



SUSTAINABLE DEVELOPMENT UNIT ■ LATIN AMERICA AND THE CARIBBEAN

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

Antigua and Barbuda



THE WORLD BANK



GFDRR

Global Facility for Disaster Reduction and Recovery



**COUNTRIES AT HIGH
ECONOMIC RISK FROM
MULTIPLE HAZARDS**

(Top 33 based on GDP
with 3 or more hazards)^a

1. Taiwan, China
2. Dominican Republic
3. Jamaica
4. El Salvador
5. Guatemala

**6. ANTIGUA AND
BARBUDA**

8. Costa Rica
10. Colombia
21. St. Kitts and Nevis
24. Honduras
27. Mexico
28. Hong Kong, China
30. Mozambique
32. Bolivia
33. United States

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

The tourism sector, a major contributor to the Antigua and Barbuda's economy, is largely insured by commercial underwriters.

ANTIGUA AND BARBUDA

Natural Disasters from 1983-1999^b

Affected People

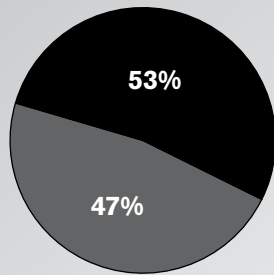
Disaster	Date	Affected (Number of People)
Drought	1983	75,000
Storm	1995	68,702
Storm	2008	25,800
Storm	1989	8,030
Storm	1999	3,423
Storm	1999	2,534
Storm	1998	2,025
Storm	1990	0

Economic Damages

Disaster	Date	Cost (US\$ x 1,000)
Storm	1995	400,000
Storm	1998	100,000
Storm	1989	80,000
Drought	1983	0
Storm	1990	0
Storm	1999	0
Storm	1999	0
Storm	2008	0

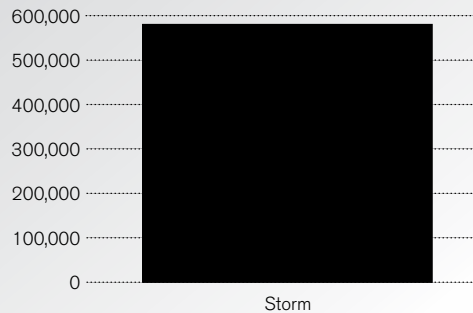
Statistics by Disaster Type^b

Population Affected by Disaster Type



■ Storm ■ Drought

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



^b UN (2009). <http://www.preventionweb.net/english/countries/statistics/?cid=6>. Source data from EM-DAT. Data displayed does not imply national endorsement.

DISASTER RISK PROFILE

Antigua and Barbuda is among the top five countries most exposed to multiple hazards.

100% of the land area and 100% of the population is exposed to 2 or more hazards. In terms of risk to GDP, Antigua and Barbuda is among the top 20 countries with an estimated 80.4% of GDP at risk from two or more hazards.¹

Antigua and Barbuda are located in the northern end of the Leeward Islands of the Caribbean, at approximately 17° 03' north latitude by 61° 48' west longitude. The two islands occupy approximately some 442 km² with Antigua, the larger of the two, covering approximately 280 km², and Barbuda with approximately 161 km² of surface area. Antigua is roughly circular in shape, measuring approximately 19 km along the north-south axis and approximately 23 km along the east-west axis. Approximately 40 km to the north of Antigua is the island of Barbuda measuring approximately 22 km along the northwest-southeast axis and approximately 14 km in width at its widest points. The estimated population for Antigua and Barbuda is approximately 90,000 persons.

Elevations on Antigua range from sea level to its highest peak, Boggy Peak, measuring 402 meters above sea level. Barbuda is a low-lying island without significant topography much of which is below 20 meters elevation. Both islands were formed from a combination of remnant volcanic peaks and limestone from ancient reef systems.

Multiple hazards impact Antigua and Barbuda, including storms, earthquakes and drought. The most common threat is the potential for hurricanes and tropical storms. Due to the size of the islands, a single storm has the potential for directly impacting the entire population. High winds and rainfall are the principal risk factors. The islands' lack of significant topographic

variability results in open exposures to the effects of wind and rain.

Since 1950, Antigua and Barbuda have been exposed to 11 named storms whose track has passed within 40 km of the two islands. This includes eight hurricanes; three notably intense storms which passed directly over the islands included Donna (1960, Category 4); Luis (1995, Category 4); and Georges (1998, Category 3).² Potential storm impacts can be crippling. Damages estimated in the aftermath of Luis, for example, were placed at approximately 2/3 of the country's GDP.

Antigua and Barbuda experience rainy and dry seasons and are particularly vulnerable to drought.

This is due to the geology of the islands, which consists largely of limestone plains. As much of the topography is relatively low-lying, these islands lack a significant stream network. Groundwater is the principal source for freshwater which is recharged by direct infiltration of rainwater through the surface. The islands have added desalination systems to augment freshwater supplies.

One seaport serves the islands and is located on Antigua in the capital St. Johns. The islands are also served by a single international airport on Antigua and two smaller airfields on Barbuda.

Economic risks are related to the country's dependence on the services sector (largely tourism) which represents an estimated 74% of GDP. Agriculture is minimal, contributing some 4% to GDP.

Geological Hazards

Antigua and Barbuda are regularly exposed to seismic risk and are located in seismic zone 4

¹ Dilley et al. (2005). Table 1.1b and Table 7.2b.

² Saffir-Simpson Scale.

(on a 0-4 scale), a high-risk earthquake zone.³

The islands are located along the eastern margin of the Caribbean plate and as recently as 1974, were hit with a 7.5-magnitude earthquake which caused structural damages estimated in the millions. No active volcanic centers are located in the island group.

While tsunami is not considered a major recurrent risk for the region, the low-lying nature of the islands would make them particularly vulnerable to storm surge and tsunami. Tsunami risk is generally associated with the potential effects of an eruption of Kick-'em-Jenny located 500 km south of Antigua. Reports on the 1939 eruption indicate that a 2-meter tsunami was generated.

Floods and Landslides

Landslides are not a pressing problem in Antigua and Barbuda, but flooding represents a significant risk to the islands. Internal drainage from development has been implicated in some flooding events; however, the greatest risk is from storm surge and wave action. Low elevations coupled with deeply intrusive bays provide ample opportunity for flood events to occur.

Determinants of Vulnerability to Adverse Natural Events in Antigua and Barbuda

Island constructions are generally exposed with little natural protection from wind forces. Much of the land in Antigua and Barbuda lies below 20 meters in elevation with limited relief. This also contributes to the potential for inland flooding. Additionally, the islands are particularly vulnerable to storm surge and wave action.

Drought is a major concern as most of the drinking water is supplied by well systems or rainwater cisterns. Both islands are predominately karstic in nature as limestone covers much of the islands' area. In this setting, water is maintained in a Ghyben-Herzberg lens.⁴ This is a lens of fresh groundwater floating above saltwater and is maintained by rainfall percolating through the ground surface. Among the factors affecting the volume of freshwater stored in this setting are the availability of rainfall and the surface area of impervious surfaces, natural or manmade. Water management is a major concern because of limited natural freshwater resources, and is further hampered by the clearing of trees to increase crop production, causing rainfall to run off quickly. Additionally, systems of this nature are also particularly susceptible to pollution either by sanitary discharge or contaminated infiltration as well as saltwater intrusion from overuse of the system.

Critical infrastructure is particularly at risk and alternative services are limited. Power generation, drinking water, international port and airport services are concentrated in the vicinity of St. Johns, in Antigua. When these facilities are damaged, services are lost until repairs can be completed. The added reliance on desalination facilities for drinking water places water resources at particular risk as loss of power and direct damages to coastal facilities can interrupt service.

Climate Change and Global Warming

Antigua and Barbuda was mentioned by Germanwatch regarding the Global Climate Risk Index 2010 (GCRI) report. The Global Climate Risk Index 2010 is based on figures from 2008 and is also an analysis of the worldwide data collection on losses caused by weather-related events during 1998–2008. While Antigua and Barbuda had no deaths from

³ SEOC (Structural Engineers Association of California) zone system. Zone 4 corresponds to a Z factor of 0.750 as defined under CUBiC 1985. Values obtained from Gibbs (1999), Appendix 1, Table 3.

⁴ Ghyben-Herzberg lenses are formed due to density differences between fresh and salt water. Lighter freshwater floats above the denser saltwater and absent turbulent mixing, remains uncontaminated. Overexploitation of these resources leads to saltwater intrusion contaminating well systems.

storms, floods or heat waves in 2008, it ranked 60th with losses of 2.94% GDP, and ranked 52nd for the decade with GDP losses of 4.51%.⁵ 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.⁶

Climate Change models⁷ have predicted that Antigua and Barbuda 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.⁸ 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.⁹ Probable climate change impacts in Antigua and Barbuda include higher temperatures, higher storm intensities and, possibly, more frequent El Niño-Southern Oscillation (ENSO)¹⁰ events, exacerbating existing health, social and economic challenges affecting Antigua and Barbuda.

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",¹¹ 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 Antigua and Barbuda, data for Puerto Rico is showing an increase of 51.84% - with 53.81% of the coastal population exposed and potential losses of coastal GDP projected to exceed 52.71%.

Antigua and Barbuda's first National Communication on Climate Change (NCCC)¹² was released in 2001. It cites the Intergovernmental Panel on Climate Change (IPCC) evidence that the global average sea level has risen by 10 to 25 cm over the past 100 years; and that it is likely that much of this rise is related to an increase in the lower atmosphere's global average temperature since 1860. Moreover, the IPCC's climate change models project that sea levels will rise another 15 to 95 cm by the year 2100. As a small island developing state, Antigua and Barbuda stands to be devastated by sea level rise. Tourism is the dominant economic sector and accounts for over 60 per cent of gross national product (GNP), and will be significantly affected.

DISASTER RISK MANAGEMENT FRAMEWORK

Specific disaster management legislation has been adopted in Antigua and Barbuda. Disaster preparedness and emergency response in Antigua and Barbuda is implemented under the authority of the Emergency Powers Act of 1957¹³ and Disaster Management Act of 2002.¹⁴

The Disaster Management Act established the office of the Director of Disaster Preparedness and Response who reports to the Prime Minister. The Act also established the National Disaster Preparedness and Response Advisory Committee. This committee is chaired by the Prime Minister and is composed of Ministers, key staff from government agencies, corporations, business and non-governmental organizations. The committee

⁵ Harmeling (2009). Table 5.

⁶ McLymont-Lafayette (2009).

⁷ 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).

⁸ Chen et al. (2008).

⁹ Giannini et al. (2002).

¹⁰ El Niño-Southern Oscillation; commonly referred to as simply El Niño, a global coupled ocean-atmosphere phenomenon.

¹¹ Dasgupta et al. (2009).

¹² Office of the Prime Minister (2001).

¹³ OAS-DSD (1957).

¹⁴ OAS-DSD (2002).

functions to coordinate the development of national disaster policy and serves as the interagency focus during disaster events. The National Disaster Preparedness and Response Advisory Committee serves to monitor progress toward national disaster policy implementation and provides the technical implementation supervision on behalf of the national council.

Disaster management in Antigua and Barbuda is executed through the National Office for Disaster Services (NODS). This office is headed by the Director of Disaster Preparedness and Response. Emergency powers are executed through the office of the Prime Minister as provided under the Emergency Powers Act. The Governor-General may, by Proclamation which shall be published in the Official Gazette, declare that a state of public emergency exists.¹⁵

Preparation of the National Disaster Management Plan is underway and a final plan is expected in 2010. Currently there is no formally adopted National Disaster Management Plan, however, the current draft plan has been in preparation since 2007. While not formally adopted, the draft plan serves to guide disaster management activities.

ACTIVITIES UNDER THE HYOGO FRAMEWORK FOR ACTION

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

NODS is operational and an Emergency Operations Center has been constructed to house NODS's activities. Currently (2010) NODS maintains a staff of 14, consisting of 4 professional

staff and 10 support staff. Warehousing space has been constructed for pre-positioned disaster supplies.

NODS coordinates with international agencies in a variety of activities including shelter management, supply pre-positioning, response exercises and workshops. NODS currently focuses on preparedness and response; risk reduction and mitigation activities have yet to be integrated into the national disaster management framework.

HFA Priority #2: Disaster risk assessment and monitoring

Risk mapping in Antigua and Barbuda is relatively advanced in the region. NODS supports GIS and mapping services and maintains a GIS specialist on staff. Hazard maps include hurricane effects, coastal erosion, inland erosion, flooding and drought. A vulnerability assessment has been conducted of critical facilities and resources including schools. The hazard maps and the Vulnerability Assessment are used by a number of agencies in Antigua, including NODS, Antigua Public Utilities Authority, Development Control Authority (DCA), banks, insurance agencies, the Ministry of Health, Ministry of Public Works, Police and Military. Base maps have been prepared in a GIS format and include contours, agricultural and urban land use, roads, water courses, electricity and telephone lines, population, social and economic facilities, land capability, parcels and a digital elevation model corresponding to a scale of 1:50,000. Maps are maintained and updated periodically at NODS and DCA.¹⁶

The Meteorological Service is the national monitoring agency for weather-related activity.

The office monitors and forecasts weather providing general forecasting services and storm alert warnings. The office coordinates with the U.S. National Oceanic and Atmospheric Administration for forecasting

¹⁵ OAS-DSD (1981a).

¹⁶ CDERA (2003a).



Nelson's Bay, Antigua and Barbuda

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support and weather satellite imagery access. NODS assists in coordinating the distribution of these warnings and provides public preparedness advice under a system prescribed under the national plan. Warnings are distributed through radio, television and loudspeaker broadcasts, as well as warning flags displayed at police stations.

Earthquake monitoring is managed through the University of the West Indies (UWI) Seismic Research Centre. Real-time observations are taken from the international system of seismograph stations and analyzed at the institute. The unit analyzes the data and provides event reports and periodic analysis as needed. NODS reviews the information provided by UWI and issues public warnings and bulletins as required.

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

Disaster risk reduction through development policy and planning is not currently 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 DRR as a development objective and has not yet been adopted as an operational principle in the national line ministries.

NODS sponsors occasional workshops dealing with disaster preparedness and response.

NODS' functions include promoting preparedness and public awareness. NODS also prepares public information activities and distributes disaster preparedness information. While educational programs in Antigua and Barbuda are limited, a recent program (2009) in earthquake awareness has been developed for public presentation.

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

Building code legislation was adopted in Antigua and Barbuda in 1996 and is enforced through the Development Control Authority (DCA).¹⁷

¹⁷ Status of Building Codes in the Caribbean, USAID/OAS Post-Georges Disaster Mitigation Project, updated 2002.

Enforcement is variable and no retrofitting program has been developed. While new construction for public buildings is monitored for code compliance, private constructions are variously monitored for compliance and eligibility requirements for mortgages and private insurance are likely factors in construction design.

DRM strategies are yet to be integrated in the national development strategy. There is no formal policy for the inclusion of DRM planning in national development programs. Land use planning is currently not a factor for disaster risk reduction in Antigua and Barbuda. While some land use planning occurs, its translation into actual land use constraints is limited.

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

Antigua and Barbuda is a member of the regional Caribbean Disaster Emergency Management Agency (CDEMA).

Antigua and Barbuda'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 for public sector risks, Antigua and Barbuda is a subscriber to the Caribbean Catastrophic Risk Insurance Facility.¹⁸ This offers some relief in the event that the policy is triggered.

The tourism sector, a major contributor to the Antigua and Barbuda's economy, is largely insured by commercial underwriters. An estimated 80% of tourism enterprises is insured. Other sectors, such as agriculture, transport, housing and public infrastructure remain relatively vulnerable. Mortgaged properties are generally insured pursuant to investor requirements.

KEY DONOR ENGAGEMENTS

Existing Projects with Donors and International Financial Institutions	Funding Agency / International Partners	Allocated Budget and Period (US\$)	HFA Activity Area(s)
Caribbean Risk Management 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	

¹⁸ The CCRIF is the first multi-country risk pool in the world, and is also the first insurance instrument to successfully develop a parametric policy backed by both traditional and capital markets. It is a regional insurance fund for Caribbean governments designed to limit the financial impact of catastrophic hurricanes and earthquakes to Caribbean governments by quickly providing financial liquidity when a policy is triggered.



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