



SUSTAINABLE DEVELOPMENT UNIT ■ LATIN AMERICA AND THE CARIBBEAN

Disaster Risk Management in Central America: GFDRR Country Notes

Nicaragua



THE WORLD BANK



GFDRR
Global Facility for Disaster Reduction and Recovery



COUNTRIES AT HIGH ECONOMIC RISK FROM MULTIPLE HAZARDS
(Top 75 based on GDP with 2 or more hazards)^a

1. Taiwan, China
2. El Salvador
3. Jamaica
4. Dominican Republic
5. Guatemala
10. Costa Rica
11. Colombia
15. Trinidad and Tobago
19. Barbados
22. Ecuador
23. Mexico
- 26. NICARAGUA**
27. Chile
30. Venezuela
34. Argentina

^a Dilley et al. (2005). Table 7.2.

Nicaragua is considered a leader in Central America because of its legal framework that enables a comprehensive and multi-sectoral approach to disaster risk management (DRM).

NICARAGUA

Natural Disasters from 1980 - 2008^b

Affected People

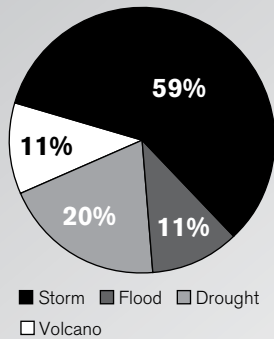
Disaster	Date	Affected (Number of People)
Storm	1998	868,228
Storm	1988	360,278
Volcano	1992	300,075
Drought	1997	290,000
Storm	2007	188,726
Drought	2001	188,000
Storm	1993	123,000
Flood	1999	107,105
Flood	1990	106,411
Drought	1994	75,000

Economic Damages

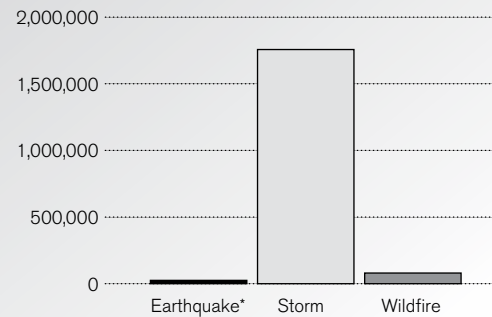
Disaster	Date	Cost (US\$ x 1,000)
Storm	1998	987,700
Storm	1988	400,000
Storm	1982	356,000
Wildfire	1991	80,000
Earthquake*	1992	25,000
Drought	1994	16,000
Storm	1996	10,000
Drought	1997	2,000
Storm	2000	1,000
Storm	2001	1,000

Statistics by Disaster Type^b

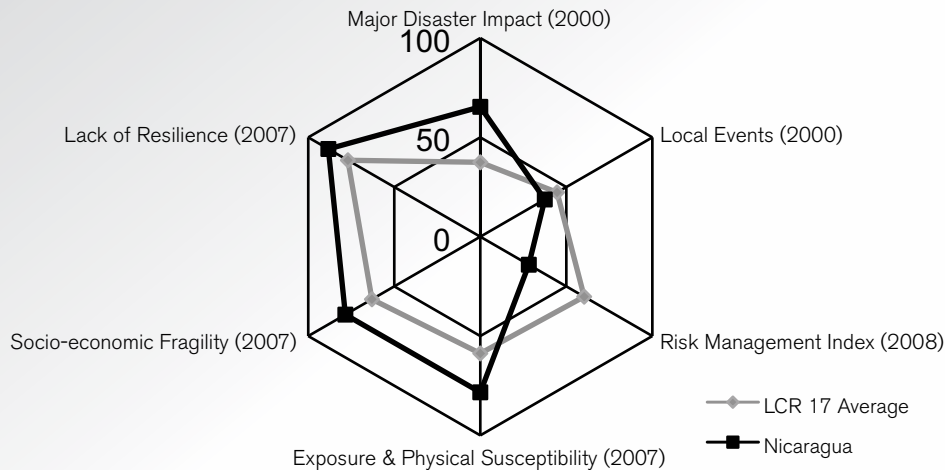
Population Affected by Disaster Type



Economic Damages / Disaster Type (1000s US\$)



Relative Vulnerability and Risk Indicators^c



^b UN (2009). <http://www.preventionweb.net/english/countries/statistics/?cid=124>. Source data from EM-DAT. Data displayed does not imply national endorsement.

^c Relative Vulnerability and risk Indicators are adapted from IADB-IDEA-ERN (2009). Values are normalized on scale of 0 – 100 and presented against the average for 17 LCR countries. Major disaster Impact taken from disaster deficit Index: the ratio of economic losses which 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 a country's risk management capability in (i) risk identification, (ii) risk reduction, (iii) disaster management, and (iv) financial protection. resilience, Fragility and exposure are taken from the component indices of Prevalent Vulnerability Index. Date for local event data depends on information available for each country. Data, and the respective LCR 17 average, from 2000 is used for Dominican Republic, El Salvador, Guatemala, Jamaica and Nicaragua. Data, and the respective LCR 17 average, from 2006-08 is used for Bolivia, Colombia, Costa Rica, Ecuador, Panama and Peru. All LCR 17 averages are calculated based on available data.

DISASTER RISK PROFILE

Nicaragua ranks second among countries most affected by tropical storms and 30th among countries most affected by earthquakes, according to the UN's Global Report on Reducing Disaster Risk. Nicaragua has the 26th highest economic risk exposure to two or more hazards, according to the Natural Disaster Hotspot study² by the World Bank. It is estimated that 10% of Nicaragua's territory is exposed to natural hazards, including low-frequency, high-impact events such as earthquakes, volcanic eruptions, hurricanes, and high-frequency, but lower-impact events such as floods and landslides.

Geological Hazards

The Pacific area of Nicaragua, including all major urban areas, is located in zones of high or very high seismic risk. As shown in Figure 1, Nicaragua as a whole is situated on two tectonic plates: the Caribbean Plate and the Cocos Plate. The subduction of these plates creates high seismic risk. Earthquakes in Nicaragua have caused significant damage and have destroyed cities, such as León and Managua, in the past. This situation requires special attention since the entire Pacific Coast continues to be exposed to seismic activity.

There are 25 volcanoes in Nicaragua, distributed along the central mountain range. The active volcanoes that result in increased risk exposure are Masaya, Momotombo, Santiago, Concepción and Madeas.

Floods and Landslides

Large parts of Nicaragua's territory are susceptible to flooding, especially in the lower

basins and valleys of the principal rivers. The Estero Real Watershed on the Pacific coast and the Rio Escondido Watershed on the Caribbean coast are the most affected areas. The North Atlantic Autonomous Region and South Atlantic Autonomous Region are susceptible to flooding, as demonstrated by Hurricane Felix in September 2007.

Landslides occur frequently as a result of the topography in the north of the country. Landslides can be attributed to hydrological phenomena. The main causes in Nicaragua are due to the softening of the ground from heavy rains and flooding of existing bodies of water.

Determinants of Vulnerability to Adverse Natural Events in Nicaragua

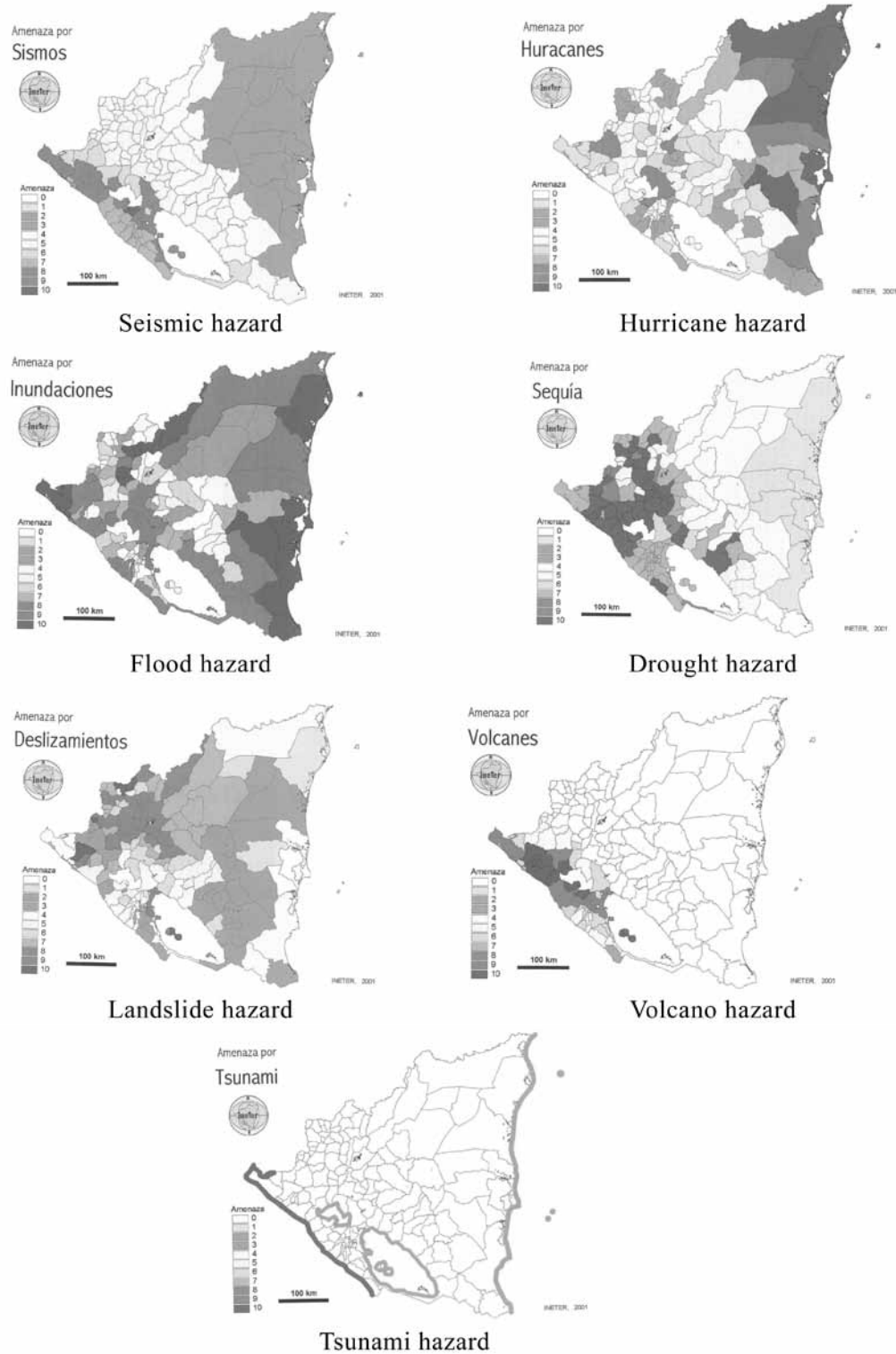
Rapidly increasing urban population has intensified Nicaragua's exposure to adverse natural events. As is the case in most Latin American countries, Nicaragua has seen a large increase in its urban population in the last fifty years. In 2005, the total population of Nicaragua was 5,483,447 inhabitants³, with a density of 42.3 persons per km². The population has multiplied by 10 within a century, from 4 to 43 inhabitants per km². Managua's population has increased 26 times between 1906 and 2005, with an approximate 360 people per km². The four largest cities in Nicaragua account for 48% of households and the vast majority of household income generated in the country.

Unplanned urban growth has disproportionately increased Nicaragua's vulnerability to adverse natural events. Most Nicaraguan cities have followed an unplanned growth pattern that has directly contributed to heightened vulnerability in many communities. Some of the most important challenges in urban areas include the predominance of unplanned

² Dilley et al. (2005).

³ Instituto Nacional de Estadística y Censos (INEC).

Figure 1. Hazard maps for Nicaragua.



Source: National Institute for Territorial Studies (INETER in Spanish).

expansions, a sharp increase in informal settlements, a lack of adequate construction practices, environmental degradation, poor transport infrastructure, and a lack of adequate public spaces.

Informal settlements tend to be situated in areas of high risk and are a physical and spatial manifestation of poverty and inequality in cities. About 85% of the houses in Nicaragua are self-constructed. According to the building code, any house built larger than 100 square meters must apply the municipal code for construction; however, this requirement is rarely met in these informal settlements and many remain poorly constructed, lack basic social services, and are located in high-risk areas.

DISASTER RISK MANAGEMENT FRAMEWORK

Nicaragua is considered a leader in Central America because of its legal framework that enables a comprehensive and multi-sectoral approach to disaster risk management (DRM). Nicaragua created the National System for Disaster Management and Prevention (SINAPRED in Spanish), regulated by the Law 337, in November 2000. This framework facilitated the creation of a comprehensive National Disaster Prevention and Response Plan.

Nicaragua's National Human Development Plan, updated in 2009, includes disaster risk management as a consideration to be promoted into the country's development activities. The country also has developed environmental protection and climate change strategies, which include the implementation of tools for environmental risk assessment and management. There are national and institutional plans for disaster preparedness and response, and a Humanitarian Network for disasters has been developed in order to promote better coordination among all stakeholders. The

country has developed a robust legal framework to foster active participation of local governments and populations in risk management activities. The National Human Development Plan defines an organizational structure that promotes local citizens' participation in risk management activities. This structure includes committees and brigades working at all levels of administration (regional, departmental, municipal, local) and at schools, and incorporates community-based organizations and agencies working at the respective administrative levels. A priority has been to create these participatory structures in communities that are at greatest risk.

For both hydrometeorological and geological hazards, Nicaragua has developed methodologies for hazard analysis. Nicaraguan experts in disaster risk management have played an important role in developing a strong knowledge base, mainly through the National Institute for Territorial Studies (INETER in Spanish) and SINAPRED. Risk reduction achievements have included the mapping of hazards, vulnerabilities, and risks for the 30 most vulnerable municipalities in the country. As part of the key activities in risk reduction, Nicaragua developed municipal programs, updated building codes and improved the enforcement of these codes, and incorporated risk management in school curricula in coordination with the Minister of Education.

Investments in DRM, including risk reduction, are managed in Nicaragua through various levels of government: the national government, departmental governments, and municipal governments. A major milestone achieved by the Nicaraguan Government has been the establishment of a National Disaster Fund, managed by the Executive Secretariat of SINAPRED, which is capitalized, among other sources, with yearly national budget allocations. The non-executed resources for the current fiscal year remain in the Fund, as mandated by Law 337 of 2000. Law 337 also mandates that local governments allocate funds for risk management activities within their jurisdictions. In the 30 most vulnerable



Concepcion Volcano, Nicaragua

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municipalities and poor settlements of Managua, significant investments in DRM were also carried out by the SINAPRED through the Social Investment Fund (FISE in Spanish), from 2004 to 2008.

Further action will need to be taken to avoid an unreasonable accumulation of new vulnerabilities, despite efforts in preventive planning in 30 municipalities and mitigation actions in 16 municipalities (including Managua). This will require continued and improved attention by the Government of Nicaragua.

Nicaragua has made little progress with urban reforms and requires comprehensive legislation for land use planning, despite some initial efforts made in several municipalities. For example, in 2000, when the Law 337 created the National System for Disaster Management and Prevention, none of the municipalities in the country, including Managua, had yet incorporated risk in their plans and programs. Between 2003 and 2008, 30 municipalities adopted land use planning with risk taken into account through

the integration of hazard, vulnerability and risk maps in urban growth planning. Continued investments at the local level are required to effectively improve preparedness and long-term risk reduction.

ACTIVITIES UNDER THE HYOGO FRAMEWORK FOR ACTION

Hyogo Framework for Action (HFA) Priority #1: Policy, institutional capacity and consensus building for disaster risk management

Nicaragua has built a National System for Disaster Management and Prevention (SINAPRED) based upon the National Disaster Prevention and Response Plan. With public and private sector participation, SINAPRED is responsible for: (i) the prevention and mitigation of risk, (ii) attention

to emergencies, and (iii) the rehabilitation of territories affected by disasters. The system is coordinated by the Executive Secretariat of SINAPRED (SE-SINAPRED) and has an operative arm coordinated by a National Operative Committee and a technical/scientific arm coordinated by the Nicaraguan Institute for territorial studies (INETER). There are regional, departmental and municipal committees presided over by the provincial governors and mayors.

Nicaragua, through its National System for Disaster Management and Prevention, has been a leader in instituting a policy and legal framework that enables a comprehensive and multi-sectoral approach to disaster risk management. Nicaraguan experts and graduate-level trainees in disaster risk management in the country have played an important role in this process.

Since 2003, Nicaragua has decentralized disaster risk management responsibilities and has made disaster risk management a national development priority. Recognizing the high cost of disasters and the need to encourage investment in disaster mitigation, SINAPRED has been institutionally strengthened by the Executive Secretariat of SINAPRED with World Bank support for the Natural Disaster Vulnerability Reduction project. Strategic studies for vulnerability reduction have been developed, risk management capacity has been enhanced in local committees, preventive municipal planning in 30 municipalities has been promoted, and mitigation measures (structural and non-structural) have been improved upon.

Nicaragua's challenge is to resist pressures to fall back into an emergency focus. In order to resist these pressures, there is a pressing need to upgrade, integrate, and further consolidate SINAPRED. Though good work is being done in most institutions in the system, technical capacity is a limiting factor, particularly at local levels, and institutional coordination remains a challenge.

SINAPRED, through its Executive Secretary (SE-SINAPRED), has demonstrated their leadership in mainstreaming disaster risk management. Although significant work remains to be done, SE-SINAPRED is the agency leading these initiatives and coordinating DRM activities in Nicaragua.

HFA Priority #2: Disaster risk assessment and monitoring

Nicaragua has strengthened information collection, early warning capacity, and risk mapping for hydrological, seismic and landslide events. With resources from the national budget and technical assistance from various donors, INETER has purchased and installed equipment to update existing systems for monitoring catastrophic events, especially for seismicity and tsunamis; however, this network is insufficient and additional resources are needed to establish an effective system.

Nicaragua has organized and improved the flow of information for vulnerability and risk evaluations and also risk reduction programs. At a scale of 1:50,000 for municipal areas and 1:5,000 for urban areas, Nicaragua has risk maps with excellent resolution (including hazard, vulnerability and risk maps) for 30 municipalities and has developed final products for land use planning and risk management plans. Urban landslide and flooding hazard maps have been produced by INETER in some vulnerable municipalities. This information is publicly available and has been used for prioritizing investments in risk reduction. It is important to institutionalize this information and to promote preventive planning in other vulnerable municipalities, as well as the North Atlantic and South Atlantic Autonomous Regions, and other areas that lack information, aerial photography and strategic studies for vulnerability reduction.

Nicaragua has worked to create a culture of risk reduction through the integration of disaster risk management in education. SE-SINAPRED has worked with the Ministry of Education to incorporate risk management in the school curricula and to train teachers.

Currently, SE-SINAPRED is establishing a Disaster Risk Information System. The system will provide a platform for agencies to further develop the National System for Disaster Management and Prevention in order to effectively manage and share information about vulnerability and risk, including scientific and technical data, and geographic information. Some modules focused on response and disaster preparedness have been developed. This project needs additional assistance to reach its objectives since it is not dynamic and is currently very expensive to update. SE-SINAPRED will receive a grant from DIPECHO to improve the module on Damage and Needs Assessment (EDAN in Spanish).

In order to facilitate a comprehensive understanding of disaster risk and risk management, SE-SINAPRED and INETER worked with the World Bank on a proposal to expand the Central American Probabilistic Risk Assessment Platform (CAPRA)⁴ to cover Nicaragua. CAPRA provides a broad set of sectors with a baseline catalogue of data required for risk evaluations, as well reference methodology and interactive software tools to support risk identification and applications for risk analysis. This helps establish standards for sharing data and a common language for understanding risk. The applications CAPRA supports are adjusted to the needs of each sector and user, such as emergency response, land use planning, and investments in mitigation or financial protection strategies. The transparent nature of the models and open architecture of the CAPRA system ensure that future users can understand, adjust, and continue to evolve these tools as their needs change. The CAPRA

⁴ <http://ecapra.org>.

platform for Nicaragua has been finished, and some municipalities have probabilistic risk assessments for different hazards including earthquakes, floods, landslides, hurricanes, and tsunamis. The CAPRA experience will be applied in twelve municipalities through the IADB Project for the next two years.

HFA Priority #3: Use of knowledge, innovation, and education to build a culture of safety and resilience at all levels

One of the reasons for Nicaragua's relative success in moving towards a proactive disaster risk management environment is the existence of a human-capital base with the appropriate technical training. At least two higher-education institutions in Nicaragua offer post-graduate training and specialization in risk management. At primary and secondary school levels, the curricula include concepts and good practices for risk management. The Government has developed and implemented various tools and strategies to train teachers and community leaders on how to incorporate disaster risk management in the school curricula.

HFA Priority #4: Reduction of the underlying risk factors (reduction of exposure and vulnerability and increase of resilience)

Corrective action to address existing disaster risk is one of Nicaragua's main disaster risk challenges. Investments in risk reduction can involve both structural mitigation works, such as seismic retrofitting, and non-structural investments, such as relocating people from high-risk areas (mainly in Managua). Often these decisions should be made at a decentralized level, as close as possible to the assets and people at risk. With such high

exposure to natural hazards, the political challenge is to define the acceptable level of risk and to adequately finance the mitigation of the risk.

Most of the investments in risk reduction in Nicaragua at a municipal level are made by the national government and donors. This is because the municipal incomes are very low and highly dependent upon the national budget and subsequent resource allocations. Grant funds could play an important role to integrate disaster risk reduction into these projects and thereby leverage significant amounts of additional resources while deriving lasting benefits.

Work still needs to be done in terms of building awareness and capacity within governments in smaller municipalities. The project supported by the World Bank's loan to Nicaragua's national government expanded coverage of this topic to a large number of municipalities. The project was completed in February 2009 and up to 140 municipalities in the country have benefited from it.

HFA Priority #5: Disaster preparedness, recovery and reconstruction at national, regional, and local levels

In Nicaragua, the disaster response structure has several levels of organization that increase the complexity of decision-making during an emergency. Response to a given adverse event starts with the local level to determine if the event is of a magnitude that the local response committee can handle or if additional help needs to be requested at the municipal, departmental or national level.

Since 2004, the National System for Disaster Prevention and Response has been providing training at local, municipal, and departmental levels through committees for disaster prevention and response. SE-SINAPRED is seeking additional financial support for this critical activity.

To test existing capacity, simulations and drills have been carried out in Managua. The latest and largest exercises have been earthquake simulations in Managua in 2004, 2008 and 2010. Responders, national and district authorities, and the general population participated in the exercise.

Since its inception, the country's emergency response system's capabilities have been tested several times, and lessons learned have been incorporated to improve the system. In recent emergency situations, including the passing of Tropical Depression 12E, which caused major flooding in Nicaragua and other Central American nations during late 2011, when the response capacity of the entire system was put to the test, its performance has been adequate. However, there is still room for improvements in key areas, including better communication and coordination capabilities among the several government administration levels to ensure ready access to critical information and to decision-makers.

With regard to disaster response, the main challenge for the Government of Nicaragua is to finance and rapidly initiate the recovery phase in the aftermath of an adverse natural event. Nicaragua needs to reinforce its fiscal strategy to provide financial support after disasters that cause damage that cannot be funded through internal reserves.

The current Government has focused on disaster risk management, but has not yet developed a financial strategy that would ensure medium- to long-term DRM commitments for Nicaragua. It is necessary to reinforce actions for disaster risk management in the following areas: (i) develop policies and strengthen institutions, (ii) identify and monitor risk and disseminate its knowledge, (iii) reduce and prevent risk, and (iv) reduce fiscal vulnerability.

KEY DONOR ENGAGEMENTS

Existing Projects with Donors and International Financial Institutions	Funding Agency / International Partners	Allocated Budget and Period (US\$)	HFA Activity Area(s)
Nicaragua Disaster Vulnerability Reduction Project	World Bank	10 million 2001-2009	1, 2, 3, 4, 5
Hurricane Felix Emergency Recovery	World Bank	17 million 2008 -2011	4
Support for DesInventar online disaster database creation of the National Disaster Prevention and Management Information System (SIAPAD)	PREDECAN	not available 2008-2009	2
Seminars and guidance for municipalities on risk reduction	PREDECAN	not available 2008-2009	2
A study to update the Disaster Risk Management Indicators	IADB	2009	2
Development of a Risk Assessment Platform for Nicaragua	World Bank (GFDRR)	350,000 2009-2010	2,3
Development of disaster risk management capacity at the local level in Bonsai	Japan International Cooperation Agency	300,000 2008-2011	2,4
Program for the Reduction of Vulnerability and Environmental Degradation in Nicaragua (PREVDA)	European Commission	3.33 million 2007-2011	1, 2, 4
Regional Plan for Disaster Reduction (PRRD)	Norway, Spanish International Cooperation Agency	400,000 2006-2011	1
Disaster Risk Management for volcanic and landslide hazards in Ometepe island	Disaster Preparedness Programme of the European Commission's Humanitarian Aid Department (DIPECHO)	520,000 2008-2011	2, 4
Training on disaster risk management to local authorities	UNDP	400,000	1
Disaster risk reduction program for Nicaragua	Swedish Cooperation COSUDE	2.2 million 2008-2012	1, 2, 3, 5
Earthquake Risk Reduction in Guatemala, El Salvador and Nicaragua with regional cooperation support to Honduras, Costa Rica and Panama (RESIS II)	Norway	2.4 million 2007-2010	2
Regional Program of Environment in Central America (PREMACA)	Danish Cooperation (DANIDA)	not available	2, 4
Mesoamerican coordination system for territorial information	IADB	800,000 2009-2011	2
Technical assistance to strengthen Information and Communication Tools for CEPREDENAC and National Commissions	World Bank	446,000 2007-2009	1, 2
Technical assistance for vulnerability reduction and response in Nicaragua (five local projects)	Humanitarian Assistance Office for Disaster Preparedness of the European Commission (DIPECHO)	not available	3, 4, 5
Capacity Building for Risk Management in Central America (BOSAI)	JICA	2,500,000 2007-2012	1, 2
Strengthening of communication systems at national and regional levels (Regional program)	China (Taiwan)	1,130,000 2009-2011	3
Action Plan AECID-CEPREDENAC (Regional level)	Spanish Cooperation for International Development (AECID in Spanish)	763,750 2009-2010	1, 2
Strengthening of CAPRA Implementation (Regional Level)	CEPREDENAC	50,000 2010	1, 2



GLOBAL FACILITY FOR DISASTER REDUCTION AND RECOVERY (GFDRR): ACTION PLAN

Given Nicaragua's disaster risk profile and its existing framework for disaster risk management, the key priority in Nicaragua is to increase awareness of the importance of disaster risk reduction and to mainstream disaster risk management at the local levels.

Strategic actions are needed in the following areas to enhance disaster risk management in Nicaragua: (i) strengthen institutional capacity for strategic planning and coordination at central and local levels, (ii) reduce vulnerabilities at the municipal level, and (iii) develop a comprehensive risk assessment and monitoring capacity.

Despite important advances in data gathering and knowledge production, as well as advances

in raising awareness, Nicaragua still has significant challenges ahead. The main challenge lies in knowledge creation among decision-makers and citizens at local levels. This is critical for improving urban planning processes that will avoid development patterns that exacerbate vulnerability. Successful implementation of the National Risk Management Plan (NRMP) and the Risk Assessment Platform will help address this challenge. The NRMP has been supported through a World Bank loan that was completed in February 2009. GFDRR support for the application of the CAPRA pilot project prior to the Mesoamerican coordination system for territorial information project financed by the IADB in twelve municipalities would greatly improve awareness while significantly advance the local tools available to effectively manage disaster risks.

The following activities have been identified in consultation with local authorities and international donor agencies. These actions

Indicative Program for GFDRR Funding (Projects and engagement areas being considered for GFDRR funding)	Implementing Agency / International Partners	Indicative Budget and Period (US\$)	HFA Activity Area(s)⁵
Support for the Pilot Project on Early Warning Systems for Hydrometeorological Hazards in Central America	World Bank (GFDRR) World Meteorological Organization	266,000 2009-2011	1, 2, 3, 4, 5
Phase II in the development of a Risk Assessment Platform for Nicaragua	IADB, UN ISDR, CEPREDENAC, SINAPRED, INETER, Municipalities, CSUCA (University Network)	600,000 2009-2010	2, 3
Strengthening of local, municipal, departmental disaster risk management	SINAPRED, Municipalities, UNDP	2.1 million 2009-2012	1, 2, 3, 4, 5
Institutional strengthening of SINAPRED and support to develop mitigation projects	SINAPRED, Municipalities	1.4 million 2009-2011	1, 4, 5
Improve information, monitoring, and knowledge dissemination of hazards	INETER	540,000 2009-2010	1, 2
Implementation of communication and educational strategies at national and local levels	SINAPRED, Minister of Education, National Communication Agency	460,000 2009-2012	1, 2, 3
Initial Budget Proposal:		US\$5.366 million	

support Nicaragua's disaster risk management program and reflect HFA priority action areas.

Ongoing dialogue with Nicaraguan authorities will determine next steps to further implement

effective DRM strategies. Additional activities currently under consideration are: (i) risk financing strategies for insurance of assets and agriculture, and (ii) support for the implementation of climate change and adaptation programs.

⁵ HFA Priority Action Areas: 1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation; 2. Identify, assess, and monitor disaster risks—and enhance early warning; 3. Use knowledge, innovation, and education to build a culture of safety and resilience at all levels; 4. Reduce the underlying risk factors; 5. Strengthen disaster preparedness for effective response at all levels.



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