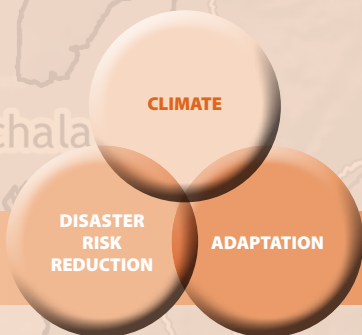


Vulnerability, Risk Reduction, and Adaptation to Climate Change

ECUADOR



GFDRR
Global Facility for Disaster Reduction and Recovery



COUNTRY OVERVIEW

AT A GLANCE

Ecuador is located in the northwestern part of South America and borders Colombia, Peru and the Pacific Ocean. The country has a total area of 248,513 km² and a population of over 13.6 million inhabitants.¹ Ecuador is highly exposed to El Niño events, floods and associated landslides. The country faces numerous environmental and socioeconomic challenges, such as erosion and unregulated land use, desertification, deforestation, overexploitation of resources, pollution, poverty, health problems, and high population density in the coastal and mountain regions, which make it extremely vulnerable to a changing climate.²

Key Sectors

Forestry
Agriculture
Coastal Ecosystems
Water Resources

Within Ecuador, vulnerability across ethnic groups differs considerably. According to the 2001 Census, about 77 percent of the population considers itself mestizo, 10 percent white, 7 percent indigenous, 5 percent Afroecuadorian.³ Ecuador has a GDP of US\$ 57.2 million. The poverty rates, however, are disproportionately higher in the indigenous group: 87 percent for the entire ethnic group and 96 percent in the rural highlands, while for non-indigenous people the poverty rate is 61 percent.⁴ Poverty is greater in rural areas where the population has limited access to health, education, and sanitation.⁵ However, in the last decades, significant migration flows to the cities have changed the demographic dynamics of the country, increasing urban poverty rates as well.⁶

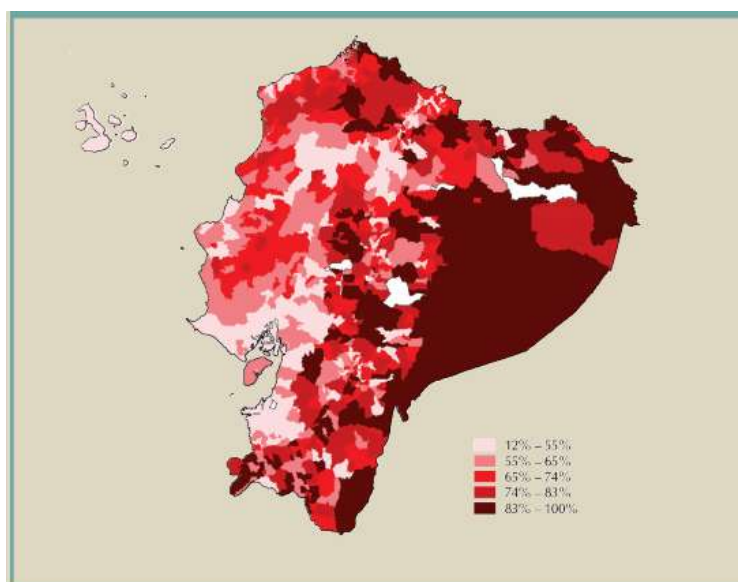


Figure 1: Incidence of poverty in Ecuador by Parish (2001)⁷

¹ World Bank data portal.2009.

² Ministry of Environment. 2000. National communication of the Republic of Ecuador to the United Nations Framework Convention on Climate Change. Quito: Ministry of Environment.

³ INEC. 2011. Ecuador en Cifras. Available in: <http://www.ecuadorencifras.com/cifras-inec/main.html>. Accessed on: April 08, 2011

⁴ Hall, G., Patrinos, H.A. (Eds.). 2005. *Indigenous Peoples, Poverty and Human Development in Latin America*. Palgrave Macmillan.

⁵ IFAD. Rural Poverty Portal. La pobreza rural en Ecuador. Available at <http://www.ruralpovertyportal.org/web/guest/country/home/tags/ecuador>. Accessed on: April 8th, 2011.

⁶ Ibid note 3

⁷ Araujo, M.C. 2007. The 1990 and 2001 Ecuador Poverty Maps. In *More Than a Pretty Picture*. Eds. Bedi, T., Coudouel, A., Simler, K. Washington, DC: The World Bank.

PRIORITY ADAPTATION MEASURES

In 2008, the Ministry of Environment proposed a National Policy and Strategy to fight climate change in Ecuador.⁸ Four general areas for intervention were prioritized, with specific emphasis on the need to build climate change adaptation capacity:

➔ Strengthening the national scientific capacity

- Strengthening of the institutional, technical, and scientific capacity of climate observation networks and systems
- Improvement and development of methodologies for vulnerability assessments, GHG emissions, and adaptation measures studies

➔ Climate system monitoring, GHG emissions registry and vulnerability assessments

- Regular climate system monitoring
- Regular update of GHG emissions inventory
- Integrated assessments of climate change vulnerability on national priority sectors

➔ GHG emissions mitigation and climate change adaptation

- Implementation of measures to mitigate GHG emissions
- Implementation of adaptation measures at the sectoral and intersectoral level
- Integrated planning and implementation of adaptation actions for highly vulnerable, poor, and densely populated zones
- Integrated planning and implementation of adaptation actions in production zones important for national food security

➔ Institutional capacity building and awareness raising

- Strengthening of institutions at the national and community level, public and private
- Climate change awareness and education campaigns

Other priority actions are highlighted below:⁹

- ➔ Revision and strengthening of the land use planning system. Better integration of disaster risk reduction criteria into the policies, strategies, mechanisms and instruments of the planning institutions.
- ➔ Strengthening of institutional capacity for strategic planning and coordination at the local level.
- ➔ Need to expand the scope of the monitoring systems and apply advanced technological tools for modeling and evaluation.
- ➔ Incorporation of risk management into new policies, strategies, and instruments of the development plan and land use planning.
- ➔ Building local capacity for disaster risk management and climate change adaptation.
- ➔ Development of a financial strategy to attend to post-disaster situations.

⁸ Ministerio del Ambiente del Ecuador. 2008. *Política y Estrategia Nacional sobre el Cambio Climático para el Ecuador*

⁹ GFDRR/World Bank. 2009. *Disaster Risk Management in Latin America and the Caribbean Region*. GFDRR Country Notes. Washington, DC: The World Bank.

CLIMATE BASELINE AND CLIMATE FUTURE

BASELINE CLIMATE

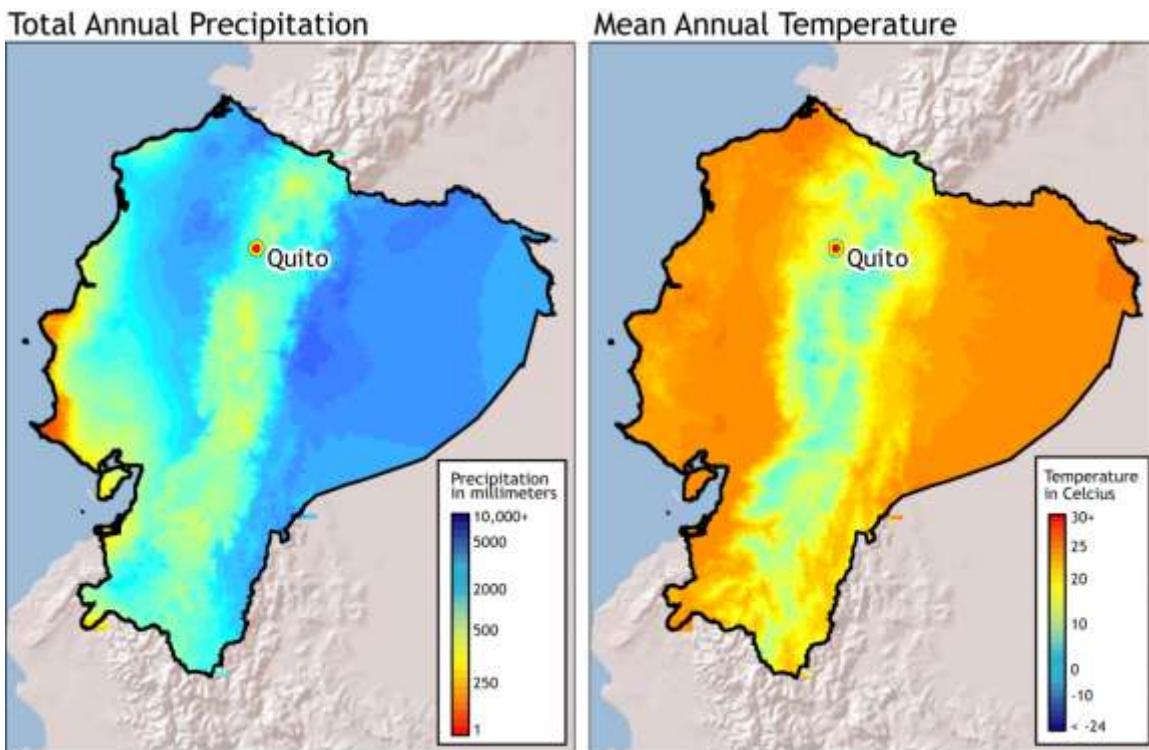


Figure 1: Climate baseline for Ecuador¹⁰

Ecuador has two major seasons that are differentiated by the distribution of rainfall (a rainy and a dry season).¹¹ The four regions that form the country have very distinct climates:¹²

- ➔ The **coast** has a tropical climate and a rainy season that extends from the end of December to May; the thermal regime is characterized by a 2 to 3° C variation between the hottest and coldest months.
- ➔ The **inter-Andean valleys** have a temperate climate and rainy season from October to May and a dry season from June to September; average monthly temperatures are about 14.5° C in the rainy season and 15° C in the dry season.
- ➔ The **Amazon Region** in the eastern part of the country experiences rainfall throughout the year; the average temperature is around 21° C during most months of the year.
- ➔ The **Island region** comprising the Galapagos Islands has a climate similar to that of the Coastal region. Average temperature is about 25/26°C during the rainy season (December to May) and 21/22° C during the dry season (June to November), mainly owing to the influence of the cold Humboldt current.

¹⁰ WorldClim 1960-1990 averages. Robert J. Hijmans, Susan Cameron, and Juan Parra, at the Museum of Vertebrate Zoology, University of California, Berkeley, in collaboration with Peter Jones and Andrew Jarvis (CIAT), and with Karen Richardson (Rainforest CRC). www.worldclim.org/current

¹¹ Ibid note 4.

¹² Ibid note 3.

RECENT CLIMATE TRENDS

Melting of glaciers, rising temperatures, and increase in extreme rainfall are trends that have been observed in regions of Ecuador. The following list is based on information from the National Communication of the Republic of Ecuador to the United Nations Framework Convention on Climate Change.¹³

- ➔ A trend toward rising temperatures has been identified, based on data from 14 stations located in different geographical regions of Ecuador.
- ➔ The rural highland zone (Cotopaxi station) has reported consistent results pointing to increasing temperature (change in mean temperature of 1.5° C).

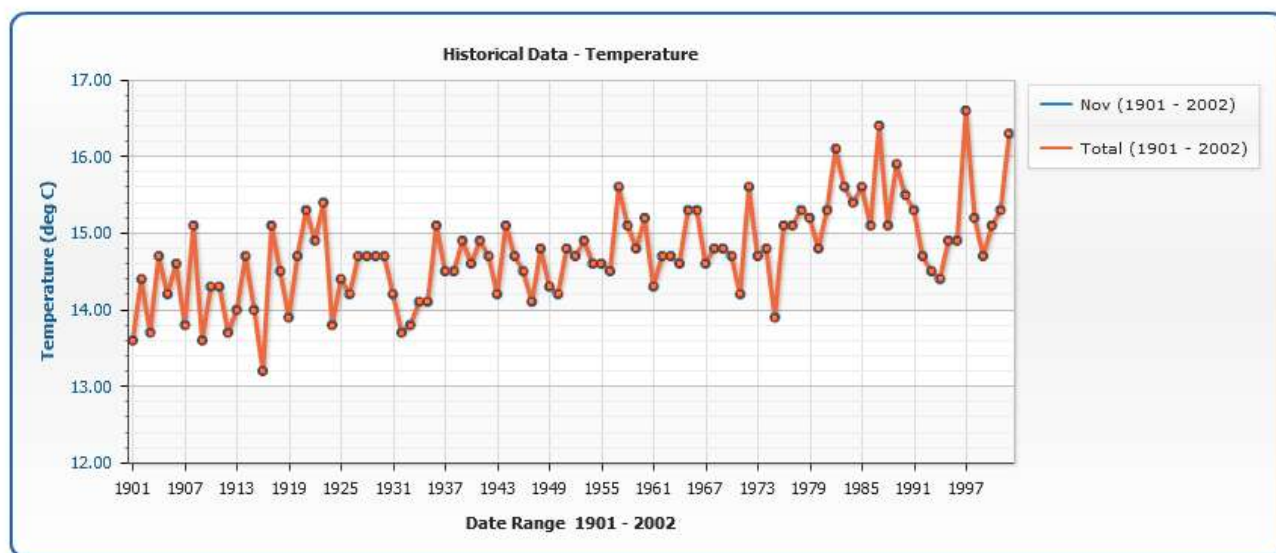


Figure 2: Historical data on temperatures for the month of November in central Ecuador (1901-2002)¹⁴

- ➔ There is no clear trend in precipitation changes at the national level, but a greater inclination toward decline in rainfall has been observed, especially on the coast.
- ➔ Increasing trend of rising temperature in water basins has been observed.
- ➔ The rural coastal zone does not show any clear positive trend in terms of temperature; however, the urban coastal zone shows a growing trend in terms of mean and extreme temperatures (between 0.5° C and 1° C in the case of mean temperature) and a declining rainfall trend.
- ➔ Positive trends in extreme rainfall have been observed on the western coast of Peru and Ecuador (1961-1990).¹⁵
- ➔ The length of glacier 15 in Mount Antisana has gradually diminished from 1956 to 1998. At over 4,555 meters above sea level, the glacier cover over has declined from 70% to 54% during that same period.
- ➔ High intensity ENSO events tend to diminish the mass-balance value of glaciers in Mount Antisana; during La Niña events the mass-balance value of glaciers tends to level out, sometimes even becoming positive.

¹³ See reference 2.

¹⁴ World Bank Climate Change Knowledge Portal. Available at: <http://sdwebx.worldbank.org/climateportal>

¹⁵ Marengo, J.A., R. Jones, L.M. Alves, M.C. Valverde. 2009. Future change of temperature and precipitation extremes in South America as derived from the PRECIS regional climate modeling system. *International Journal of Climatology*, v. 29, issue 15.

- ➔ There are increasing trends of cold nights in northern Peru and Ecuador, possibly linked to increases in the maximum dry spell length in this region (1961-1990).¹⁶

CLIMATE FUTURE

The climate science community sources a suite of models to inform decision makers on future climate. GCMs (Global Climate Models), RCMs (Regional Climate Models), downscaling techniques (both empirical and statistical), and several comprehensive reviews are available on the subject. GCMs are our primary source of information about future climate (Table 1). They comprise simplified but systematically rigorous interacting mathematical descriptions of important physical and chemical processes governing climate, including the role of the atmosphere, land, oceans, and biological processes.

Climate change summary for Ecuador:

- ➔ According to the majority of IPCC GCM scenarios, mean annual precipitation and temperature are both expected to increase by 3% and 2°C to 3°C, respectively, in the period 2030-2049 as compared to 1980-1999 (Figure 3). This represents substantially higher temperature increases than the global average. On the other hand, a high resolution model (20 km) projects a decrease in mean annual precipitation by the end of the century (Table 1).
- ➔ December-February (DJF) and March-May (MAM) precipitation levels are also likely to increase by 3% and 5%, while temperatures in December-February (DJF) are likely to increase by 1°C in 2030-2049.
- ➔ For the June-August (JJA) period, precipitation levels are likely to decrease by 3% and temperatures to increase by 1°C in 2030-2049.
- ➔ Increases are projected for the frequency and intensity of extreme rainfall events on the northern coast of Peru and Ecuador in the period of 2071-2100 (PRECIS, IPCC SRES A2 and B2).¹⁷

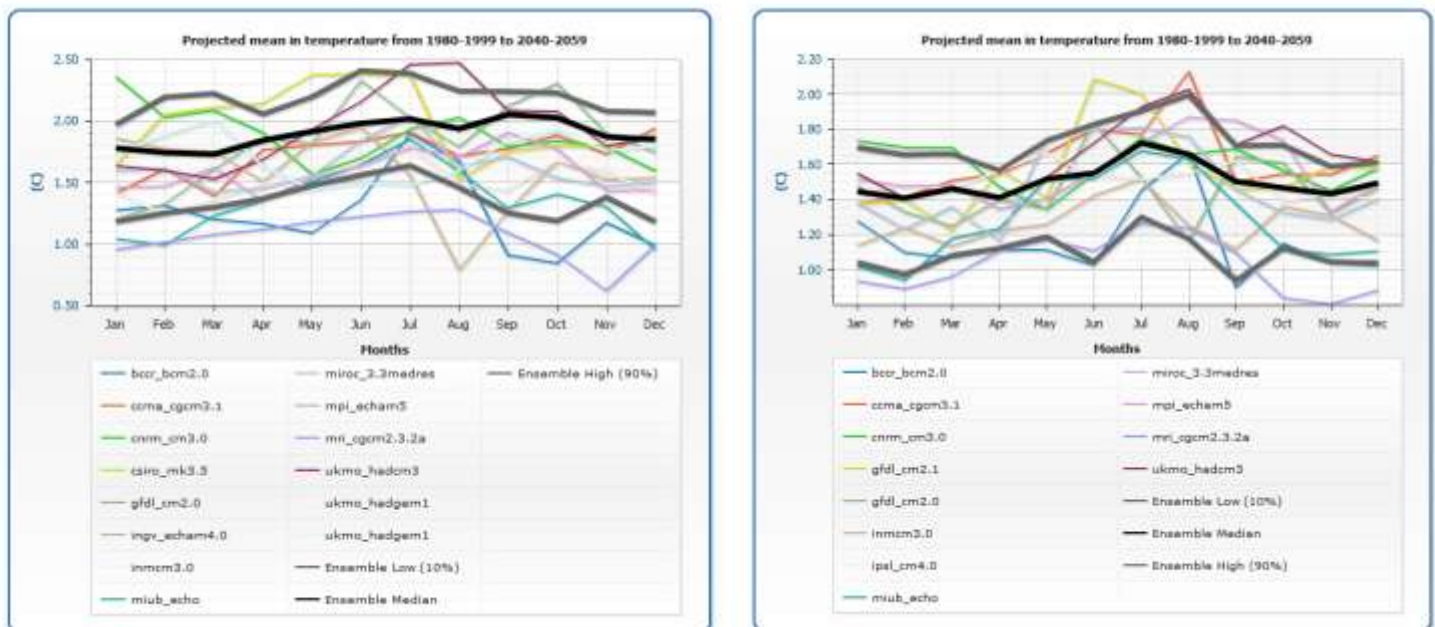


Figure 3: Projected changes in mean temperatures from 1980-1999 to 2020-2059, using GCMs under the IPCC SRES A2 and B1 emissions scenarios

¹⁶ Ibid note 10.
¹⁷ Ibid note 10.

Yet, even with the high uncertainty of long-term precipitation pattern projections, some impacts emerge more clearly. Climate change is expected to increase variability and the incidence of extreme weather events, such as droughts, floods, and intense rainfall events. The variability can be expected to negatively impact crop production, particularly because agriculture is already vulnerable to current fluctuations in climate. Increasing temperatures will cause greater evapotranspiration, which will lead to drier soil conditions in many areas. The increasing demand for water will likely decrease water availability even with an increase in precipitation.¹⁸ Projections shown in the graphs below indicate that it is very likely that there will be increases in temperature in Ecuador for all months as a result of climate change.

Table 1: Temperature and precipitation projections for central Ecuador¹⁹

	IPCC GCMs		Japanese High Resolution GCM (20 km.)
	Change (2030 - 2049 vs. 1980-1999)	# Models Projecting Same Change	Change (2091 - 2100 vs. 1981 - 1990)
Mean Annual Precipitation:	3%	14 out of 20	-9%
DJF Precipitation:	3%	11 out of 20	--
MAM Precipitation:	5%	13 out of 20	--
JJA Precipitation:	-3%	11 out of 20	--
SON Precipitation:	2%	12 out of 20	--
Runoff:	9%	8 out of 12	--
Mean Annual Temperature:	2 (°C)	--	3 (°C)
DJF Temperature:	1 (°C)	--	--
JJA Temperature:	1 (°C)	--	--

CLIMATE CHANGE IMPACTS ON NATURAL HAZARD VULNERABILITY

AT A GLANCE

High migration flows have increased the vulnerability and poverty of urban areas that are now home to 66% of the population.²⁰ Vulnerability to phenomena like ENSO and related disasters such as floods and landslides is exacerbated by the fact that 96% of the urban population live in the coastal and mountainous region.²

Insufficient policies and land use planning instruments, environmental deterioration of the river basis, the expansion of farmland, and poorly constructed infrastructure are factors that contribute to the high vulnerability of the country to natural hazards.²¹

Approximately 48% of the country is affected by soil erosion at different degrees, according to the Ministry of Agriculture, Livestock, Aquaculture and Fisheries and the most affected area is the Andean region (70%).²² About a fourth of the country is also affected by drought.²³ Historically, political instability has also been a major component of the country's vulnerability to disasters. During the 1997/1998 El Niño event, for instance, political instability reduced the capacity of the country to respond to the immediate and long-term needs of the

¹⁸ Ibid note 15.

¹⁹ Ibid note 9.

²⁰ World Development Indicators. Available in: <http://data.worldbank.org/data-catalog/world-development-indicators>

²¹ Ibid note 3.

²² World Bank. 2009. *Climate Change Aspects in Agriculture*. Ecuador Country Note. Washington, DC: The World Bank.

²³ 2011. Ecuador en Cifras. Available in: <http://www.ecuadrencifras.com/cifras-inec/main.html>.

population, increasing its vulnerability.²⁴ Compared to other Latin American and Caribbean countries, Ecuador is behind in economic resilience; risk preparedness, and socio-economic fragility (see Figure 4).

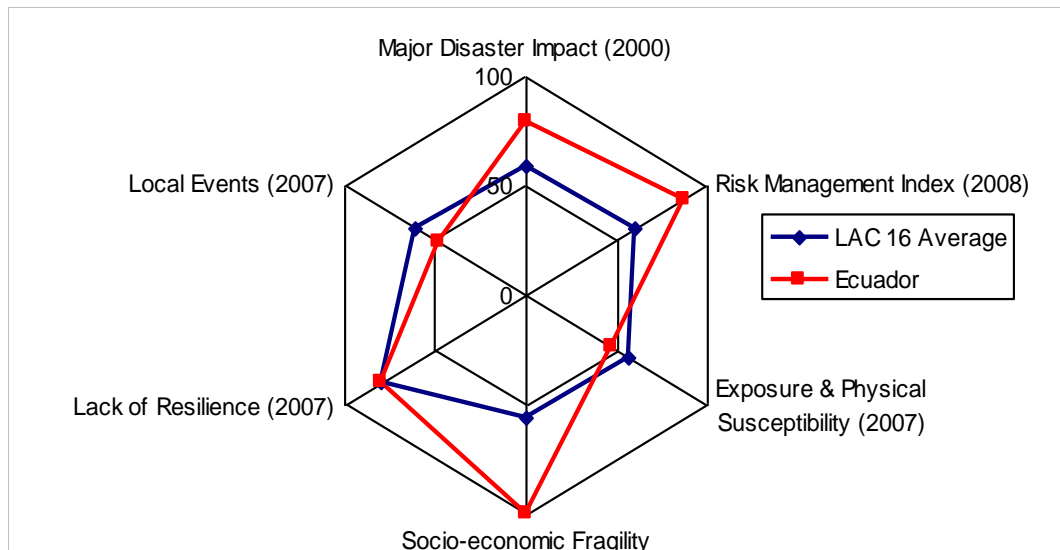


Figure 4: Relative vulnerability and risk indicators for Ecuador²⁵

El Niño events: In the last century, El Niño-Southern Oscillation (ENSO) events occurred in 1925, 1934, 1941, 1953, 1957, 1958, 1965, 1972-1973, 1976-1977, 1982-1983, 1986-1987 and 1997-1998.²⁶ The El Niño of 1997-1998 caused damages of US\$ 280 million, equivalent to approximately 15% of the GDP for 1997, with significant impacts on the health, education, agriculture, and transportation sectors.⁹

El Niño events in Ecuador have also contributed to increase in the incidence of health problems. Studies found that during ENSO events, suspended sediments and metal contamination increase significantly in the Puyango river basin in Southern Ecuador.²⁷ The 1997-1998 El Niño event was accompanied by four epidemics: cholera, leptospirosis, dengue, and malaria.⁹ However, the number of cholera cases was significantly lower than that during the 1991-1992 event, possibly due to a national plan prepared by the Ministry of Public Health for prevention of epidemiological diseases.²⁴

After floods, which are often associated with the El Niño phenomenon, landslides are the most frequent natural hazards in Ecuador, in part as a result of the concentration of development in the mountains.² Droughts also affect

²⁴ Ecuador Country Case Study: Impacts and Responses to the 1997-98 El Niño Event. The Case of El Niño-Southern Oscillation (ENSO). Available at: <http://www.ccb.ucar.edu/un/ecuador.html>. Accessed on: April 01, 2011.

²⁵ Note: Relative Vulnerability and Risk Indicators are adapted from IADB-IDEA (2007), Programa de Información e Indicadores de Gestión de Riesgos (Manizales, Colombia, 2004), Annex (2009). Values are normalized on scale of 0 – 100 and presented against the average for 16 LAC countries found in IADB-IDEA (2007). Values are normalized on scale of 0 – 100 and presented against the average for 16 LAC countries found in IADB-IDEA (2007). *Major Disaster Impact* taken from *Disaster Deficit Index*: the ratio of economic losses that a country could suffer during a Maximum Considered Event and its economic resilience. *Local Events* taken from *Local Disaster Index*: the propensity of a country to experience recurrent, small-scale disasters and their cumulative impact on local development. *Risk Management Index* is presented as the negative (i.e. 0 = optimal, 100 = incipient) of IADB's *Risk Management Index*: measures country's risk management capability in (i) risk identification (ii) risk reduction (iii) disaster management (iv) financial protection. Resilience, Fragility and Exposure are taken from the component indices of the *Prevalent Vulnerability Index*.

²⁶ Ibid note 2.

²⁷ Magrin, G., C. Gay García, D. Cruz Choque, J.C. Giménez, A.R. Moreno, G.J. Nagy, C. Nobre and A. Villamizar, 2007: Latin America. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 581-615.

the country. In November 2009, prolonged drought conditions affected 107,500 people,²⁸ particularly in the province of Manabi. Subsequently, in February 2010, heavy rains caused floods and landslides affecting nearly 5 thousand families in the country's coastal provinces.²⁹

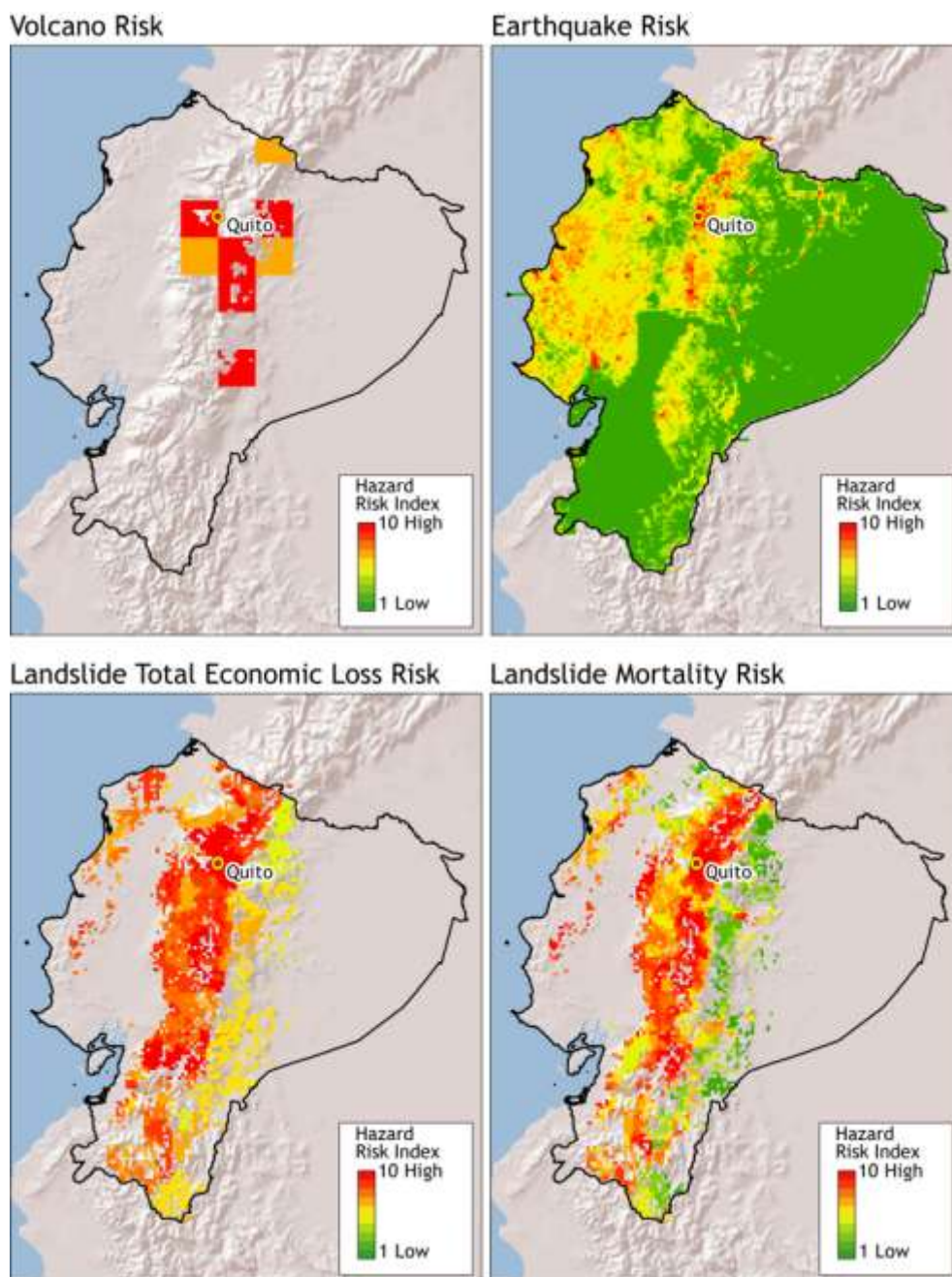
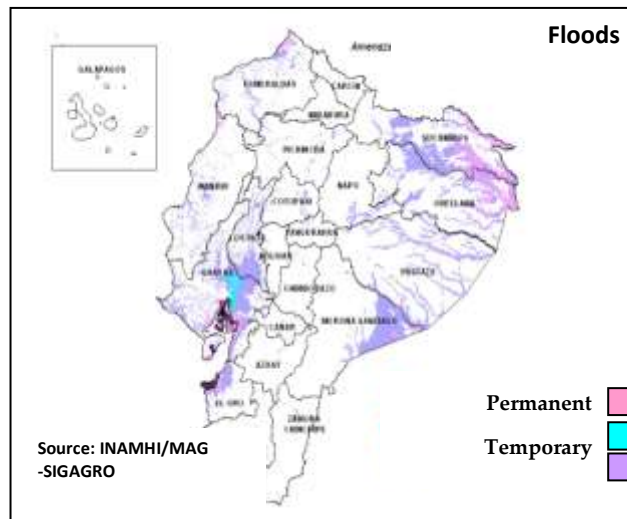
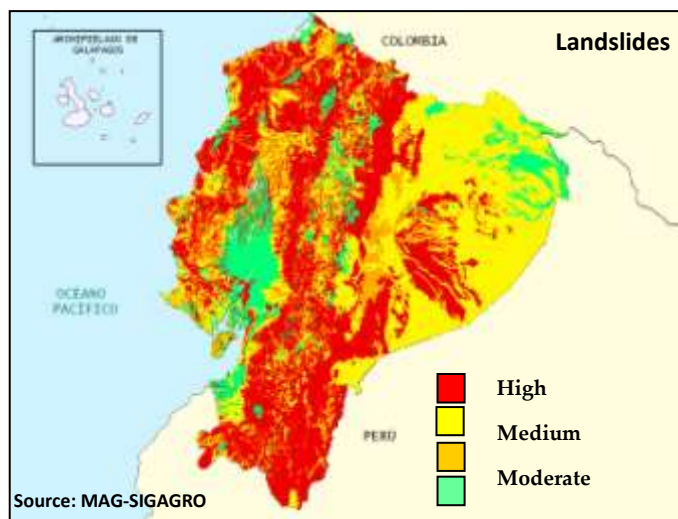


Figure 5: Exposure to climate-related hazards across Ecuador³⁰

²⁸ EM-DAT- Source of data: "EM-DAT: The OFDA/ CRED International Disaster Database, Université Catholique de Louvain, Brussels, Bel." Data version: v11.08 .

²⁹ GIEWS Country Brief. Ecuador. Available at [http://www.reliefweb.int/rw/RWFiles2010.nsf/FilesByRWDocUnidFilename/SNAA-84C8EG-full_report.pdf/\\$File/full_report.pdf](http://www.reliefweb.int/rw/RWFiles2010.nsf/FilesByRWDocUnidFilename/SNAA-84C8EG-full_report.pdf/$File/full_report.pdf). Accessed on: April 8, 2011.

³⁰ UNEP's Global Risk Data Platform, Columbia University Center for Hazards and Risk Research (CHRR), and Columbia University Center for International Earth Science Information Network (CIESIN) and Instituto Nacional de Meteorología e Hidrología – INAMHI



Climate change is expected to change the frequency and intensity of extreme climate events in many regions of the world.³¹ In Ecuador, climate extremes are already the most common type of disaster, adversely affecting the population and economy of the country.

Implications for Disaster Risk Management (DRM)

- ➔ If there is a correlation between climate change and increases in the El Niño/Southern Oscillation (ENSO), the associated extreme weather events, including floods, droughts, and heat waves could produce severe socioeconomic and environmental impacts, including crop failure, forest fires, and reduction in energy security due to interruptions in hydropower generation. Increases in La Nina events might lead to higher incidence of droughts, affecting water supplies and crop production.
- ➔ Runoff levels are expected to rise in coastal regions and could affect areas that already exhibit prevalent floods and landslides, increasing erosion and the occurrence of natural disasters.
- ➔ Increases in climate variability, reduction in the length of the rainy season, and uncertain projections of increasing extreme rainfall events can lead to insufficient crop yields. In order to prevent detrimental effects on the economy, support needs to be extended for the implementation of cost-effective risk transfer and risk reduction measures such as the provision of “safety nets” and the development of early warning systems.
- ➔ To reduce the loss of lives and destruction of infrastructure during extreme events, spatial management of rural and urban areas as well as housing construction materials, design, and locations need to be improved.
- ➔ Government sector ministries should include risk reduction of hazards and vulnerabilities into future planning and concrete actions, including establishing “better multi-sector coordination within the ministries and key-stake-holders in order to assure a common approach in disaster prevention management.”

³¹ Christensen JH, Hewitson B, Busuioic A, Chen A, Gao X, Held I, Jones R, Kolli RK, Kwon W-T, Laprise R, Magaña Rueda V, Mearns L, Menéndez CG, Rissmann J, Rinke A, Sarr A, Whetton P. 2007. Regional climate projections. In: Chapter 11, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007: The Physical Science Basis, Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt KB, Tignor M, Miller HL (eds). Cambridge University Press: Cambridge, United Kingdom and New York, NY

SECTORAL CLIMATE RISK REDUCTION RECOMMENDATIONS

AGRICULTURE

Approximately 27% of the country's territory is used for agriculture and livestock –22% for pasture and 5% for cultivation.³² The sector is responsible for 6% of the GDP and employs about 6% of the total workforce.³³ According to the Ecuador Government, the country continues to expand its land used for farm and agricultural purposes at an annual growth rate of 5.7%.² The main agricultural products in 2008 (in terms of total production) were sugarcane, bananas, milk, rice and maize, plantains, indigenous chicken meat, palm oil, and potatoes.³⁴

Climate change is expected to impact agriculture in different ways depending on specific scenarios and crops. For the year 2030, it is likely that there will be a deficit in rice production of 3% to 60%, if no adaptation measures are pursued. For potatoes, one scenario predicts a shortage of 34%, while a more optimistic scenario projects a surplus in production. Soybeans would also be adversely impacted by climate change, while hard corn would benefit from it.²

In the First National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), the Government of Ecuador prioritized the following adaptation measures:

- ➔ Agro-ecological zoning and suitable seasons for sowing and harvesting;
- ➔ Introduction of higher-yield varieties to reduce the need for expansion of the agricultural frontier and the deforestation rate;
- ➔ Implementation of irrigation systems;
- ➔ Suitable use of fertilizers;
- ➔ Implementation of pest and disease control systems.

The National Climate Change Policy and Strategy,³⁵ proposed in 2008, lists the following priority adaptation measures:

- ➔ Development of research, systems, techniques, and other procedures for crops and livestock production that facilitate adaptation to climate change.
- ➔ Technical assistance programs, capacity building, and financing of adaptation measures in the agricultural sector, through intra-sectoral, multi-sectoral coordination and public, private, and community cooperation.

FORESTRY

Approximately 39% of Ecuador is forested.⁵ Its forest plantations cover an area of 78,000 hectares, 90% of which are in the inter-Andean region, 8% in the coastal region and 2% in the Amazon region.² The Amazon Ecuador is one of the poorest areas in the country due in part to the lack of land tenure and the constant pressure of oil and mining companies on indigenous lands.³⁶

³² Ibid note 5.

³³ World Development Indicators. Available at: <http://data.worldbank.org/data-catalog/world-development-indicators>

³⁴ FAO. Top Production Ecuador. Available at <http://faostat.fao.org/site/339/default.aspx>

³⁵ Ibid note 7.

³⁶ IFAD. Rural Poverty Portal. La pobreza rural en Ecuador. Available at <http://www.ruralpovertyportal.org/web/guest/country/home/tags/ecuador>. Accessed on: April 8th, 2011.

Most scenarios agree that dry areas are likely to increase in Ecuador.² The National Communication of Ecuador provides a list of needed adaptation measures to ensure a sustainable land and forestry management under future climate variability:

- ➔ Community production activities to obtain non-timber products in the remaining dry forests of the canton of El Carmen;
- ➔ Sustainable management of forest plantations in the provinces of Cotopaxi y Tungurahua;
- ➔ Integral rural development in micro watersheds in the province of Loja;
- ➔ Sustainable management of the sierra moorlands of El Cajas;
- ➔ Protection plantations in the province of El Oro;
- ➔ Establishment of community agroforestry systems in the province of Tungurahua;
- ➔ Establishment of woodland/grazing land systems in the rural cattle areas of the province of Manabí;
- ➔ Forest fire protection in the green belts of the metropolitan area of the city of Quito;
- ➔ Comprehensive anti-desertification programs in areas that are vulnerable to climate change.

The Government also prioritizes the implementation of reforestation/afforestation programs, mainly in areas affected by desertification and using species with high carbon absorption.⁸

COASTAL SECTOR

The coastal area of Ecuador is highly vulnerable to natural hazards and climate change because of high population and infrastructure density and its exposure to the effects of El Niño, sea level rise, and floods in general.

Priority measures for the sector, according to the National Communication, include:

- ➔ Establishment of a climate change biophysical and surveillance program;
- ➔ Reconfiguration of sewage and clean water systems for the city of Guayaquil;
- ➔ Mangrove preservation and reforestation;
- ➔ Reorganization of shrimp-farming activities;
- ➔ Establishment of withdrawal lines, buffer zones, and urban protection borders;
- ➔ Reconfiguration of road drainage systems;
- ➔ Adoption of adaptation programs and policies that include research on production capacity and ecological needs, climate change impact assessments, monitoring and surveillance mechanisms, financing policies and economic incentives for marine conservation.³⁷

EXISTING ADAPTATION FRAMEWORK/STRATEGY/POLICY AND INSTITUTIONAL SET-UP

After the 1997-1998 El Niño events, the National Climate Committee was established in 1999 to serve as the political and coordinating entity for climate change issues. In 2000, the Ministry of the Environment created the Climate Change Unit and tasked it with preparing the country's national communications to the UNFCCC, working

³⁷ Ibid note 7.

on carbon market activities, specifically the Clean Development Mechanism, and coordinating the work of the National Climate Committee.

In 2008, the constitution of Ecuador established sustainable development for the country that protects the environment, communities, and mitigates climate change. In 2009, the Government of Ecuador, through Executive Decree 1815, declared that climate change adaptation and mitigation are a national priority and that the Ministry of Environment is responsible for formulating and implementing a national strategy and plan.³⁸ In 2010, Executive Decree 495 created the Interinstitutional Committee of Climate Change to coordinate the implementation of climate change national policies, the climate change national strategy and the commitments made with UNFCC.³⁹

The International Research Center on El Niño is located in Ecuador with the mission of promoting and conducting scientific research to improve the understanding and early warning of El Niño events as well as climate variability and change at the regional level.⁴⁰

The study “Sistematización de Iniciativas de Cambio Climático en el Ecuador,” which was funded by GEF, compiled all the initiatives and projects related to vulnerability and adaptation to climate change in the country. The study identified eight ongoing activities and ten ongoing projects at the national, regional, and local level. One hundred eighty five studies on vulnerability and adaptation are ongoing or have been completed.⁴¹

Ongoing Efforts- At a Glance

Adaptation

- ➔ The Adaptation to the Impact of Rapid Glacier Retreat in the Tropical Andes Project- PRAA (GEF)
- ➔ Adaptation to Climate Change through Effective Water Governance (GEF)
- ➔ Scientific Cooperation Agreement between EMAAP-Q and IGM (Government and IGM)
- ➔ Capacity Development for Policy Makers to Address Climate Change (UNDP)
- ➔ Thinking Green – Green Schools Manual (CEA – Universidad de Cuenca)
- ➔ Information and Evaluation of Rural Lands in the River Guayas Basin (Government). Proyecto de Generación de GEO Información y Valoración de Tierras Rurales en la Cuenca del Río Guayas
- ➔ SINCHE Project. Sustainable Development and Adaptation to Climate Change (Sinche group)
- ➔ Climate Change Adaptation: Project. Proyecto Gestión de la Adaptación al Cambio Climático (Government)
- ➔ Risk management system and early warning in the Metropolitan District of Quito (Government)
- ➔ Great Ice – Ecuador (IRD, Government)
- ➔ Ecological footprint of Azuay
- ➔ Identification and modeling of water resources as a function of changes in climate: toward integrated water management in the Andes of Ecuador (IRD).
- ➔ Afforestation Program in the Metropolitan District of Quito basins (Government).
- ➔ Disaster Risk Reduction Program for the Municipality of Quito-Ecuador (GFDRR/World Bank)
- ➔ PREANDINO. Regional Andean Program for Risk Reduction and Disaster Prevention

³⁸ Ministry of Environment. Executive Decree 1815. Available at <http://www.ambiente.gob.ec/?q=node/934>. Accessed on April 6th, 2011.

³⁹ Ministry of Environment. Executive Decree 495. Available at <http://www.ambiente.gob.ec/?q=node/934>. Accessed on April 6th, 2011.

⁴⁰ For more information, please go to <http://www.ciifen-int.org/>

⁴¹ Ministry of environment website:

<http://www.ambiente.gob.ec/sites/default/files/users/dhermida/SISTEMATIZACION%20DE%20INICIATIVAS%20SOBRE%20CC.pdf>

- ➔ Community initiative project for funding adaptation to climate change in the agricultural sector (GEF and counterparts)
- ➔ Agricultural insurance for peasant and family farming
- ➔ Analysis of Glacial, Paramos and underground water resources and its response to Climate Change (National Government and IRD)

INSTITUTIONAL AND POLICY GAPS

- ➔ Economic, institutional, human (technical) constraints and limitations related to the current observation network system, climate analysis and information dissemination. The Climate Observation System of Ecuador was established in 1961. It is under the National Meteorology and Hydrology Institute (INAMH) and has 260 meteorological stations. However, the system lacks the necessary resources to operate and update hydrometeorological instruments.⁴²
- ➔ Lack of community climate adaptation planning to increase the resilience of vulnerable and indigenous populations.
- ➔ Climate change adaptation needs to be better mainstreamed into national and sectoral planning.
- ➔ Insufficient institutional capacity at national and local level.

RESEARCH, DATA, AND INFORMATION GAPS

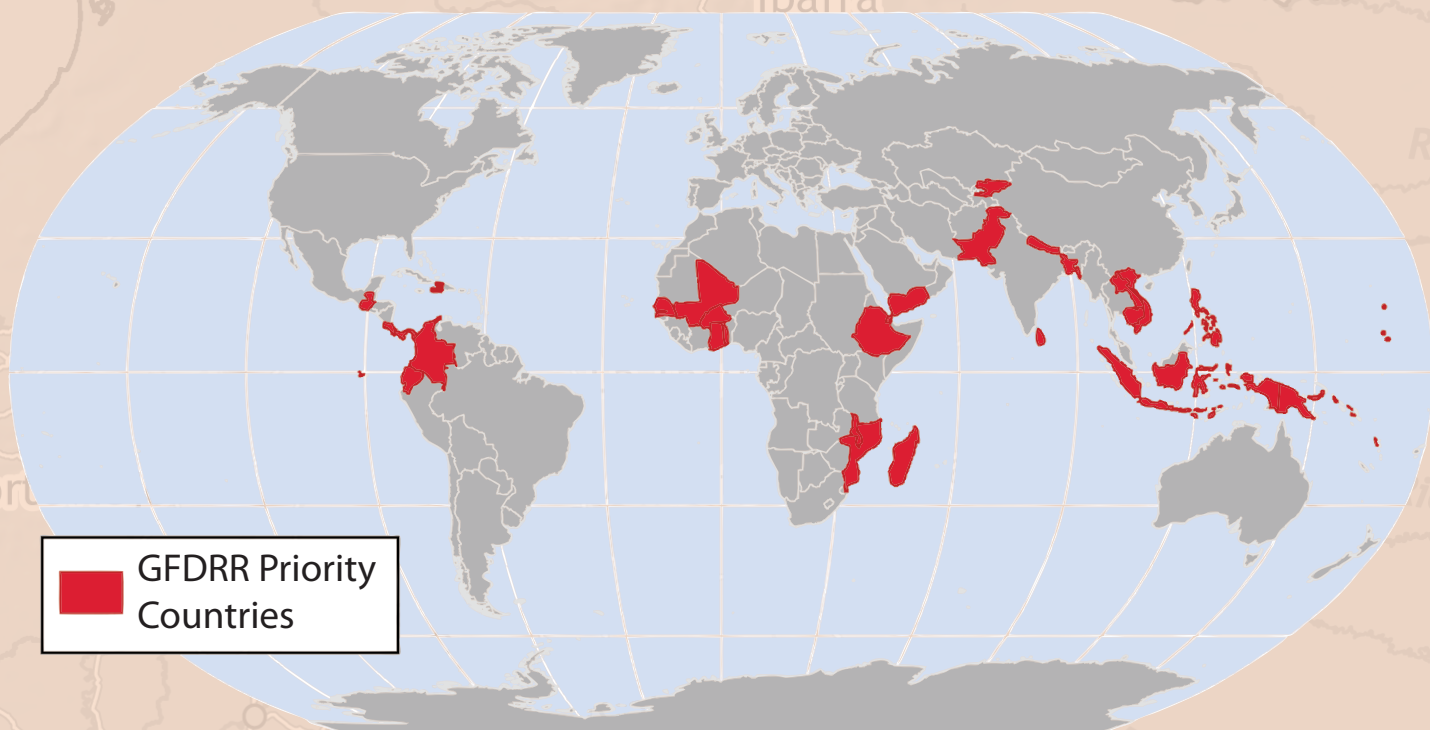
At this point, a number of research and scientific studies have been initiated on climate projections, climate change impacts, and adaptation measures at both the sector and the local level in Ecuador. As the outcomes of such studies are yet to become available, however, the following gaps still persist.

- ➔ Lack of information related to climate change and variability in the country at all levels.
- ➔ Poor resolution and lack of thematic and interdisciplinary approach of the Climate Observation System.
- ➔ Limited territorial scope of the observation network.
- ➔ Lack of vulnerability and risk assessments.
- ➔ Insufficient adaptation measures at the sectoral level.
- ➔ Limited capacity to store and electronically disseminate information.

⁴² Ibid note3.

Climate Risk and Adaptation Country Profile

This Country Profile (<http://countryadaptationprofiles.gfdr.org>) is part of a series of 31 priority country briefs developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) as part of its Disaster Risk Management Plans. The profile synthesizes most relevant data and information for Disaster Risk Reduction and Adaptation to Climate Change and is designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and operations. Sources on climate and climate-related information are linked through the country profile's online dashboard, which is periodically updated to reflect the most recent publicly available climate analysis.



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