countries in the region that have signed the Convention, only 12 have presented National Implementation Plans, or NIPs—one of the obligations assumed in the Convention

(see table 5.3). The percentage of countries in LAC that have presented NIPs is lower than in any other region of the world.⁶¹

Table 5.3
NATIONAL IMPLEMENTATION PLANS (NIPs) FOR THE STOCKHOLM CONVENTION, BY REGION

	Latin America and the Caribbean	Africa	Asia-Pacific	Central and Eastern Europe	Western Europe, others	Total
Parties	30	48	44	19	21	162
NIPs presented	12	29	21	11	20	93
%	40%	47%	58%	58%	95%	57%

Source: “Stockholm Convention on Persistent Organic Pollutants—Overview and Status of Implementation”, Secretariat of the Stockholm Convention, Barbados, March 2009.

The Convention also requires periodic reporting on implementation and on quantities of POCs listed in the annexes to the Convention that are produced, imported and exported. To date, only Argentina, Antigua and Barbuda, Brazil, Chile, Costa Rica, Mexico and Uruguay have submitted such reports.⁶²

Lack (or inadequate quality) of data constitutes a major obstacles to implementation of the Stockholm Convention in the region (UNEP, 2008^a). The advances made in terms of information include inventories of dioxins and furans in Argentina, Cuba, Mexico, Chile, Ecuador, Nicaragua, Panama, Paraguay, Peru and Uruguay. With regard to inventories of polychlorinated biphenyls (PCBs), a number of countries—Uruguay, Chile, Cuba and Ecuador, among others—have generated preliminary inventories that require more work.

The Stockholm Convention has four regional centres: the Environmental Agency of the State of São Paulo (Companhia Ambiental do Estado de São Paulo, or CETESB), in São Paulo, Brazil, the National Centre for Environmental Research and Training (Centro Nacional de Investigación y Capacitación Ambiental, or CENICA), in Mexico City, and the Centre for Research and Information on Medicines and Toxic Substances (Centro de investigación e información de medicamentos y tóxicos, or CIIMET), in Panama City.

An assessment of the technical assistance needed to implement the NIPs has indicated that other impediments to progress include inadequate monitoring and research capacities, difficulties with final disposal, dissemination of information, and improving legislative and institutional frameworks (Secretariat of the Stockholm Convention, 2009; UNEP, 2008a). Various projects are currently underway to help the region’s countries meet their monitoring

⁶¹ The national reports of Mexico and Colombia include detailed information on measures taken to implement the Stockholm Convention in these countries (Government of Mexico, 2009; Ministry of Foreign Relations of the Republic of Colombia, 2009).

⁶² See: <http://chm.pops.int/Countries/NationalReporting/tabid/254/language/en-US/Default.aspx>.

commitments under the Stockholm Convention, with funding from the SAICM Quick Start Programme and from GEF.⁶³

D. Production of consistent and integrated data: Pollutant Release and Transfer Registers (PRTRs)

Pollutant Release and Transfer Registers (PRTRs) are one of the instruments for producing consistent, integrated data on chemicals. These are databases on emissions and transfers of potentially hazardous chemicals that include information on the nature and quantity of the emissions and transfers involved. The information is collected at the principal sources of contamination (industrial plants, as well as diffuse sources, such as those involving agricultural activity and transportation). In general, they cover air, water and soil contaminants, and wastes transported to treatment and disposal sites.⁶⁴ PRTRs are key instruments to ensure that civil society has access to environmental information, while serving as instruments for governments to manage chemical products and take action to meet commitments assumed under multilateral agreements. They facilitate the process of constructing national inventories and prioritizing action on sources of contamination.

Since the early 1990s, various national and regional organizations have developed systems within the region to collect and disseminate data on emissions and transfers of toxic chemicals from industrial facilities. Mexico pioneered the establishment of PRTRs in the region, a process influenced by its commitments under the North American Free Trade Agreement (NAFTA). Mexico's PRTR includes information on emissions and transfers from industrial plants subject to federal regulation, including automotive, cement, chemical, electrical, oil, iron and steel, and paper plants.

Chile developed its PRTR proposal between 2002 and 2005, and the system began operation in 2008. Chile's PRTR will be strengthened, in relation to POCs, through funding from GEF and support from UNITAR and UNEP, in a project that also provides for designing national PRTR systems to report POCs in Peru and Ecuador. Chile and Ecuador have also developed strategies to integrate data on mercury emissions in their POC inventories (in the case of Ecuador, this remains a future goal). Panama is in the process of designing a national PRTR with support from the Trust Fund of the SAICM Quick Start Programme and UNITAR. The country has a strategy for making mercury emissions reporting part of a future national PRTR.

Trade agreements have been an important force driving PRTRs in the region. In addition to the relation between Mexico's PRTR and NAFTA, the process in Chile was influenced by its free trade agreement with Canada. Currently, Guatemala, El Salvador, Nicaragua, Costa Rica and the Dominican Republic are beneficiaries of a cooperation programme with the United States, in the context of the Dominican Republic-Central America-United States Free Trade Agreement (CAFTA-DR), for the development of PRTRs. Costa Rica and the Dominican Republic are preparing an assessment of legal, institutional, administrative and technical infrastructure relevant to their national PRTRs and the implementation of these in the public

⁶³ See: www.chem.unep.ch/pops/GMP/LAC/default.htm.

⁶⁴ See: <http://www.unitar.org/cwm/es/node/101>.

and private sectors (see Costa Rica's national report), with support from UNITAR and the United States Environmental Protection Agency (EPA). Other projects are underway in the region in the context of CAFTA-DR, in coordination with UNITAR, CCAD and the United States Agency for International Development (USAID), providing for implementation of a subregional PRTRs in seven Central American countries and the Dominican Republic.

However, most of the countries do not yet have wide-ranging systems with rigorous and systematic data entry capable of providing access to, and sharing of, information (Salinas, 2007). There is still scant knowledge regarding the issues involved in PRTRs. Moreover, the technical resources available (including training at the national and international levels), financial resources, and infrastructure for data collection, are inadequate, while the relevant legal frameworks in various countries remain fragmented (UNEP, 2004).

E. Implementation of the Globally Harmonized System of Classification and Labelling of Chemicals

The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) is a classification of chemicals based on types of hazards. It harmonizes the information collected and disseminated on the subject, with the goal of making information on product hazards and toxicity available and promoting measures to protect health and the environment when these substances are handled, transported and used. Universal adoption of the system will facilitate communication and actions in responding to accidents. The GHS is also a basis for harmonizing regulation at the national, regional and international levels, and will help ensure secure trade in the products involved. The first edition of the GHS was published in 2003, and it has been revised periodically. The third edition was published in July 2009.

Implementation of the GHS involves initiatives in a number of sectors. Transportation, industrial activity, agrochemicals, the participation of civil society, and labour issues must all be addressed. In relation to the transportation of hazardous products in the region, the four MERCOSUR countries are applying the MERCOSUR Agreement on Transport of Hazardous Products (1994), based on the seventh edition of the United Nations Model Regulations. The Andean Community (the Plurinational State of Bolivia, Colombia, Ecuador and Peru) has developed a regulatory project based on the 13th edition of the Model Regulations, which is in the process of being evaluated. Chile has implemented the GHS for the transportation of hazardous materials. In other sectors, the countries have moved forward in building awareness, training, establishing standards for reporting and certification, and conducting sectoral studies. The implementation of the GHS has been identified as a priority by the MERCOSUR Ad Hoc Group on Chemicals (UNECE, undated). Implementation of the GHS for pesticide certification, as in other developing regions, is in the preliminary stages (Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals, 2006).

Difficulties identified in implementing the GHS include: the need to ensure coordination among the relevant government agencies and between these and other relevant stakeholders; strengthening institutional capacity; enhancing training; and obtaining the financial resources for implementation and verification (Minister of Foreign Relations of the Republic of Colombia, 2009; Bosch, 2007). Capacity building for implementation of the GHS has received support in the framework of the Global Partnership, created at the World Summit on Sustainable Development in Johannesburg and, more specifically, in the context

of the UNITAR/International Labour Organization (ILO) Global GHS Capacity Building Programme.⁶⁵ There is great demand in the region for support in the area of education and training designed to facilitate implementation of the GHS. UNITAR and ILO have projects underway with Uruguay and Jamaica (with support from the Swiss government) and, in 2010, will launch a project with Barbados (with support from the SAICM Quick Start Fund). Requests are pending from 15 other countries in the region for this type of support and assistance.

F. Promoting partnerships for collaboration among stakeholders – firms and civil society

Compliance with commitments assumed internationally by the region's countries, and other initiatives undertaken at the national level to manage chemicals, entail major financial costs and require investing in technical capacity in the public and business sectors, as well as in infrastructure.

1. Technical and financial cooperation

Technical and financial cooperation (including technology transfer) has been a key element in promoting progress, and it is essential that this continue on an ongoing basis. A number of international organizations have been active in technical and/or financial cooperation with the region's countries to ensure the various aspects of rational management of toxic substances, in particular through the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), which includes FAO, ILO, UNEP, the United Nations Industrial Development Organization (UNIDO), UNITAR, WHO, the Organisation for Economic Co-operation and Development (OECD) and, as observers, UNDP and the World Bank. Support is provided according to the areas of activity in which each institution is active: training; international fora to facilitate agreements and define common guidelines and codes; situation analysis; support for the design of policy and instruments; facilitation of information access; communication to promote awareness and mobilize public support; technical assistance in developing and identifying necessary infrastructure; and technology development and transfer. Major cooperation has also occurred in the contexts of the OAS, free trade agreements, and trade integration agreements. Other collaborative efforts include: cooperation among the MERCOSUR, as well as among the Andean Community, countries; support from the United States and Canada, directed principally at Mexico, in the context of NAFTA; and support for CAFTA-DR countries from the United States EPA. The Central American Commission for Environment and Development (CCAD) has conducted various initiatives in Central America.

The only specific financial mechanism of SAICM is its Quick Start Programme, which supports initial capacity-building activities through a trust fund made up of voluntary contributions. The fund has a limited lifetime and is administered by UNEP. It is open for contributions until 2012, and disbursements can be made until 2013. Since May 2006, 185 requests have been

⁶⁵ Information on the state of implementation of the GHS in the region's countries can be found at: http://www.unece.org/trans/danger/publi/ghs/implementation_e.html.

received, with 82 projects approved in 76 countries, for a total of US\$ 16 million. The region received approximately US\$ 4.4 million after the sixth round of the Quick Start Programme Trust Fund in April 2009.⁶⁶ The projects are listed in the SAICM Secretariat's Information Note. However, the Quick Start Programme covers only a minimal portion of the activities involved in implementing the Strategic Approach.

The Global Environmental Fund (GEF) has provided a major financial contribution. This organization played a key role in the successful implementation of the Montreal Protocol, and continues to play an important role in the ongoing efforts to eliminate substances that damage the ozone layer. It has also been a key player in implementation of the Stockholm Convention. Of 149 projects worldwide, aimed at implementation of the Convention, 28 are in LAC, representing a total of US\$ 13 million.

2. Public-private partnerships and business initiatives

As in other areas vital to sustainable development, and as recognized by the Dubai Declaration, encouraging private initiatives and the participation of civil society are key elements in public-private partnerships for chemicals management. The region has had varying experiences with regard to agreements between governments and firms, or groups of firms, aimed at implementing the objectives contained in legislation and international agreements. Mexico's experience demonstrates the effectiveness of coordinated efforts between the public and private sectors to reduce the adverse effects of chemicals. The region's major chemicals firms are participants in the global Responsible Care programme of the International Council of Chemical Associations (ICCA), which promotes effective management of chemicals throughout the value chain, e.g., through product stewardship systems, transparency in industrial activities and global harmonization between programmes of different businesses around the world—objectives that are aligned with those of SAICM.⁶⁷

⁶⁸

An innovative example of the role of the private sector in chemicals management is the chemicals leasing model implemented in Mexico with support from UNIDO, providing for manufacturers and users to share responsibility for products. Instead of the traditional purchase-sales arrangements, this model calls for selling the benefits, throughout its lifecycle, of a product, rather than merely selling the product itself, thus encouraging collaboration between producer and user. This has helped to reduce the consumption of chemicals, and has encouraged the replacement of chemicals by less hazardous substances, while promoting improved management of emissions and residues (UNIDO, 2008).

Nevertheless, there continue to be vast differences, within the region, between large companies with access to capital and technology and small and medium-sized enterprises (SMEs) that, in many cases, find it difficult even to comply with existing standards, due to

⁶⁶ The Caribbean countries are able to take advantage of the European Commission's capacity-strengthening programme, which is associated with the Multilateral Environmental Agreements (MEAs) in the ACP (Africa, the Caribbean and the Pacific) countries, through the Quick Start Programme.

⁶⁷ See: <http://www.icca-chem.org>.

⁶⁸ See the presentations made at the international workshop, "Global Strategy for the Responsible Management and Care of Chemicals", Buenos Aires, 10-11 September 2009. <http://www.ciqyp.org.ar/templates/default/index.php?archivo=noticias&pagina=43>

lack of knowledge or resources. One example of an effort to enlist the participation of SMEs in managing chemicals is Brazil's PreparAR initiative, which was conceived as a way of bringing these firms into Responsible Care. Through cooperation with larger firms, the project helps smaller companies implement better environmental, health and safety systems (ICCA, 2008).

3. Non-governmental organizations

The role of non-governmental organizations (NGOs) is also important in a variety of areas, including verification of information in official records and monitoring of progress on initiatives (OAS, 2008). This has been recognized in the various international instruments in the SAIDCM. Some examples of the contributions of these organizations to chemical products management in the region are: the Pesticide Action Network and Alternatives for Mexico and Latin America and the Caribbean—an effort to develop alternatives to endosulfane; and activities of Health Care Without Harm, whose objectives include encouraging the replacement of mercury in hospitals (IPEN, 2009). However, these organizations continue to face difficulties in accessing information to effectively fulfill their role in managing chemicals.

G. Reducing the risks associated with heavy metals

A number of the region's countries have taken measures to reduce contamination from heavy metals—particularly lead and mercury.

The LAC countries have succeeded in eliminating leaded gasoline (see chapter 4); the remaining challenge, regarding lead, is that of addressing its effects throughout the product lifecycle, and the importance of replacing it in products such as toys and paint. Paint was considered a priority by the second International Conference on Chemicals Management (ICCM). A partnership was formed by UNEP and WHO to address this issue and promote alternatives.

Mercury has been recognized, since 2003, as a contaminant meriting attention at the global level, and has been the focus of multiple efforts by countries and international organizations. In LAC, a first step towards controlling it has been to establish inventories of mercury emissions. With the support of the United States EPA, UNEP and UNITAR, Chile, Ecuador and Panama have developed inventories of mercury emissions as part of a number of pilot projects that also included creating a risk management plan for mercury and strategies to incorporate mercury inventories in the PRTRs. These pilot projects are currently being replicated in Nicaragua and the Dominican Republic, and future projects are being evaluated.

One of the main sources of mercury contamination in the region is its use in gold mining, which has had significant effects in the Amazon basin. This has impacted human health, through the mercury ingested in fish (IOMC/UNEP, 2002). There are alternative technical solutions that need to be promoted through dissemination campaigns.⁶⁹ As part of

⁶⁹ See UNIDO (1997): Introducing new technologies for abatement of global mercury pollution, Phase II: Latin America, UNIDO, April 1997, quoted in IOMC/UNEP (2002).

Colombia's National Policy for Cleaner Production, projects have been designed and implemented to promote reengineering of technologies to reduce or eliminate the use of mercury in mining activities (Ministry of Foreign Relations of the Republic of Colombia, 2009). Various projects have been conducted, in cooperation with UNEP, UNIDO, and under the SAICM Quick Start Programme, in Suriname, the Plurinational State of Bolivia, Colombia, Ecuador and Peru. Currently, UNEP is developing a database on mercury use in mining, which relies on information from the countries.

Other mercury-related issues include its use in products (e.g., hospital products) and industrial processes, storage and management of mercury wastes and management of contaminated sites, as well as the serious health effects on workers exposed to mercury.

There are substitutes for most products that contain mercury. The majority of the region's countries have had considerable success in transitioning to alternative products, particularly with respect to thermometers, sphygmomanometres, thermostats, batteries and switches. The main obstacle to further replacement efforts is the cost of certain replacement products, making them a problematic alternative for people with limited purchasing power in developing countries. The issue of mercury use in hospital products has been the object of the UNEP Health Care Without Harm programme in Argentina, and a similar initiative has been undertaken with cooperation from the United States EPA, in the framework of CAFTA-DR.

Other products that contain mercury for which replacement technologies are available, but whose adoption entails economic, technical or other obstacles, include lighting devices for LCD screens, dental amalgam, and compact fluorescent lamps. In terms of processes, chlor-alkali chlorine manufacturers in the region have plans to convert to mercury-free technologies, but there is a need for guidance on when and where to store remaining elemental and metallic mercury from their plants (UNEP, 2008b).

In 2009, a decision was made to launch negotiations on an internationally binding regime for mercury. It is important for the region's countries to establish their positions and priorities in preparation for these negotiations.

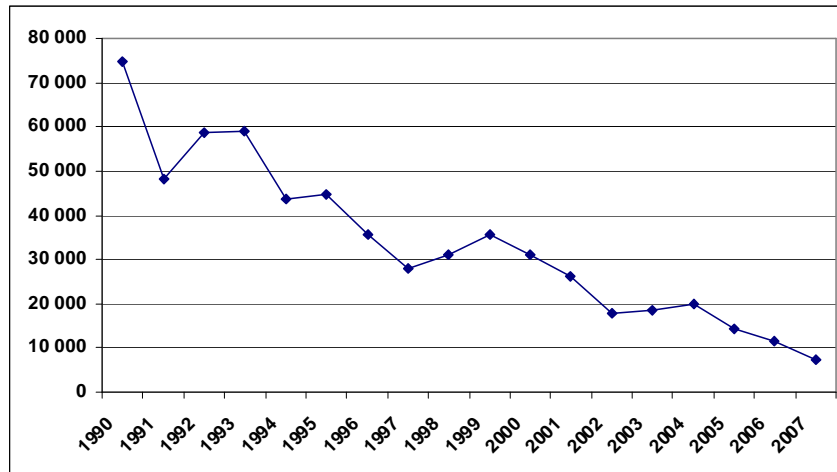
With regard to cadmium, UNEP is preparing a review of available scientific information, particularly as related to cross-border movements. UNEP has a programme to support governmental efforts to address the health and environmental effects of products throughout their lifecycle, and to seek alternative products.

H. Reduction of emissions of ozone-depleting substances (ODS)

All of the region's countries have ratified the Vienna Convention for the Protection of the Ozone Layer, as well as the Montreal Protocol on Substances that Deplete the Ozone Layer—in most cases prior to 1993. Implementation of the International Regime to Protect the Ozone Layer, and the Montreal Protocol in particular, have been considered successful in the region. The use of substances harmful to the ozone layer was reduced by approximately

90% between 1990 and 2007—from 74,652 tons to 7,445 tons (see figure 5.1) (United Nations, forthcoming).

Figure 5.1
LATIN AMERICA AND THE CARIBBEAN: CHANGING CONSUMPTION OF OZONE DEPLETING SUBSTANCES (ODS), 1990-2007
(Ozone depletion potential (ODP), in tons)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), with statistics from the official United Nations Millennium Development Goals (MDG) site, based on data compiled by the Ozone Secretariat of the United Nations Environment Programme. Online, as of October 2009, at: http://ozone.unep.org/Data_Reporting/Data_Access/.

The Multilateral Fund for Implementation of the Montreal Protocol to safeguard the ozone layer has played an important role in funding these efforts. From its beginning up until July 2009, the Multilateral Fund managed contributions from the developed countries totalling US\$ 2.5 billion, to cover the additional costs of eliminating SDOs in developing countries operating under protections of Article 5 of the Montreal Protocol. The World Bank, UNIDO, UNDP and UNEP function as implementation agencies for projects submitted by the developing countries, including LAC countries. Such projects have promoted technology transfer, while helping to build institutional capacity so that the developing countries can meet their commitments under the Protocol. Examples of activities funded in the region include: formation of institutions; research on users and major investment projects; creation of tools for interaction and problem solving, in close cooperation with the countries; licensing systems to regulate imports and exports of SDOs, in conjunction with training customs employees and other relevant national officials to prevent illicit trafficking in these substances; activities to increase public sensitivity and awareness; reengineering of production processes that use SDOs; and reengineering and suspension of the production of CFC-12 in nationally capitalized plants.

Achievements include the following:

- Costa Rica has succeeded in eliminating the use of methyl bromide, which is used as a pesticide in the cultivation of flowers and tobacco. Technological alternatives were also identified for the production of cantaloupes and watermelons.
- All household and commercially used refrigerants and aerosol products produced in Mexico today are free of chlorofluorocarbons (CFCs). Support was provided to over 200 firms in the automobile, construction, shoe sole manufacturing subsectors and in other applications, to effect technological changes and provide training in the use of alternatives to CFCs. As of September of 2005, Mexico permanently stopped production of CFCs .
- Colombia succeeded in eliminating the use of CFCs in manufacturing household and commercial refrigerators and in polyurethane and polyesterine products; ceased importation of halones (used in fire extinguishers); discontinued use of methyl bromide in agricultural applications and over 90% of the baseline amount of carbon tetrachloride; and ceased methyl chloroform imports and 90% of CFC imports (as of December 2008). These imports are expected to be eliminated entirely by 2010.

I. Regional challenges

Despite progress, the region lags significantly in critical areas of chemicals management. While circumstances vary from one country to another, the following challenges and needs are common to the LAC countries as they strive to meet the 2020 objective of rational management of chemicals (OAS, 2009; SAICM Secretariat, 2009; IPEN, 2009):

- **Information:** Clearly, information on contaminants in the region is insufficient. There are few satisfactorily and systematically maintained inventories and registries of contaminants. There are also few wide-ranging, up-to-date studies on the effects of chemical contaminants on human health and the environment. The lack of information on the use and disposal of chemical contaminants makes it difficult to build adequate awareness of the costs incurred by contamination and inaction (in terms of human health, soil degradation, etc.). This, in turn, prevents the issue of chemicals management from gaining priority on the region's policy agendas, and from being effectively incorporated in sectoral policy and poverty reduction strategies. Even when the issue receives the priority it deserves, the lack of information is a barrier to effective management of the substances, and to adequate prevention and response to accidents. Providing public access to the relevant information is a necessary condition for the effective participation of civil society in efforts to manage these products.
- **Public agenda, legislation, regulation, policy instruments, administrative procedures and processes:**
 - The region's public agendas do not generally assign high priority to this issue, and it is not effectively integrated in sectoral and social policies. Even within the environmental policy area, chemical contaminants have been a secondary concern, overshadowed by global issues such as climate change and biodiversity.
 - There is no effective incorporation of rational chemicals management in the relevant sectors (health, development aid, etc.), and governments have not clearly understood the importance of chemicals management for achieving the Millennium

Development Goals and other development and human rights goals—this, as part of ensuring better health conditions (especially for children and mothers), availability of safe potable water, good air quality, soil productivity, etc. (OAS, 2009).

- Although some countries have advanced in this area, many still lack adequate legislation and regulations on importation, exportation, transport, use, production, emission, storage and disposal of potentially toxic substances. The administrative procedures and processes involved in implementation, and communication with relevant stakeholders, need to be improved. It is important to ensure that there are mechanisms to establish liability and responsibility for compensation for damage generated by poor chemicals management.

- A number of innovative experiments have been conducted, but there has generally been little use of market instruments, which can be effective and efficient tools for achieving good management throughout the product lifecycle.

- **Infrastructure to eliminate and monitor contaminants, and to develop replacement products:**

- In almost all of the region's countries, infrastructure for disposal of hazardous wastes is precarious. There are few laboratories equipped for monitoring, and little technological capacity for developing alternative, accessible products adapted to local needs. Thus, there is a need for investment in infrastructure to facilitate the proper disposal of hazardous wastes and provide accredited reference laboratories, as well as reference technology centres capable of developing solutions for specific problems in the region, including finding substitutes for chemical products whose health and environmental risks cannot be mitigated.

- Institutions devoted to the issue lack resources and personnel to effectively implement legal mandates.

- Lack of training creates a major bottleneck in all of the countries. There are deficiencies in the public sector—e.g., among customs officials—as well as in the private sector, where the problem is concentrated among small and medium-sized firms.

- **Financial resources and cooperation:**

- National financial resources must be secured (in government budgets) to address the national challenges and contribute to common regional efforts.

- A mechanism must be established to replace the Quick Start Programme when it concludes, and to finance projects that go beyond the initial stages of implementing SAICM.

- Technical cooperation by international organizations and between countries is vital to addressing the challenges related to information, technical, technological and institutional capacities, and policy-making.

- **Stakeholder participation:**

- The availability of information is critical in making it possible for citizens and civil society organizations to be active in chemicals management, as is made clear in the Dubai Declaration.

- Support must be provided to small and medium-sized firms in the region to improve their management of chemicals production and use, ensuring best practices throughout the value chain and product lifecycle.

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6. SOLID WASTE

“Prevent and minimize waste and maximize reuse, recycling and use of environmentally friendly alternative materials, with the participation of government authorities and all stakeholders, in order to minimize adverse effects on the environment and improve resource efficiency, with financial, technical and other assistance for developing countries. This would include actions at all levels to: (a) Develop waste management systems, with the highest priority placed on waste prevention and minimization, reuse and recycling, and environmentally sound disposal facilities, including technology to recapture the energy contained in waste, and encourage small-scale waste-recycling initiatives that support urban and rural waste management and provide income-generating opportunities, with international support for developing countries; (b) Promote waste prevention and minimization by encouraging production of reusable consumer goods and biodegradable products and developing the infrastructure required.” United Nations, 2002, paragraph 22 of Chapter III: Changing unsustainable patterns of consumption and production. Johannesburg Plan of Implementation.

A. Description of activity in the region

Public policy on solid waste management and disposal in Latin American and the Caribbean (LAC), though still far from ideal, has advanced significantly, as evident from the national reports submitted for this RIM, as well as from recent events and documents in the region.

In some countries, especially the largest and most industrialized (Mexico and Brazil), the issue has been addressed in the context of alleviating the problem of solid waste levels and disposal as a threat to development, especially in the urban environment. The urgency of the situation has made the issue a priority, with attention focused on addressing the problem through public policy actions. While private sector efforts in this area have had important effects, this is clearly a problem that cannot be solved at the municipal level, and the need for state or national action has become increasingly apparent.

Although the approaches being employed include all facets of waste management, there remain, in some of the region’s countries, major gaps in certain essential phases of the process, such as collection and disposal. Among the problems is that of incomplete and insufficient collection, and open-pit dumps are still common, despite progress the progress achieved. All of the countries are working to address this challenge, primarily through the creation of sanitary landfills. Clandestine dumps continue to be a major problem in terms of their implications for health and tourism, and because of the pollution and soil degradation that they cause (Díaz, 2009).

Waste collection systems are still insufficient, primarily due to a lack of financial resources. This is associated with the fact that, in many places, collection has remained a municipal responsibility, giving rise to serious management problems, particularly in poor municipalities where inhabitants are unable to pay for service. By contrast, in places where payment is

guaranteed and where collection has been privatized, collection is generally adequate. Nevertheless, even in these situations, proper disposal in sanitary landfills is not a given.

The key problems in municipal solid waste management result principally from major population growth in urban centres without the necessary long-term planning. Collection services have poor coverage, there is a lack of proper final disposal sites, and inappropriate technologies are being used. Unfortunately, the strategies employed in most of the region's countries are limited to a minimal level of informal recycling and final disposal in open-pit dumps (Collazos Peñaloza, 2008).

The situation is more complex for industrial wastes—particularly hazardous wastes—although there is considerable concern about this issue. In the more industrialized countries, such as Argentina, Brazil, Chile, Colombia and Mexico, regulations and enforcement measures have been broadly implemented. This is producing new institutional arrangements in the form of legislation, standards and regulations, which are being closely monitored by health and environmental authorities, as well as by NGOs and the general population.

1. Collection and disposal

In LAC, only 23% of solid waste disposal occurs in sanitary landfills. This is a serious environmental and health problem, since open dumps continue to proliferate. Approximately 284,000 of the 369,000 tons of waste collected in the region on a daily basis end up being disposed indiscriminately in the environment (Szantó, 2009).

Waste that is not collected is burned or dumped, with no controls, in streets, on highways and in waterways, polluting the environment and jeopardizing human health. This situation is aggravated by lack of proper management of hospital wastes and other hazardous waste—a problem that is especially acute in cases where these substances are dumped along with municipal waste, as is fairly common practice in a number of the region's countries (Henríquez Gallo, 2009). There are, however, well-tested techniques for improving this situation, some of which involve recovery from dump sites (Szantó, 2009).

Overall, the region still lacks an adequate legal and institutional basis for sound solid waste management. The growth of megacities, with their vast amounts of waste, has complicated waste management to such a degree that special institutional arrangements have been necessary in countries like Argentina, Chile, Colombia and Mexico.

The rate at which waste is generated in the region—0.25 to 1.5 kg/inhabitant/day—is lower, by a factor of 2 or 3, than that in the industrialized countries. In the United States and Australia, the figure is close to 2 kg/inhabitant/day, and in countries such as France and the Czech Republic it is only slightly lower (Arrieta Bernate, 2009). The density of the waste generated in urban areas varies between 180 and 500 kg/m³, with high humidity and a high concentration of biodegradable matter being characteristic of the region's domestic waste (Díaz, 2009; Szantó, 2009). In Mexico, the food content of this waste is 32%, and in Colombia 56%. The corresponding percentage in the United States and France (Arrieta Bernate, 2009) is 20%.

Open dumps in the vicinity of airports represent a significant risk, in that they attract large birds. This issue has led to the adoption of standards and measures to prevent bird-related accidents (Páez Piñeras, 2009).

Despite the problems, many countries have made progress in various areas—from collection and disposal in sanitary landfills to treatment and use of waste through recycling plants and energy generation. The sections below describe actions taken by some of the region's countries, which have proven to be sustainable. Although there have been setbacks in some cases, due to poor management, the magnitude of the problem has unquestionably stimulated public efforts to study the technical, economic and environmental dimensions of the problem and to find the best possible solutions.

2. Waste treatment and incineration

Information compiled by the International Panel on Climate Change, although by no means complete, indicates the average percentage of incineration of household solid waste at 1% in South America for 2000, and 2% in the Caribbean countries, as against 6% in the countries of North America. The percentage of composting is as low as 0.3%, making this particular strategy a strictly marginal one at present (PICC, 2006).

The new forms of treatment and incineration being employed today in the countries of the European Union, the United States and Canada are, as yet, utilized very little in Latin America and the Caribbean (Hettiaratchi, 2009). However, transnational corporations that use standard technologies for waste treatment and recovery and follow international codes of conduct are demonstrating the viability of practices that contribute to sustainable solid waste management.

Incineration is the method most widely used to treat hospital wastes, which by definition are hazardous. In many municipal hospitals, however, incinerators are in sub-standard condition, while equipment in others fails to meet proper technical standards (Henríquez Gallo, 2009). These problems are present in most of the region's countries (Díaz, 2009). Brazil, however, has instituted thorough regulations in this area. In force since the mid-1990s, these regulations have been supplemented by specific provisions, which have been in place since the end of the last century. However, there are vast disparities in the approaches taken by the different states and municipalities (De Andrade, 2009).

One of the mechanisms being used moves beyond sanitary landfills as a waste disposal method, taking advantage of the methane they produce (see below). Efforts are underway in the region to encourage use of the new incineration methods being employed in the developed world. Experts are concerned about the problems posed by sanitary landfills—even those that, from a technical perspective, are the best managed (Szantó, 2009). Objections to landfills as a form of disposal include the leaching of liquids and the contamination of water basins, proliferation of vectors that adapt to the conditions created by the landfills, the unpopularity of landfills among the population, and the perverse incentives that they generate due to the fact that they do nothing to encourage reducing the amount of waste generated.

3. Recycling and reuse

Experience in the region tends to be scattered and isolated. Recycling is often confused with the practice of allowing access to dumps in order to collect materials—as though this constituted “recycling”. However, there is a potential for recycling. In Colombia, the percentage of waste that is recyclable ranges between 22% and 31% of the total (Arrieta Bernate, 2009).

Another notable approach, in terms of exploiting the potential value of waste, is Colombia’s Industrial Wastes and By-products Exchange (Bolsa de Residuos y Subproductos Industriales, or BORSI) mechanism, created by Colombia’s National Cleaner Production and Environmental Technologies Centre, designed to encourage trade in waste materials and industrial by-products through purchase-sales transactions between sources and users, and through recovery, recycling and reintroduction of waste materials for productive use. The BORSI mechanism is also being used in Ecuador and Costa Rica.⁷⁰

Many of the region’s countries have recycling and reuse campaigns, mostly at the local level. Chile has created “green points” in some municipalities for the collection of recyclable materials. In Venezuela, the banking sector has instituted campaigns to reduce waste generation, increase energy efficiency and recycle paper (Valderrama, 2009). Recycling is strong in Cuba, where the business community is active in recycling metals, plastics, paper, electronic waste and other types of recyclable waste (Leal, 2005).

Coprocessing—e.g., in the cement industry—appears to be on the rise in the region, and some corporations encourage it in their subsidiaries, with significant environmental and economic benefits (Cortés Otero, 2009). In cement coprocessing, wastes are placed in cement furnaces for final safe disposal that does not generate new residues. The process occurs simultaneously with clinker production. Environmental problems are thus reduced, while used catalytic converters, soils contaminated with agrochemicals or hydrocarbons, and other materials serve as fuel.

Thus, there are sectors in which there is now a significant level of recycling, which has itself become a large industry—or, at least, an economic sub-activity of its own. For the metallurgy sector, which has traditionally been a recycler because of the nature of its production methods and, more recently, for the cement and paper industries, recycling has become an important operational strategy. It has even led to technological changes comparable with those occurring in the industrialized countries. In most of the region’s countries, however, which are less industrialized, recycling continues to be a marginal activity, albeit one that is important environmentally and for disadvantaged social groups.

4. Methane recovery and use

One area in which a number of countries have made progress is the exploitation of methane, which is known to be a powerful greenhouse gas (GHG) with a high potential for increasing global warming. Indeed, it is the second most important GHG, accounting for 18% of global climate change. It is a major component of natural gas, however, and is a valuable source of clean energy.

⁷⁰ <http://www.borsi.org/>

The benefits of methane projects have been widely recognized. Methane recovery and use prevents wasting a valuable fuel and energy source, improves air quality and reduces odours, as well as reducing greenhouse gas emissions. Such projects provide a significant contribution to sustainable development. They do, however, confront obstacles. Methane emissions levels and their economic value are still unknown, information on training in available technologies and management practices is lacking, and there is a limited market and scant infrastructure for the proper handling of methane.

Support from sources such as the Methane to Markets Partnership (M2M)—a programme of the United States Environmental Protection Agency (EPA) in which a number of the region's countries participate—has encouraged the adoption of appropriate national policies in this area. In 2009, Argentina, Brazil, Chile, Colombia, Ecuador and Mexico were involved in the programme. The M2M initiative is an international effort that promotes methane recovery and use as a source of clean energy (Ludwig, 2009).

Also of note is the Clean Development Mechanism (CDM) established under the Kyoto Protocol. This is an economic or market instrument that allows investors in developing countries to promote sustainable development, while reducing GHG emissions. It offers both governments and private-sector entities opportunities to develop projects to reduce methane emissions, while at the same time using the gas as an energy source.

More specifically, waste management has potential for CDM projects in the following areas, to cite only the most important ones: recovery of methane from sanitary landfills, use of methane from sanitary landfills, conversion of waste to energy, and composting of municipal organic wastes (Leal, 2009).

According to World Bank projections, some of the region's countries with potential to capture methane from sanitary landfills are (in millions of m³): Mexico: 1,220; Brazil: 1,210; Argentina: 580; Colombia: 320; and Ecuador: 90. Successful projects have been reported in Chile (the El Molle, Lo Errázuriz, Lepanto and La Feria projects) and Mexico (the Monterrey project).

5. Reducing generation of waste

The strategies appropriate for the region are the same as those used in the industrialized countries. These consist essentially of:

- Minimizing waste;
- Recycling (including biological treatment); and
- Reducing the amount of waste deposited in landfills.

Little progress has occurred in the first of these three areas, although there have been attempts to study this in Chile, with a view to creating an economic instrument to encourage the population to generate less waste (ECLAC, 2002).

According to available statistical information (which remains incomplete), the trend in the countries has generally been towards an increase in the generation of household solid waste,

as well as an increase in industrial and hazardous wastes. Over a period of ten years (1996-2006), Mexico was the only country in which there was not a major increase in the per capita amount of household solid waste generated—which, as can be seen in table 6.1, increased in the remaining countries.

Table 6.1
COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN:
PER CAPITA HOUSEHOLD WASTE (KG./INHABITANT/YEAR)

PER CAPITA HOUSEHOLD WASTE (kg/person)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belize		168.58			283.27			360.84	390.71	428.99	
Brazil					240.30						
Chile	228.40				303.90	315.85	352.71	337.84	340.38	335.57	321.79
Cuba	137.90	267.84	284.60	292.66	307.28	335.15	349.10	329.11	352.23	355.92	342.74
Guatemala							130.30				
Mexico	273.60	246.18	242.81	242.14	237.16	240.47	253.42	247.30	257.97	261.59	264.20
Peru	50.47	51.12	56.04	55.51	55.03	57.56	58.81	81.02	79.98	71.59	75.65

Source: ECLAC – CEPALSTAT, 2009.

6. Exploiting the energy potential of waste

Brazil has been a pioneer in this area, and has a number of sanitary landfills that operate under good technical conditions and that generate varying amounts of electrical energy. In Salvador, Bahia, for example, the “Canabrava-Golden e Cra” landfill produces 75 KWh; in Nova Iguaçu, in the state of Rio de Janeiro, the Adrianópolis project produces 9MW; and in metropolitan São Paulo, the 35-million ton Bandeirantes landfill generates 20MW. In Colombia, a number of sanitary landfills are planning to submit energy recovery proposals in the form of Kyoto CDM projects.

This process requires moving from so-called “first generation” landfills, which are simply a substitute for open dumps, to “second generation” operations, which include bioreactors that exploit the gas generated (Hettiaratchi, 2009). The LAC countries are still at the first generation stage. Developed countries are implementing a third generation, with sustainable landfills, or “biocells”.

B. Environmental problems associated with solid waste generation and disposal

The environmental problems associated with poor solid waste management are well known, and all of the region’s countries have regulations in this area, although in many cases these are obsolete or are inadequately enforced. There is, however, an awareness of the issue, and there have been reports of efforts to advance in this area. Poor waste management, particularly with regard to open-pit dumps, can have major health impacts, most notably in the form of enteric diseases such as typhus, cholera and hepatitis, as well as cysticercosis, trichinosis, leptospirosis, toxoplasmosis, scabies, mycosis, rabies, salmonella and others, depending on local conditions.

Environmental impacts include damage to surface water quality as a result of runoff of waste products leaching from water-containing waste, which is aggravated by rain runoff, as well as percolation of liquids into aquifers. Air quality suffers from gas emissions—particularly biogas (methane)—with consequences for climate change. Risk of fire, strong odours from the uncontrolled decomposition of organic matter, proliferation of disease vectors, poor use and degradation of soils are among the typical environmental impacts of poor management of household solid waste.

The multiple environmental problems associated with solid waste combine and increase as treatment and disposal capacity is exceeded, creating serious social problems. An example of this is the situation at La Chureca, in Managua, Nicaragua, which is said to be the region’s largest inhabited dump. The 40 hectares that it covers are home to 1,200 people, and 3,000 more work there in sub-human conditions, earning US\$ 2 per day. International cooperation (from Spain) is implementing a rehabilitation project designed to create jobs and better living conditions for this population (Díaz, 2009).

There is a correlation between income and per capita waste generation, as shown by a comparison of selected cities in the region (table 6.2).

Table 6.2
PER CAPITA GENERATION OF MUNICIPAL WASTE IN CITIES

Municipal Solid Waste (MSW) by city, population and per capita waste generation in selected cities of over 1 million inhabitants in Latin America and the Caribbean, 2005		
Cities	Population (millions)	Per capita waste generated (kg/inhab./day)
São Paulo	16.4	1.35
Buenos Aires	12	0.88
Santiago, Chile	5.3	0.87
Bogotá	5.6	0.74
Belo Horizonte	3.9	0.83
Guatemala City	2.5	0.50
Havana	2.1	0.75
Cali	2.1	0.77
Brasília	2	0.75
Medellín	1.9	0.81
Montevideo	1.3	1.23
Córdoba	1.2	1.29
Average waste per capita generated	0.976	

Source: Pan American Health Organization. Sustainable Development and Environmental Health Area, Regional Report on the Evaluation of Municipal Solid Waste Management Services in the Latin American and Caribbean Region, Washington, D.C.: PAHO, 2005, p. 126.

Per capita generation of municipal waste in selected cities of more than one million inhabitants in Latin America and the Caribbean in 2005 was nearly 1kg/person/day. The amount in 2001, according to estimates by the Pan American Health Organization (PAHO), was 0.91/kg/inhabitant/day. This suggests a relationship between economic growth and waste generation, as well as reflecting a lack of public policy to address the problem. This pattern is typical for the region. Only Chile has carried out studies at the municipal level to develop proposals for systems to encourage reduced waste generation, though this has not resulted in the implementation of actual programmes (PAHO, 2005).

C. Progress, obstacles and best practices

As mentioned above, household solid waste management is seriously deficient in Latin America and the Caribbean. The situation is even more complex with regard to industrial waste. This problem, however, has received priority attention in policy-making, and most of the region's countries have taken action—with varying degrees of success—to deal with its economic, social and environmental complexities. A number of success stories are described below, including an indication of the difficulties and obstacles that they have faced. This information is based principally on national reports from the countries.

1. Mexico

1.1 Progress

In 2003, the General Law for the Prevention and Integral Management of Waste (Ley General para la Prevención y Gestión Integral de los Residuos, or LGPGIR) was passed, and related regulations were published in 2006. In addition, a comprehensive National Programme for the Prevention and Integral Management of Waste was instituted in 2009. The objective of the programme is to foster Mexico's sustainable development through a waste management policy that promotes changes in the models for production, consumption and management of waste, aimed at encouraging the prevention and integral management of urban solid wastes, wastes requiring special handling, and hazardous and mining/metallurgical wastes. This legal framework is complemented by a Guide for the Integral Management of Municipal Solid Waste and a Guide for Environmental Compliance by Mining Enterprises.

The installed capacity of hazardous waste management operations authorized in the last few years had reached 13.7 million tons/year as of June 2007. It is in recycling infrastructure that the greatest growth has occurred. In 2000, fewer than 30 companies were authorized to handle hazardous wastes; by 2006 over 200 had been authorized.

1.2 Obstacles

The General Law on Ecological Balance and Environmental Protection (Ley General del Equilibrio Ecológico y Protección Ambiental, or LGEEPA) cites solid waste as the principal source of soil contamination, but it does not take into account contaminants produced by industrial activities, such those from oil refining (including fuels and petrochemicals) or used oils and metals, which are considered hazardous substances.

Poor management of hazardous waste and materials leads to soil contamination and other effects resulting from accidental spills, as well as from ongoing releases into the environment due to poor disposal practices, such as burning, spills, dumping and other improper disposal practices.

Mexico is currently generating an increasingly wide variety of wastes. New products and substances appear in waste, as increasingly sophisticated (and more varied) processes, activities and services develop. The hazardous waste problem is following an upward curve, a trend for which there have not been corresponding regulatory measures (infrastructure, etc.). Waste management involves a wide range of social actors whose interests are affected in different ways, and who react differently, thus adding to the complexity of the challenge.

1.3 Best practices

In an effort to take advantage of biogas from sanitary landfills, Mexico has been participating, since 2005, in the Methane to Markets (M2M) initiative. In March of 2006, the country signed the agreement on SEMARNAT-USAID-USEPA cooperation, for the purpose of developing projects for the capture and productive use of methane in Mexico. The United States Environmental Protection Agency provides M2M support in the form of technical

assistance and demonstration projects that promote and create multiplier effects in relevant sectors.

There are currently 30 projects in various stages of the Clean Development Mechanism (CDM) process: 12 are in the proposal stage, 7 consist of registered projects, 2 have pending requests to become official projects, and 9 are currently in the validation process.

2. Colombia

2.1 Progress

Regulatory mechanisms have worked towards creating systems to recover hazardous wastes generated by consumption. Pesticides constituted the first sector to be regulated, under Resolution 693 of 2007, which established plans to manage recovery of containers, packaging and unused pesticides. Resolution 0371 of February 2009 established “the elements that must be considered for plans to manage the recovery of post-consumption pharmaceutical products and expired drugs”, while Resolution 0372 of February 2009 established “the elements that must be included in plans to manage the recovery of post-consumption, used lead-acid batteries, and other provisions.” This year, Resolution 0503 of 2009 was issued, “clarifying Resolution 372 of 2009, establishing the elements that must be contained in plans to manage the recovery of used lead-acid batteries, and other provisions.”

Encouraging efforts to deal with hazardous waste in sustainable ways is one of the strategies of the Environmental Policy for the Integral Management of Hazardous Waste and Residues. The strategy focuses on developing instruments to facilitate access to exploitation technologies suitable to the country’s needs, improve processes designed to reincorporate materials into the production cycle, and discourage informal activity in this area. There has been an increase in the number of firms authorized to exploit and develop uses for hazardous wastes—from 9 in 2006 to 32 in 2007, growing to 36 in 2008. Resolution 1362 of 2007 created a registry of hazardous waste sources, which will provide data on waste generation and management in individual jurisdictions and help to identify and prioritize the most strategic regional lines of action in this regard.

The Ministry of Environment, Housing and Territorial Development (Ministerio de Ambiente, Vivienda Desarrollo Territorial, or MAVDT) is using international loans to support the construction, optimization and design of 11 plans that will make use of urban solid wastes in various regions, benefiting over 60 municipalities. The investments total more than CO\$ 4.8 billion through the SINA II project, with most based on a regional approach.

Moreover, through the Tax Statute, the State is supporting the importation of recycling machinery by exempting it from the value added tax (VAT). Tax benefits of approximately CO\$ 1.062 billion were certified in 2008, representing investments on the order of CO\$ 5.770 billion.

The business sector is also making contributions to the effort. MAC, for example, is a battery recycling company that has a “reverse, or inverse, logistics” programme—an initiative launched by a number of companies to recycle used products.

Locally, there have been some notable successes with closing dumps and converting them into parks, in the process creating new green areas and raising the value of infrastructure and property in adjacent areas. An example of this is the Parque de los Sueños (“Park of Dreams”) in the municipality of Armenia (Collazos, 2008; Toro Zuluaga, 2009).

2.2 Obstacles

Colombia suffers from a lack of comprehensive facilities for the treatment and final disposal of many types of hazardous waste, and needs to identify methods used successfully by other countries for this purpose. It is important to improve the exploitation and use of recoverable wastes, as well as enhancing efforts to minimize waste generation by promoting responsible consumption.

One mechanism for accomplishing this is the integral solid waste management programmes (Programas Integrales de Gestión de los Residuos Sólidos, or PGRIS) promoted by the MAVDT, since 2004, with support from international technical assistance programmes. These programmes contract regional corporations to guide the process, hiring professionals whose sole job is to provide advice to municipalities and small manufacturing/processing facilities and advise municipal working groups on methodological questions (MAVDT, 2009).

An assessment found that 67% of the PGRIS evaluated needed to be modified. While their initial designs may have been good, they became outdated, since the original projections for waste generation proved to be inaccurate. Moreover, they reflected methodological confusion between activities, projects and programmes, and experienced problems in properly identifying viable financial plans and implementing sound investment planning. Although there has been no lack of assessments in identifying problems, planning has been a weak point. Finally, this mechanism is not being used by municipalities as an ongoing consultative tool (Arrieta Bernabé, 2009).

The principal problems currently being reported with regard to integral waste treatment plants concern a lack of planning—the result of failure to conduct market studies. This has led to: an accumulation of materials and a consequent loss of value; failure to bring technology to bear in processing and transforming materials; and operational failures due to management problems and difficulties in distributing costs between final disposal and treatment plants—resulting in poor financial sustainability.

Finally, it should be noted that, according to MAVDT estimates for 2006, 65% of household solid wastes are organic. However, PAHO data indicate that only 2.2% of all such waste is recovered in the LAC region, while composting operates on a very limited scale, converting only 0.6% of the organic waste generated.

3. Barbados

3.1 Progress

Under the Returnable Containers Act, cash deposits have worked to encourage returns with regard to plastic and other types of beverage containers. The money received for returns produces high levels of collection and return. In light of the success of this initiative, the

government is exploring the possibility of applying the same principle to other recyclable items.

The government is also studying the feasibility of generating energy from waste. This would be highly beneficial for the island, since this would simultaneously address the dual issues of waste disposal and energy supply. An Environmental Management Act (EMA) and various complementary provisions are being discussed for allocating resources for hazardous waste management for both individuals and commercial establishments.

3.2 Obstacles

The Barbados Sanitation Service Authority (SSA) is working with the Solid Waste Project Unit (SWPU) to conduct workshops and promote recycling wherever possible. Thus, although citizens are not given access to the Bulky Waste Disposal Site to recycle materials, they are at times permitted entry in circumstances in which proper conduct can be guaranteed. Various options—including incentives, permits and licenses—are being considered to promote such sites.

The level of infrastructure needed to accommodate recycling is not currently available in Barbados. For example, sorting equipment, specialized trucks, and containers for different types of materials are needed. The private sector is the principal engine of development in this area, with the government playing a regulatory role.

Another area of concern is illegal disposal and dumping. Trash containers have been placed throughout the country, especially in problem areas such as Bridgetown and other tourist venues. Most of the country's illegal dump sites are in remote ravines. There has been some success in reducing illegal dumping by offering monetary compensation for private recycling efforts, particularly those involving household appliances (refrigerators, washing machines and stoves).

The legislation now being discussed includes a section on toxic substances and covers everything from importation to disposal. Currently, the Environmental Protection Department (EPD) oversees all disposal of hazardous waste, on a case by case basis, under a standard procedure. Disposal is authorized as long as the waste can be neutralized; otherwise, it is exported—under the Basel Convention—generally to Canada. The absence of legislation is one of the principal constraints on the EPD's operation in various areas.

Hazardous waste disposal continues to be a daunting problem, due to lack of facilities for managing such waste. The transfer station in Vacluse, in the parish of St. Thomas, includes hazardous waste storage facilities, but the service is not currently in operation. Once this situation is remedied (in the short or medium term), the Vacluse facility will be able to accommodate hazardous waste.

4. El Salvador

4.1 Progress

El Salvador's Residues and Waste Coprocessing project, based on the technique described above, destroys residues and wastes as a part of the cement production process, using the cement furnaces of the firm Cemento de El Salvador, S.A. The project operates at the firm's facilities located in the canton of Tecoma, in the municipality of Metápan (department of Santa Ana).

Coprocessing takes advantage of the high temperatures involved in cement manufacturing (approximately 2000° C) to ensure safe final disposal of wastes, in accordance with national and international environmental standards (ECOTEK, 2007).

During coprocessing, the waste materials are reduced to elements such as calcium, silicon, iron and aluminium—ingredients needed for the manufacture of cement. The residues and wastes processed include tires, oil (mineral, vegetable and synthetic), sediment from the bottom of tanks, treatment-plant wastes, sediment from chemical processes, drilling sediments, contaminated water, solvent and hydrocarbon residues, plastics (pure, and those contaminated with lubricants or agrochemicals), expired drugs, textiles, soils, sand, dust, contaminated clays, pesticides, wastes with PCBs, biomass, cardboard and municipal solid waste (MARN, 2007)

The substances not permitted for coprocessing include: infectious and biologically active medical waste; waste with asbestos that has high concentrations of cyanide; acids; pure minerals; radioactive wastes; and unclassified solid waste (MARN, 2007). Coprocessing is increasingly widespread in Latin America and the Caribbean. In Chile, the Polpaico Group is employing this process at facilities of its partner firm Coactiva (Porcile, 2006).



5. Brazil

5.1 Progress

An Integrated Solid Waste Management project in Novo Hamburgo, Brazil was implemented by the United Nations Environment Programme (UNEP) at the request of the municipality. This demonstration project for the city was organized in collaboration with the municipality (in order to ensure local ownership of the project) and the Venturi Institute for Environmental Studies, as a national capacity-building measure. The project was conducted in 2008-2009, and provided a detailed description and quantification of all of the waste flows generated in Novo Hamburgo. In addition, it identified management deficiencies, included a broad survey of the citizenry, and established medium term (2010-2015) and long term (2013-2025) goals.

The goals are designed to reduce waste generation in the short-term, as follows: 10% reduction of industrial wastes; 5% reduction of construction wastes; and 10% reduction of materials from demolitions. The short-term goals also call for 100% sorting of hazardous wastes, as well as the sorting—in varying percentage—of organic wastes (80% of industrial organic waste and 50% of municipal organic waste), as well as 80% sorting of recyclables. The long-term goals call for: 90% composting of organic waste, accompanied by biogas recovery; sorting of 90% of inorganic waste at transfer stations, in order to enable recovery of materials; and recovery of 80% of construction and demolition wastes at local facilities.

These goals served as the basis for developing an Integrated Solid Waste Management Plan. In addition to establishing policies, technologies and voluntary interventions, the plan includes descriptions of 30 projects covering various aspects of waste management, such as at-source sorting of waste, trade in residues, waste exchange, generation of methane gas, establishment of an industrial recycling park, and other measures.

Based on the success at Novo Hamburgo, a number of other municipalities have approached the Venturi institute to request assistance in developing similar plans.

6. Cuba

6.1 Progress

Between 2004 and 2007, roughly 75% of the population had access to garbage collection. In the smallest and most isolated population centres, draft animals are used for this purpose.

Recycling initiatives have received major support from government, due to the efforts of the Union of Raw Materials Recovery Enterprises (Unión de Empresas de Recuperación de Materias Primas, or UERMP) (UERMP, 2003). In addition to traditional recycling measures, there has been an enhancement of the technological capacities for the recovery of other products previously responsible for environmental contamination, such as accumulators, discarded electronics, etc.

Raw materials recovery from ferrous and non-ferrous metals, glass, plastics, paper and cardboard products increased over these four years.

6.2 Obstacles

Problems in recovering materials from waste among the 25% of the population without access to these collection services—principally the rural population—are associated primarily with the deterioration of used vehicles, which cannot be repaired due to lack of replacement parts at maintenance facilities.

In terms of solid waste collection, there is a wide gap between different provinces in the country. In some, such as Matanzas, Sancti Spíritus, Santiago de Cuba and the Special Municipality of Isla de la Juventud, the volume of solid waste collected has declined—considerably, in some cases. In other provinces, such as Pinar del Río, Camagüey and Las Tunas, volume has doubled, while there have been only slight increases in certain other provinces.

D. Concluding remarks

Almost without exception, environmental policy in Latin America and the Caribbean has placed emphasis on solid waste management, due to the multiplicity of consequences it gives rise to. This has led to improved practices, although major deficiencies remain. In addition, new factors, not given sufficient consideration earlier, have arisen: the possibility of creating new recycling businesses, exploiting the energy potential of waste, contributing to the mitigation of climate change, producing fertilizers, etc. In order for these activities to have meaning within a context of sustainability, there must be a change in the approach that has governed the waste disposal “business” in the past few decades, in which “more waste means more profit”. Public policy must encourage a new perspective. This could produce major benefits to sustainable development efforts in a variety of dimensions.

Political will is required within the government in order to address the solid waste problem from a positive perspective, and to create national policy that not only provides for sound waste management, but also includes strategies to provide continuity in public-service staffing, prevent corruption, provide technical means of determining types of waste, and implement programmes for experts to train municipal personnel.

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