



Environmental Integrated Assessments for Cities in Latin America and the Caribbean:

GEO Cities Project



UNEP



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To analyse the state of the global environment, assess global and regional environmental trends and provide early warning information on environment threats.

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GEO

Cities

GEO Cities Project

Since 1995, the United Nations Environment Programme (UNEP) has been conducting an ambitious integrated environmental assessment project known as GEO (Global Environment Outlook).

Within the framework of the GEO project and responding to the call of the Forum of Ministers of the Environment and activities related to the Johannesburg Summit, the GEO Cities project was launched in 2001. This project aims at promoting a better understanding of the dynamics of cities and their environments, providing local governments, scientists, policy makers and the public in general in the region with reliable and up-to-date information about their cities.

The objectives of the project are to:

- Recognize the links between environmental conditions and human activities, especially those related to urban development.
- Contribute to build local technical capacities that will permit integrated assessments to be made on the state of the urban environment.
- Guide consensus building on the most critical environmental problems in each city by encouraging all sectors of society to engage in dialogue and participate in the decision-making process.
- Make it possible to formulate and implement urban strategies and plans that will help cities improve urban environmental management.
- Encourage the creation of institutional networks in the city.



In the first phase of the project, which began in November 2001, seven pilot cities were identified in Latin America and the Caribbean. Most of them are capital cities and each with different characteristics (type of eco-system, number of inhabitants, size of the economy, etc.) but all sharing many of the same urban environmental problems (air pollution, water quality, waste management, transport, land use, etc.). Some of these GEO Cities Reports were prepared with the financial support of World Bank. The seven cities are:

- Bogota, Colombia
- Buenos Aires, Argentina
- Havana, Cuba
- Manaus, Brazil
- Mexico City, Mexico
- Rio de Janeiro, Brazil
- Santiago, Chile

GEO

Given the success of the GEO Cities project and thanks to the financial support from the governments of Belgium, Norway, and the Netherlands, the second stage of the project began in 2003 with new cities (May 2005):

- Arequipa, Peru
- Asuncion, Paraguay
- Beberibe, Brazil
- Chiclayo, Peru
- Cienfuegos, Cuba
- Esmeraldas, Ecuador
- Guatemala City, Guatemala
- Holguin, Cuba
- Lima and Callao, Peru
- Loja, Ecuador
- Maraba, Brazil
- Montevideo, Uruguay
- Panama City, Panama
- Pirahnas, Brazil
- Queretaro, Mexico
- San Miguel de Tucuman, Argentina
- San Salvador, El Salvador
- Santa Clara, Cuba
- Santo Domingo, Dominican Republic
- Sao Paulo, Brazil
- The Greater Metropolitan Area of Costa Rica, Costa Rica

The analysis in the GEO Cities reports focuses on the effects of urban development on the environment from a perspective of sustainability. Specifically, it aims at learning how urbanization affects the environment through factors that strain local natural resources and ecosystems, giving way to a certain state of the environment, with impact on the quality of life in the cities and bringing about specific responses from public, private and social actors aimed at the problems generated.

Effective environmental and natural resources management needs to be based on solid information about the state of the environment. The methodology developed for GEO Cities supplies this information by developing Integrated Environmental Assessments that answer the following six basic questions:

- What is happening to the environment?
- Why is it happening?
- What is the impact?
- What action is being taken on environmental policies?
- What will happen if we do not act now?
- What can we do to reverse the present situation?

The methodology used to respond to these questions is based on analysing the indicators included in the State-Pressure-Impact-Response (SPIR) matrix. This matrix seeks to establish a logical link among the various components that directs the assessment of the state of the environment analysing the factors that put pressure on natural resources (which could be understood as the "causes" of their present state), going through the present state of the environment ("effect"), up to the responses ("reactions") made to deal with the environmental problems of each city.

One of the purposes of the GEO Cities Report is to contribute to the decision-making process in the scope of public policies regarding urban-environmental interaction, making it important to assess the environmental impact of current actions and policies. Thus, it is possible to analyze corrective measures, adopt new approaches for dealing with environmental problems and identify the capabilities and levels of responsibility of committed social actors.

The GEO Cities methodology is a very useful tool that will strengthen the capacity of institutions to prepare integrated environmental assessments, which will lead, over the long term, to making informed decisions towards sustainable development and achieving the Millennium Development Objectives. For more



Cities that are Part of the GEO Cities Project (May 2005)





1. Rio de Janeiro



2. Manaus



3. Mexico City



4. Bogotá



5. Buenos Aires



6. Santiago



7. Havana



8. Montevideo



9. Sao Paulo



10. Arequipa



11. Lima and Callao



1. GEO Rio de Janeiro

Basic information:

- Rio de Janeiro is located in the southeast region of Brazil.
- It is the core-municipality in the Metropolitan Region of Rio de Janeiro, which includes 19 other municipalities.
- The city of Rio de Janeiro is the 4th largest city in Latin America and the Caribbean. Taking the Metropolitan Region into account, it is considered the 20th largest urban area in the world.
- The city's total population was 5,857,904 inhabitants in 2000. Today the estimated population is 6,051,399.
- Rio de Janeiro covers an area of 1,264.20 km², all of which is considered urban area.
- The physical characteristics of the city of Rio de Janeiro is characterized by its relief that groups together contrasting physical aspects, such as the mountains and the sea, forests and beaches, exuberant steep rocky mountains and valleys at the same time.

The Process

The GEO Rio de Janeiro process, the first of the GEO Cities series, began with the adaptation of the methodology developed for GEO on a country level with the reality and necessities of the urban areas in Latin America and Caribbean. The preparation of the GEO Cities methodology and its application in Rio de Janeiro was carried out by *Consortio Parceria 21* which is formed by three non-governmental organizations – *Instituto de Estudos da Religião (ISER)*, *Instituto Brasileiro de Administração Municipal (IBAM)* and *Rede de Desenvolvimento Humano (REDEH)*. The Ministry of Environment of Brazil with the support of Parceria 21 managed to generate an objective assessment for the local administration, permitting the gathering of information from different levels of various public governmental agencies as well as from other institutions.

Environmental Priorities

The main strains on the environment of the city of Rio de Janeiro are the result of accelerated urban growth, characteristic of most of the cities in the country and in the region of Latin America and the Caribbean over recent decades. These strains can be summarized in: housing shortage (in particular for people in the low-income bracket); use and occupancy of both legal and illegal land in environmentally frail areas; a growing deficiency in infrastructure of adequate water collection and treatment in areas occupied legally and illegally; inefficient solid waste management; a deficient urban transportation system that generates an overload in the roadway system due to the number of private and collective vehicles; among others.

Water

Information on faecal coliform bacteria and the demand of biochemical oxygen was selected in the GEO Report as indicators for assessing water quality. The Guanabara Bay presents a coliform count above the established level for bathing (1.000 MPN/100mL). The locations with the highest concentrations are usually found close to river estuaries, areas with lower water circulation near crude or partially treated effluent discharge from industrial or residential areas.

Land

Due to the high occurrence of irregular occupation and growth of the population density in Rio de Janeiro, there is a high incidence of hazardous areas, that is, areas that are vulnerable to floods and landslides. According to the GEO Rio de Janeiro assessment, the area that is degrading corresponds to close to 31% of the total area of the municipality.

Biodiversity and Green Areas

The disaggregated analysis of vegetation coverage shows that the central neighbourhoods are the most affected by the lack of vegetation, presenting 71% of the total urban area. The areas with forest coverage represent just 5.4%, of which 3.38% show alterations. The forest and wetland ecosystems have been reduced by 16.7% and 30.1% respectively in the period between 1984 and 1999. Salt marshes no longer exist and mangrove swamps diminished to 0.16%.

The deterioration of the ecosystems in the city of Rio de Janeiro has brought about the extinction of species that are the most sensitive to changes in the balance of their habitat. The eutrophication and the lower amount of oxygen associated with a rise in temperature has resulted in a heavy loss of fish in lagoons.



Advances

Over the last three decades, the Government, in its three administrative levels (municipal, state and federal), has institutionally structured itself to attend environmental needs. In the Municipality of Rio de Janeiro, an environmental management program was institutionalised through the creation of the Municipal Secretariat of the Environment, the Municipal Environment Council and the Fund for Environment Conservation.

Principal environmental projects underway in the city of Rio de Janeiro:

- Clean Bay – Activities of the Decontamination Program of the Guanabara Bay – PDBG.
- Clean Sandbar – Sanitation program of the Tijuca and Jacarepaguá Sandbars.
- Sepetiba Bay – Macro-plan of Environmental Management and Sanitation of the Sepetiba Bay Basin.
- Our Beaches – Revitalizing the beaches of Ipanema, Copacabana, Roça, Leblon and San Conrado.
- Our Rivers – drainage and cleaning work on rivers and canals, focusing on flood control.
- Our Parks – Recovery and demarcation of their boundaries, by setting up offices and developing a Master Plan in the Piedra Blanca State Park.
- Integrated Environmental Education Project – informing the population of the work done by the PDBG.



Impact of the GEO Rio de Janeiro Assessment

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GEO

The GEO Rio de Janeiro process counted on the participation of the city's municipal agencies and is one of the first cities in applying the methodology of GEO Cities. It is important to say that the assessment generated much interest on the part of other Brazilian cities to use the methodology and the GEO Rio de Janeiro and GEO Manaus reports as examples for the preparation of their own GEO assessments. At this moment, three other Brazilian cities – Piranhas (AL), Beberibe (CE) and Marabá (PA) – are producing their assessments; and other cities in Brazil are soliciting informative and technical support for their GEO Cities assessments.



2. GEO Manaus

Basic information:

- The Municipality of Manaus is located in the northern of Brazil, the geographic center of the Brazilian Amazon.
- The total surface area of the municipality is 11,458.5 km².
- The urban area of Manaus extends 377 km², which corresponds to just 3.3% of the municipal territory.
- The city is built on a low plain that extends along the left bank of the Negro River, at the confluence of this river with the Solimões River, where the Amazon River is formed.
- Manaus has a total population of 1,403,796 inhabitants, with a concentration of 99.35% in the urban area.

The Process

The GEO Cities Project in Manaus was developed by *Consorcio Parceria 21* which is formed by three non-governmental organizations – *Instituto de Estudos da Religião (ISER)*, *Instituto Brasileiro de Administração Municipal (IBAM)* and *Rede de Desenvolvimento Humano (REDEH)* with the assistance of the Ministry of the Environment of Brazil, which made it possible to attain an external view of the local government's perception on gathering information from different administrative levels of the various institutions and public agencies.

During the preparation of the GEO Manaus, some obstacles presented themselves, such as: difficulty in obtaining information from public agencies and private institutions, the lack of information and duly prepared figures on relevant topics; lack of systemized databases for some of the topics covered and the absence of databases in chronological order, as well as discontinuity in sequenced data.

Environmental Priorities

Manaus faces acute growth of urban population, going from 300,000 inhabitants in the 1970s to close to 1.4 million inhabitants in the beginning of the 21st century. It is clear that the uncontrolled advance of urbanization on native forests and irregular occupancy in protected areas, such as the banks of the "igarapés" (lateral ramifications of the river in the Amazon rainforest) and environmentally fragile areas, such as stretches along the Negro River and other unstable areas.

Manaus, one of the most important cities in Brazil, is located at the mouth of the Negro River on the Amazon River. From 1992 to 2001, there was considerable urban growth in the



2001

city, especially towards the west and north of the city, as well as higher concentration in the southeast, close to the Negro River. Urban growth has displaced considerable portions of the remaining tropical forest in Manaus, as well as in the surrounding areas. The land cover change can be seen around the boundaries of the "Ducke" Reserve, especially deforestation and conversion of forest to agricultural land. Deforestation can also be seen along the Negro River tributaries close to Manaus, where the original forest has been replaced by patches of farming, resulting in the fragmentation of the tropical forest.

Water

The *igarapés* (lateral ramification of the river in the Amazon rainforest) are in good shape, although signs of occupancy can already be seen in areas near their headwaters. In some stretches of the *igarapés* where human activities take place, bodies of

acciones antrópicas, los cuerpos de agua presentan intensos cambios, presentando un estado de total descomposición, en virtud de la poca capacidad de auto-depuración de las cargas contaminantes.

Biodiversidad

El Municipio de Manaus presenta un alto índice de especies endémicas – hecho que es atribuido a la confluencia de regiones fito-geográficas distintas y a la posibilidad de la región de servir de refugio para las diferentes especies. Existe una alta riqueza de especies, a pesar de que los suelos son menos fértiles, de que llueve menos y de que presenta una estación de sequía bien definida, características que son distintas de aquellas de la Amazonia Occidental. La alta diversidad asociada a la presencia de especies de diferentes provincias fito-geográficas, toma la región de Manaus de gran importancia para la conservación de la biodiversidad.

Avances

Desde la creación de la Secretaría Municipal de Desarrollo y Medio Ambiente en 1989, la actuación del poder público sobre el medio ambiente en Manaus ha venido creciendo. En 1993, fue creado el Fondo Municipal para el Desarrollo y el Medio Ambiente. En 1995 fue instituido el Código Ambiental del Municipio de Manaus.

El Plan Plurianual del Municipio de Manaus – 2002-2005, aprobado por la Ley Nº 639, del 14 de diciembre de 2001, destaca los asuntos ambientales y urbanos prioritarios al enunciar las Directrices para la Acción del Gobierno Municipal para dicho período.

El Ministerio Público del Estado de Amazonas ha actuado de forma decisiva en la defensa del medio ambiente, tanto en el ámbito local como en el ámbito estatal.



Impacto de la evaluación GEO Manaus

La alcaldía de la ciudad de Manaus incorporó la metodología GEO Ciudades y las recomendaciones del Informe GEO Manaus en la elaboración del Sistema Municipal de Información Ambiental. El Informe GEO Manaus fue ampliamente divulgado en el ámbito escolar del Municipio de Manaus como parte de una campaña de educación ambiental. Ha habido interés por parte de la nueva administración municipal en promover una actualización y una revisión del Informe GEO Manaus.



3. GEO Ciudad de México

Información básica:

- La Zona Metropolitana de la Ciudad de México (ZMCM) se asienta en un ecosistema lacustre.
- En la ZMCM habitan 17,9 millones de personas (Censo 2000) y para 2020 estará poblada por cerca de 24 millones de habitantes.
- Concentra al 18% de los mexicanos que viven en el país, en menos de 1% del territorio nacional.
- La densidad poblacional es de 121 habitantes por hectárea.
- La ZMCM genera el 32,5% del PIB nacional, centraliza más del 60% de la actividad bancaria y más de las tres cuartas partes del ahorro financiero del país.

El Proceso

El GEO Ciudad de México fue elaborado por el Centro de Investigaciones en Geografía y Geomática "Ing. Jorge L. Tamayo" (CentroGeo), perteneciente al Sistema de Centros Públicos de Investigación del Consejo Nacional de Ciencia y Tecnología, centro colaborador del PNUMA, con el apoyo del Gobierno del Distrito Federal.

Con la finalidad de extender el carácter participativo, común a todos los proyectos GEO de PNUMA, los borradores iniciales de este Informe se revisaron en un taller de especialistas y, posteriormente, para consultas puntuales, se consideró la opinión de académicos y funcionarios públicos.

Para contribuir a la visión territorial, además de la elaboración de la publicación, se utilizaron avances metodológicos que proporcionan herramientas robustas para el análisis de las interacciones entre desarrollo urbano y medio ambiente en el territorio. El resultado permitió diseñar y estructurar un documento cibernético de información geo espacial denominado GEO Ciudad de México: una visión territorial del sistema urbano ambiental.

Prioridades ambientales

Urbanización sin planeación

La urbanización de la ZMCM ha ocurrido en forma acelerada, desordenada y con graves afectaciones para el medio ambiente. El área urbana, que en 1940 ocupaba cerca de 12 mil hectáreas, casi se duplicó al alcanzar en 2000 cerca de 148 mil hectáreas. La expansión ha ocurrido a expensas del suelo destinado a la conservación.

Agua

Todos los cuerpos de agua de la cuenca han sido irreversiblemente dañados. Casi todos sus ríos han sido entubados y los manantiales han dejado de fluir en forma natural. El desempeño del sistema hidráulico se encuentra gravemente amenazado, no sólo se explotan los acuíferos más allá de su capacidad, sino que se tiene que importar el recurso de otras cuencas. El manejo del agua es inadecuado, sólo se reutiliza el 10% del agua y las fugas significan el 38% del caudal que se inyecta a la red, además, muchas familias no cuentan con el servicio constante de agua potable.



Aire

Si bien recientemente se observa una disminución en los niveles de bióxido de azufre y plomo, para el resto de los contaminantes (ozono y partículas suspendidas) la situación sigue siendo crítica, ya que el 80% de los días se rebasa la norma. Lo anterior se traduce en alteraciones a la salud de la población. El problema es complejo, ya que en la ZMCM circulan 3,6 millones de vehículos particulares y las condiciones geográficas y climáticas complican el escenario.

Residuos sólidos

Cada habitante de la Ciudad de México genera en promedio más de 1,2 kg. de basura diariamente, lo que significa que cada día se producen más de 21 mil toneladas de residuos sólidos. No hay suficientes espacios y sitios de disposición final de la basura



Biodiversity and Green Areas

20.4% of the urban land is covered by public and private green areas, and 55.9% of this area has trees and the rest have lawns and/or shrubs. There is a total of 20 m² of green areas per inhabitant. However, the number drastically drops to 7 m² if one only takes into account those that are under management.

Vulnerability

The overexploitation of the MZMC aquifer, which supplies 70% of the water consumed, causes sinking in various places, as well as cracks and fractures in pipes. The city sinks 5 to 40 centimetres each year in some areas, weakening building foundations and making them more vulnerable to earthquakes.

Advances

The Federal District Law on Solid Waste, published on 22 April 2003, is the first law of its kind in Latin America and the Caribbean that a local government has enacted to regulate the handling of solid waste, as well as offering public maintenance services.

Over recent years, the air quality of the MZMC has relatively improved its levels of some highly toxic pollutants. Thus, concentrations of sulphur dioxide and lead have been permanently kept within the accepted limits, and those of carbon monoxide (99% of which is emitted by transport) are exceeded only sporadically. Moreover, over the last 14 years, it has been possible to minimize "critical" days. This has been achieved by improvements made to gasoline and changing catalytic converters in old cars.

Reforms to the Federal District Law on the Environment shows significant evolution in terms of regulating and endorsing green areas by creating the General Inventory of Green Areas and management programmes, as well as introducing a new concept known as areas of environmental value.



Impact of the GEO Mexico City Assessment

The GEO Mexico City assessment consists in a prototype of a highly interactive tool with an important collection of geo spatial data that is offered and distributed in a CD format. This tool is known as a geo-spatial data cybernetic document. The publication and the CD have made it possible to build "a spatial outlook on the urban environmental system".

This points towards significant progress on a simple, but hard to implement, objective – making spatial dimensions explicit in:

- urban environment system assessment;
- government strategies and policies on Conservation Area; and
- communication between policy-makers, experts, social organizations and the public in general.

4. GEO Bogota

Basic information:

- Bogota, Capital District, is the largest urban centre in the country with the highest index of environmental deterioration and the highest demographic and industrial concentration.
- The population of Bogota is 6,495,873 people, 15% of the national total and provides more than 20% of the Gross National Product (GNP).
- The city takes up more than 42,000 hectares (17%) and the rest of the area is for rural use.
- During 2000 to 2010, the rate of growth is calculated at 1.81% with an estimated 7.6 million by 2010.
- 43.2% of the population belong to economic levels of high poverty that receive an average annual income that is some 35-40 times lower than the groups of higher incomes and livelihood.

The Process

GEO Bogota was carried out by the *Departamento Técnico Administrativo del Medio Ambiente of Bogota* with support of UNEP. It began with an environmental diagnosis of Bogota and includes a description of the overall advances made, as well as advances on the themes that come under the heading of environmental management, i.e. of areas, stakeholders and processes that cause changes to or impacts on the environment.

Environmental Priorities

Unplanned Urbanization

In the decade of 50, the city limits consisted of an extension of 30,700 hectares, 22,968 of which corresponded to the built-up area. However, from 1990 to 1995, the limits extended to include 46,050 hectares, 24,972 of which have been built-up area. This enlargement is due to the population explosion, that grows at a rate of 1.81% each year.

Water

Eleven discharging sites contaminate the Bogota River with domestic and industrial effluents. Three sites discharge 90% of the total effluent in a lethal manner. The Bogota River dumps 1,473 tons/day of suspended solids into the Magdalena River (the principal riverbed in Colombia). This causes ecological imbalance in which it no longer serves as a self-purification system.

These rivers present septic environmental conditions, permanent pestilence and a risk to the health of the inhabitants since they contain high concentrations of organic loads and chemical contamination by heavy metals and solid materials.

Air

Air quality in Bogota is affected in certain areas by emissions from fixed point sources, which are concentrated in certain city sectors (almost 2,400 industries) that will eventually increase. Other causes of pollution include the age of the vehicular fleet and the excessive number of vehicles on the streets, as well as the lack of traffic control measures. The effects are manifested in respiratory illnesses and damage to the human nervous system, mainly in children.

Solid Waste

The inhabitants of Bogota generate approximately 5,611 tons of trash daily (0.77 kg per person). Deficiencies in the design and operation of the Doña Juana landfill have resulted in geotectonic problems, gas emissions and the combination of hazardous and pathogenic waste. Although the landfill was projected for 30 years of use, after just 15, its usefulness has seriously gone down to the point in which it will be necessary to outfit one or several sites for solid waste disposal.



Biodiversity and Green Areas

Bogota has a vast diversity in trees, which exceeds three hundred native and exotic species. The number of trees per inhabitant depends on the area, but there are an estimated 212,000 trees in Bogotá, with a density of 18.5 trees per hectare.

Vulnerability

The main risks found in Bogota are: earthquakes, massive landslides, floods, phenomena of a technological nature, mass spectator events and forest fires.

Bogota has the largest concentration of the productive sector in the country and the main government institutions. An earthquake could create a social and economic crisis, causing the death of approximately 38,700 people and damaging 45% to 48% of the buildings and various structures in the city.

Advances

In order to respond to the need and responsibility to preserve, maintain and protect the biodiversity in the Capital District, the Departamento Técnico Administrativo del Medio Ambiente of Bogota has set up plans for managing and recovering areas of particular importance in the precepts known as Protected Area System (PAS). Through the PAS management programs, an Ordinance Plan is being developed, as well as a plan for managing the Eastern Mountains, which make up 5,000 hectares of the Protected Forest Preserve, on the eastern edge of the city.

There are 800 hectares of wetlands or flood areas in the hydric system in the plain on which the city is located. After implementing and operating the management plans (with the re-introduction of native species of flora), various wetlands have become suitable micro-habitats for native and migratory birds to nest and recover from their journeys, as well as for bird-watching.



Impact of the GEO Bogota Assessment

In addition to compiling the environmental problems and their causes, GEO Bogota also outlines the principal directives and areas of action considered priorities to reduce the environmental impact the capital of Colombia experiences.

The diagnosis in the GEO Bogota was used to contribute in the formulation of the priority environmental projects for the Bank of Projects of the local government. The report brought about changes and adjustments to State Action Plans, which translate into projects that have a buttress for the most important fields of action contained in the Bogota Environmental Management Plan.

5. GEO Buenos Aires

Basic information:

- Buenos Aires is made up of 21 school districts, 28 voting districts, 47 neighbourhoods and 16 Management and Participation Centres.
- The Metropolitan Area (MABA) extends over 8,173 km².
- In 2001 Buenos Aires had 2,776,138 inhabitants. Between 1991 and 2001 the rate of growth was -6.4 per thousand. By 2010, it is estimated that there will be 3,076,436 inhabitants, just 7.4% of the country's total population.
- The highest densities stand at more than 30,000 inhabitants per km² while the lowest ones have densities closer to 5,000 km². The average density was 14,827 inhabitants/km² in 1991 and 13,679 inhabitants/km² in 2001.



Environmental Priorities

Unplanned Urbanization

The rapid growth of the MABA has led to the incorporation of land in which new settlements have no infrastructure or basic services for their inhabitants. This is what is known as unplanned sub-urban expansion, a city with areas of a low density. This makes providing services, such as paving, building public networks of water supply and sewer, as well as household waste collection, more difficult and more expensive.

Water

Water consumption in City of Buenos Aires is about 540 litres per inhabitant a day. This figure, however, is not very exact, since a large amount, approximately 161 litres/ inhabitant/day is wasted due to leakage and unknown use. Currently, La Plata River supplies water to part of the MABA. The City of Buenos Aires supplies almost all the network services of potable water and sewage collection (99%). Of the total amount of sewage collected, just 10% is treated and the rest is dumped untreated along with industrial discharge into water currents such as the Matanza-Riachuelo basin and La Plata River.



The Process

GEO Buenos Aires was prepared by *El Instituto de Medio Ambiente y Ecología* of the *Vicerrectorado de Investigación y Desarrollo* of the University of Salvador in collaboration with the Government of Buenos Aires; it is designed as an environmental decision-making tool for the city of Buenos Aires. This assessment report stemmed from a participatory process that incorporated the points of view and perceptions of experts, institutions and politicians involved in urban environmental management in the city and created consensus on priority issues and matters through dialogue.

Air

The MABA lacks continuous air quality surveillance. Vehicles are the main producers of contaminating gases. The rate of motorization in the city is of 0.55 vehicles per inhabitant and an average of 1,375,000 vehicles come in every day from the surrounding areas. An attenuating factor is that the contribution of fixed point sources went down with the drop of industrial production over recent years.

Solid Waste

Although the generation of household waste has gone down in recent years due to the economic depression that lowered consumption and the informal recovery of some waste, the amount of waste comes to a daily average of 1.5 kilograms/inhabitant. The land used as dumps are practically full and there are various proposals for new sites for final disposal.

Biodiversity and Green Areas

By following up and making improvements on public policies, the joint interest of the government and civil society has contributed to the increase of urban green areas. At present, Buenos Aires has 860 hectares of green areas used as parks. As a result, each inhabitant has the use of approximately less than 2 m² of this area for his or her pleasure.

Vulnerability

Buenos Aires suffers from the natural phenomenon of floods without a metropolitan outlook. To avoid these floods it was recommended to manage the river headwaters by changing their course to uninhabited areas or temporarily storing it. Enlarging the space of green areas was also encouraged so as to mitigate the effects of strong rains by slowing the flow and absorbing part of the rainwater.

Advances

Since 2003, urban waste collecting has been enhanced, backed and protected by Law 992. With these actions, the so-called "cartoneros" are given a legal standing and are integrated into the system as waste recovery and recycling. Publicity and awareness campaigns on the importance of recycling and separating waste at its source are underway.

In 2004 Law 1,356 on the Air Quality of the Autonomous City of Buenos Aires was approved, giving a regulatory framework, among other things, to monitoring air quality and epidemiological surveillance, control over fixed point and mobile sources of emissions and incentives for using less contaminating technical and combustion substitutes. At present, the inventory of fixed point sources is about to be completed and two new monitoring stations will soon be installed.

An area of Buenos Aires close to the river has been proposed to UNESCO as a Cultural Heritage Site, under the category of Cultural Landscape. Likewise, in-depth work was carried out on the Metropolitan Dimension of the Strategic Plan for the City of Buenos Aires.

Impact of the GEO Buenos Aires Assessment

The GEO Buenos Aires report was disseminated on various types of local and national media: in print (*La Nación*, *Clarín*, *La Razón*, *Infobae*, *Cónica* and *La Prensa*), on the radio (*El Mundo*, *Continental*, *FM Patricios*, *América*, *Del Plata* and *Ciudad*), on television (*Canal 7* and *CVN*) and in cyberspace (*Boletín SIMMAIL*). It was also published on the City of Buenos Aires Government's website and on the Ministry of the Environment and Sustainable Development's website.

The GEO experience has encouraged participation in various specialized meetings, such as that of the permanent Advisory Council created by Law 123 on Environmental Impact Assessment for the City of Buenos Aires; The Commission for the Regulations Task Force for Law No. 1356 on the Air Quality of the City of Buenos Aires; the "Cultural Landscapes in Living Cities" International Workshop sponsored by the Undersecretary for Cultural Heritage and UNESCO to declare Buenos Aires a World Heritage Site. Furthermore, it has created links with non-government organizations, such as *Fundación Metropolitana* and *Fundación Cambio Democrático*.



6. GEO Santiago

Basic information:

- The Metropolitan Area of Santiago does not have its own administrative structure, but has a conglomerate of 34 municipalities, each with its own municipality with similar powers.
- 5.4 million people live in the Metropolitan Area of Santiago, which is growing at an annual rate of 1.2%.
- It has a potable water network and drainage system that almost covers the entire urban area, with coverage over 99% and 97% respectively.
- Santiago is in the Mediterranean zone of Chile and is one of the 25 hotspots for global biodiversity conservation.

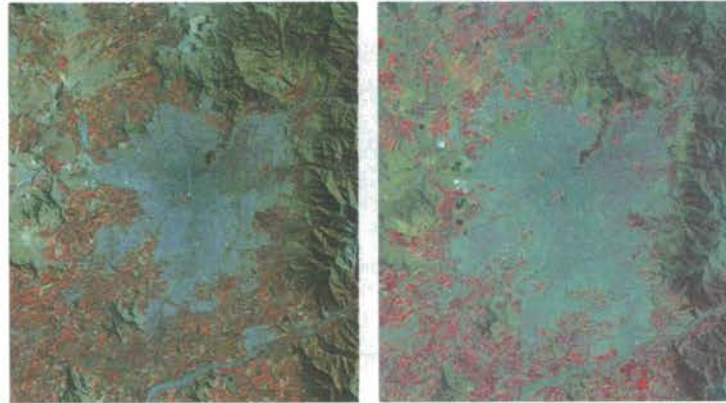
The Process

The GEO Santiago assessment was prepared by the Metropolitan Regional Government of Santiago and the Institute of Urban Studies of *la Pontificia Universidad Católica de Chile*, with aim of contributing to the construction of a regional environmental vision, and to the creation of information systems that would support the decision-making process of the member countries in Latin America and the Caribbean.

In general, Santiago has a vast amount of statistical information available. However, much of it is not regularly updated, resulting in a lack of continuity of basic information. The process required the construction of the special indicators for the assessment of the environmental impacts such as environmental problems related to the population, and the economy, and environmental policies. The data used to develop the indicators come from Chilean public institutions, non-governmental organizations, universities and research centres. Indicators also came from the information that was not regularly reported by any institution, such as that of urban expansion (hectares per year). GEO Santiago contributes to the work of collecting, organizing and comparing information that comes from various sources.

Environmental Priorities

The images below show the significant growth this city has had over a period of 24 years: while in 1975 the city occupied 40,000 hectares, by 1999 it had spread over 58,000 hectares and had expanded in almost every direction. The most notable growth has taken place towards the south, where there are large concentrations of low-cost housing, characterized by a high building density that waterproofs the soil and prevents aquifer replenishment. This makes the land impermeable, making it difficult for aquifers to recharge. This urban growth took over the agricultural land seen in the red area area on the 1975 image.



1975

1999

Air

The geographic and climatic characteristics of Santiago make it difficult for the dispersion of pollutants and urban activities that emit a large amount of gas emissions and particles are responsible for the contamination in the city. The size of the city, the increase in the rate of motorization and the preference for driving worsen the problem.

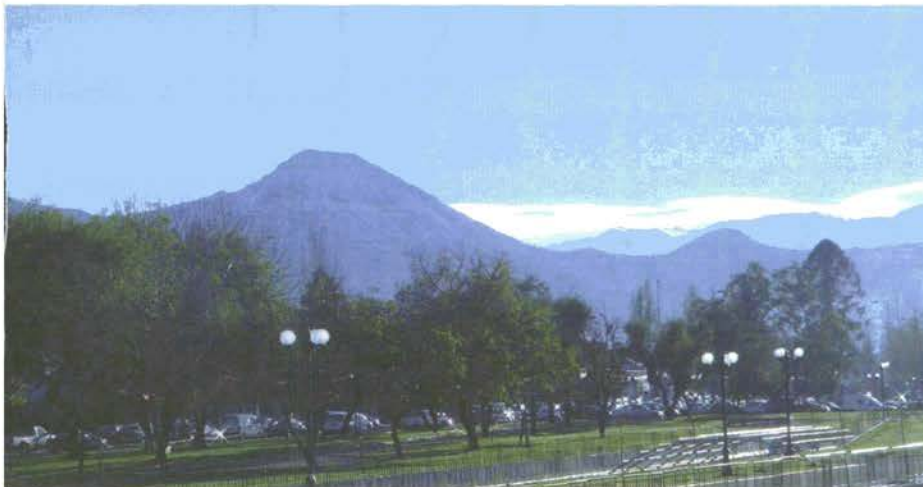
Water

The availability of water is assured thanks to the Andes mountain range, which serves as a permanent water reserve for the city and its activities. Until 2003, surface water contamination was a serious environmental problem in Santiago, which even limited agricultural activities since its use for irrigation was hindered.

As of 2000 work began on the Hydric Sanitation of the Great Santiago Plan, which includes building three large water treatment plants in the outskirts of the Metropolitan Area: El Trebal, La Farfana and Los Nogales, and 13 other smaller plants located in other urban centres in the region. With this, 75% of the city's wastewater is treated and by 2009 the figure will reach 100%.

Solid Waste

The economic and demographic growth of Santiago has come with an increase in the volume and complexity of household solid waste. On average, each inhabitant of Santiago produces 1.34 kilograms of trash/day, which adds up to 2.6 million tons/year. If we add construction, garden and industrial waste, it amounts to 7 million tons/year.



Biodiversity and Green Areas

The Metropolitan Region of Santiago has a surface area of 1,550,658 hectares, 56% of which are mountains. The high endemism of its native species that characterizes the region makes it very important in the conservation of biodiversity at a global level, since they are species that are unique in the world. Meanwhile, in the urban area, there is an average of 3.5 m² of green space per inhabitant, but this figure may conceal a great imbalance: while the wealthier zones have an average of 10 m²/inhabitant, the poorer zones only have but 1 m²/inhabitant.

Advances

With the implementation of environmental policies since the mid 90's, progress has been made in almost every aspect. This is seen in the implementation of the Plan for Prevention and Atmospheric Decontamination for Santiago, the Master Plan for Rainwater Collection, the Hydric Sanitation Plan and the Urban Transport Plan for Santiago (TRANSANTIAGO). Likewise, half of the industrial waste is recycled in and out of the company that produces it. An average of 8.000 tons of paper and cardboard are recovered each month and 33% of the glass bottles on the market are made from recycled material.



Impact of the GEO Santiago Assessment

The GEO Santiago Report has been well received in the National Environment Commission (CONAMA), the institution responsible for environmental matters. The report was requested by the Regional Director as part of the CONAMA documentation for different lines of work. In the region of Santiago, the report contributed to outlining the priorities for the Regional Development Strategy, in which the environment is a core issue.

At the level of the Universidad Pontificia Católica de Chile, the GEO Santiago process facilitated communication between distinct careers that have environmental backgrounds and in particular the graduate students have used the GEO Santiago Report as a source of information.

7. GEO Havana

Basic information:

- The province of Havana, the capital of the Republic of Cuba, is located along the northwestern coast of the island.
- It has population of 2,181,000 inhabitants, which represents 27% of the total urban population of the country, and extends over 727 km².
- The city is divided into 15 municipalities and 105 Popular Councils. Its urbanized area takes up around 40% of the territory.
- Average population density is about 3,000 inhabitants per km².
- Havana's economic activity has significant weight when compared to the other provinces, estimated at 42% of the country's Gross National Product.

The Process

The GEO Havana assessment was prepared by the Delegation of the Ministry of Science, Technology and Environment (CITMA) in Havana with the support of the Havana City Government. Twenty two institutions and 37 specialists of the province, all involved with the condition of the environment in the area, participated in preparing the assessment.

The assessment aims at providing decision-makers, professionals, teachers, students and the public in general with reference material that makes it possible to analyse and ponder the current state and outlook of the city's environment and the possible solutions to the existing problems. It also offers the basis on which urban environmental policy should be grounded and the direction of the actions that will help the Capital of Cuba become a sustainable city and improve the quality of life of its inhabitants.

Environmental Priorities

Water

Havana uses 470 litres of water a day per person. Currently, there is leakage in the network that not only causes high energy costs, but also overexploitation of the sources of water supply and consequently, a decline in underground and surface water sources. Potable water is piped to 99.7% of the population in the capital city.

The Central Drainage System was constructed in the early 20th century for a maximum population of 600,000 people. However, it currently serves 945,000 inhabitants. This overuse implies deterioration of hygienic-sanitary conditions due to breaks or overflows of the sewer network, as well as an increased risk of contamination in the aqueduct system.

Air

Most of the contamination in the city of Havana comes from the 1,961 facilities in the industrial sector and from the influence of vehicles in certain areas of the city. Nowadays, the monitoring system for emissions and their effects is at a standstill although work on determining the basic parameters is underway at several stations. The area around the Bay of Havana shows the most deterioration in air quality, the result of emissions from the refinery and other industries. Sulphur dioxide is the main pollutant in the zone, with concentrations between 3 and 27 times above the maximum threshold.

Urban Solid Waste

In the city, garbage collection service is given to 100% of the population. Every Havana resident generates around 0.7 kg of solid waste daily, a total of 1,500 tons per day. In 1990, with the start of the Special Period, difficulties arose in terms of the proper disposal in provincial dump sites. Therefore, it was necessary to place 26 dump sites in city areas, increasing the risk of soil contamination.

Biodiversity and Green Areas

Havana has 18m² of green areas per inhabitant, including the Great Park area. This indicator rises to 35 if the area for urban agriculture is included. The city has 811 parks, 49% of which are in good conditions and the rest presenting problems of lack of maintenance. Last year, complete restoration was done to most of the parks with maintenance problems.





Vulnerability

The natural events that cause the most damage to structures and infrastructure in general are hurricanes and tropical storms. These natural phenomena produce strong winds, intense rain and floods in zones with insufficient rainwater drainage caused by the increase in urbanized areas and obstruction of existing drains.

Advances

In 2003, of the 274,730 tons of solid waste with potential for economic uses, 266,012 tons or 96.83% was reused, which increased by 11% in 2004.

The forested area has grown by more than 0.4% per year. With a forest conservation effort over 6,807.08 hectares, forests represented 3,564.4 hectares which is 52.4% of the total area.

Coverage of potable water has increased 0.1%, basically in areas of the Eastern Basin Council areas to stand at 99.1%. Sanitation coverage activities have attained an increase of 0.25%. It has been possible to maintain the bacteriological quality of the water in the province to 95%.

The city's Piped Gas Program reaches 97.3% of the population, notably improving the quality of life of capital city residents, contributing to energy efficiency, lowering the negative impact on the environment and land and sea water and lowering the number of cases of Acute Respiratory Infections in the municipalities that participate in this program.

Impact of the GEO Havana Assessment

The presentation of the GEO Havana report took place before the highest authorities of the Province Government as part of the 485th anniversary of the founding of the City. It was made known through the different means of mass communication, including National Television.

GEO Havana has been distributed to municipal government agencies, agencies belonging to the CITMA, the education system and to the Ministry of Public Health, the institutions that form the *El Polo Científico del Oeste*, province and municipal libraries and to the offices that coordinate projects in the city.

Among the priorities established in the GEO Havana Report, work is currently underway on:

- Development Studies with the collaboration of the Japan International Cooperation Agency (JICA) for the Integrated Management of Urban Solid Waste in the City of Havana.
- Decontamination of the surface waters
- Air quality.

8. GEO Montevideo

Basic information:

- Montevideo is one of the 19 departments in which Uruguay is divided.
- The country's principal port is found in this city.
- Its metropolitan area contains 1,800,000 people, 56% of the country's population.
- The poorest half of the households receives 20% of the total income, while the richest 4% receives another 20%.
- Unemployment in Montevideo is 14.1%.
- The GNP per capita is US \$ 2,002.

The Process

The GEO Montevideo assessment took place in 2004. The Environmental Group Montevideo received the responsibility of carrying it out with the help of a team based in the Environmental Education Group (GEA) from La Intendencia Municipal de Montevideo (IMM). For this end, GEA put together a multidisciplinary team made up of 19 experts of the IMM itself, *La Universidad de la República*, various non-governmental environment organizations, the National Office for the Environment and the other two municipalities that form part of the Metropolitan Area, San José and Canelones. The GEO Montevideo Report is the fourth of a series of reports started under the title Montevideo Environmental Report XXI.

Environmental Priorities

Unplanned Urbanization

Toward the last century, the urban area of the capital expanded beyond the political-administrative limits of the department of Montevideo. The metropolis ad-

vanced over its rural areas and neighbouring communities entering in the departments of Canelones and San José, thus forming a still expanding metropolitan area that shelters more than half of the country's three million inhabitants.

Water

The most important water sources near the Metropolitan Area are integrated by the Santa Lucía River and the Raigón aquifer. The Santa Lucía River, whose course runs through part of the Metropolitan area, constitutes the source of potable water for 60% of the country's population.

In so much, the Raigón aquifer, constituted by a current of subterranean water in all of its extension, covers the total surface of the San José department which integrates itself in the Metropolitan area and constitutes one of the principal water reserves of the country.

These water resources are made potable and used for agricultural irrigation and industrial uses. Unfortunately, they run the risk of contamination by solid waste, industrial waste and lead.

Solid Waste

Each inhabitant generates an average of 0.75 to 0.9 kg of trash a day, which means 1,530 tons daily and 558,268 tons a year. There are only two places where solid waste is taken: an organic waste treatment plant and a final waste disposal site.

Although Montevideo has a good collection and public maintenance system, 225 dumps can still be found in the city. In an attempt to solve this problem, many empty lots have been fenced off with the means of preventing its use as a dump site. Furthermore, a series of measures have been implemented, including telephone numbers for making complaints and exercising fines.

Biodiversity and Green Areas

In Montevideo, 22 terrestrial mammal species, 11 aquatic mammal species, 34 terrestrial and aquatic reptile species, 20 species of amphibians, more than 200 species of birds and 200 species of fish have been identified. Presently there are approximately 290,000 trees in Montevideo.

The characteristic vegetation of the city is dominated by meadows and trees but its green zones have suffered profound modifications by urban expansion and of consequence of environmental pollution.



Vulnerability

Montevideo does not present great natural risk factors. However, still lacking are sanitation services in low-income settlements located near the natural course of water with risk of flooding and also contact water polluted with lead, solid and industrial waste.

Advances

With reference to the advances in environmental management, various legal instruments for the protection of the environment were announced in 1992. Emphasized among them are the Framework Decree of the Environmental Policies, the Land Use Plan and some intergovernmental agreements on the Metropolitan area.

Through an agreement signed between the municipality of Montevideo and the State Sanitation Works service, the city's sewerage system was extended, which has come to cover service for 2,996,750 inhabitants with 756,282 connections, offering the coverage of 98%.

The Municipality of Montevideo has developed and implemented an Environmental Management System (EMS) to improve the environmental performance of some of the Montevideo beaches, working systematically on the environmental aspects of their activities and services. Said EMS has been designed in accordance to the ISO 14000 standard, whose objective is to provide an environmental focus and a systematic vision of its actions and processes and the continuous improvement in the system itself. Today, almost all the beaches have been recovered so that they can be enjoyed by city residents and the thousands of tourists that visit Montevideo every year.

Furthermore, significant has been made in regard to citizen participation and environmental education with diverse programs implemented



by the Municipal Commissariat of Montevideo has been developed and directed to children in grade school and the general public.

In June 2000 the Montevideo 2000 Environmental Agenda was approved which had been contrived with the participation of more than 350 neighbours and representatives from both public and private organizations from the department. This Agenda permitted to advance in the environmental diagnostic of Montevideo and outline guidelines and concrete actions and consensus with the objective of achieving a better quality of life.



Impact of the GEO Montevideo Assessment

The GEO Montevideo assessment is considered of great interest to the municipality in the aim given of the continuity of the strategy to promote and act on a transparent management of the information with the objective of strengthening the citizen participation. It focus on environmental problems with a perspective that permits an integrated glimpse of the processes, the actual situation and the future scenarios.

9. GEO Sao Paulo

Basic information:

- Sao Paulo is the main urban centre in the country. In 2000, it had a population of 10,434,252 inhabitants, distributed in a surface area of 1,509 km².
- The municipality is divided into 96 districts and 31 sub-municipalities.
- Sao Paulo, along with 38 other municipalities, form the Metropolitan Region of Sao Paulo (MRSP), home to 17.3 million people. Over the last 30 years, the city and its metropolitan region have had a marked drop in the rates of growth and has experienced industrial deconcentration. Even then, it still has 32.5% of all the industries in the State of Sao Paulo.
- In 2000, the Gross National Product was US \$51.5 billion, 52% of the entire MRSP and 8.6% of Brazil.

The Process

The GEO Sao Paulo assessment was prepared by the *Secretaria Municipal del Verde y Medio Ambiente*, with the technical support of the *Instituto de Pesquisas Tecnológicas*. This report deals with the existing demands in the city's environmental legislation that defines the need to prepare an environment quality report every year. The city hopes that having the diagnosis serve as support towards in decision-making, including that of allocating the financial resources of the *Secretaria Municipal del Verde y Medio Ambiente* and the Municipal Fund for the Environment and Sustainable Development. It also is used to support drafting and prioritising public policies in the fields of solid waste, water conservation, recovery of degraded areas, etc.

Environmental Priorities

Unplanned Urbanization

In less than 100 years, Sao Paulo has undergone a drastic transformation in its urban profile. In 1870 there were less than 20,000 inhabitants. In 1900, that number had already reached 240,000. In 1930, the city had 1 million inhabitants, jumping to 5.6 in the 1970s. Today, with more than 10 million inhabitants, it is the largest city in South America.

Water

Water consumption in Sao Paulo is 65 m³/inhabitant/year. The distribution system shows a high rate of physical loss, around 31%. The metropolitan region is supplied through an Integrated System, needing 4 of the 8 supply sub-systems to deliver 43 m³/s just for Sao Paulo, which greatly depends on water brought in from other places outside its boundaries (60% of the total amount)

The city has almost 100% water supply coverage, while areas with irregular settlements have 85%. As to the sewer system, the most highly populated area has coverage of 87%. However, only 70% of the water discharged is treated and the rest is disposed in the waterways.

Air

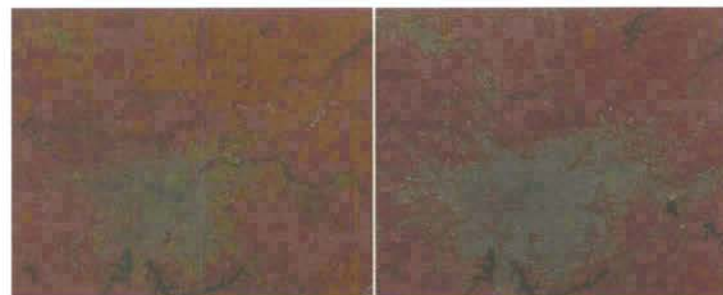
Air pollution in Sao Paulo and in its metropolitan region has decreased over the last decade. The highest contribution comes from vehicles, since industrial activity has gone down in recent years and industries are under stricter environmental control. The city has a fleet of 5.6 million vehicles with a rate of motorization of 0.5 cars/inhabitant. Between 1997 and 2000, of the 215,000 deaths recorded in the elderly population, 9,000 were caused by air pollution.

Solid Waste

Although recent years have shown a drop in the generation of household waste in Sao Paulo, close to 11,000 tons/day of household waste and 15,000 tons/day of construction scrap are still generated. This waste is disposed at two sanitary landfills (*Bandeirantes* and *Sao Joao*) and in an inert waste landfill (*tatinga*). The average waste generation per inhabitant greatly varies according to the region of the city and socio-economic status, varying from 0.5 kg/inhabitant to 2.3 kg/inhabitant. The life span of present landfills has diminished and there are no more areas in the city available for setting up new sanitary landfills.

Biodiversity and Green Areas

Vegetation coverage in the city is close to 39% of its territory, 20% of which is native vegetation. However, the spatial distribution of these areas is quite irregular, with shrubbery in the south, in the narrow strip in the north and to the east. The more central districts show rates lower than 3 m² of green area/inhabitant, sometimes even reaching values close to zero.



1975

2000

Biodiversidad y áreas verdes

La cobertura vegetal en la ciudad ocupa cerca de un 39% de su territorio, siendo un 20% de vegetación nativa. Sin embargo, la distribución espacial de esas áreas es bastante irregular, concentrando las áreas de mata al sur, en angosta franja al norte y al este. Los distritos más centrales presentan tasas inferiores a 3 m² de área verde/hab, llegando hasta a valores cercanos a cero.

Vulnerabilidad

En 2002 fueron registrados más de 300 casos de inundaciones y 284 episodios de deslizamientos, alcanzando viviendas, en general en áreas de barrios.

Las áreas contaminadas amenazan la calidad del suelo de la ciudad. Levantamientos preliminares apuntan la existencia de más de 400 áreas contaminadas, siendo un 80% de estas por fugas de puestos de combustibles.

Avances

Desde 2002, la ciudad cuenta con un nuevo Plan Urbano, aprobado por la ley N° 13413, incorporando importantes instrumentos urbanísticos, teniendo como principios básicos la función social de la propiedad y la sostenibilidad ambiental de la metrópoli. A partir de esa fecha, fueron elaborados los Planos Directores Regionales para cada uno de los 31 sub-municipios y una nueva ley de zonificación y uso del suelo (ley 13885). Esas leyes incorporaron las especificidades y las realidades locales.

En 2001 fue creada el Área de Protección Ambiental Municipal Capivari-Monos comprendiendo un área de 25 mil hectáreas en área de gran fragilidad ambiental (área de producción de agua, rica en mata y biodiversidad). A partir de 2003 fue aprobada la ley específica de su zonificación geoecológica e implantado su Consejo Gestor participativo.



Impactos de la evaluación GEO São Paulo

El Informe GEO Ciudad de São Paulo, lanzado en diciembre de 2004, tuvo amplia divulgación en los medios, ya sea como reportajes de los periódicos (Folha de São Paulo, Diário de São Paulo, entre otros), materias en programas de televisión (Reporter Éco y Jornal da Band) y en medios virtuales (web de la Fundación de Amparo a la Pesquisa del Estado de São Paulo).

Desde enero de 2005, el resultado de la evaluación ha sido presentado en diferentes foros técnicos, además de reuniones con la población promovidas por los Centros de Educación Ambiental de la Secretaría Municipal del Verde y Medio Ambiente. Se destaca la reunión realizada en febrero de 2005, del Consejo Municipal de Medio Ambiente y Desarrollo Sustentable – CADES, órgano colegiado constituido por órganos públicos y sociedad civil. A partir del GEO Ciudad de São Paulo, el CADES eligió el tema agua como prioritario para la asignación de recursos del Fondo Municipal de Medio Ambiente y Desarrollo Sustentable.

10. GEO Arequipa

Información básica:

- Arequipa se encuentra ubicada en la región centro occidental sudamericana y en el sur oeste del Perú, es una ciudad "oasis" debido a que forma parte de la zona de influencia y de alto riesgo del desierto de Atacama, crítica en el mapa de desertificación.
- Como provincia políticamente esta dividida en 29 distritos de los cuales 17 forman el área metropolitana.
- Arequipa ocupa una superficie de 2.923,53 km²
- Ha crecido vertiginosamente desde 1940 cuando tenía 112.300 habitantes y en el 2003 llegó a 804.729 habitantes. La ciudad concentra el 95,69% de la población total de la provincia.
- En 1990 sólo existían 35.076 vehículos y en 2003 llegaron a 94.117, registrándose un crecimiento de 268% en 13 años.

El Proceso

La evaluación GEO Arequipa fue elaborada por la Municipalidad Provincial de Arequipa con el apoyo de la Asociación Civil Labor, a través de un proceso participativo y en consulta con diversas instituciones vinculadas con la gestión ambiental en la ciudad, lo que ha comprendido dos talleres y consultas con expertos. La evaluación recoge un proceso de gestión ambiental iniciado en la década del 90 y ahora contribuye en su institucionalización a través del un sistema local de gestión ambiental, liderado por el gobierno local.

Prioridades ambientales

Urbanización sin planeación

La ciudad ha tenido un desigual y desordenado crecimiento por la escasa planificación. Esto ha dado lugar a la ocupación de áreas agrícolas y zonas de difícil acceso y peligroso emplazamiento como los causes de la torrenteras. Una consecuencia de este proceso ha sido la aparición de zonas con deficientes condiciones de habitabilidad que impiden un normal y adecuado desarrollo de sus habitantes.

Aire

En los últimos años se ha evidenciado el aumento de contaminantes atmosféricos provenientes de las emisiones de fuentes móviles y fuentes fijas que ha convertido a la contaminación del aire en uno de los aspectos más preocupantes para la población, principalmente por su incidencia y riesgo para la salud pública.

Los resultados del inventario de emisiones realizados en la ciudad señalan que el parque automotor de la ciudad genera 67.599 toneladas de contaminantes atmosféricos al año en forma global, siendo los más significativos el monóxido de carbono (CO) y el material particulado (PTS, PM-10).

Agua

El río Chili es la principal fuente de abastecimiento de agua para Arequipa, con una capacidad total de regulación de 346 MMC. De la oferta hídrica del sistema regulado 1.500 Lps son para el consumo humano, 350 Lps son para la industria, 100 Lps para uso minero y 13.270 Lps para el riego de tierras agrícolas.

Las demandas actuales y futuras de la ciudad y de sus áreas agrícolas han puesto de manifiesto un déficit del recurso hídrico en especial en años de sequía. En épocas de lluvia un volumen de 360 millones de metros cúbicos se pierden en el mar.

La actual planta de tratamiento de aguas residuales, sólo da tratamiento al 9,5% del total de las aguas servidas producidas en la ciudad, por tanto, el resto de aguas no tratadas tienen que ser conducidas vía colector hacia el cause del río Chili en la parte sur de la ciudad.

Residuos sólidos

La producción estimada diaria es de alrededor de 625 toneladas de residuos sólidos, de los cuales los domiciliarios representan el 70%. El sistema municipal



where waste is disposed of without any technical treatment that prevents contaminating to the land, air and possibly underground water.

Green Areas

These areas have been suffering an involution process, where its reduced size is due to the explosive urban growth since the 1960s, a growth that was not foreseen in master plan projections. In addition to this, social pressures and weak institutions gave way to the unorganised and horizontal occupancy of the city on agricultural areas. In 1944, there were 10 agricultural hectares for each urban hectare. Currently, there is one agricultural hectare for every urban hectare and there is a notable tendency to continue urbanizing agricultural areas.

Vulnerability

Arequipa is located in a highly seismic area. The last high-intensity earthquake occurred on 23 June, 2001, at 6.9 degrees on the Richter scale. Scientists have identified this zone as an area high probability area earthquakes. Therefore, in 2000 an assessment of the different risks (seismic, volcanic, flooding by gullies in the rainy season) that could eventually affect the city were carried.

Advances

The environmental aspects have been internalised in various economic, social and political agents having formulated proposals on long-term environmental management and the existence of professional and technical capacity for environmental management. Furthermore, an outlook shared by the professionals involved in environmental management and committed to contributing to improving the environment of the city of Arequipa is gradually being created.

The Local Government has issued consensed norms regarding vehicle emissions and wastes handling that are establishing policies that promote the proper management of the environment. However, there are problems in their implementation and compliance.

There are various initiatives of environmental education that aims at incorporating environmental education into various levels: school and university, with the objective to transmit knowledge and information, as well as bringing about a change in people's attitudes in favour of conserving the environment.



Impact of the GEO Arequipa Assessment

The GEO Arequipa assessment obliges local authorities to rescue the importance of planning and management as an instrument for sustainable development. A proposal has been made to evaluate the Local Agenda 21 and develop an Environmental Action Plan for the city within the framework of the local Environmental Management System.

Its preparation made it possible to acknowledge the existence of a generation of leaders and officials committed to environmental management and local development who have developed various planning proposals in aspects such as: strategic development (PEAM), urban development (PDAM), environmental management (Local Agenda 21), transport (PADECO, URBAL), air (Decontamination Plan, Air Zone GESTA), solid waste (PIGARS) and Rio Chili (PROCHILI).



11. GEO Lima and Callao

Basic information:

- The City of Lima and Callao extends over a total surface area of 2,817 Km², with approximately 60,700 blocks and is made up of 49 districts (43 of which correspond to the Province of Lima and 6 to the Constitutional Province of Callao).
- In absolute terms, between 1940 and 2004, the population in the Metropolitan Area of Lima and Callao has multiplied by more than 12 times, going from 662,000 inhabitants to almost 8 million. It continues to grow at a current rate of 2.1%. By 2015, an estimated 9,590,000 people will reside in the capital city.
- Population density is 2,716.54 inhabitants per Km².
- Lima and Callao have a potable water and sewerage network that serves 88% and 83.5% respectively of the population in the metropolitan area.

The Process

The preparation of the GEO Lima and Callao assessment was done by to the *Grupo de Emprendimientos Ambientales (Grupo GEA)*, at the request of the national environment authority, the National Environment Council (CONAM), the Metropolitan Municipality of Lima and the Province Municipality of Callao. The preparation of the report saw the participation of all the institutions involved in urban environmental management, incorporating and integrating previously dispersed information and statistics, creating consensus on priority and imminent issues and preparing conclusions and recommendations to improve environmental management in the city.

It is fitting to highlight three innovations in the above participatory process: first of all, the discussions held in all 49 district municipalities on the environmental management in their jurisdictions; secondly, carrying out a survey on citizens' perception of the environmental problems in Lima and Callao, applied to a representative sample of more than 500 inhabitants; finally, the preparation of a GEO for Youth Lima and Callao Report that included the opinions and proposals of the young people for the city. The results of these surveys have contributed to enriching and acknowledging the city's environmental agenda.



1998

Environmental Priorities

Water

The Metropolitan Area of Lima and Callao extends over three hydrographic basins (del Rimac, Chillón and Lurin) whose hydric networks supply the city. However, the recurring drought and over-use of water from the Rimac, the main water supply for industrial, mining, electric generation and agricultural activities and for human consumption, is putting a strain on the availability of this resource. In 2004, the demand for potable water in Lima and Callao exceeded the supply by approximately 2 m³/second, that is, there was a production deficit of approximately 10%. Leakage in the distribution system reaches 50%.

The generation of household wastewater in Lima and Callao is almost 218 litres/inhabitant/day, meaning that the city's total production of discharge is between 15 and 17 m³/s. Of this amount, only 10% of the urban wastewater is treated. The rest is sent into the Costa Verde and rivers without any treatment whatsoever.

Air

The vehicular fleet is responsible for generating high level of gas and particle emissions. There are currently 750,610 vehicles on the roads and an estimated 1,540,000 cars and vans will be in circulation by 2015. The obsolete vehicular fleet, the absence of technical verifications, the informality and bad organization of the transportation system and the use of dirty combustibles with very high levels of sulphur are the main causes of this pollution.

Land and Urban Expansion

The total area of urban land in Lima and Callao extends over more than 2,800 km². Most of this area (approximately 55%) is land of limited use, made up of mountains and steep slopes. The rest is made up of urban settlement (24%), land that can be utilized for urban expansion and agricultural settlements (9%) and land that is not suitable for urban settlement (12%), which includes agricultural areas, ecological reserves and extra-urban recreation areas.

The principal strain on agricultural land is the expansion of the metropolitan area. Of the 40,000 hectares of agricultural area recorded in 1935, only 11,500 exist today. In other words, almost 70% of the fields in the agricultural valleys of Lurín, Chillón and Rimac have been lost in the last 68 years.

Cultural Heritage

The Metropolitan Area of Lima and Callao is rich in history, traditions and architecture. 1,348 monuments and historical places have been identified, 1,215 of which have been declared heritage sites, 11 historic centres, 7 archaeological zones as national heritage, and one site has been declared a World Heritage Site (Downtown Lima). However, an estimated 50% of the heritage sites are in bad conditions of preservation while 32% are in acceptable conditions and 14% are in good conditions.

Advances

Environmental management in the metropolitan area is fragmented and dispersed in many agencies and institutions. However recently an institutional structure has been built to attend environmental problems by forming environmental commissions by zones (South, North, Callao) that will improve joint work and institutional coordination. The environmental aspect has been gradually included in sectoral and municipal policies, with unequal progress among the different sectors and districts.

In case of the most acute environmental problems in Lima and Callao, authorities, citizen organizations and private companies have taken action, and in some cases developing shared agendas. Some of the most important initiatives are: 1) mass installation of water meters on behalf of the *Servicio de Agua Potable y Alcantarillado de Lima* company to encourage saving water; 2) setting up the Clean Air Committee that is facing the problem of air pollution in the city through the Integrated Air Recovery Plan (PISA); 3) backing mass housing and neighbourhood improvement programs (MIVIVIENDA and MIBARRIO); and 4) The Master Plan for the Historic Centre of Lima and various initiatives to restore and preserve sites considered part of the heritage.



Impacts of the GEO Lima and Callao Assessment

The GEO Lima and Callao experience involved strong participation from public and private institutions, experts and young people. It made it possible to compile and analyse the information and statistics on the city's environmental situation in depth. It also made it possible to know the social perception on the environmental problems that the Municipalities, citizens and young people of Lima and Callao have. Moreover, thanks to its participatory nature, it created new ties between various institutions and public and private organizations.



Urban Environmental Strategy for Latin America and the Caribbean: The GEO Cities-Local Agenda 21 Collaboration



The Urban Environmental Strategy for Latin America and the Caribbean was created between the United Nations Environment Programme (UNEP) and the United Nations Human Settlement Programme (UN-HABITAT). It consists of a joint agency endeavour with the objective to benefit from the comparative advantages of each agency and reinforce the complementary efforts of the urban environment programs in support of action taken towards urban environmental management in the region, strengthening the capacities of the different levels of government.

The strategy builds on experiences developed in both agencies in the fields of urban environmental planning and management and is supporting municipalities and cities in preparing urban-environment assessments, based on the UNEP GEO Cities Project and its methodology for urban environmental assessment. During the assessment phase, UNEP assume the leadership in supporting the preparation of GEO City Reports in order to supply local governments, policy-makers and the public in general with reliable and up-to-date information about the urban environment, thus providing a foundation on which to base policy-making. In turn, this helps to strengthen national and local capacities to continuously monitor the state of the urban environment.

Once the environmental assessment of the city has been concluded, the support concentrates on improving urban planning and management processes by: selecting priority issues; identifying strategic options shared by all concerned actors; formulating urban-environmental action plans to be included in municipal and physical planning; and implementing such plans. Given its experience, UN-HABITAT play a central role during this phase. The experience gained in more than 40 cities around the world within the framework of the Local Agenda 21 and Sustainable Cities Programmes will be strategic. This experience will be made available to local and central governments in the region by providing technical support and the tools needed to support urban environmental planning and management processes.

This strategy enhances cooperation between national and local governments. It also allows national ministries responsible for the urban sector and the environment to establish and strengthen their cooperation and joint efforts, thus providing better support to municipalities. This strategy is also conceived to offer an attractive framework for regional funding mechanisms and for attracting bilateral and multilateral donors interested in supporting a concerted initiative on the urban environment in Latin America and the Caribbean that will help reduce urban poverty.

The strategy, which was agreed upon at the beginning of 2004, is currently implemented in three countries in the region: Brazil, Peru and Cuba. In each country, three or four cities are supported and will serve as a basis for similar support to other cities in the region.



Brazil

The Brazil National Programme is co-funded by the Government of Norway, through UNEP's GEO Cities Project, and the Dutch Partnership Programme, through UN-HABITAT's Local Agenda 21 Programme as well as the Brazilian Ministry of Cities and the Ministry of Environment.

The programme was implemented during the second half of 2004 in three cities: Marabá, Beberibe and Piranhas with the support of the Ministry of Cities and the Environmental Ministry of Brazil. Anchoring institutions will be selected to provide direct technical support to the cities and to work on the adaptation of GEO instruments and environmental planning management in the Brazilian context.

Cuba

The Cuba National Programme began with the creation of a National Capacity Building Centre in Santa Clara, which made it possible to establish a modern training centre to deliver the Environmental Planning and Management training course.

In response to a pressing request from the Cuban Government to replicate the Local Agenda 21 experience in Bayamo in other Cuban cities, the National Replication Programme was prepared during the second half of 2003. A Project Document was drafted and all the provincial capitals were invited to participate in a selection process. The cities of Santa Clara, Cienfuegos and Holguín were selected to receive support from the Norwegian government through UNEP and UN-HABITAT to replicate the Bayamo experience and the preparation of their GEO Cities report.

Peru

The Peruvian program is an inter-ministerial initiative (Ministries of Environment and Housing) and has been financed and supported jointly by UNEP and UN-HABITAT with funds from the Belgium government in collaboration with the local administrations, the national association of local authorities and national technical support institutions.

The programme strengthens the capacity of local and national authorities to plan and manage the urban environment. This programme is supporting the municipalities of Lima and Callao, Arequipa and Chiclayo.



Network of Urban Environmental Management Authorities in Latin America and The Caribbean

Links to Strengthen Local Capacities

Most people in Latin America and the Caribbean now live in the Region's cities. Over the past 30 years the urban population grew from 176.4 million to 391 million, representing 73.5% of the total. As a consequence of this growth, there have been changes in land use over large extensions of agricultural or forest areas, causing ecosystems and natural cycles to deteriorate.

The adverse economic conditions of most of the population, as well as city authorities' budgetary and technical limitations, make it imperative that they cooperate to confront and solve urban environmental problems.

General Objective Of The Network

The general objective is that the Network should become an instrument to link local authorities and help them to strengthen urban environmental management in cities in Latin America and the Caribbean, in accordance with the Latin America and Caribbean Initiative for Sustainable Development, the Johannesburg Plan of Implementation, the Millennium Development Goals and the agreements reached by the Forum of Ministers of the Environment of Latin America and the Caribbean.

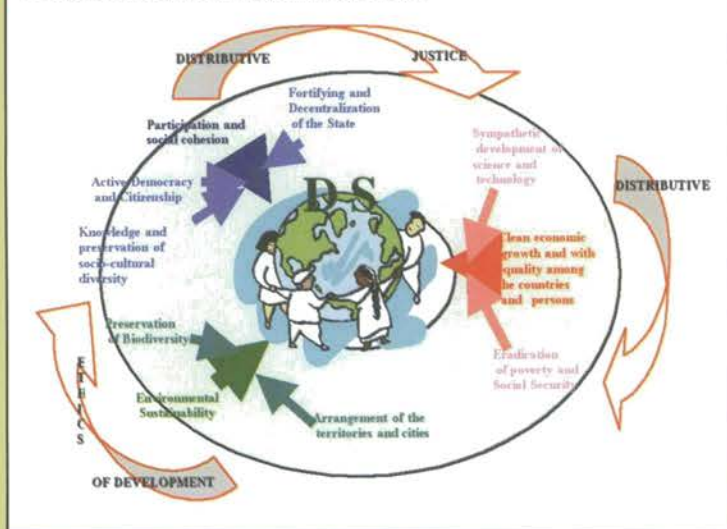
Facing this reality and with the purpose of innovative contribution, the Network of the Authorities for the urban-environmental management in the cities of Latin America and the Caribbean was created, with aim to achieve integration and action of social, economic and political partners in order to address socio-environmental problems. It is an inclusive mechanism and available for all.

Specific Objectives

- To undertake capacity building activities with local government authorities and to provide them with scientific and technical support on public urban environmental management. Encouragement will be given to establish the mechanisms that will allow social organizations, business, higher education institutions and urban environmental management specialists to contribute to the democratic formulation of relevant public policies and instruments, to put them into practice and to manage them.
- To improve urban environmental management in the Region, related themes will be investigated and information circulated. Views will be exchanged, discussions held and information disseminated about the agreements established in the "Declaration on the Valley of Mexico Metropolitan Zone".
- To foster and strengthen environmental urban management synergies, relations with other networks and government entities at regional, state, national and international levels will be facilitated.

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GEO

Urban Environmental Planning Basis



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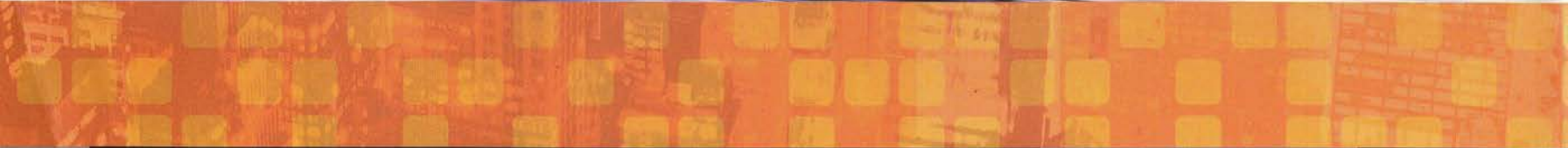
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