

**POTENTIAL DISASTER RISK REDUCTION STRATEGY
ELEMENTS FOR ECUADOR**

Final Document



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- Insurance Association (ACOSE)
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We expect that the results and recommendations generated through this study, will contribute to the ongoing improvement of natural disaster risk management in Ecuador.

Sincerely,

SUN MOUNTAIN INTERNATIONAL

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1. Introduction

Sun Mountain International, in compliance with the agreement signed with the Inter-American Development Bank, presents the following study, “Disaster risk reduction strategy elements in Ecuador.” This study is intended to be used as an information and reference document for the Sixth Meeting of Regional Dialogue on Natural Disasters, to be participated in by Latin American and Caribbean countries.

The study is based on the results of the Disaster Indicators Program¹, created by 12 Latin American countries, including Ecuador². The study details social, environmental, and resilience vulnerabilities, as well as financial activities that could have a strong, macroeconomic impact on Ecuador. It also considers potential social and environmental losses at the local and national levels, including the institutional dynamic that characterizes risk management in the country.

The study data for each of Ecuador’s 2005 indicators was updated according to the availability of information. The study followed guidelines that were proposed in the Technical Report, “Indicators for Disaster Risk and Risk Management.” The Technical Report was prepared by the IDEA research team, Colombia (2003-05). (See methodology in Annexes A and B).

The study included national, regional and local actions as part of a development Risk Management strategy. The strategy incorporates Risk Management in development plans to reduce vulnerabilities in Ecuador. Risk Management strategy proposes specific actions, such as the technical assistance provided by the National Secretary of Planning and Development-SENPLADES since 2001. Financial support from the Inter-American Development Bank for Provincial Boards helped to incorporate Risk Management concepts into strategic planning at all levels.

It is important to note that, in spite of increasing losses caused by natural occurrences³ which were exacerbated by environmental degradation, national and local governments and society as a whole continue to concentrate on reactive efforts such as emergency response and post-disaster rehabilitation and reconstruction, instead of focusing on proactive investment which would reduce or eliminate disaster impact.

In Ecuador, due to socioeconomic vulnerabilities in all provinces, the consideration of political factors are essential in development planning. Therefore significant restrictions exist that make adequate Risk Management difficult. However, some initiatives are being developed to incorporate Risk Management in the sectorial field. (Ex: water and sanitation, health and electricity).

This study is divided into the following four sections:

- I. Strategic actions to avoid potential losses. The degree of indicator institutionalization as well as an assessment of each indicator’s (LDI, PVI, RMI) components is identified. These indicators encompass the socioeconomic characteristics that influence Risk Management in Ecuador;

¹ Cardona, Omar Dario, (2005). Indicators for disaster risks and risk management, Operation ATN/JF-7907-RG. Inter-American Development Bank

² BID-CEPAL-IDEA. (2004). *Indicator system applications 1980: 2000.Ecuador*. Program for information and risk management indicators. Implementation of component II: Risk management indicators. Operation ATN/JF-7907-RG.

³ Between 1993 and 2002, the losses were evaluated in USD \$32 billion and affected 42.2 million people.

- II. Based on the Stage I, strategy proposals to reduce potential losses in the event of a natural disaster will be implemented. These loss reductions will occur through Risk Management, which will reduce the existing socioeconomic vulnerabilities;
- III. Proposal of financial strategies to cover the gap between potential losses and projected available financial resources.
- IV. Conclusions and recommendations to execute the proposals identifying the institutions that will be in charge of implementing strategies and economic resources for appropriate Risk Management.

It's important to consider recent events in Ecuador, including reforms to the Hydrocarbon Law, which increased prices, and the termination of OXY's contract (May 2006), which are not included in the study, affected the calculations of the petroleum company DDI.

This study is intended as a positive contribution to the disaster risk reduction efforts already begun in Ecuador. The study is also meant to continue to provide technical assistance to local governments for the incorporation and implementation of Risk management regarding provincial development planning that is framed within IDB policies. We also expect this study to serve as a reference for other Latin-American countries, which have similar experiences to those of Ecuador.

2. Objectives

2.1 General Objective

To identify successful disaster risk reduction strategy elements in Ecuador, that can be used as a case study for other Latin America and Caribbean countries participating in the Sixth Meeting of Regional Policy Dialogue on Natural Disasters.

2.2 Specific objectives

- 1) To evaluate Disaster Indicators Program results, to determine if the Government has instituted strategies to effectively reduce risks.
- 2) To determine different ways to finance losses that can't be mitigated in the presence of an event, at the national and local levels, with representatives of both public and private sectors.
- 3) To systematize the policies and strategies identified to serve as important inputs for the Sixth Meeting of Regional Policy Dialogue on Natural Disasters.

3. Degree of institutionalization and update of indicator data (LDI, PVI, RMI)

Variable “risk” has recently been introduced to development planning in Ecuador. Initiatives that prove this phenomenon are observable in provincial development plans and in such sectors as: health, electricity, potable water, and others.

Some experiences are observable within best practices in local field, with the support of multilateral organisms. The work implemented by the municipality of Quito on the slopes of Pichincha and the quality and quantity of the city's water supply are two examples. The construction of the OCP (Heavy Crude Pipeline) compared to SOTE (Ecuadorian Pipeline System), illustrate best practices at the private sector level. (A list of examples of best practices is presented in Annex C).

According to interviews done with main officials from AME (Ecuadorian Municipality Association), COPEFEN, SENPLADES (National Development Secretariat), Civil Defense, CONCOPE (Ecuadorian Provincial Governments Councils), UNDP (United Nations Development Program), and ACOSE, the Indicator Program (Cardona, O.D. 2005) is not well known. Only SENPLADES is familiar with the Indicator Program, The lack of familiarity is the primary reason the Indicator Program has not been widely spread or socialized and its degree of institutionalization is incipient.

3.1 Institutional legal framework

Risk prevention and mitigation are the principle weakness of risk management in Ecuador. The country depends on national legislation and rules that govern the various fields concerning prevention. Competence problems have weakened the institutional ability of responsible organizations.

Within the six areas in natural disaster management (training, prevention, mitigation, reaction, rehabilitation and reconstruction), it is well known that different organizations occasionally duplicate their efforts by implementing similar activities. This overlap results in a lack of coordination in project and program execution, and of utilization of existing information. For example, CORPECUADOR carries out the rehabilitation and reconstruction of all infrastructure damaged by natural disasters. The Public Works Ministry is responsible of the construction, maintenance and recovery of roads and highways nationwide.

Even so, constant government changes, due to political instability, affect project continuity developed by organizations such as COPEFEN or CORPECUADOR. Such situations entail wastes of the organizations' efforts and resources.

Another problem caused by the political cycle and the application of short term planning is the inefficient use of funds. This problem is created by the lack of established priorities and fund expenditure opportunities.

3.2 Local Disaster Index (LDI) characterization and evaluation

The results of the study done by Cardona show that LDI for Ecuador reached the highest levels between 1986 and 1990, affecting 185,761 people during this period.

The LDI (which identifies the concentration of loss at the municipal level) indicates that 10% of municipalities concentrated 82% and 66% of losses between the years 1986 and 2000. These losses occurred on the Ecuadorian coast where 3 of 5 provinces (Los Rios, Esmeraldas and Manabi), are among the five provinces with the highest poverty index (Unsatisfied Basic Needs NBI) in the country.⁴

The problems that create natural disasters in Ecuador at the local level have an impact nationwide, due to the significant volume of economic loss. This is because most of the resources used in rehabilitation and reconstruction come from budgetary reallocations, which leaves little for the execution of new projects. Regrettably, Ecuador is not implementing corrective actions to

⁴ According to INEC, Population and Housing Census, **Dissatisfied Basic needs NBI**, is defined as the number of people (or homes) that live in poverty conditions, expressed as the total population in a year. Considering “poor” a person who had persistent lacks for satisfying basic needs including shelter, health, education and employment.

mitigate impacts that can be anticipated, for example, winter floods on the Ecuadorian coast. It is necessary to enforce the implementation of actions for each stage of risk management. The different levels of State Administration should also be integrated into the process and local level responsibilities should be decentralized to the maximum extent possible.

3.3 Prevalent Vulnerability Index (PVI) characterization and evaluation

The PVI index is based on indicators that are not under risk management control. Due to the need to reduce vulnerability, policies and actions can be implemented in order to improve exposure and susceptibility indicators.

Vulnerability levels are related to the poor economic structure that characterizes Ecuador’s operation regarding natural resource exploitation, pollution and a general lack of rules and regulations in this area. This is the main cause of the increasing levels of vulnerabilities regarding the geographic, environmental, social and economical threats, to environmental conditions and human lives.

For a greater comprehension of the actions that are taking place in Ecuador, we have made explanatory tables of the situation for each index. These tables analyze the current and intended tendencies including the Risk Management control to revert the tendency for each index. We have also listed the organizations that should be working regarding these actions. (See Annex D).

Within the components of sub-index “exposure and susceptibility”, the most important are:

Capital stock in million US\$ dollar/km²: In case of a natural disaster the country’s public and private infrastructure will be seriously affected. The funds designated for the reconstruction will be extremely high, due to the fact that 95% of infrastructure is not insured. (According to Public Works Ministry).

Urban growth, avg. annual rate (%): Poverty and economic and social pressures such as migration, unemployment and the illegal possession of lands, have made people vulnerable. This has forced many to live in dangerous places, generally in unsafe lands, inappropriate, precarious housing susceptible to phenomenon impact.

Poverty-Population living on less than US\$1 per day PPP disposable income: Without any doubt, the poorest and most vulnerable groups are also the most prone to be affected by natural and human threats.

Arable land and permanent crops as a % of land area: *Since* Ecuador is an agricultural country, in the case of natural disaster all crops can be seriously affected. It is likely to take a long time to recover the resources of these natural disaster victims..

The study of the “Socio-Economic Fragility” sub-index reveals that the most important results are:

Debt serving burden as a % of GDP: Ecuador assigned the 7.7% (UNDP, Human Development Report. Ecuador, 2001) of GDP to pay both external and internal debts, meaning that there are less funds available to invest in disaster prevention and reconstruction.

Human Poverty Index: According to UNPD studies⁵, 73.42% of the Ecuadorian population is classified as poor. Additionally 41% of these people live in extreme poverty. Should a disaster occur those living in extreme poverty will be unable to adequately respond to a critical situation.

Annual increase in food prices %: The presence of inflation means that the population have less resources to protect themselves in the case of a natural disaster, and their projected economical recovery capacity is lower.

Social disparity, concentration of income: In Ecuador 10% of population controls 90% of country's wealth., so very few people are able to insure their properties. Most of the population has the necessary resources to survive; they lack the ability to assign resources to insure their properties against the probability of future calamities.

The following are the most relevant results for the sub-index study “Resilience (lack of)”:

Governance Index: Poor governance and weak institutional strength have contributed, in recent years, along with other factors, to an increase in this socioeconomic fragility and personal and environmental deterioration. Integrated management of governance and risk may help to reduce the potential impact of natural disasters, at local levels.

Hospital beds per 1000 people: The number of hospital beds per 1000 people, must continue to increase to achieve the capacity to take care of disaster emergencies. This health indicator is important, in the disaster context because it will be affected by the location of the institution, medical personnel, paramedics and available resources.

As long as there is no immediate need to respond to a capacity the number of beds nationwide is acceptable. Public hospitals in main cities like (Quito, Guayaquil, Cuenca) are often full. However other large cities like Latacunga and Ambato have good hospitals although they lack resources and personnel.

Social expenditure, on pensions, health and education, % of GDP: If legally predetermined resources in the national budget are applied as they should be, the country could handle the impacts of a disaster (23% of budget is assigned to health, education and social welfare).

Human Development Index (HDI): According to studies made by UNDP⁶, Ecuador showed a light improvement in HDI results between the year 2002 (0.757) and 2003 (0.759), due to an increase in life expectation, and an increase in GDP/capita related to rises in petroleum sales. This data illustrates that Ecuador could invest in its most important sectors in order to prevent or reduce natural disaster impact.

3.4 Risk Management (RMI) characterization and evaluation

Risk Identification Indicators (RI): For the year 2005, these indicators were identified at the national level as *incipient* management, due to descriptive and qualitative studies on vulnerability and disaster threats with potential impacts at both national and local levels.

Ecuador lacks good hazard and forecast monitoring. The country is also deficient in the areas of hazard evaluation and mapping due to inadequate technical and economic capacity within the

⁵ Human Development Report, UNPD, 2001

⁶ Human Development Report. UNDP, 2003

responsible institutions, as INAMHI. In addition, weak management contributes to work deficiencies.

Ecuador also has a substantial deficiency of personnel trained in Risk Management, who would be able to publicly and efficiently inform and educate the community in subjects related to Risk Management.

Risk Reduction Indicators (RR): When defining Land use and urban planning activities, Ecuador was graded in the lowest level, due to the complete lack of specific legislation that includes hazards as a decisive factor in territorial organization. The Municipalities and Province Government control these activities through regulations.

The territorial planning organization and responsible entities remain unclear in Ecuador. There are differences between SENPLADES and MIDUVI on this subject. The main cities do not validate or implement Planning Secretary proposals. Other institutions, as the Agricultural Ministry, which is also responsible for this area, are not in the work field.

For ***hydrographic basin intervention and environmental protection***, the country is graded in the low/incipient level because it lacks a legal framework for this control. However, reforestation, environmental protection and basin restoration have been successfully implemented in specific sectors at local and community levels.

Laws such as the Forestry Law that has been in force since 1960, oblige those who exploit natural forests to restore the forest by planting more trees than the quantity harvested.

Among other environmental laws are Environmental Management Law and Environment Ministry Legislation, which emphasize regulations concerning reforestation, hydrographic basin correction, slopes protection and correction, appropriate waste management, appropriate toxic and dangerous waste management, among others.

Environmental management should be integrally managed, but it finds itself in the middle of many fields. As a result there is not a clear definition of responsibilities among the institutions working with this area. This confusion of responsibilities between institutions and offices has also become a power struggle.

The problem does not lie in a lack of laws, regulations, and norms of which there are already a great quantity in the country. It lies in the ignorance of these regulations. Poor community involvement in the management of certain subjects exacerbates this problem.

In the ***update and enforcement of safety standards and construction codes*** Ecuador was graded at the low/incipient level. Construction Codes issued in 2000 by the INEN (Ecuadorian Institute of Standardization), defined seismic zoning of national territory, and is currently in the process of updating its remaining chapters. However, its application is not mandatory. The use of these codes is voluntary. There are no controllers responsible for reducing risks, through infrastructure vulnerability reduction.

Finally, ***reinforcement and retrofitting of public and private assets*** was also graded at a low level, due to the fact that rules concerning vulnerability were issued after the construction of buildings. There are no studies on current physical vulnerabilities nationwide. The reinforcement and retrofitting of public and private resources and assets is related to territory

growth and urban planning where on-going development makes it possible to reduce risks in disasters such as floods, land slides and flows.

The ***implementation of control and protection techniques prior to hazard events*** are reflected in works that are economically and technically manageable such as walls and drainage. However, these actions are not possible when the magnitude of phenomenon is larger, making the work a national responsibility. There is no awareness of the potential damage resulting from high levels of vulnerability, either at the authority or community levels. Therefore, not only are there no vulnerability intervention, but vulnerabilities continuing to be constructed and reconstructed.

The ***housing improvement and human settlement relocation from prone areas*** may reduce risk. This is not always possible due to a lack of resources for obtaining better sites for housing location and population re-location or because such places constitute permanent income sources for inhabitants. (Canton Baños). In this situation there is also no permanent control to guard against illegal human settlements.

Ecuadorian reality shows that disaster prone areas are re-occupied in a short period of time due to social pressure and the fact that natural disasters are not seen annually.

Disaster Management Indicator (DM)

The ***organization and coordination of emergency operations*** received low and incipient designations, since there are many organizations that must respond to emergencies, with low resources and only voluntary personnel. In the case of Ecuador, although they have significantly limited resources, the Civil Defense is legally in charge of managing and attending disasters. Politicians see this as an opportunity for immediate action but it results in improvised disaster management.

Emergency response planning and implementation of warning systems were also graded at low/incipient levels because there are no basic emergencies and contingency plans for specific places depending on the disaster, for example, for Cotopaxi and Tungurahua.

Community preparedness and training received a grade between incipient and appreciable levels. Some institutions offer sporadic training courses on emergency simulation, but they are voluntary and depend on institutional policies.

There are some specific phenomenon-related cases that affect population, for example, community training has been done for Baños inhabitants living near to Tungurahua Volcano and occasional training for Cotopaxi’s nearby population, both volcanoes are currently monitored due to their constant activity.

4. Strategy Proposal to reduce potential losses.

Risk Reduction and Recovery strategy depends on the nature of risk. This means that, each country has its own vulnerabilities and economic, social and environmental development levels. Therefore, levels of development and vulnerability will depend on the magnitude of a disaster and the nature of the recovery strategy.

A main component of any development strategy should include the reduction of existing vulnerabilities. This implies prevention investment and the promotion of societal transformation plans. Regrettably, this kind of vulnerability analysis has not been done in Ecuador. Therefore,

political policies are not focused on vulnerability reduction, in spite of the fact that most disaster vulnerabilities are already well known.

Despite the number of organizations involved in the disaster management process within Ecuador, there is not a general nationwide plan for efficient resource management. The lack of communication and coordination among institutions make this process even more difficult.⁷

Ecuadorian legislation delegates responsibilities among government agencies, which often result in unsatisfactory execution. A series of repetitive laws and regulations generated superposition and contradiction among institutions. This created an environment of competition for resources and influences between agencies in this field.

The following strategies have been proposed to reduce possible losses:

- a) Promote actions that include Risk Management in planning processes, currently in development at the sectional level, of all 22 Ecuadorian provinces in areas such as health, electricity, potable water, and others.⁸
- b) Encourage Risk Management to be directed toward risk identification and prevention.
- c) Implement dissemination and awareness campaigns regarding the importance of Risk Management for civil society.
- d) Conduct studies of climate changes including vulnerability in agricultural, coastal and water resource sectors. All vulnerability studies nationwide should focus on prevention.
- e) Develop management skills among the institutions responsible for Risk Management, to coordinate efforts and optimize resources.
- f) Develop proposals through the Planning Secretary to articulate institutional capacities concerning regional and local development as part of planning decentralization proposals.

5. Financial strategies Proposal

5.1 Disaster Deficit Index (DDI) Characterization and Evaluation

Only one aspect of potential losses can be mitigated. This excludes important financial needs that change according to the characteristics of a particular risk. Potential loss indicators identified as DDI, clearly show a rising tendency in losses from 1980 until now (2003)⁹ in Ecuador.

There are two main mechanisms available for the state, risk and finance transference. Ecuador, like many other developing countries, suffers from weak private wealth coverage,¹⁰ which combined with low/medium private incomes (US\$2212/per capita)¹¹ tend to leave the reconstruction process to the state.¹² This situation exerts strong pressure on the budget. Which can compromise economical resilience when projecting increased worst-case scenario losses.

⁷ Solberg, Scott et al. (2002). Manejo de desastres naturales y la red vial en el Ecuador. Consideraciones políticas y recomendaciones. Banco Interamericano de Desarrollo

⁸ Chimborazo, Bolivar, Imbabura and Manabi already have a Development Program with a Risk Management proposal.

⁹ IDEA (2004)

¹⁰ Salas

¹¹ CEPAL (2004)

¹² Kunreuther Linnerooth-Bayer (1999)

Following the IDEA proposal (2004), which outlines the key components that define a state’s financial resilience, potential reinforcement strategies are detailed for Ecuador. Although the strategies were suggested for Ecuador, many of them apply to other countries.

5.2 Evolution of current tools in Ecuador and alternatives to cover financial gaps caused by natural disaster.

a) Insurance and reinsurance payments:

Ecuador’s Insurance market is regulated by the General Insurance Law, which has offered a range of services within the country since 1960. Unfortunately, these products have experienced difficulty in entering the Ecuadorian market.

Financial Management and Control Law encourage public goods protection, through insurance contracts. This insurance protection only applies to certain limited sectors such as electricity and airports, including productive infrastructure, in crude oil transportation (OCP and SOTE pipelines), and Hydro thermo-electric generation and distribution. Road infrastructure remains inadequately covered. The same inadequacy applies to the buildings that house state institutions.

The most vulnerable financial resources are those possessed by decentralized entities such as Provincial Governments and City Councils. This is especially true regarding transportation infrastructure (bridges), as well as education and health care infrastructure. In addition, insurance payments are not the equivalent of full replacement coverage, because the actual value of goods that have not been updated over time must be depreciated. Although the law exists, administrative fiscal responsibilities are not well defined. For example, financial managers are directly responsible for guaranteeing their institution’s debt payments, but regulations regarding the amount of insurance that must be in force for various institutions are unclear. Currently, approximately USD\$ 14,000 million in assets is covered by catastrophe insurance.¹³ This excludes the electricity sector, which covers USD\$ 3,079 million of Petroecuador’s¹⁴ productive system. Private asset coverage is concentrated on productive assets while most other assets receive lower coverage according to their field, due to the poor cultural integration of insurance and to high premium costs¹⁵

There are clear tendencies that indicate changes favoring more insurance coverage. These positive tendencies are not ready to face catastrophes, but they are proposing better distribution between private and public sectors at the decentralized levels. The cities of Quito and Guayaquil have developed Municipal Insurance Plans.

The Insurance Association is currently proposing the creation of “micro-insurance” and is prepared to develop these products as long as a legal framework supports them. This would follow an assessment of the needs of potential clients to assess potential losses that are expected to be due to the projected vulnerability regarding certain disasters.

b) Catastrophe Bonds subsidized by cooperation (Charity CAT bonds)

Although this mechanism to transfer risk to capital markets has been developed principally by commercial insurers at the international level, it also offers possibilities for Ecuador.

¹³ Petroecuador (2006)

¹⁴ Petroecuador (2006)

¹⁵ Ibid.

Unfortunately premium payments could be too high, based on the volume of the bonds that would be necessary. It is also important to note that although negotiations on CAT bonds were begun 15 years ago¹⁶, few investors have realized actual titles.

Catastrophe bonds offer multilateral banks, such as the IDB, an opportunity to actively support development within the framework of the bank’s efforts in management and risks. This intervention, through subsidizing premium and promotion payments, may encourage the participation of additional contributors traditionally interested in disaster response management, such as Catholic Relief Services, The Italian Mission, USAID, Save the Children, World Vision, Deutsche Gesellschaft für Technische Zusammenarbeit-GTZ, German Service for Social-Technical Cooperation-DED (initials in German).

The micro-insurance proposal suggests investigating options that offer catastrophe bonds developed between the state and donors (charity CAT bonds) proposed by Goes and Skees (2003). This proposal makes some limitations, observed in the commercial bond market, more bearable. However, this type of risk transfer mechanism will only be developed when the insurer is able to prove to investors which risks will be effectively covered through investments in mitigation and more traditional insurance.

c) Reserve funds for disasters

Ecuador has a Saving and Contingency Fund, supplied by CEREPS (Special Account for Productive and Social reactivation) ex-FEIREP, allows for petroleum savings, which was previously used exclusively to pay public debt. Ecuador’s Saving and Contingency Fund now has USD\$ 313 million¹⁷ to apply to resources destined to face future emergencies.

These sums are complemented by other funds at the national level as stipulated in the National Security Law, which establish a Contingency Fund managed by the Civil Defense. This Contingency Fund is minimal. It does not possess the capacity to sufficiently contribute to emergency response. It is important to note that the Contingency Fund depends on the political will.

Contingency Funds are open in a sense that they can receive funds from a variety of sources, in the case of an Emergency Declaration. This Contingency Fund lacks constant supply and varied income sources. The petroleum surplus contribution is as positive as it is vulnerable. This is true regarding both the quantity and the quality¹⁸ of resources. A portfolio of diverse funding activities such as banana production, petroleum and general exports should ideally supply the fund.

d) Aids and donations

This item can potentially suffer the greatest fluctuation, due to competition between other countries with the same needs and political situations.

The quantitative capacity to utilize aid coupled with the quality of expenditures make the use of these resources more efficient. Coordination between mitigation and finance strategies is vital in

¹⁶ Goes and Skees (2003)

¹⁷ Presidency (2006)

¹⁸ Quality meaning variability, origin, and source vulnerabilities, etc

this context. The proposal is intended to strengthen the response to disasters, by demonstrating effective expenditures and investments, before interest spreads toward other international events.

e) New Taxes

Previous experiences as Josefina (1993) and war tax in 1995 showed that the population responded positively to governmental appeals. It is reasonable to assume that in the future people will respond to extenuating circumstances in the same manner. Success will depend on effective communication between the government and its citizens. The availability of new taxes will continue to depend on the current situation.

f) Budgetary Reallocations

This solution is very destabilized and has serious consequences when reallocation takes longer than its originally estimated time. Real quantity depends on the flow of supply planned for capital investment, from the moment an event occurs in a fiscal year to the moment that the political decision is made to face the event. There are regulations in General State Budget that make possible money transfer between different accounts (USD\$ 115 million for 2006¹⁹).

g) External Credit

Credit availability will depend on the lender's evaluation of the Ecuador's risk and guarantees. One of the largest financial responsibilities is state debt. This debt is viewed as a restriction regarding the implementation of Risk Management. Ecuador is classified as a medium income country but has high debts (US\$ 14416 million)²⁰ compared to other developing countries. The current Ecuadorian debt (capital and interest paid annually) is equivalent to 31%²¹ of export value and a 20%²² of the state's general budget.

Ecuador's increasing vulnerability to risk has destabilized the normal flow of payments in the case of disaster events. It is possible to re-negotiate part of pending debts in exchange for mitigation and investment from the Savings and Contingency Fund. This exchange will allow the offer of better payment guarantees regarding existing debts as well as those contracted to handle catastrophic events.

h) Internal Credit

The current public internal debt (USD\$ 3.9 billion) constitutes State Bonds emission with different purposes, terms and interest rates that can finance budgetary deficit or investment projects. The majority of this debt consists of long-term bonds and bonds from the Deposit Guarantee Agency (AGD). These debts have been absorbed by two main sources: Ecuadorian Social Security Institute (IESS) and the national banking sector. The current non-existence of short-term debts (until June 2005) after reaching US\$ 116 million in 1999 leaves open the possibility of returning to this resource in the event of emergencies.

Consignment availability provides the opportunity to buy Government Bonds to be used exclusively in Risk Management and post disaster recovery. The rise in savings and performance

¹⁹ Ecuadorian Economy and Finance Ministry (2006)

²⁰ Ecuadorian Economy and Finance Ministry, Public Credit (2006)

²¹ World Bank (2005)

²² Ecuadorian Economy and Finance Ministry (2005)

is very positive. Currently, the consignments annually give to Ecuador approximately USD\$ 1.5 billion²³. However, a great part of these funds are consumed, with 20% being invested (real-estate 4%, business investment 8%, savings 8% and education 2%)²⁴.

5.3 Sectorial Interpretation of DDI

Due to Ecuador’s economic structure, financial resilience is a “dependent variable” of the petroleum sector, which provides more of 50% of the country’s income. Using this data, possible economic losses were calculated based on a hypothetical event that destroyed the Esmeraldas Refinery due to a Maximum Considered Event (MCE), such as 9.0-degree earthquake.

The probability of a MCE occurrence is 50% in 50 years, which is why macroeconomic decisions and prospective measures must be taken now. Proactive macroeconomic actions will reduce physical vulnerabilities in Esmeraldas oil company structures and in the country in general.

When petroleum DDI is calculated it is remarkable that it could easily be greater or equal to 1 (See analysis on Annex E), this does not take into account that in case of a big earthquake, economic losses will be greater, due to effects in other economic sectors and recovery capacity will take more time.

The data used to evaluate physical disaster impact is limited because the analysis was not done by the economic sector, or by those responsible for Risk Management in the country.

The possible disaster scenario appears favorable, since recovery and reconstruction is being planned for a year. However a meaningful evaluation reveals that recovery and reconstruction will take longer due the fact that contract procedures and data analysis is planned only for Esmeraldas without considering the impact of real losses at the national level.

Petroleum DDI Scenarios for Esmeraldas Refinery destruction.

DIRECT DAMAGES	<i>Current Value</i> 1050 M USD	<i>Total Loss</i> 1050 M USD	<i>75% loss</i> 787.5 M USD	<i>50% loss</i> 525 M USD
ESTIMATED LOSSES	<i>Budget 2006</i> 2019 M USD	<i>1 year interruption</i> 1784 M USD	<i>9 months interruption</i> 1338 M USD	<i>6 months interruption</i> 892 M USD
AVAILABLE FUNDS		<i>Maximum funds</i> 1666 M USD	<i>Possible funds*</i> 1550 M USD	<i>Probably funds*</i> 1433 M USD
PETROLEUM DDI	<i>Most favorable situation</i> DDI = 0.85	<i>Most unfavorable situation</i> DDI = 1.98	<i>Medium situation</i> DDI + 1.46	

* Possible funds represent income that could exist based on country’s organization, in economic, tax system and legal infrastructure sectors.

* Probable funds represent income from action application, without legal resolutions and rules.

²³ Bendicen & Associates (2003)

²⁴ Ibid

6. Conclusions and recommendations to make operative different proposals while identifying specific institutions that will be in charge of implementing the most effective strategies and identifying the necessary economic resources.

All detailed recommendations are framed in the general conclusion of the Study. The Indicators Program has not been widely disseminated at the national and local public levels, or in the private sector. The main objective is the identification of the intended target audience to be used to spread the Indicators Program in Ecuador.

The IDB has planned a second phase for the socialization of the Indicators Program. Three possible alternatives have been identified to ensure the new phase is amply communicated. Understood and accepted by everyone involved in Risk Management in Ecuador. It is further recommended the team in charge of creating the IDEA Indicators Program so that training reflects lessons learned during the Indicator development process do that implementation.

The Second Phase of Risk Management and Recovery responsibilities:

1. Make nationwide training available to participants in Risk Management throughout all of Ecuador.
2. Create regional training by the essential participants in Risk Management. This system will produce mentors or “trainers of trainers”. The Bank will be responsible for monitoring the process and helping the concept spread to each country.
3. Set up a training program with the head office in Ecuador. From a regional standpoint all members of PREDECAN, in order to include Risk Management indicators in each country.

Ecuador is entirely lacking when it comes to clearly defined Risk Management policies and procedures. However, some initiatives are currently underway to incorporate Risk Management in both provincial and regional fields that correspond to a variety of areas and basic services, which have the greatest vulnerability and potential impact nationwide.

It is important to note that initiatives, can be found in Ecuador’s participation in policies, strategies, legislation and rules definitions through the country’s participating institutions such as the Disaster Prevention and Attention Andean Committee –CAPRADE- and the Risk Prevention and Mitigation Andean Program as well as Ecuador’s future involvement in the Warning System and Institutional Strengthening, due to a loan from the IDB.

Limited national legislation and regulations that govern prevention, attention, recovery and reconstruction fields, indicate some coordination, competence and responsibility issues are being addressed. The primary institutional challenges are due to the lack of a single national institution dedicated to effective coordination and collaboration regarding Risk Management.

Each of the institutions in charge of Risk Management in Ecuador, whether mandatory or voluntary, should have specific responsibilities. Each institution must be responsible for specific independent actions that also relate to all involved institutions. Current problems due to a lack of coordination and overlapping responsibilities must be reduced.

The fact that Ecuador does not have a National Indicator Program concerning Risk Management is clear to all. The importance of an Indicator Program may be a good place to start creating and managing a preliminary indicator system to monitor Ecuador’s improvement over a specific time period.

Under these circumstances it is possible to identify and analyze the indicators that appear to be the most important. Other indicators that are not currently included may also be analyzed based on their potential Risk Management importance in Ecuador. It could also be possible to work with an existing social indicator platform that generates important data, regarding technical and analytical capacity. A connection between social indicators from IDB-IDEA Indicators Program should also be done.

Specific institutions should be assigned, to create and enhance a social indicator platform to supply critical data that will strengthen Risk Management Indicators. This data management platform will reduce the implementation costs of the Risk Management Indicators Program.

Ultimately a National Risk ATLAS could be developed to serve as an efficient and effective planning tool clearly defining institutional competences, capacities and responsibilities.

The following action recommendations for strategy proposals have already demonstrated their usefulness.

Local Disaster Index (LDI)

- a) Assign both technical and economic resources regarding the implementation of Risk Management proposals that are currently being incorporated in Provincial Development Plans.. The Risk Management proposals presently being executed require constant monitoring to guarantee each action’s efficiency²⁵.
- b) It is also important to assign technical and economic resources to implement and monitor plans that are being formulated and validated locally and nationally. These resources should be reimbursable and no reimbursable in nature.
- c) Establish a database that includes all province municipalities, to have statistics of occurred events as well as to assess social, environmental and economic impact. This database will be useful source when providing local data to the Integrated Indicators System.

Prevalent Vulnerability Index (PVI)

- a) Community work concerning housing vulnerability is very important. Some incentives such as tax reduction can apply. The establishment of obligatory reinforcement programs for economic fields (petroleum, electricity, lodging, etc) will create an effective exchange of reductions and operation permissions
- b) The fulfillment of application and verification of land use and urban planning. Requirements must become mandatory. The establishment of verification and approval processes for structural plans, both independent and institutional, is also essential.

Risk Management Index (RMI)

- a) Scientific and technical skills in Risk Management must be developed to establish risk estimation and spreading mechanisms.

²⁵ SENPLADES (Planning and Development National Secretariat) with financial support from Ecuadorian Development Bank have formulated the basis of Risk Prevention National Plan, and on this basis Provincial Governments are implementing Risk Management provincially.

- b) The creation of a Risk Management National System, to avoid overlapping duties thereby enhancing the works coordination and continuity. The Risk Management National System will specifically clarify roles and communication between institutions.
- c) Create and strengthen technical skills of permanent units within ministries and provincial governments to develop and execute Risk Management plans.
- d) Prepare communities to promote social response mobilization and appropriation. This includes the organization and preparation of a variety of community citizens, to enable them to face potential disasters that could affect important programs such as public safety and healthy schools.
- e) Include a formal education process regarding Risk Management with the goal of creating population awareness through the creation of interactive and multimedia activities.
- f) Design simulations and tests based on risk scenarios. These simulations and tests should be organized by hazard, geographical area and economical/social criteria.
- g) Develop community skills to prepare for future response actions and provide basic equipment, for example, DIPECHO²⁶ (ECHOS’s Disaster Preparedness Program) in Tungurahua.

Disaster Deficit Index DDI

- a) Achieve agreements with private sector in order to obtain a profit percentage to form a pre-disaster fund to be managed by both public and international institutions. This could be made by adding a regulation in the National Security Law, similar to Labor Code that stipulate 15% of profit to employees.
- b) Assign a percentage of property tax revenues from the municipalities, to create a disaster fund managed by AME (Ecuadorian Municipalities Association).
- c) Strengthen risk reduction and training programs from CEREPS through a public debt exchange agreement between interested countries in Risk management making them National Government creditors.
- d) Develop a strategy to direct a percentage of emigrant consignments, through the use of support networks in case of disaster, owing to the new elector register system abroad.
- e) Strengthen investment capacity, improving expense quantity for disaster reconstruction thereby encouraging donation response.
- f) Promote the development of new insurance products focused on the most vulnerable people. The State with international cooperation should support the creation of a legal framework to analyze project feasibility. The National Insurance Sector had expressed interest in developing such products.
- g) Make insurance mandatory to strengthen individual responsibility regarding adverse events.
- h) Help transfer risk, through the creation of a catastrophe bond between the State and multilateral banks with experience in these financial markets. (Charity CAT bonds).

²⁶ DIPECHO (ECHOS’s Disaster Preparedness Program)

7. Annexes

A. Methods used

Interviews were conducted with various leaders responsible for managing risk in Ecuador. This resulted in improving their knowledge regarding the use of the indexes made by IDB. The main institutions interviewed were Civil Defense, Planning and Development National Secretariat (SENPLADES), Ecuadorian Municipalities Association (AME), Interamerican Development Bank officials in Ecuador (IDB) and the United Nations Development Program (UNDP).

Once the interviews were finished, an update to the year 2005 of the results of the Indicator Risk Management Program information for Ecuador in 2000 was made (See Tables in Annex B). For the indicators where it was not possible to update the information due to a lack of sources (Capital stock in millions US dollar per thousand square kilometers and Dependents as a proportion of the working age population) the results of 2003 were used as “actual” and the analysis was made using this information.

Part of the method used by the consulting team was the analysis of each of the indicators that made the four indexes. The value assigned for each was recommended according to the method used by the IDEA-IDB Indicators Program, as pointed in this technical document (pages 83-131), an specific weigh within the general index and then a consideration was made for determining which of these indicators had the most weight in Ecuador’s context, so with these results direct feasible strategies can be implemented and which of those have positive results in integral Risk Management.

B. Updated Data of PVI and RMI Indicators

1. Indicators of Exposure and Susceptibility

Indicator	2000 IDEA/ IDB	2005 Updated	Wpaj Updated
ES1. Population growth, average annual rate.	1.83	1.7%	0.156
ES2. Urban growth, avg. Annual rate (%).	3.00	2.1%	9.198
ES3. Population density (people/ 5 km2).	228.40	232.5	5.189
ES4. Poverty, population living on less than US\$1 per day PPP.	15.60	18%	1.8
ES5. Capital stock in millions US dollar per thousand square kilometers.	297.02	297.02*	297.02*
ES6. Imports and exports of goods and services as a percent of GDP.	73.23	58.75%	6.46
ES7. Gross domestic fixed investment as a percent of GDP.	16.17	23.8%	1.666
ES8. Arable land and permanent crops as a percent of land area.	5.15	10.53%	2.000

*Data didn't find for updating information

2. Importance factor allocation of the Indicators of Exposure and Susceptibility

Which of the indicators is perceived as the most important?				In which degree?
	ES1. Population growth, average annual rate.	X	ES2. Urban growth, avg. annual rate (%).	4.6
	ES1. Population growth, average annual rate.	X	ES3. Population density (people/ 5 km2).	3.4
	ES1. Population growth, average annual rate.	X	ES4. Poverty, population living on less than US\$1 per day PPP.	3.8
	ES1. Population growth, average annual rate.	X	ES5. Capital stock in millions US dollar per thousand square kilometers.	7.6
	ES1. Population growth, average annual rate.	X	ES6. Imports and exports of goods and services as a percent of GDP.	3.2
X	ES1. Population growth, average annual rate.		ES7. Gross domestic fixed investment as a percent of GDP.	3.6
	ES1. Population growth, average annual rate	X	ES8. Arable land and permanent crops as a percent of land area.	5.4
X	ES2. Urban growth, avg. annual rate (%).		ES3. Population density (people/ 5 km2).	3
	ES2. Urban growth, avg. annual rate (%).	X	ES4. Poverty, population living on less than US\$1 per day PPP.	1
	ES2. Urban growth, avg. annual rate (%).	X	ES5. Capital stock in millions US dollar per thousand square kilometers.	4.4
X	ES2. Urban growth, avg. annual rate (%).		ES6. Imports and exports of goods and services as a percent of GDP.	2.2
X	ES2. Urban growth, avg. annual rate (%).		ES7. Gross domestic fixed investment as a percent of GDP.	3.2
X	ES2. Urban growth, avg. annual rate (%).		ES8. Arable land and permanent crops as a percent of land area.	5.6

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	ES3. Population density (people/ 5 km2).	X	ES4. Poverty, population living on less than US\$1 per day PPP.	3.8
	ES3. Population density (people/ 5 km2).	X	ES5. Capital stock in millions US dollar per thousand square kilometers.	5.6
X	ES3. Population density (people/ 5 km2).		ES6. Imports and exports of goods and services as a percent of GDP.	3.4
X	ES3. Population density (people/ 5 km2).		ES7. Gross domestic fixed investment as a percent of GDP.	2
	ES3. Population density (people/ 5 km2).	X	ES8. Arable land and permanent crops as a percent of land area.	2.2
	ES4. Poverty, population living on less than US\$1 per day PPP.	X	ES5. Capital stock in millions US dollar per thousand square kilometers.	4.8
X	ES4. Poverty, population living on less than US\$1 per day PPP.		ES6. Imports and exports of goods and services as a percent of GDP.	4
	ES4. Poverty, population living on less than US\$1 per day PPP.	X	ES7. Gross domestic fixed investment as a percent of GDP.	2.8
X	ES4. Poverty, population living on less than US\$1 per day PPP.		ES8. Arable land and permanent crops as a percent of land area.	5.2
X	ES5. Capital stock in millions US dollar per thousand square kilometers.		ES6. Imports and exports of goods and services as a percent of GDP.	5.2
X	ES5. Capital stock in millions US dollar per thousand square kilometers.		ES7. Gross domestic fixed investment as a percent of GDP.	7
X	ES5. Capital stock in millions US dollar per thousand square kilometers.		ES8. Arable land and permanent crops as a percent of land area.	7
X	ES6. Imports and exports of goods and services as a percent of GDP.		ES7. Gross domestic fixed investment as a percent of GDP.	5.2
X	ES6. Imports and exports of goods and services as a percent of GDP.		ES8. Arable land and permanent crops as a percent of land area.	4.6
X	ES7. Gross domestic fixed investment as a percent of GDP.		ES8. Arable land and permanent crops as a percent of land area.	1.6

3. Indicators of Socioeconomic Fragility

Indicator	2000 IDEA/IDB	2005 Updated	Wpaj Updated
SF1. Human Poverty Index, HPI-1	16.80	10,8%	1.392
SF2. Dependents as a proportion of the working age population.	0.62	0.62*	0.62
SF3. Inequality as measured by the Gini coefficient.	43.73	47.98%	7.244
SF4. Unemployment as percent of the total labor force.	9.00	9.2%	0.982
SF5. Annual increase in food prices (%).	120.31	4.31%**	0.428
SF6. Share of agriculture in total GDP growth (annual %).	9.98	17.3%	1.911
SF7. Debt service burden as a percent of GDP.	9.38	8,6%	1.283
SF8. Soil degradation resulting from human activities (GLASOD).	2.66	8.66%	1.180

*Data didn't find for updating information.

**This data has a great difference with the one of the year 2000, because there was more annual increase on that period due to the fact of the Ecuadorian economy change of sucres into dollars.

4. Importance factor allocation to Indicators of Socioeconomic Fragility

Which of the indicators is perceived as the most important?			In which degree?
X	SF1. Human Poverty Index, HPI		SF2. Dependents as a proportion of the working age population. 4.6
	SF1. Human Poverty Index, HPI	X	SF3. Inequality as measured by the Gini coefficient 4.2
X	SF1. Human Poverty Index, HPI		SF4. Unemployment as percent of the total labor force 5.8
X	SF1. Human Poverty Index, HPI		SF5. Annual increase in food prices (%). 4.6
X	SF1. Human Poverty Index, HPI		SF6. Share of agriculture in total GDP growth (annual %). 3.6
X	SF1. Human Poverty Index, HPI		SF7. Debt service burden as a percent of GDP. 2.4
X	SF1. Human Poverty Index, HPI		SF8. Soil degradation resulting from human activities (GLASOD). 5.6
X	SF2. Dependents as a proportion of the working age population.	X	SF3. Inequality as measured by the Gini coefficient 2.8
	SF2. Dependents as a proportion of the working age population.	X	SF4. Unemployment as percent of the total labor force 5.2
	SF2. Dependents as a proportion of the working age population.	X	SF5. Annual increase in food prices (%). 6.6
X	SF2. Dependents as a proportion of the working age population.		SF6. Share of agriculture in total GDP growth (annual %). 4.2
	SF2. Dependents as a proportion of the working age population.	X	SF7. Debt service burden as a percent of GDP. 7
X	SF2. Dependents as a proportion of the working age population.		SF8. Soil degradation resulting from human activities (GLASOD). 4.4
	SF3. Inequality as measured by the Gini coefficient	X	SF4. Unemployment as percent of the total labor force 7.4
	SF3. Inequality as measured by the Gini coefficient	X	SF5. Annual increase in food prices (%). 4.8
X	SF3. Inequality as measured by the Gini coefficient		SF6. Share of agriculture in total GDP growth (annual %). 4.8
	SF3. Inequality as measured by the Gini coefficient	X	SF7. Debt service burden as a percent of GDP. 8.2
X	SF3. Inequality as measured by the Gini coefficient		SF8. Soil degradation resulting from human activities (GLASOD). 6.8
X	SF4. Unemployment as percent of the total labor force		SF5. Annual increase in food prices (%). 6.6
X	SF4. Unemployment as percent of the total labor force		SF6. Share of agriculture in total GDP growth (annual %). 7
	SF4. Unemployment as percent of the total labor force	X	SF7. Debt service burden as a percent of GDP. 5.6
X	SF4. Unemployment as percent of the total labor force		SF8. Soil degradation resulting from human activities (GLASOD). 7.8
X	SF5. Annual increase in food prices (%).		SF6. Share of agriculture in total GDP growth (annual %). 5.8
	SF5. Annual increase in food prices (%).	X	SF7. Debt service burden as a percent of GDP. 7.4
X	SF5. Annual increase in food prices (%).		SF8. Soil degradation resulting from human activities (GLASOD). 5
	SF6. Share of agriculture in total GDP growth (annual %).	X	SF7. Debt service burden as a percent of GDP. 6.6
X	SF6. Share of agriculture in total GDP growth (annual %).		SF8. Soil degradation resulting from human activities (GLASOD). 4.6
X	SF7. Debt service burden as a percent of GDP.		SF8. Soil degradation resulting from human activities (GLASOD). 8.8

5. Indicators of (Lack of) Resilience

Indicator	2000 IDEA/IDB	2005 Updated	Wpaj Updated
LR1. Human Development Index, HDI	0.73	0.759	0.126
LR2. Gender-related Development Index, GDI	0.76	0.716	23.842
LR3. Social expenditures on pensions, health and education as a percent of GDP	2.76	4.5	57.6
LR4. Governance Index.	0.66	27	2.97
LR5. Infrastructure and housing insurance as a percent of GDP.	1.21	2.7	33.75
LR6. Television sets per 1000 people.	218.25	293	97.56
LR7. Hospital beds per 1000 people.	0.76	1.5	0.18
LR8. Environmental Sustainability Index, ESI	54.30	52.4	6.86

6. Importance factors allocation to Indicators of (Lack of) Resilience

Which of the indicators is perceived as the most important?				In which degree?
X	LR1. Human Development Index		LR2. Gender-related Development Index, GDI	6.2
X	LR1. Human Development Index		LR3. Social expenditures on pensions, health and education as a percent of GDP	7
	LR1. Human Development Index	X	LR4. Governance Index.	5.6
X	LR1. Human Development Index		LR5. Infrastructure and housing insurance as a percent of GDP.	3.8
X	LR1. Human Development Index		LR6. Television sets per 1000 people.	9
X	LR1. Human Development Index		LR7. Hospital beds per 1000 people	7.6
X	LR1. Human Development Index		LR8. Environmental Sustainability Index, ESI	7.8
	LR2. Gender-related Development Index, GDI	X	LR3. Social expenditures on pensions, health and education as a percent of GDP	7.8
	LR2. Gender-related Development Index, GDI	X	LR4. Governance Index.	8.2
	LR2. Gender-related Development Index, GDI	X	LR5. Infrastructure and housing insurance as a percent of GDP.	8
X	LR2. Gender-related Development Index, GDI		LR6. Television sets per 1000 people.	5
	LR2. Gender-related Development Index, GDI	X	LR7. Hospital beds per 1000 people	8
	LR2. Gender-related Development Index, GDI	X	LR8. Environmental Sustainability Index, ESI	2
	LR3. Social expenditures on pensions, health and education as a percent of GDP.	X	LR4. Governance Index.	7.2
	LR3. Social expenditures on pensions, health and education as a percent of GDP.	X	LR5. Infrastructure and housing insurance as a percent of GDP.	4.8

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X	LR3. Social expenditures on pensions, health and education as a percent of GDP.		LR6. Television sets per 1000 people.	7.6
X	LR3. Social expenditures on pensions, health and education as a percent of GDP.		LR7. Hospital beds per 1000 people	3.2
X	LR3. Social expenditures on pensions, health and education as a percent of GDP.		LR8. Environmental Sustainability Index, ESI	6
X	LR4. Governance Index.		LR5. Infrastructure and housing insurance as a percent of GDP.	3.4
X	LR4. Governance Index.		LR6. Television sets per 1000 people.	8.6
X	LR4. Governance Index.		LR7. Hospital beds per 1000 people	7.2
X	LR4. Governance Index.		LR8. Environmental Sustainability Index, ESI	7.4
X	LR5. Infrastructure and housing insurance as a percent of GDP.		LR6. Television sets per 1000 people.	8.6
X	LR5. Infrastructure and housing insurance as a percent of GDP.		LR7. Hospital beds per 1000 people	8
X	LR5. Infrastructure and housing insurance as a percent of GDP.		LR8. Environmental Sustainability Index, ESI	6.6
	LR6. Television sets per 1000 people.	X	LR7. Hospital beds per 1000 people	6
	LR6. Television sets per 1000 people.	X	LR8. Environmental Sustainability Index, ESI	5.2
X	LR7. Hospital beds per 1000 people		LR8. Environmental Sustainability Index, ESI	4.25

7. Risk Identification Indicators

Indicator	2005
RI1. Systematic inventory of disasters and losses.	2. Incipient
RI2. Hazard monitoring and forecasting.	2. Incipient
RI3. Hazard evaluation and mapping.	2. Incipient
RI4. Vulnerability and risk assessment.	1. Low
RI5. Public information and community participation.	2. Incipient
RI6. Risk management training and education.	2-1. Incipient-Low

8. Budgetary designation (weigh) to Risk Identification Indicators

Indicator and Levels of Fulfill	Estimation
RI1. Systematic inventory of disasters and losses.	15
RI2. Hazard monitoring and forecasting.	15
RI3. Hazard evaluation and mapping.	20
RI4. Vulnerability and risk assessment.	20
RI5. Public information and community participation.	15
RI6. Risk management training and education.	15

9. Importance factor allocation to Risk Identification Indicators

Which of the indicators is perceived as the most important?				In which degree?
X	RI1. Systematic inventory of disasters and losses	X	RI2. Hazard monitoring and forecasting.	1
	RI1. Systematic inventory of disasters and losses	X	RI3. Hazard evaluation and mapping.	5
	RI1. Systematic inventory of disasters and losses	X	RI4. Vulnerability and risk assessment.	8
	RI1. Systematic inventory of disasters and losses	X	RI5. Public information and community participation	2
	RI1. Systematic inventory of disasters and losses	X	RI6. Risk management training and education.	2
	RI2. Hazard monitoring and forecasting.	X	RI3. Hazard evaluation and mapping.	3
	RI2. Hazard monitoring and forecasting.	X	RI4. Vulnerability and risk assessment.	5
	RI2. Hazard monitoring and forecasting.	X	RI5. Public information and community participation	3
	RI2. Hazard monitoring and forecasting.	X	RI6. Risk management training and education.	3
X	RI3. Hazard evaluation and mapping.	X	RI4. Vulnerability and risk assessment.	1
X	RI3. Hazard evaluation and mapping.		RI5. Public information and community participation	2
X	RI3. Hazard evaluation and mapping.		RI6. Risk management training and education.	3
X	RI4. Vulnerability and risk assessment.		RI5. Public information and community participation	5
X	RI4. Vulnerability and risk assessment.		RI6. Risk management training and education.	5
X	RI5. Public information and community participation	X	RI6. Risk management training and education.	1

10. Risk Reduction Indicators

Indicator	2005
RR1. The extent to which risk is taken into account in land use and urban planning.	1. Low
RR2. Management of river basins and environmental protection.	1. Low
RR3. Implementation of control and protection techniques prior to hazard events.	1. Low
RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	1. Low
RR5. Updating and enforcement of safety standards and construction codes.	2. Incipient
RR6. Reinforcement and retrofitting of public and private assets.	1. Low

11. Estimated allocation (weigh) to Risk Reduction Indicators

Indicator and Performance levels	Estimation
RR1. The extent to which risk is taken into account in land use and urban planning.	18
RR2. Management of river basins and environmental protection.	18
RR3. Implementation of control and protection techniques prior to hazard events.	14
RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	14
RR5. Updating and enforcement of safety standards and construction codes.	18
RR6. Reinforcement and retrofitting of public and private assets.	18

12. Importance factor allocation to Risk Reduction Indicators

Which of the indicators is perceived as the most important?			In which degree?
X	RR1. The extent to which risk is taken into account in land use and urban planning.	RR2. Management of river basins and environmental protection.	5
X	RR1. The extent to which risk is taken into account in land use and urban planning.	RR3. Implementation of control and protection techniques prior to hazard events.	6
X	RR1. The extent to which risk is taken into account in land use and urban planning.	RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	6
X	RR1. The extent to which risk is taken into account in land use and urban planning.	X RR5. Updating and enforcement of safety standards and construction codes	1
X	RR1. The extent to which risk is taken into account in land use and urban planning.	RR6. Reinforcement and retrofitting of public and private assets.	5
X	RR2. Management of river basins and environmental protection.	X RR3. Implementation of control and protection techniques prior to hazard events.	1
X	RR2. Management of river basins and environmental protection.	RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	5
	RR2. Management of river basins and environmental protection.	X RR5. Updating and enforcement of safety standards and construction codes	2
X	RR2. Management of river basins and environmental protection.	X RR6. Reinforcement and retrofitting of public and private assets.	1
X	RR3. Implementation of control and protection techniques prior to hazard events.	RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	5
	RR3. Implementation of control and protection techniques prior to hazard events.	X RR5. Updating and enforcement of safety standards and construction codes	5
	RR3. Implementation of control and protection techniques prior to hazard events.	X RR6. Reinforcement and retrofitting of public and private assets.	5
	RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	X RR5. Updating and enforcement of safety standards and construction codes	5
	RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	X RR6. Reinforcement and retrofitting of public and private assets.	3
X	RR5. Updating and enforcement of safety standards and construction codes.	RR6. Reinforcement and retrofitting of public and private assets.	2

13. Disaster Management Indicators

Indicator	2005
DM1. Organization and coordination of emergency operations.	1.Low-2
DM2. Emergency response planning and implementation of warning systems.	1. Low-2
DM3. Supply of equipment, tools and infrastructure.	2. Incipient-1
DM4. Simulation, updating and testing of inter-institutional response capability.	1. Low-2
DM5. Community preparedness and training.	2. Incipient-3
DM6. Rehabilitation and reconstruction planning.	1. Low-2

14. Estimated allocation (weigh) to Disaster Management Indicators

Indicator and Performance Levels	Estimation
DM1. Organization and coordination of emergency operations.	20
DM2. Emergency response planning and implementation of warning systems.	20
DM3. Supply of equipment, tools and infrastructure.	12
DM4. Simulation, updating and testing of inter-institutional response capability.	13
DM5. Community preparedness and training.	20
DM6. Rehabilitation and reconstruction planning.	15

15. Importance factor allocation to Disaster Management Indicators

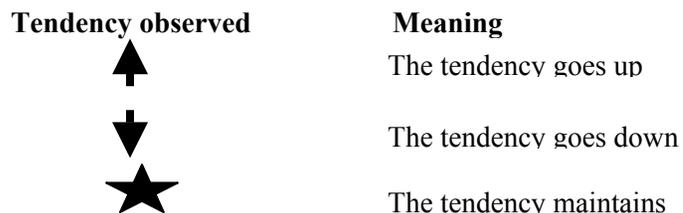
15. Importance factor allocation to Disaster Management Indicators				
Which of the indicators is perceived as the most important?			In which degree?	
X	DM1 Organization and coordination of emergency operations.	X	DM2. Emergency response planning and implementation of warning systems.	1
X	DM1. Organization and coordination of emergency operations.		DM3. Supply of equipment, tools and infrastructure	3
X	DM1. Organization and coordination of emergency operations.		DM4. Simulation, updating and testing of inter-institutional response capability	5
X	DM1. Organization and coordination of emergency operations.		DM5. Community preparedness and training.	2
X	DM1. Organization and coordination of emergency operations.		DM6. Rehabilitation and reconstruction planning	5
X	DM2. Emergency response planning and implementation of warning systems.		DM3. Supply of equipment, tools and infrastructure	5
X	DM2. Emergency response planning and implementation of warning systems.		DM4. Simulation, updating and testing of inter-institutional response capability	2
X	DM2. Emergency response planning and implementation of warning systems.	X	DM5. Community preparedness and training.	1
X	DM2. Emergency response planning and implementation of warning systems.		DM6. Rehabilitation and reconstruction planning	2
X	DM3. Supply of equipment, tools and infrastructure	X	DM4. Simulation, updating and testing of inter-institutional response capability	1
	DM3. Supply of equipment, tools and infrastructure	X	DM5. Community preparedness and training.	5
	DM3. Supply of equipment, tools and infrastructure	X	DM6. Rehabilitation and reconstruction planning	3
	DM4. Simulation, updating and testing of inter-institutional response capability	X	DM5. Community preparedness and training.	5
	DM4. Simulation, updating and testing of inter-institutional response capability	X	DM6. Rehabilitation and reconstruction planning	3
X	DM5. Community preparedness and training.		DM6. Rehabilitation and reconstruction planning	5

16. Estimated allocation (weigh) of Governance and Financial Protection Indicators

Indicator and Performance levels	Estimation
FP1. Decentralized organizational units, inter-institutional and multisector coordination.	2. Incipient-1
FP2. Availability of resources for institutional strengthening.	1. Low
FP3. Budget allocation and mobilization.	1. Low-2
FP4. Existence of social safety nets and funds.	2. Incipient-1
FP5. Insurance coverage and loss transfer strategies for public assets.	1. Low-2
FP6. Housing and private sector insurance and reinsurance coverage.	1. Low-2

A. Explanatory tables of Ecuador’s current situation for the PVI and RMI Indicators

Within these explanatory tables there is a column that refers to the tendency observed for each indicator and are represented by the following signs:



Indicators of Exposure and Susceptibility

Indicator	Desired Tendency: ∨	What we can do to revert the tendency?	¿ Do we have control through risk management to do it?	¿What we possibly do?	¿What should be done and by who?
	Tendency Observed				
ES1. Population growth, average annual rate.	↑	- Birth rate control - Education	NO		
ES2. Urban growth, avg. annual rate (%)	↑	- Investment at the field - Decentralization	NO		Urban development component implementation in the sectorial risk prevention plans.
ES3. Population density (people/5km2).	↑	- Investment at the field - Decentralization - Deconcentration	NO		Make territorial order laws being fulfilled.
ES4. Poverty, population living on less than US\$1 per day PPP.	↑	- Investment at the field - Better richness distribution	NO		
ES5. Capital stock in millions US dollar per thousand square kilometers.	↑	- Deconcentration - Rural Investment - Economic bonuses	NO		
ES6. Imports and exports of goods and services as a percent of GDP.	↑		NO		

“Potential disaster risk reduction strategy elements in Ecuador”

ES7. Gross domestic fixed investment as a percent of GDP.	↑	Don't want the tendency to be reverted	NO		
ES8. Arable land and permanent crops as a percent of land area.	↑	Don't want the tendency to be reverted.	NO		

Indicators of Socioeconomic Fragility

Indicator	Desired Tendency: ↓	What we can do to revert the tendency?	¿Do we have control through risk management to do it?	¿What we possibly do?	¿What should be done and by who?
	Tendency Observed				
SF1. Human Poverty Index, HPI-1.	↓	<ul style="list-style-type: none"> - Education, Health and Security - Investment at the field - Richness redistribution - Improve social security 	NO		Carry out what is stipulated in the national budget for investment in social expenses.
SF2. Dependents as a proportion of the working age population.	↑	<ul style="list-style-type: none"> - Improve social security - Education, health - Richness redistribution - Investment at the field 	NO		
SF3. Inequality as measured by the Gini coefficient.	↑	<ul style="list-style-type: none"> - Investment at the field - Richness redistribution - Education, health, security 	NO		The Ministry of Economy should invest in programs for covering the basic needs
SF4. Unemployment as percent of the total labor force.	↑	<ul style="list-style-type: none"> - More public and private investment - Investment at the field 	NO		
SF5. Annual increase in food prices (%).	↑	<ul style="list-style-type: none"> - Major production and productivity - Adequate economic and monetary policy 	NO		
SF6. Share of agriculture in total GDP growth (annual %).	↓	<ul style="list-style-type: none"> - Major investment in industry and services. 	NO		Invest in other sectors (industry and services)

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SF7. Debt service burden as a percent of GDP.	↓	- International policy debt and debt exchange	NO		*Implement mechanisms for debt exchange for investing in vulnerability reduction programs.
SF8. Soil degradation resulting from human activities (GLASOD).	↑	- Education - Better practices	NO	* Better practices training *Crops diversification * Investment alternative sources	* MAG and IICA must reconsider land use in the country.

Indicators of Resilience

Indicator	Desired Tendency: ↑	What we can do to revert the tendency?	¿Do we have control through risk management to do it?	¿What we possibly do?	¿What should be done and by who?
	Tendency Observed				
LR1. Human Development Index	↑	Invest in Education, Health and Social Security Increase non petroleum richness Improve richness redistribution	NO		Invest in health and education programs (UNDP, MEC, PHM)
LR2. Gender-related Development Index, GDI	↑	Implement specific policies with gender approach Improve education levels	NO		Include gender variable in all development programs (CONAMU, UNDP)
LR3. Social expenditures on pensions, health and education as a percent of GDP	↑	Reduce the service of the debt Optimize the expense	NO	Better accomplishment of what is stipulated in the social budget for social projects	
LR4. Governance Index	↓	Improve education levels Improve the system of justice	NO		Governance and corruption control project (USAID, Citizenship Participation, Esquel Foundation)
LR5. Infrastructure and housing insurance as a percent of GDP	★	Implement specific laws, incentives with clear conceptions of risk transference and acceptance.	SI	Laws and incentives for insurance	
LR6. Television sets per 1000 people.	↑	Improve the access to electric light Improve media coverage and quality.	NO	Early alert systems allow to have more instruments	
LR7. Hospital beds per 1000 people.	★	Make more investments in health sector	NO		Improve hospital infrastructure and equipments (World Bank, PHM)

<p>LR8. Environmental Sustainability Index, ESI</p>		<p>Implement environmental education plans and environmental policies.</p>	<p>SI</p>	<ul style="list-style-type: none"> * Reforestation * Correction of hydrographic beds * Correction and protection of slopes. * Liberation and protection of natural drainages for timely evacuate floodwaters. * Flood Control Infrastructure and processes. * Appropriate integral management of waste and residues, toxic and hazard materials. 	<p>Improve the environmental law (Environment Management Law, Forestry Law, Unified Text of Secondary Legislation, Ministry of Environment)</p>
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Risk Identification Indicators

Indicator	Desired Tendency: ↑	Estimated weigh	Performance levels
	Tendency Observed		
R11. Systematic disaster and loss inventory.	↑	2. Incipient	<ol style="list-style-type: none"> 1. Some basic and superficial data on the history of events that have affected the city. 2. Continual registering of current events, incomplete catalogues of the occurrence of some phenomena and limited information on losses and effects. 3. Some complete catalogues at the national and regional levels, systematization of actual events and their economic, social and environmental effects. 4. Complete inventory and multiple catalogues of events; registry and detailed systematization of effects and losses at the local level. 5. Detailed inventory of events and effects for all types of existing hazards and databases at the sub-national and local levels.
R12. Hazard monitoring and forecasting.	↑	2. Incipient	<ol style="list-style-type: none"> 1. Minimum and deficient instrumentation of some important phenomena. 2. Basic instrumentation networks with problems of updated technology and continuous maintenance. 3. Some networks with advanced technology at the national level or in particular areas; improved prognostics and information protocols established for principal hazards. 4. Good and progressive instrumentation cover at the national level, advanced research in the matter on the majority of hazards, and some automatic warning systems working. 5. Wide coverage of station and sensor networks for all types of hazard in all the city; permanent and opportune analysis of information and automatic early warning systems working continuously at the local, regional and national levels.
R13. Hazard evaluation and mapping.		2. Incipient	<ol style="list-style-type: none"> 1. Superficial evaluation and basic maps covering the influence and susceptibility of some phenomena. 2. Some descriptive and qualitative studies of susceptibility and hazard for principle phenomena at the national scale and for some specific areas. 3. Some hazard maps based on probabilistic techniques for the national level and for some regions. Generalized use of GIS for mapping the principle hazards. 4. Evaluation is based on advanced and adequate resolution methodologies for the majority of hazards. Microzonation of the city based on probabilistic techniques. 5. Detailed studies for the vast majority of potential phenomena throughout the city using advanced methodologies; high technical capacity to generate knowledge on its hazards.
R14. Vulnerability and risk management.	↓	1. Low	<ol style="list-style-type: none"> 1. Identification and mapping of the principle elements exposed in prone zones in the city. 2. General studies of physical vulnerability when faced with the most recognized hazards, using GIS having into account basins inside and near the city. 3. Evaluation of potential damage and loss scenarios for some physical phenomena in the

			<p>principal cities. Analysis of the physical vulnerability of some essential buildings.</p> <p>4. Detailed studies of risk using probabilistic techniques taking into account the economic and social impact of the majority of hazards in some cities. Vulnerability analysis for the majority of essential buildings and lifelines.</p> <p>5. Generalized evaluation of risk, considering physical, social, cultural and environmental factors. Vulnerability analysis also for private buildings and the majority of lifelines.</p>
R15. Public information and community participation.	★	2. Incipient	<p>1. Sporadic information on risk management in normal conditions and more frequently when disasters occur.</p> <p>2. Press, radio and television coverage oriented towards preparedness in case of emergency. Production of illustrative materials on dangerous phenomena.</p> <p>3. Frequent opinion programs on risk management issues at the national and local levels. Guidelines for vulnerability reduction. Work with communities and NGOs.</p> <p>4. Generalized diffusion and progressive consciousness; conformation of some social networks for civil protection and NGOs that explicitly promote local risk management issues and practice.</p> <p>5. Wide scale participation and support from the private sector for diffusion activities. Consolidation of social networks and notable participation of professionals and NGOs at all levels.</p>
R16. Risk management training and education.	▲	2-1. Incipient Low	<p>1. Incipient incorporation of hazard and disaster topics in formal education and programs for community participation.</p> <p>2. Some curricular adjustments at the primary and secondary levels. Production of teaching guides for teachers and community leaders in some localities or districts of the city.</p> <p>3. Progressive incorporation of risk management in curricula. Considerable production of teaching materials and undertaking of frequent courses for community training.</p> <p>4. Widening of curricular reform to higher education programs. Specialization courses offered at various universities. Wide-ranging community training at the local level.</p> <p>5. High technical capacity of the city to generate risk knowledge. Wide-ranging production of teaching materials. Permanent schemes for community training.</p>

Risk Reduction Indicators

Indicator	Desired Tendency: ⤴	Estimate weigh	Performance levels
	Tendency observed		
RR1. The extent to which risk is taken into account in land use and urban planning.	★	1. Low	<ol style="list-style-type: none"> 1. Consideration of some means for identifying risk, and environmental protection in physical planning. 2. Promulgation of national legislation and some local regulations that consider some hazards as a factor in territorial organization and development planning. 3. Progressive formulation of land use regulations in various cities that take into account hazards and risks; obligatory design and construction norms based on microzonations. 4. Wide ranging formulation and updating of territorial organization plans with a preventive approach in the majority of municipalities. Use of microzonifications with security ends. Risk management incorporation into sectorial plans. 5. Approval and control of implementation of territorial organization and development plans that include risk as a major factor and the respective urban security regulations.
RR2. Management of river basins and environmental protection.	⤵	1. Low	<ol style="list-style-type: none"> 1. Inventory of basins and areas of severe environmental deterioration or house considered to be most fragile. 2. Promulgation of legal dispositions that establish the obligatory nature of reforestation, environmental protection and river basin planning. 3. Formulation of the plan for organization and intervention in strategic water basins and sensitive zones taking into account risk and vulnerability aspects. 4. Environmental protection plans and impact studies that consider risk a factor in determining investment decisions. 5. Intervention of deteriorated basins, sensitive zones and strategic ecosystems. Environmental intervention and protection plans.
RR3. Implementation of control and protection techniques prior to hazard events.	★	1. Low	<ol style="list-style-type: none"> 1. Some structural control and stabilization measures in some more dangerous places. 2. Channeling works, sanitation and water treatment constructed following security norms. 3. Establishment of measures and regulations for the design and construction of hazard control and protection works in harmony with territorial organization dictates. 4. Wide scale intervention in mitigable risk zones using protection and control measures. 5. Wide implementation of mitigation plans and adequate design and construction of cushioning, stabilizing, dissipation and control works in order to protect human settlements and social investment.
RR4. Relocation of persons living in disaster prone areas and improvements to housing in those areas.	⤵	1. Low	<ol style="list-style-type: none"> 1. Identification and inventory of marginal human settlements located in hazard prone areas. 2. Promulgation of legislation establishing the priority of dealing with deteriorated urban areas at risk for improvement programs and social interest housing development. 3. Programs for upgrading the surroundings, existing housing, and relocation from risk areas. 4. Progressive intervention of human settlements at risk and adequate treatment of cleared areas.

			5. Notable control of risk areas of the city and relocation of the majority of housing constructed in non-mitigable risk zones.
RR5. Updating and enforcement of safety standards and construction codes.		2. Incipient	<ol style="list-style-type: none"> 1. Voluntary use of norms and codes from other countries without major adjustments. 2. Adaptation of some requirements and specifications according to some national and local criteria and particularities. 3. Promulgation and updating of obligatory urban norms based on international or national norms that have been adjusted according to the hazard evaluations. 4. Technological updating of the majority of security and construction code norms for new and existing buildings with special buildings and life lines. 5. Permanent updating of codes and security norms: establishment of local regulations for construction in the city based on urban microzonations, and their strict control and implementation.
RR6. Reinforcement and retrofitting of public and private assets.		1. Low	<ol style="list-style-type: none"> 1. Retrofitting and sporadic adjustments to buildings and lifelines; remodeling, changes of use or modifications. 2. Promulgation of intervention norms as regards the vulnerability of existing buildings. Strengthening of essential buildings such as hospitals or those considered indispensable. 3. Some mass programs for evaluating vulnerability, rehabilitation and retrofitting of hospitals, schools, and the central offices of life line facilities. Obligatory nature of retrofitting. 4. Progressive number of buildings retrofitted, lifelines intervened, some buildings of the private sector retrofitted autonomously or due to fiscal incentives given by government. 5. Massive retrofitting of principal public and private buildings. Permanent programs of incentives for housing rehabilitation lead to lower socio-economic sectors.

Disaster Management Indicators

Indicator	Desired Tendency: ⤴	Estimate weight	Performance levels
	Tendency observed:		
DM1. Organization and coordination of emergency operations.	★	1. Low	<ol style="list-style-type: none"> 1. Different organizations attend emergencies but lack resources and various operate only with voluntary personnel. 2. Specific legislation defines an institutional structure, roles for operational entities and coordination of emergency commissions throughout the territory. 3. Considerable coordination exists in some localities or districts of the city, between organizations in preparedness, communications, search and rescue, emergency networks, and management of temporary shelters. 4. Permanent coordination for response between operational organizations, public services, local authorities and civil society organizations in the majority of localities or districts. 5. Organization models that involve structures of control, instances of resources coordination and management. Advanced levels of interinstitutional organization between public, private and community based bodies.
DM2. Emergency response planning and implementation of warning systems.	★	1. Low	<ol style="list-style-type: none"> 1. Basic emergency and contingency plans exist with checklists and information on available personnel. 2. Legal regulations exist that establish the obligatory nature of emergency plans. Articulation exists with technical information providers at the national level. 3. Protocols and operational procedures are well defined in the city. Various prognosis and warning centers operate continuously. 4. Emergency and contingency plans are complete and associated with information and warning systems in the majority of localities or districts. 5. Response preparedness based on probable scenarios in all localities or districts. Use of information technology to activate automatic response procedures.
DM3. Supply of equipment, tools and infrastructure.	★	1. Low-2	<ol style="list-style-type: none"> 1. Basic supply and inventory of resources only in the operational organizations and emergency commissions. 2. Center with reserves and specialized equipment for emergencies at national level and in some localities or districts. Inventory of resources in other public and private organizations. 3. Emergency Operations Center, which is well stocked with communication equipment and adequate registry systems. Specialized equipment and reserve centers exist in various localities or districts. 4. EOCs are well equipped and systematized in the majority of localities or districts. Progressive complimentary stocking of operational organizations. 5. Interinstitutional support networks between reserve centers and EOCs are working permanently. Wide ranging communications, transport and supply facilities exist in case of emergency.
DM4. Simulation, updating and testing of inter-institutional response capability.	★	1. Low-2	<ol style="list-style-type: none"> 1. Some internal and joint institutional simulations between operational organizations exist in the city. 2. Sporadic simulation exercises for emergency situations and institutional response exist with all operational organizations. 3. Desk and operational simulations with the additional participation of public service entities and local administrations in various localities or districts. 4. Coordination of simulations with community, private sector and media at the local level, and in some localities or districts. 5. Testing of emergency and contingency plans and updating of operational procedures based on frequent simulation

			exercises in the majority of localities.
DM5. Community preparedness and training.	▲	2. Incipient-1	<ol style="list-style-type: none"> 1. Informative meetings with community in order to illustrate emergency procedures during disasters. 2. Sporadic training courses with civil society organizations dealing with disaster related themes. 3. Community training activities are regularly programmed on emergency response in coordination with community development organizations and NGOs. 4. Courses are run frequently with communities in the majority of cities and municipalities on preparedness, prevention and reduction of risk. 5. Permanent prevention and disaster response courses in all municipalities within the framework of a training program in community development and in coordination with other organizations and NGOs.
DM6. Rehabilitation and reconstruction planning.	★	1. Low-2	<ol style="list-style-type: none"> 1. Design and implementation of rehabilitation and reconstruction plans only after important disasters. 2. Planning of some provisional recovery measures by public service institutions and those responsible for damage evaluation. 3. Diagnostic procedures, reestablishment and repairing of infrastructure and production projects for community recovery. 4. Ex ante undertaking of recovery plans and programs to support social recovery, sources of employment and productive means for communities. 5. Generalized development of detailed information plans dealing with physical damage and social recovery based on risk scenarios. Specific legislation exists and anticipated measures for reactivation.

Governance and Financial Protection Indicators

Indicator	Desired Tendency: ▲	Estimate weigh	Performance levels
	Tendency observed:		
FP1. Decentralized organizational units, inter-institutional and multisector coordination.	★	2 Incipient	<ol style="list-style-type: none"> 1. Basic organizations in commissions, principally with an emergency response approach. 2. Interinstitutional and multisectorial organization for the integral management of risk. 3. Interinstitutional risk management systems active. Work in the design of public policies for vulnerability reduction. 4. Continuous and decentralized implementation of risk management projects associated with programs of environmental protection, energy, sanitation and poverty reduction. 5. Expert personnel with wide experience incorporating risk management in sustainable human development planning in major cities. High technology information systems available.
FP2. Availability of resources for institutional strengthening.	★	1 Low	<ol style="list-style-type: none"> 1. A reserve fund does not exist for a city. City depends of national disaster or calamity funds. 2. City depends on economic support from national level. International resources management is made. Incipient risk management strengthens. 3. Some occasional fund to co-finance risk management projects in the city exist in an interinstitutional way. 4. A reserve fund in the city exists, regulated for project so financing institutional strengthens and recovering in case of disaster. 5. A reserve fund operates in the city. Financial engineering for the design of retention and risk transfer instruments.
FP3. Budget allocation and mobilization.	★	1 Low	<ol style="list-style-type: none"> 1. Limited allocation of national budget to competent institutions for emergency response. 2. Legal norms establishing budgetary allocations to local level organizations with risk management objectives. 3. Legally specified specific allocations for risk management at the local level and the frequent undertaking of interadministrative agreements for the execution of prevention projects. 4. Progressive allocation of discretionary expenses at the national and municipal level for vulnerability reduction, the creation of incentives and rates of environmental protection and security. 5. Local orientation and support for loans requested by municipalities and sub national and local organizations from multilateral loan organizations.
FP4. Existence of social safety nets and funds.	★	2 Incipient	<ol style="list-style-type: none"> 1. Sporadic subsidies to communities affected by disasters or in critical risk situations. 2. Permanent social investment funds created to support vulnerable communities focusing on the poorest socioeconomic groups.

			<ol style="list-style-type: none"> 3. Social networks for the self-protection of means of subsistence of communities at risk and undertaking of post disaster rehabilitation and reconstruction production projects. 4. Regular micro-credit programs and gender oriented activities oriented to the reduction of human vulnerability. 5. Generalized development of social protection and poverty reduction programs integrated with prevention and mitigation activities throughout the territory.
FP5. Insurance coverage and loss transfer strategies for public assets.	↑	1 Low	<ol style="list-style-type: none"> 1. Very few public buildings are insured. 2. Obligatory insurance of public goods. Deficient insurance of infrastructure. 3. Progressive insurance of public goods and infrastructure. 4. Design of programs for the collective insurance of buildings and publicly rented infrastructure. 5. Analysis and generalized implementation of retention and transfer strategies for losses to public goods, considering reinsurance groups, risk titles, bonds, etc.
FP6. Housing and private sector insurance and reinsurance coverage.	★	1-2 Low Incipient	<ol style="list-style-type: none"> 1. Low percentage of private goods insured. Incipient, economically weak and little regulated insurance industry. 2. Regulation of insurance industry controls over solvency and legislation for insurance of house loan and housing sector. 3. Development of some careful insurance studies based on advanced probabilistic estimates of risk, using microzoning, auditing and optimum building inspection. 4. Design of collective housing insurance programs and for small businesses by the city and insurance companies with automatic coverage for the poorest. 5. Strong support for joint programs between government and insurance companies in order to generate economic incentives for risk reduction and mass insurance.

D. Examples of Risk Management Good Practices

1. **Pichincha slopes at Quito Metropolitan District:** In 1996 the Interamerican Development Bank and the Potable Water Municipal Company in Quito invested 30 USD million dollars for making a program for draining, floods and mud flows that were produced currently at the slopes of the Pichincha volcano, affecting nearby settlements.

The program also include a component for improving the existent technical information about the natural events that were occurring at the slopes and its effects over the city, it was focused on a better natural resources management and make the community aware about appropriate agricultural practices and environmental risk reduction existing at this zone.

2. **Construction of the Heavy Crude Pipeline against the Ecuadorian Pipeline System:** The Heavy Crude Pipeline (OCP) turn into the most modern infrastructure and the highest hydrocarbon technology in Ecuador in 2004, the time when it started to operate.

At its 500 Km from the Amazonia to Esmeraldas, the pipes were buried 98%, crosses 25 kilometers of protected areas and reserve zones, where strict environmental controls and ecologist pressure force the contractors to use the most modern technology for reducing risks to possible natural hazards. The OCP counts with the highest technology: a sophisticated communications system, optic fiber, satellite support and authomatized control systems.

The OCP construction applied physical measures that guaranteed the pipe stability and avoid the beginning of erosive processes.

In hilly slope zones, soil barriers in a fish spine form can also be put for reducing the hillside water erosion and avoid the beginning of erosion processes over the trail that can affect the pipe stability.

In recovered slop cut zones where the trail crosses borning gullies, transversal lateral drainage channels will be constructed to prevent the water run off by those gullies and pull along laterally the recomposition material of the trail.

After the construction there will be a permanent stability slopes monitoring, erosion control and revegetation success.

3. **Potable water management at Quito Metropolitan District:** One of the main goals of the mayor of Quito has been water quality and management, with the supply of potable water sources until 2015 through Salve Faccha projects, hand in march 2002 and La Mica-Quito South Project, for being complimentary sources in the provision of potable water, after Papallacta, the principal source of Quito that became vulnerable with the OCP construction (Heavy Crude Pipeline). That’s why; the Municipality started these projects and today they are concluded.

The Salve Faccha Dam is located at the northwestern region of the Ecuadorian territory, within the Cayambe-Coca Ecological Reserve at the Napo province that has a storage capacity of 10.5 million cubic meters, increasing the water flow for the city in about 1.000 liters per second, this quantity makes possible flow management and regulation and reduces the pumping of the Papallacta system, also increases the potable water distribution to vast sectors in Quito that had been suffering unsupplied for many years. The total investment in this work was 13 millions three hundred thousand dollars approximately made by Charities

Aid Foundation (CAF), EMAAP (Potable Water Municipal Company) own resources and Quito Municipality.

E. DDI estimate at the petroleum sector

PETROLEUM SECTOR	INCOMES/REPLACEMENT COST	POTENTIAL LOSSES		
NUMERATOR: LOSSES	USD MILLIONS IN 2006 BUDGET	1 YEAR INTERRUPTION SCENARIO	9 MONTH INTERRUPTION SCENARIO	6 MONTH INTERRUPTION SCENARIO
Exports	926	926	694.5	463
Intern Fuel Sells	364	120.12	90.09	60.06
Import Additional fuels	300	300	225	150
Other Petroleum companies	316	252.8	189.6	126.4
Private Petroleum companies	185	185	138.75	92.5
	2091	1783.92	1337.94	891.96

DIRECT DAMAGES	MILLION USD IN ACTUAL PRICE	TOTAL LOST SCENARIO	75% LOST SCENARIO	50% LOST SCENARIO
Pipeline	100	100	75	50
Storage tanks	200	200	150	100
Loading float	20	20	15	10
Rooms facility operation+ACC	40	40	30	20
Refinery	600	600	450	300
Poliducto	20	20	15	10
Thermic Esmeraldas	70	70	52.5	35
	1050	1050	787.5	525

DENOMINATOR: AVAILABLE FUNDS		MAXIMUM FUNDS SCENARIO	POSSIBLE FUNDS SCENARIO	PROBABLE FUNDS SCENARIO
Insurance and Reassurance	3079	787.5	787.5	787.5
Reserve funds for disasters (CEREPS)	313	313	313	313
Aids and donations	50	50	50	50
New taxes	50	50	50	50
Budgetary reallocations	115	115	86.25	57.5
External credit (Renegotiation)	300	300	225	150
Internal credit	50	50	37.5	25
(Cat Bonds)				
SUSTAINABLE RESOURCES SUM		1665.5	1549.25	1433

	TOTAL LOST VS MAXIMUM FUNDS	75% LOST VS POSSIBLE FUNDS	50% LOST VS PROBABLE FUNDS	75% LOST VS PROBABLE FUNDS	TOTAL LOST VS PROBABLE FUNDS	50% LOST VS MAXIMUM FUNDS
(PETROLEUM) DDI	1.70154308	1.371915443	0.988806699	1.483210049	1.977613398	0.85077154
						1.457582971

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- Duval Llaguno-Interamerican Development Bank-Ecuador (IDB)
- Economist Patricio Salas – Director of the Ecuadorian Insurance Association (ACOSE)
- General Fernando Grijalva-Civil Defense Director

- General Gutierrez-Civil Defense Sub director
- Ing. Augusto Arias- Subsecretario de Inversión Pública, Ministerio de Economía y Finanzas
- Rodrigo Barreto- Oficial de Programa Gestión de Riesgos, Programa de las Naciones Unidas para el Desarrollo (PNUD)
- Rodrigo Pareja-Ecuadorian Municipalities Association (AME)
- Steven Stone-Interamerican Development Bank-Ecuador (IDB)
- Ma. Augusta Banda- Environment Area, Pichincha Provincial Government
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- Ma. Sol Yépez y Steffany Espinoza-CONCOPE
- Ing. Gloria Roldán-PREDECAN
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