

# Quito, Ecuador

## Disaster Risk Management Profile

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### 1 Introduction

#### Demographic, economic, social and cultural characteristics

Located within an area of intense volcanic activity Quito, the capital city of the Republic of Ecuador, lies at 9,350 ft (2,850 m.) above sea level, on the lower slopes of the Pichincha Volcano in a narrow valley of the Andes mountain range. It is the oldest of all South American capitals, and its old town has preserved most of its colonial atmosphere. It is one of Ecuador's main two industrial centers, and the setting for the national government. The old town was named as UNESCO World Heritage Site in 1978.

Quito is part of the Quito Metropolitan District (QMD), which has a total area of 424.717 hectares<sup>1</sup>. The urban area of the city of Quito occupies approximately 20.000 hectares. According to census figures, by the year 2001 the population of the DMQ had reached 1,842,201 inhabitants, out of which 1,414,601 (mainly

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<sup>1</sup> It comprises three main land uses: 42.273 hectares of urbanized areas; 191.723 hectares of natural reserves, parks and ecological protected areas; and 189.921 hectares of agricultural lands.

concentrated in Quito) could be considered as urban population. Recent estimations show that the population will increase to 2,200,000 by year 2009. 51% of the population is female and 71% of the population is 15 years old or more in the city of Quito. The highest population density is about 168 inhabitants/ha in 5 clearly identified zones of the Quito Metropolitan District (QMD), but the mean can be estimated in 75 inhabitants/ha.

#### Governance style

Ecuador is a democratic republic where the president is both the chief of the state and head of the government. Both, the president and vice president, are elected on the same ticket by popular vote for a four-year term, no immediate reelection is possible. The president appoints the members of the cabinet.

The legislative branch counts on a unicameral National Congress or Congreso Nacional, its 100 members are popularly elected by province to serve four-year terms. The Supreme Court or Corte Suprema represents the judiciary branch; per the Constitution, the full Supreme Court elects new justices.

Each one of the 22 provinces of the country has an appointed governor who is the president representative at that administrative level. The provinces are further divided into cantons, each canton elects a mayor and the members of the municipal council, which, this scheme replicates the legislative branch at this administrative category. Elections are called every four years and these local authorities can be re-elected for as many periods as they would like to serve.

#### National hazardscape

Ecuador has been subjected in the past to eruptions, flooding, earthquakes, tsunamis, landslides and droughts. Among all of them, Earthquakes are considered to be the ones that would produce the bigger losses. There is not a disaster and loss inventory or a systematic database collection available at the National level, the information provided in the table was taken from recent evaluations done by CEPAL and the Andean Corporation for Development (CAF). Some research is being carried out by technical organizations looking at specific events, through which a partial systematization has been attempted and some reports, on selected events, are available. National Polytechnic School

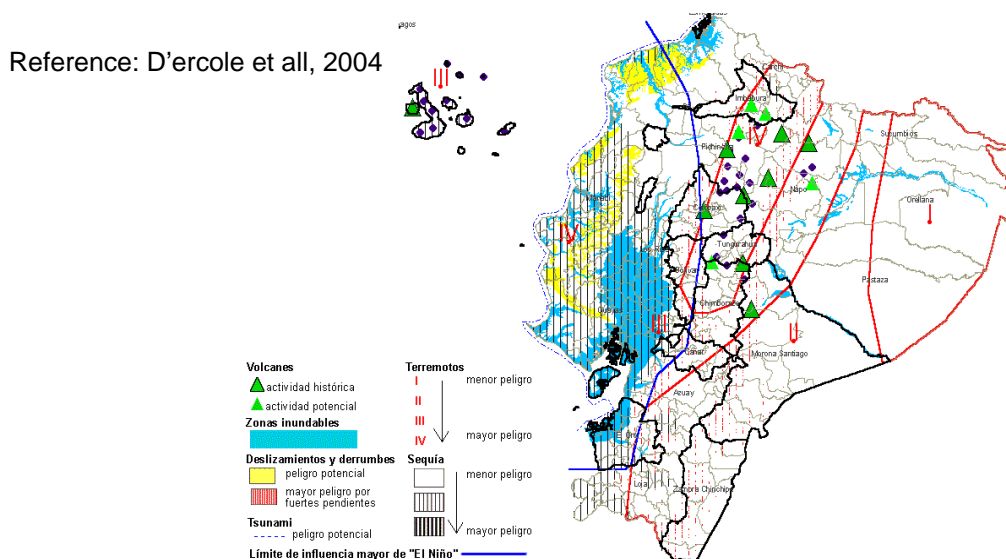
(EPN) is making important efforts to update a disaster database, which can discriminate the inventory of events at national, provincial and canton levels, making use of LA RED-DESINVENTAR software.

Table 1 shows a summary of losses in the last 25 years in the country.

**Table 1: Estimated Losses in Recent Natural Disasters in Ecuador**

Type of Event	Year	Impact
El Niño Event	1982-1983	National GDP felt down in 2.8%
Napo Earthquake	March 5 <sup>th</sup> 1987	Losses estimated in 1 billion USD due to severe damage in the oil pipeline, GDP felt in 6%
El Niño Event	1997-1998	Only direct losses estimated in USD 2,882 millions, equivalent to 15% of total 1997 GDP.

Figure 1. MULTI-HAZARDS MAP OF ECUADOR



The multi-hazard map on Figure 1 shows in light blue flooding prone zones in the low lands in the Pacific Coast and in the eastern side of the country. Landslides can be expected in the Andes Mountains due to high slope susceptibility, but also in the lower mountains in the coast, shown in the map in red and yellow shaded areas. A number of historically active volcanoes are located in the Andes, among them Pichincha, Cotopaxi, Tungurahua, Reventador and Cayambe, which have shown some kind of reactivation in the

recent years; they are depicted in green triangles. Finally the seismic zonation of the country that shows highest expected accelerations of 0.4 in the mountainous region, due to a number of complex and rather superficial faulting systems and in the coast due to the subduction of the Nazca Plate under the South American Plate in front of the Ecuadorian coasts.

#### National disaster management structure and relevant legislation

The national agency in charge of disaster management is the Civil Defense<sup>2</sup>, with a national structure that includes a National Direction, Provincial boards (Juntas) and various other local bodies. The organization is often headed by a retired army general, which partly explains its response-focus and close ties with the military organization during emergencies.

Little effort at the national level has been made by the national government except that ad hoc governmental entities for areas affected by the El Niño phenomenon were created. (Note: These were the Corporación Para Enfrentar el Fenómeno de El Niño 1997-1998 (COPEFEN) and the Corporación Para Reconstrucción de las Zonas Afectadas por el Fenómeno El Niño (CORPECUADOR)). Since April 2002, the National Secretary for Planning and Development (SENPLADES, formerly ODEPLAN) started a project to set the direction for national disaster management. With the support of the Andean Development Corporation (CAF) under the Regional Program for Risk Prevention and Mitigation (PREANDINO), the project ends in March 2005. The project concentrates on defining sectoral policies to prevent and mitigate risks by integrating them into planning processes at all levels (Fiallos, 2004).

Apparently with functions overlapping, the government bodies mentioned and other national ministries do not coordinate properly (Solberg, Hale and Benavides, 2003). This makes it complex for local level organizations to deal with national level organizations.

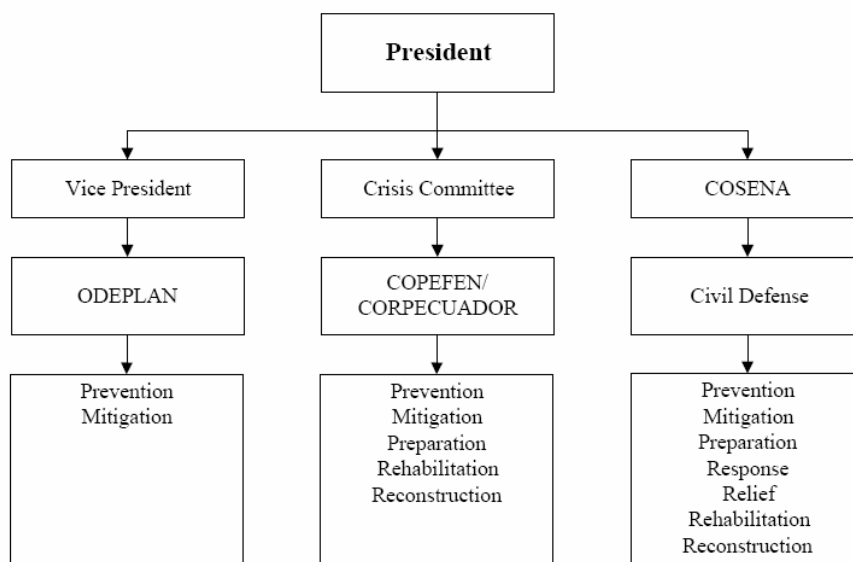
This national organizational setting is affected by some drawbacks that were mentioned in a recent study by IADB-Solberg et al (2003):

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<sup>2</sup> Established by the National Security Act 275 of 1979

*“It is worth mentioning the coordination drawbacks of the system... In theory, each of these three competing branches must coordinate their activities with each national ministry on a basis depending on the situation and resources required. However, history has shown that in the event of a disaster, coordination has not been functional (problem magnified by the existence of overlapping functions.) Each organization uses and allocates its own resources and make decisions without formal knowledge of the activities of others”.*

At national level, non-ministry governmental entities responsible for disaster management are depicted in the following chart taken from Solberg et al, 2003. COSENA stands for National Security Council.



These organizational problems make it more complicated for local organizations to relate with the national level. The PREANDINO PROJECT, founded by Corporacion Andina de Fomento (CAF) offers an opportunity to re-orient the institutional arrangement and coordination, also at national level.

#### National land use management system and relevant legislation

Ecuador is increasingly a country of city dwellers; its urban population exceeded 50% of the total for the first time in the 1990 national census<sup>3</sup>, at present is has

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<sup>3</sup> INEC, 1990

raised up to the 61%<sup>4</sup>. The urban areas of the country are dominated by two cities: the economic and export agriculture center of Guayaquil on the coast (1990 urban core population 1.5 million, metropolitan area population 2 million), and Quito, the highland capital city (1990 urban core population 1.1 million, metropolitan area population 1.3 million). Together these cities contain 48% of the total urban population of the country, and 27% of the population of the country as a whole.

In its bipolar urban development, Ecuador does not follow the pattern of many other countries of the developing world, which are completely dominated, by a single city. While the growth of Quito and Guayaquil has been remarkable since the 1970s, the explosion of a single megacity has been avoided in Ecuador. In fact, the population growth of the two dominant urban centers has been accompanied by the simultaneous steady expansion of several intermediate sized cities during the last few decades.

According to current legislation, every municipality is exclusively responsible and has the mandate to provide for physical and urban development of its specific canton; consequently, the municipalities through the municipal council and their respective ordinances draw standards and regulations to shape urban development and guide land use of their respective cities.

#### Significance of the city to the nation

Being the capital city of the country, and of the Pichincha Province and of the Metropolitan District, Quito has gained special characteristics as the center for major political and administrative decisions for the development of the Nation. In a still strongly centralized country like Ecuador, most of the social, political and economic activities are managed from this city. Quito hosts every institution and organization related to the three powers of the State, the Legislative, the Executive and the Judiciary, but also financial organizations like the Central Bank and the International Community represented by all the Embassies, Consular Body and Cooperation Agencies are located here.

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<sup>4</sup> INEC National Census 2001

According to recent statistics, 278,642 students attend 945 education centres, approximately 43% of them attend elementary school, 25% correspond to secondary instruction and 26% to Higher Education. It is important to mention that 39% of all the higher education supply of the country is concentrated in Quito, in fact, 20 out of 51 higher education centres officially registered in the country are located in this city.

Regarding health infrastructure, there are approximately 30 beds available for every 10,000 inhabitants, almost the double of the national average, these figures have been reducing from 52 beds in the 70s, which shows an important degradation in the capacity of health provision in the city. Nineteen hospitals provide 80% of all the beds in the QMD and the private sector owns only the 28% of the total number of beds, meaning that health provision is mainly a public responsibility.

According to the document “Strategies for Development of the Quito Metropolitan District for the year 2025”, the most important economic activity of the city is related to business and provision of services, accounting for more than 50% of the global economic activity of the city. Poverty affects an important share of the city’s population; around 45% according to the same document and informal construction is estimated at 60% of the total construction in the city.

#### Geographical setting of the City

Quito, the Capital city of Ecuador, is located in a North-South Andean longitudinal valley (2.860 meters above sea level) between the Pichincha volcano in the west—which erupted again in 1998 after its last major eruption of 1866— and Itchimbia hills in the East.<sup>5</sup> The city develops North-South, 40 to 50 Km. length and 4 to 10 Km. wide. It has a mild weather: an average temperature of a maximum of 21 C and a minimum of 8 C; an average relative humidity of 75 percent.

The urban structure has been conditioned by the scarcity of flat land and by the topographic irregularities of the surrounding mountain system. During recent

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<sup>5</sup> Quito is located at Latitude 0° 15' 30'' and 0° 35' 49'' and Longitude 78° 57' 05'' and 78° 10' 13''.



past decades significant residential developments have also occupied slopes of mountains (in El Pichincha volcano and other hills such as Panecillo, Puengasí, Guanguiltagua).

Major seismic sources capable to produce earthquakes big enough to hit the city are found as close as 60 to 80 Km, associated with a continental complex faulting system and as far as 180 to 200 Km. West to Quito on the Pacific Subduction Zone.

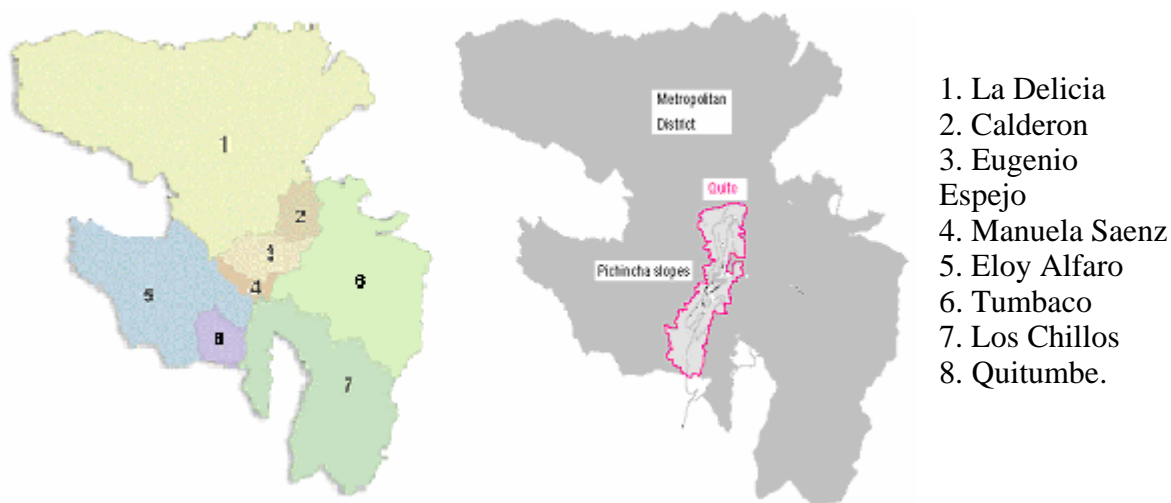
## 2 *Inter-City Linkages*

### Internal division of the City

QMD is administratively divided into 8 zones (Administraciones Zonales), which main responsibility is developing two strategic lines of action under the overall municipal administration:

- Execute the institutional process of decentralization and de-concentration of activities looking for a faster and more effective attention and service provision and
- Develop a participatory management process where the communities boast a vigorous exchange with their elected authorities.

### **Administrative zones in the QMD**



The contour of the city of Quito is shown in red, 6 and 7 are the new areas of development of the city.

Governance/management style

The actions that the Municipality has to accomplish are clearly divided into three different categories: political, administrative and provision of services. To address the political level, the municipality counts on the Mayor as the executive and the Municipal Council as the legislative. For administrative purposes, it is organized through different Directions, which can propose policies, planning and supervision of specific actions in their particular field of expertise, for example the Direction of Transport and Highway or the Direction of Citizens Safety.

Based on the Law for Decentralization that created the Quito Metropolitan District (QMD) and looking after a better provision of services and a closer relationship between the community and the local government, the QMD was divided into the above-mentioned Administrative Zones

Formal arrangements

To be completed

Relevant legislation/regulations

To be completed

### **3 Land Use Management**

In the last two decades, the Quito region has experienced important spatial transformations. The urban area has evolved from a "centrally-oriented city" towards the formation of a disperse agglomeration that develops in the adjacent valleys of Tumbaco-Cumbayá, Los Chillos, Calderón and Pomasqui-San Antonio de Pichincha.

During the seventies and eighties massive immigration to Quito occurred; population grew from 432,228 in 1974 to 890,355 in 1982 and to 1'112,575 in 1990. Urban area grew from 7,355 hectares in 1970 to 19,176 hectares in 1990. The city was not prepared to receive such unprecedented population increase. Most of this growth is due to low-income rural population moving into Quito.

The need of land for building has caused deforestation is caused. About 100 hectares of forest are destroyed every year; this means that in 15 years it may disappear if strong actions are not taken. Population growth and bad environmental practices generate an increase of solid waste that is not adequately treated. The city produces 1,400 tons/day of solid waste; about 200 tons/day of this waste is deposited in empty lots and ravines affecting the natural drainage system of the city, and blocking the access to the sewage and collector systems where available. Additionally, slopes are anti-technically cut weakening soils, and adding debris to these areas.

One phenomena associated with urbanization is the appearance of low-income settlements. These barrios emerge as a survival strategy of low-income groups to find a place to live in the city. It is especially significant in Quito the increase of popular barrios since the 70's.

#### **Low-income settlements in Quito**

<b>year</b>	<b>has</b>
1950	267
1960	653
1970	1938
1980	1479
2003	687

These barrios are mainly located in slopes or on risky sites, because of initial

low purchasing land prices. Most houses are built through self-help, which have not been approved by the Municipality, though are illegal. Usually low-income families, who settle in these barrios, are subject to “pirate developers”, who tricks the people.

#### Relevant legislation

Art. 2, section 1, of the law that constitutes the Quito Metropolitan District gives full and exclusive authority to the municipality to deal with land use and urban planning, as well as the control of buildings and other types of constructions in its area of influence.

Since 2000, the Municipality plans and manages the territory with several updated legal instruments, which incorporate a strategy for risk reduction, sustainable land use and safe territorial development under the strategic development document for the city: Quito for Century XXI.

Based on this strategic document the General Plan for Land Development of Quito Metropolitan District (Plan General de Desarrollo Territorial –PGDT) was prepared, as the instrument to regulate a harmonic growth of the city through efficient urban measures that allow a rational land use respecting the historical and cultural heritage, taking into consideration the hazardous zones of a geographically challenged city and considering decentralization as an alternative for a holistic development management that incorporates legal, planning, regulatory and administrative elements.

The Metropolitan Council approved the PGDT ordinance and the Mayor signed it on November 16, 2001. Other complementary instruments to this ordinance are the Zoning, Architecture and Urbanism Standards and The Land Regime Ordinances approved in November 2003. The Architecture and Urbanism Standards comprises the seismic provisions that specify the design forces and other earthquake resistant requirements for the structures build in the city, as well as the microzonation that defines the soil characteristics in the urban area, for design purposes.

For development planning purposes, the land of the metropolitan district deems three general categories:

1. The urban land that is located inside the urban limit of the city, it is fully equipped with all the public services such as water, sewerage, roads,

electricity and other lifelines.

2. Those areas, which are possible to be urbanized, they count on basic rural services but can be easily incorporated under the infrastructure expansion plans of the city.
3. Not for urban purposes, these areas either constitute the strategic reserve of the city; have been designated as agricultural lands, forest belts or high-risk zones such as flooding, landslides or lahar prone zones.

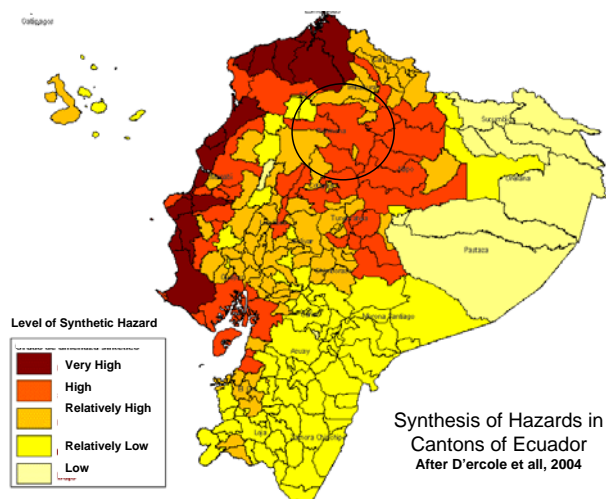
All of them already defined and appear on specific maps that are an integral part of the above-mentioned ordinances. There is an express prohibition to change the definition of these areas, the Consultative Council will revise and approve the new zoning maps every five years.

Responsible agents and their relationship

Effectiveness of current arrangements

#### 4 Vulnerability Issues

According to D'ercole on his publication "Hazards, Vulnerabilities, Capacity and Risk in Ecuador", Quito, 2004, the city is given a global hazards index of 9, being the highest 12, due to equally high values given to individual hazards like earthquakes (highest seismic zone), very high susceptibility of landslides due to steep slopes and high volcanic exposure. The following map shows the levels of Synthetic Hazard in the different cantons of Pichincha Province, in particular the Quito Canton, where the capital city is located; it corresponds to a high level. Flooding during severe rainy seasons, wildfires and technological hazards may threaten the city as well.



The following table shows some of the most damaging natural events that the city has suffered in the last 30 years:

Type of Event	Year	Remarks
La Liberta, La Gasca, La Comuna	1973 1975 1997	Important loss of life and property in the city, particularly on poor neighbourhoods located in the Pichincha slopes. Severe mud and debris flooded the northern plains of the city.
Mud Flooding and Landslides		
Baeza Earthquake	1987	

		registered in the northern or modern part of the city. Registered acceleration was on 7%g
Pichincha Eruption	1999	The city was covered with several millimetres of ashes. Normal activity was disrupted for several weeks. Schools and airports were closed.
El Reventador Eruption	2002	Same as above

Results from a recent study carried out in 12 countries from Latin America and The Caribbean<sup>6</sup>, show that the most catastrophic event for Ecuador would be the occurrence of an earthquake, generated either in the subduction zone of the Pacific, some 200 km west to the city with expected earthquakes of M 6 and above, the highest 1906 in from of the coasts of Ecuador and Colombia produced an M=8.9 in the so called Esmeraldas Gap. Smaller but shallower earthquakes can take place in any of the faulting systems inside the continent, some 60 to 80 Km to the east, north or southern parts of Quito, such as the 1987 Baeza Earthquake.

Prevalent conditions of vulnerability in the country are associated with high exposure of its building stock, which in most of the cases uses inappropriate construction materials, and do not count on seismic designs, but also a high socio-economic fragility linked to a poor resilience capacity.

Specific studies done for the city of Quito<sup>7</sup>, have already pointed out the high physical vulnerability of the buildings in Quito, particularly those in the old or historical town, which are made out of adobe or un-reinforced masonry; along with the high number of informal construction around the city (estimated 60%) and a weak seismic code enforcement capacity, despite the fact that the city has adopted the newly revised and updated national seismic provisions of 2000 that encompasses a microzonation study for the city.

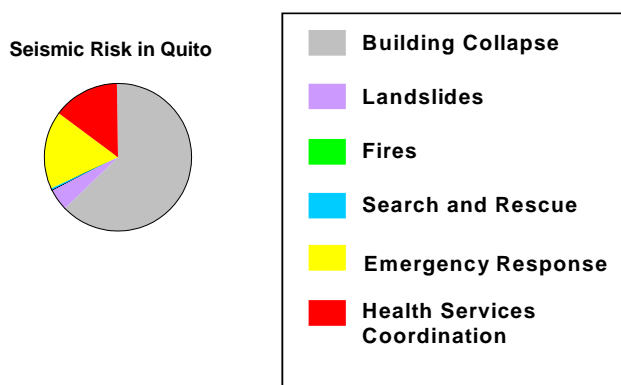
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<sup>6</sup> Indicators for Disaster Risk Management, IADB-IDEA, 2004

<sup>7</sup> like the Quito-Ecuador, Disaster Risk Management Program (1994/DMQ, GHI, EPN, OYO Corporation, IRD, and others) and the Global Earthquake Seismic Index Project (2001/GESI PROJECT, UNCRD, GHI, EPN, MDMQ and others),

There are additional factors that may contribute to a high risk in Quito which are associated to a deficient Emergency Response and Recovery System, particularly seen from the perspective of a massive emergency in the city. Poor coordination among different stakeholders, lack of appropriate protocols and organizational problems can be anticipated.

### Factors that Contribute to Risk in QUITO Ref. GESI Project /2001



#### At-risk groups

According to D'Ercole (2004), there is a high population exposure to vulnerability. Out of total population of 1.842.105, there is an 18.7% (344,158 inh.) under high to very high vulnerability; 42.8% (789,070 inh.) under relatively high vulnerability: and, 38.5% (708,877 inh.) under low to relatively low vulnerability.

#### At-risk locations

Regarding landslides the surrounding steep slopes at the Pichincha Mountain on the west side of the city or Guanguiltagua to the east, are the most at risk sites. Floodings usually occur in the low lands of the Valley. Whereas seismic vulnerability is associated with poor quality of building construction that can be found all along the city.

Detailed information on the vulnerability of specific lifelines of the city are found



on a detailed study jointly done by the municipality and IRD<sup>8</sup>.

#### Non-engineered dwellings

- **Vulnerability of Illicit Construction.** Estimates show that there are approximately 60% of total buildings built without municipal permits. In addition, there is no certainty about anti-seismic structures in registered buildings.
- **Vulnerability of Informal housing.** Out of a total 508.728 housing units in QMD, it is estimated that there are about 153.317 housing units built illicitly by low-income groups in popular barrios, mostly through self-help. These buildings do not comply with anti-seismic standards.
- **Vulnerability of Heritage Buildings.** In Quito, there are 5.086 registered heritage buildings, built since colonial times (16th. Century) up to early 20th. Century. Most of these buildings do not have anti-seismic structures.

#### City policies on vulnerability alleviation

How to reduce the overall risk of the city that is yearly threatened by so many natural hazards and how to optimise the use and investment of scarce municipal resource? These are some of the questions that the municipality, with the support of the French Institute for Research (IRD) have been trying to respond in a way that can lead to the implementation of specific mitigation and risk reduction policies in the city.

A comprehensive research program that started in 1999 has produced two important documents, useful for this purpose: "The vital elements of the city"<sup>9</sup>,

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<sup>8</sup> D'ercole R., Meztger Pascale., *La Vulnerabilidad del Distrito Metropolitano de Quito*, Coleccion Quito Metropolitano, MDMQ-Direccion Metropolitana de Territorio y vivienda-IRD, 2004

<sup>9</sup> D'ercole R., Meztger Pascale., Los lugares esenciales de Quito, Coleccion Quito Metropolitano, Published by Municipality of Quito and L'Institut de Recherche pour le Developpement-France, 2002

which describes each one of the different components of the city and its relevance to DRM and emergency response; and “The vulnerability of Quito Metropolitan District”<sup>10</sup>, which is an strategic document that identifies the vulnerability of the different systems in the city such as roads, electricity, water and sewerage, the health system, but also the local public and private enterprises, and the population at risk, to propose alternatives to reducing that vulnerability on the face of a multihazard approach.

The municipality has considered at least three different initiatives to reduce the vulnerability of exposes people and infrastructure in the city. Most relevant are mentioned here:

### ***New Planning Instruments***

New regulations that incorporate strategies for risk reduction and sustainable land use and development are available since year 2000.

### ***Potable Water and Sewage Programme***

During 2001 to 2004, the Municipality has developed a major potable water and sewage infrastructure programme, especially concentrated in low-income settlements: benefiting 350,000 inhabitants with 1,300 Km of water lines and 1,300 sewage lines.

The Environmental Sanitary Programme (funded by IDB) has been working since 1998 in the protection of El Pichincha slopes and installing water and sewage systems in various critical areas.

These municipal efforts have resulted in an important reduction of landslides and floods.

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<sup>10</sup> D’ercole R., Meztger Pascale., La Vulnerabilida del Distrito Metropolitano de Quito, Coleccion Quito Metropolitano, MDMQ-Direccion Metropolitana de Territorio y vivienda-IRD, 2004

### ***Land Tenure Regularization Programme***

Since 2000, the Municipality is working in an aggressive Land Tenure Regularization Programme.

By 2001 there were 200 Illegal Barrios to be regularized

90 barrios from 2001 to 2004 regularized with 23.339 individual plots

182 barrios are under approval process.

61 barrios are not subject of approval because they are located on environmental protected or risky areas.

For the administrative period 2005-2008, the Municipality will develop a massive upgrading programme addressed to low-income settlements.

## ***5 Disaster Risk Management Arrangements***

### Functional arrangements

Disaster planning and management functions in the Metropolitan District of Quito are performed by lower administrative units, despite the Law for the Metropolitan District which assigns the competencies to the municipality, the inter-institutional relationships with the national organizations in charge of managing the emergencies remain undecided. The Community Safety Metropolitan Office, through its Disaster Risk Management Unit is directly in charge of DRM in the city. The unit of special studies at the Direction of Land Use and Planning also provides technical support to this unit, while different municipal enterprises act on their specific fields of expertise, like the Municipal Public Works or the Water and Sewerage Municipal Enterprises.

According to Dr. Lorena Vinueza, head of the Safety Office<sup>11</sup>, the municipality and its special units have intensified their inter-institutional coordination role related to disaster risk management, while keeping an important responsibility

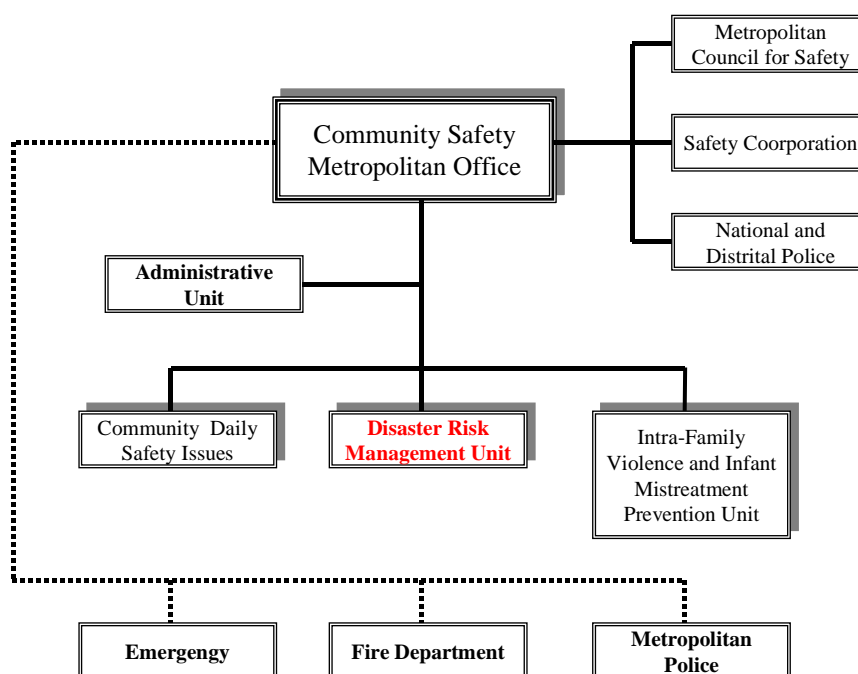
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<sup>11</sup> Personal communication Nov. 2004

on the land use and planning side where the Administrative Zones or decentralized municipal offices are in charge of supervising the compliance of these regulations.

In effect, year 2000 a new municipal administration decided to create the Metropolitan Office for Community Safety (Dirección de Seguridad Ciudadana) with two major objectives: improve the living conditions of the community in aspects related to crime and intra-familial violence and introduce preventive concepts associated to natural and man made hazards and risk reduction.

### Organizational Chart CSMO



The chart above shows the Disaster Risk Management unit as part of the Safety Office. This unit has undertaken an important role of inter-institutional coordination of the multiple stakeholders such as the emergency response and preparedness sector, the universities and research institutes, the municipal enterprises dealing with public works, water and sewerage provision and a very important link with the Land and Territory Office of the municipality which is in charge of the urban planning and land use regulations of the city. It also has direct contact and communication with the national dependencies like the Civil Defence, the Armed Forces, the Minister of Government and the Presidency of

the Republic. Sustained work is done with the organized community and the NGO sector.

An auto evaluation of this unit identified their weaknesses as relate to the insufficient number of technical personnel they have, a very reduce budged for operation and lack of an appropriate protocol of communications to manage emergencies. The budget is assigned as a percentage of the Safety Tax charged to the residents of Quito, which is administered by the Safety Corporation.

At city level there are several independent plans related to disasters: The Quito-Ecuador Seismic Risk Management Program (MDMQ-GHI-EPN et all, 1994), FIRE PLAN (to prevent fires on the hills surrounding the city, particularly during summer); RAIN PLAN (to prevent flooding on the lower parts of the city during heavy rainfalls); and COTOPAXI PLAN (to find solutions to the possible consequences on the city of an eruption of the Cotopaxi Volcano), The Healthy Schools Program, which are in different levels of their implementation process. Details to be observed when analyzing sound practice in the Quito Metropolitan District.

### Risk Assessment

The city counts on a seismological and an accelerographic network both of them maintained by the Geophysics Institute at EPN, a pluviometer network managed by the Institute of Meteorology and Hydrology and the Water and Sewerage Municipal Corporation (INAMHI and EMAAP), an atmospheric monitoring network has been recently installed to monitor the quality of air in Quito which is severely affected by an old stock of city busses with bad combustion systems.

There are also some risk identification instruments within the city that include hazard maps and studies on physical/social vulnerability, mainly related to volcanic eruption and earthquakes. Quito counts on an Earthquake Damage Scenario and a loss inventory associated with that scenario<sup>12</sup>. Vulnerability

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<sup>12</sup> 1994/DMQ, GHI, EPN, OYO Corporation, IRD, and others

assessment at different levels has been performed for several public buildings such as schools, hospitals and historical buildings. Retrofitting programs included several churches in the old city, some other buildings that have been declared as city and world heritage and a few schools.

Other important instruments that, if used properly, can significantly contribute to reduce and mitigate natural disasters are:

- A revised seismic code for the country adopted by the city on year 2000
- A microzonation study to be used along with the seismic code, June 2002
- The Quito-Ecuador School Seismic Safety Program
- Vulnerability assessment of 8 major hospitals in Quito
- A Methodology for Adobe construction Reinforcement
- A Methodology for Retrofitting Historical Monuments such as Churches and other stone or masonry construction.
- A Global Plan for Land and Territory Development, which foresees the need of reducing natural hazards impact and environmental degradation, approved by a municipal ordinance in November/2001
- A Land Use and Occupancy Plan

#### Risk Communication

The recent volcanic episode that started with the reactivation of Pichincha Volcano in 1999 in Quito and the later eruption of Mt. Reventador some 100 Kms east of the city and finally the activity of Mount Tungurahua with successive eruptive episodes in the last 5 years have helped the authorities setting the discussion around natural hazards, vulnerability issues and risk reduction concepts on top of the discussion, while at the same time raising awareness in the community.

The permanent communication between the experts from the Geophysics Institute, in charge of monitoring and evaluation of the volcanic activity, and the local authorities, in charge of defining the policies of communication and action plans, allowed the city to have one of the most successful and rational population behaviours during those events when the city was fully covered of ashes. This is a good example on how a well-informed community may contribute to reduce the risk of a disaster in a city.

On regular basis the civil defence executes periodic mock drills at selected

schools under a program to sensibilise kids and teachers on issues related to earthquake and volcanic eruption scenarios in the city.

Some research organizations such as the Geophysics Institute have permanent media exposure and have gained credibility on aspects related not only to the monitoring process but also on the overall DRM criteria that they manage.

## ***6 Disaster Risk Management Vision***

Quito on Century XXI is the official strategic document that contains the vision local authorities have for the capital city of Ecuador: “By year 2020, the Metropolitan district of Quito will become a consolidated urban complex and a modern territory which is expected to have 3’3000.000 inhabitants living in a competitive, well organized, environmentally sustainable and safe district where solidarity, democracy and gobernability are true practices of its constituency”.

And further, when referring to specific natural risks and social violence features, which are dealt under Social Safety Issues, “The metropolitan government will promote an active community participation and an adequate inter institutional coordination among official, scientific and non governmental organizations to constitute its own system for prevention and mitigation”

## ***7 Issues***

Illicit construction is a critical vulnerability issue in Quito. It has been a result of unprecedented population growth, poverty, shortage of public resources and institutional weakness.

Given the highly hazard prone area where Quito is developed and the number of vulnerability factors identified, the authorities and population should develop policies, strategies, and actions in order to make Quito a safer place, with enough capacity to prevent, mitigate and reduce risk as well as be able to respond on the face of a given emergency.

### **An adequate institutional arrangement**

In order to meet such challenges it is urgently required to develop an adequate institutional arrangement for prevention and crisis management. This institutionalization should:

Design and implement permanent policies related to risk prevention and mitigation and establish appropriate legislation and control mechanisms.

Overcome weak institutions and institutional arrangement, leadership and coordination, to incorporate disaster prevention and crisis planning.

Develop and adequate institutional framework: clarifying roles of different involved actors, risk institutionalization, and it is suggested, that the municipality should lead institutional coordination.

### **Risk Reduction Plan**

Quito requires a comprehensive *Risk Reduction Plan* for prevention and preparation for crises. This Plan must concentrate on actions for prevention and crisis, but also on research and monitoring.

**Institutional actions for prevention and crisis:** protection actions against hazards; strengthen municipal controls over land use and construction; accessibility improvement for basic services and communications network; insurance contracts for social services and infrastructures; train sufficient personnel; overcome weak community perception about hazards and its capacity on how to react.

**Research and Monitoring:** Research about the natural environment and the social functioning; micro-seismic research and zoning; research on future urban expansion areas; systematize local and foreign experiences; Monitoring of identified hazards; establish a "Risk Information System".



## 8 *References*

This document is based on the results of the survey questionnaires on disaster risk management conducted by EMI-EdM between May and August 2004, on the presentations made by the Quito technical and city representatives on the March 2004 at the EMI America's Cluster Meeting in Los Angeles, and on a series of personal interviews performed during the month of November 2004 in the city of Quito by Jeannette Fernandez, as part of PDC initial activities to join the 3cd Program, to the following persons:

- Dr. Diego Carrion, Director of Land and Housing, MDMQ
- Arq. Nury Bermudez, Head of Information Technologies, MDMQ
- Dra. Lorena Vinueza, Director of Metropolitan Safety, MDMQ
- Arq. Milton de la Cadena, Head of Disaster Management, MDMQ
- Dra. Ximena Jijon, Zonal Safety Head, MDMQ
- Dra. Norma Miranda, Safety Office, MDMQ
- Ing. Othon Zevallos, Coordinator Pichincha Slopes Project, EMAAP
- Eco. Blanca Fiallos, Coordinator PREANDINO PRGRAM, Presidency of the Republic
- Ing. Hugo Yepes, Director Geophysics Institute, EPN
- Ing. Alexandra Alvarado, Researcher Geophysics Institute, EPN

It was updated based on the paper "Dealing with illicit Construction in Quito" and presentation made by Dr. Diego Carrion, Director of Land and Housing, MDMQ, on January 2005 during the World Conference on Disaster Reduction in Kobe-Japan, Thematic Session 1-10

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