



SUSTAINABLE DEVELOPMENT UNIT ■ LATIN AMERICA AND THE CARIBBEAN

Disaster Risk Management in Latin America and the Caribbean Region: GFDRR Country Notes

Dominica



THE WORLD BANK



GFDRR

Global Facility for Disaster Reduction and Recovery



**COUNTRIES AT RELATIVELY
HIGH MORTALITY RISK
FROM MULTIPLE HAZARDS**
(Top 35 based on population
with 3 or more hazards)^a

1. Taiwan, China
2. El Salvador
3. Costa Rica
5. Dominica
6. Antigua and Barbuda
7. Guatemala

9. DOMINICA

11. Nicaragua
14. Honduras
17. Colombia
20. Trinidad and Tobago
23. Chile
26. Mexico
33. Venezuela
35. Panama

^a Dilley et al. (2005). Table 1.2.

The combination of rainfall, geology and topography in Dominica is particularly favorable to the development of landslides of various types.

DOMINICA

Natural Disasters from 1980 - 2007^b

Affected People

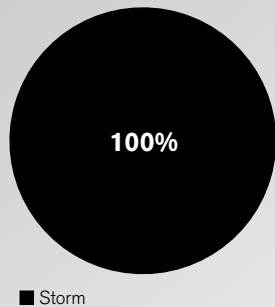
Disaster	Date	Affected (Number of People)
Storm	1984	10,000
Storm	2007	7,530
Storm	1995	5,001
Storm	1999	715
Storm	1989	710
Storm	2001	175
Earthquake*	2004	100
Storm	1980	0
Storm	1995	0

Economic Damages

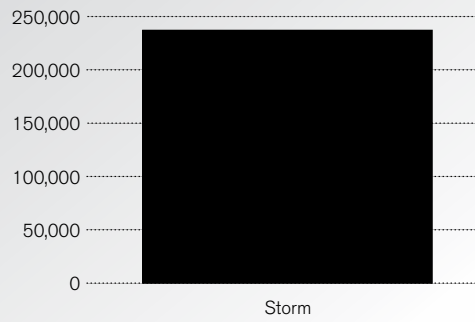
Disaster	Date	Cost (US\$ x 1,000)
Storm	1995	175,000
Storm	1989	20,000
Storm	1995	20,286
Storm	2007	20,000
Storm	1984	2,000
Storm	1980	0
Storm	1999	0
Storm	2001	0
Earthquake*	2004	0

Statistics by Disaster Type^b

Population Affected by Disaster Type



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



^b UN (2009). <http://www.preventionweb.net/english/countries/statistics/?cid=51>. Source data from EM-DAT. Data displayed does not imply national endorsement.

DISASTER RISK PROFILE

Dominica is the northernmost member of the Windward Island group of the Caribbean. It is north of Martinique located at 15 o 25' north latitude by 61 o 20' west longitude. The island occupies approximately 751 km² and is approximately 48 km on the north-south axis and approximately 24 km in the east-west direction. The country supports an estimated population of 110,000 persons.

Dominica is a mountainous volcanic island with steep terrain features. The highest point on the island is Morne Diablotin which rises to approximately 1,447 m and is located in the northern area of the island. Morne Trois Piton rises to approximately 1,424 m and is located in the southern section of the island. Much of Dominica's center is dominated by steeply dissected terrain. As a result, population centers tend to be located along mountain tops and stream valleys with the majority of the population, nearly 90%, located in settlements along the coastal fringe of the island.

Dominica experiences some of the highest annual rainfall amounts in the region which are heavily influenced by orographic effects. As a result, annual rainfall totals vary across the island depending on the topographic setting. There is some seasonality to the rainfall distribution but amounts typically range from 500 cm along the coast to over 900 cm annually. This rainfall coupled with the island's steep topography contributes to the increased risk of landslide and floods.

Since 1950, Dominica has been exposed to 13 named tropical storm systems passing within 40 km of the island. Since 1979, the island has been impacted by 15 tropical systems including 11 hurricanes. The most notable recent storm was hurricane David, a Category 4 storm whose eye crossed the southern portion of the island. This storm produced 250mm of rainfall over a 24-hour period and produced sustained winds of 240 km/h. Damage to the island was severe with major agricultural losses

and the damage or destruction of some 80% of the island's housing stock. In August 2007, Dominica was impacted by Hurricane Dean with gusts up to 170 km/h and about 200mm rainfall over an 18-hour period. The hurricane resulted in flooding and landslides in parts of the island and strong waves affected coastal areas. The agricultural sector (crop, livestock, fisheries) was hardest hit.

Geological Hazards

Dominica is considered the most geologically active island in the Caribbean. It lies close to the eastern margin of the Caribbean plate and is the only island with more than one volcano. Dominica has eight volcanoes. Earthquake activity originates from two sources, tectonic activity associated with plate movement and magma displacement associated with volcanic activity. The severe topography of the island favors landslide potential and flooding from the island's many streams; this is a significant recurrent event. Dominica is considered by the scientific community to be at significant risk from volcanic eruption within the next 100 years.

Seismic Activity

Most of the seismic activity on Dominica is associated with the island's volcanic activity which produces shallow small-magnitude earthquakes. Earthquake swarms are not uncommon and appear to be tending toward stronger and shallower events. This suggests an increase in the risk of magmatic eruption. The region is tectonically active and Dominica is exposed to potential earthquake impacts associated with plate activity. In 2004, an earthquake of magnitude 6.3 was located some 10 km north of the island. The quake coincided with a three-day period of rainfall and triggered numerous landslides throughout the island. Damages

to structures were significant but no deaths were reported on the island. In 2007, an earthquake of 7.4 magnitude located off the coast of Martinique was felt throughout the entire region. While no major damage was reported in Dominica, the earthquake did trigger a payment to Dominica under the recently created Caribbean Catastrophic Risk Insurance Facility (CCRIF). This was the first payout ever to be made under the CCRIF.

While tsunamis are not considered a major recurrent risk for the region, the low-lying nature of the coastal developments would make them particularly vulnerable to tsunami activity. Particularly vulnerable is the island's tourism infrastructure. Recent studies have evaluated the potential for earthquakes in the vicinity of Dominica to create tsunamis.

Floods and Landslides

The combination of rainfall, geology and topography in Dominica is particularly favorable to the development of landslides of various types. Steep cliffs present a constant threat to roads and villages from rock fall and debris slides. Landslides along river courses are not uncommon and the temporary pooling of water behind landslides is a significant contributor to flood risk on the island. One such location is an active slide located at the confluence of the Matthieu and Layou rivers some 6 km northeast from the mouth of the Layou. The landslide formed in 1997 effectively blocked the discharge of the Matthieu river to the Layou. Subsequent failure of the slide dam resulted in the flooding of the downstream portions of the Layou river and major damage along the Layou Valley to the coast. Over the years, the landslide stabilized flooding watershed of the Matthieu River, creating a lake known as Miracle Lake. The relatively large volume of water

compounded in this system presents a continuing threat to the Layou Valley.

Flash floods are also a constant threat in Dominica.

Determinants of Vulnerability to Adverse Natural Events in Dominica

An estimated 90% of the population lives within 5 km of a live volcano.¹ Dominica is a highly active volcanic island and while major eruptions are not a regular event, Dominica is currently considered overdue for an eruption event.

Dominica's steep topography is a major factor contributing to the island's vulnerability to landslides. Landslides are a recurrent threat and the tendency for development in coastal areas places infrastructure frequently at the base of landslip-prone slopes. The limited area available for construction is generally found along rivers that have cut through the mountainous terrain, which exposes these areas to potential flooding.

Limitations on land suitable for construction have forced an expanding population to construct homes on vulnerable slopes, increasing their risk potential. Terrain also determines where transportation routes can be constructed. In the case of Dominica, mountain roads are circuitous and have limited capacity. For many areas there are limited access options should the principal access route be impeded.

Dominica has a single port with container-handling capacity and two ports that can accommodate smaller inter-island traffic. There are two airports: Canefield's, used largely for inter-island traffic, and Melville Hall, Dominica's

¹ CDERA (2003b).

principal international airport facility. Electric power generation is provided by both diesel and hydropower generation. Two diesel-generating facilities are located at Fond Cole and Portsmouth. Three hydro-power facilities are located at Laudat, Trafalgar and Padu. Diesel facilities are entirely dependent on imported fuel to sustain operations, and hydro facilities are vulnerable to seismic and extreme rainfall events. Distribution is by above-ground transmission lines which are subject to impacts from high winds and landslip activity.

The health infrastructure is comprised of 51 health centers/clinics and 3 hospitals.² The Princess Margaret Hospital (PMH), in Roseau, is the main healthcare facility in Dominica.

Climate Change and Global Warming

Dominica has recently been cited as one of six Caribbean countries in the world's top 40 climate "hot spots" by the Germanwatch Global Climate Change 2009 Risk Index.³ The country was ranked 25th out of 150 countries based on an analysis of weather events between 1998 and 2007. The 2010 Global Climate Risk Index is based on figures from 2008 and is also an analysis of the worldwide data collection on losses caused by weather-related events from the years 1998–2008. Dominica was ranked 55th with losses of 9.62% GDP, and 72nd for the decade with GDP losses

of 7.25%.⁴ Two factors were cited: the impact of global warming on rising sea levels which increase the risk of storm surges, and secondly the increase in the strength of hurricanes.⁵

Climate Change models⁶ have predicted that Dominica will undergo a warming and drying trend and is expected to endure more frequent heat waves and droughts, rainfalls with increased intensity, and rising sea levels as predicted for the rest of the Caribbean consistent with the projected global median.⁷ It is known that inter-annual climate variability of either the Pacific or Atlantic explains a significant amount of the total variance in rainfall in the Caribbean and Central America.⁸ Probable climate change impacts in Dominica include higher temperatures, higher storm intensities and, possibly, more frequent El Niño-Southern Oscillation (ENSO)⁹ events, exacerbating existing health, social and economic challenges affecting Dominica.

Changes in sea surface temperature as a result of climate variability could increase the intensity of cyclones and heighten storm surges, which in turn will cause more damaging flood conditions in coastal zones and low-lying areas. According to the World Bank's study, "Sea Level Rise and Storm Surges",¹⁰ the impact of sea level rise and intensified storm surges in Latin America and the Caribbean will be high. While data is not available for Dominica, data for Puerto Rico is showing an increase of 51.84% - with 53.81% of the

² PAHO (2007).

³ McLymont-Lafayette (2008).

⁴ Harmeling et al. (2009). Table 5.

⁵ McLymont-Lafayette, I. (2009).

⁶ Hadley Centre Coupled Model, Version 2 (HADCM2), as reported in Mulligan (2003). Same modeling data as used by the Intergovernmental Panel on Climate Change (IPCC).

⁷ Chen et al. (2008).

⁸ Giannini et al. (2002).

⁹ El Niño-Southern Oscillation; commonly referred to as simply El Niño, a global coupled ocean-atmosphere phenomenon.

¹⁰ Dasgupta et al. (2009).

coastal population exposed and potential losses of coastal GDP projected to exceed 52.71%.

Dominica's first National Communication on Climate Change (NCCC)¹¹ was released in 2001.

Based on Intergovernmental Panel on Climate Change (IPCC) models, it projects that by 2050 the annual precipitation will decrease by 20 to 30 percent, the sea level will rise by 26 to 39cm, and the temperature will increase by 1.71 to 2.5 degrees Celsius. All of the principal social and economic sectors in Dominica are vulnerable to the potential impacts of climate change.

DISASTER RISK MANAGEMENT FRAMEWORK

Disaster preparedness and emergency response in Dominica is implemented under the authority of the Emergency Powers Act of 1951 (amended in 1973 and 1990).¹² A National Disaster Plan was initially developed in 1988 and subsequently revised. The latest revision is from 2006.¹³

While no national disaster management act has been passed in Dominica, the Office for Disaster Management (ODM) operates under the auspices of the National Emergency Planning Organization. NEPO is chaired by the Prime Minister and is composed of Ministers, key staff from government agencies, corporations, businesses and non-governmental organizations. The committee functions to coordinate the development of national disaster policy and serves as the inter-agency focus during disaster events. Proclamations of an emergency are made by the President.¹⁴

ACTIVITIES UNDER THE HYOGO FRAMEWORK FOR ACTION

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

ODM is largely focused on emergency response preparedness and response activities. The office is staffed with 3 technical specialists and 2 support staff. Technical specialists include a Geologist, a Disaster Specialist/Aviation Manager and a Disaster Specialist/Meteorologist.

Disaster management operations are executed in accordance with The National Disaster Plan. This plan was initially prepared in 1996 and subsequently revised in 2006. The 2006 plan was not formally adopted and is being revised. A final plan is expected to be issued in 2010.

ODM is operational and an Emergency Operations Center has been constructed. A national warehouse has been prepared and satellite storage in the form of containers has been located around the island.

Dominica has recently been cited as one of six Caribbean countries in the world's top 40 climate "hot spots" by the Germanwatch Global Climate Change 2009 Risk Index.

¹¹ Ministry of Agriculture and Environment (2001).

¹² OAS-DSD (1951). See also OAS-DSD (1987a).

¹³ The Office for Disaster Management (ODM) is currently operating on a draft plan revised in 2006 but not formally adopted. Efforts are underway (2010) to revise this draft in preparation for the formal adoption of the revised management plan.

¹⁴ OAS-DSD (1978a).



Disaster risk reduction through development policy and planning is currently not included in the national DRM strategy. A building code is being managed through the Development Control Agency (DCA) but enforcement is variable. National policy currently does not yet mandate DRM as a development objective and has not yet been adopted as an operational principle in the national line ministries.

HFA Priority #2: Disaster risk assessment and monitoring

The Meteorological Service is the national monitoring agency for weather-related phenomena. The office monitors forecasts provided by U.S. National Oceanic and Atmospheric Administration and Barbados Meteorological Service.

As needed, the Meteorological Service provides public warnings and relays forecasts to the ODM for planning and action. ODM assists in coordinating the distribution of these warnings and provides public preparedness advice under a system prescribed in the national plan. Warnings are distributed through radio, television and loudspeaker broadcasts, as well as storm warning flags displayed at police stations.

Real-time seismic and volcano monitoring is managed through the University of the West Indies Seismic Research Centre. A network of 10 seismographic stations has been installed on Dominica through the UWI program. This is augmented by private contributions of additional stations and ongoing research activity relating to mapping and monitoring of the volcanic systems of Dominica. Periodic deformation surveys are made using precision GPS equipment to assess volcanic activity. Dominica

has been experiencing a swarm of seismic activity that began in May 2009 and continued through January 2010. Warnings and bulletins are issued to ODM by UWI for action. ODM issues public announcements as needed. Additionally, UWI provides public bulletins and information through their website.¹⁵

Hazard Mapping has been completed in several areas and GIS map datasets have been prepared. Past initiatives have produced several hazard maps including landslide risk, volcanic hazard assessment, multiple hazard map, storm hazard, wind, wave, seismic, structural and human structural. Additionally digital base maps at a scale of 1:25,000 have been prepared and include roads, contours, beaches, rivers, rainfall, electric lines, schools settlements, ports, and quarries.¹⁶ Maps are maintained by the physical planning unit of the Ministry of Housing, Lands, Settlement and Water Resources.

ODM currently lacks GIS mapping resources.

ODM currently does not have a GIS mapping capability and lacks equipment, software and trained GIS professional staff. As a result, ODM is unable to use the hazard mapping tools developed under past initiatives.

Dominica ranks 6th in regional benchmarking.

A vulnerability risk assessment utilizing the Vulnerability Benchmarking Tool (BTool), was conducted in all six independent Eastern Caribbean States during 2006 to 2007. The report indicated that within the OECS region, Dominica placed sixth in the assessments of the risk mitigation, risk transfer, recovery and rehabilitation indices. A second BTool audit commenced in 2008 but has not been completed for Dominica.

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

Socialization of disaster awareness is not currently a strong component under Dominica's disaster management program. Citizens are generally aware of the geologic and meteorological hazards facing the island but an active education and awareness program has yet to be developed. ODM does issue alerts and preparedness advice at the onset of the hurricane season but no formal education programs have been developed for integration into the educational curriculum. Additionally, there currently (2010) is no program for training construction contractors in disaster-resistant construction techniques.

Educational programs in Dominica are limited.

A recent advancement was the conduct of the first Hazard Awareness Week (2009), sponsored by ODM. Additional activities are contemplated under this area as resources become available.

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

Building-code legislation has not been formally adopted in Dominica.¹⁷ While the Caribbean Building Code (CuBIC) was developed in the 1990's under the OECS (Organization of Eastern Caribbean States) initiative, Dominica has yet to adopt a standard building code that carries force of law.

Land use planning currently does not fully incorporate disaster risk reduction considerations in Dominica. While some land use

¹⁵ <http://www.uwiseismic.com>.

¹⁶ CDERA (2003b).

¹⁷ World Bank (2001).

planning occurs, its translation into actual land use constraints based on disaster risk criteria remains to be fully incorporated into the planning process. Land use planning and approval of construction plans rests with the Ministry of Housing, Lands, Settlement and Water Resources.

DRM strategies are yet to be integrated into the national development program. The disaster management program in Dominica is oriented at response and response planning. The program is in the early stages of considering the integration of risk reduction strategies and enabling legislation is yet to be developed to assign DRM responsibilities and authorities.

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

Dominica's capacity to respond to a major disaster without major outside support will remain limited for the foreseeable future. Risk reduction and improved insurance coverage will be key factors supporting reconstruction capacity. As it relates to public sector risks, Dominica is a subscriber to the Caribbean Catastrophic Risk Insurance Facility. This offers some

relief in the event that the policy is triggered.

Dominica is a member of the regional Caribbean Disaster Emergency Management Agency (CDEMA).

The tourism sector, a major contributor to the Dominica's economy, is largely insured by commercial underwriters. While insurance is available in Dominica, sectors such as agriculture, transport, and/or housing remain relatively vulnerable.

Vulnerability assessments of the health sector infrastructure have been carried out recently. The Princess Margaret Hospital, the main healthcare facility in the country, was assessed in 2008 using PAHO/WHO hospital safety index. The assessment provided an estimate of the hospital's capacity to continue providing services during and after a large-scale disaster or emergency and guided necessary interventions actions to increase the hospital's safety in case of disasters. The recommendations addressed structural, non-structural and functional aspects of the facility. Some of these recommendations have already been implemented. Using the same methodology adjusted to serve smaller health facilities, all 51 health centers/clinics and 2 district hospitals have also being assessed. At this point the country has clarity about the vulnerability status of its health infrastructure.

KEY DONOR ENGAGEMENTS

Existing Projects with Donors and International Financial Institutions	Funding Agency / International Partners	Allocated Budget and Period (US\$)	HFA Activity Area(s)
Comprehensive Disaster Management Harmonised Implementation Program (CDM HIP) - Community disaster risk reduction component (technical support including the conduct of vulnerability assessments for communities, training, infrastructural works, multi-hazard database development)	CDEMA / OECS / CIDA / DFID	125,000 2009-2010	1, 2, 4
Caribbean Risk Initiative	UNDP	2.1 million 2004-2010	1, 2, 3
Enhancing Resilience to Reduce Vulnerability in the Caribbean	Government of Italy	4.5 million 2009-2011	1, 2, 3, 4, 5
Mainstreaming DRM in the OECS countries	IDB	400,000 2008-2011	
Regional DRM Strategy for the Caribbean Tourism Sector	IDB	800,000 2007-2009	
Regional Monitoring and Evaluation Framework for DRM in the Caribbean Tourism Sector	IDB	750,000 2009-2012	
Natural Disaster Management – Emergency Relief Hurricane Dean	CDB	100,000 2007	5
NDM – Rehabilitation of Sea Defences, Hurricane Omar	CDB	4,060,000 5,100,000 2008	4
NDM Immediate Response Consultancy Services – Hurricane Omar	CDB	500,000 20,000 2008	



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