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Monographic issue

The disaster profile of Belize

Aisha Andrewin

University of Oviedo – Department of Medicine
Unit for Research in Emergency and Disaster

Letter from the editors

The *Emergency and Disaster Reports* is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This second issue of 2015 of Emergency and Disaster Reports is dedicated to give a comprehensive description of the current situation of Belize related to disaster risk, risk reduction and management, highlighting improvements and identifying areas for further work. It is a desk review utilizing mainly secondary sources of information in addition to one key informant discussion with the national coordinator of National Emergency Management Organization (NEMO).

With a small open economy supported primarily by its natural resource base, Belize remains one of the poorest of the Caribbean nations and has seen increased poverty with currently 40% of the population classified as poor. Belize ranks 96 of 187 countries on the Human Development Index (HDI), a ranking that has been increasing since 1980.

Belize has experienced 19 disasters between 1900 and 2013 all of which were natural with floods and cyclones accounting for 18/19 (95%). In addition to the instantaneous disruption and loss of lives, economic costs have previously been estimated at as high as 45% of GDP in a single event. Some events have also caused major alteration of the natural environment and significant resource degradation.

Factors which increase the country's vulnerability are geographical location, topography and climate, poor building quality, increased poverty and the coastal settlement of the population. Additionally, the huge dependence on natural resources makes for extreme vulnerable to the economic shocks caused by disasters. Factors that decrease vulnerability include political stability and reasonable standards of living and health as indicated by the increasing HDI. The low population density is also likely a protective factor.

The Belizean government supports the implementation of programs and activities related to the DRM through its annual budget- primarily for administrative purposes in the form of NEMO employees' salaries in addition to infrastructure and equipment purchases and logistic support. Many activities are cross-cutting and subsumed under other Ministries and sectors therefore posing challenge in isolating and quantifying DRM resource allocation.

DRM is of high priority as evidenced by the creation of NEMO as the legally mandated coordination mechanism for DRM, ratification of several international conventions, active membership in regional bodies including the Caribbean Disaster Management Agency and the Caribbean Risk Insurance Facility, participation in numerous initiatives at national and regional levels and numerous unilateral and bilateral agreements. Additionally, a paradigm shift is occurring with more efforts being committed to prevention, mitigation and preparedness than previously seen. Significant work also continues to be undertaken under the auspices Climate Change and Sustainable Development. Moreover, the couching of DRM within larger developmental issues such as sustainable development and poverty reduction symbolizes a deeper understanding of risk management and vulnerability.

Disaster response is arguably the best developed phase of the disaster management cycle and more so for hydrometereological than other types of events. Among the gaps noted is the need to broaden the scope to include more disaster types, striking a balance with adequate planning and resource allocation given the brunt of impact by disaster type. The phase of the management cycle for which progress is less clear is that of the reconstructive phase and the concept of building back better. Another gap is the apparent lack of identified indicators for monitoring DRM based on the national disaster mitigation plan and this is notwithstanding the adoption of the HFA and other international and regional frameworks.

The visibility and momentum of DRM need to be maintained as DRR is a long-term process that will continue to require broad social participation, education, cultural shifts, policy reform, institutional capacity, financial resources, and political will. The country must continue recognize DRM as a developmental issue and to embrace the pillars of sustainable development and poverty reduction as well as benefit from the collective wisdom of the existing international and regional frameworks.

Prof. Pedro Arcos, Prof. Rafael Castro
Editors, Emergency and Disaster Reports

Unit for Research in Emergency and Disaster
Department of Medicine. University of Oviedo
Campus del Cristo 33006 Oviedo – Spain
www.uniovi.net/uied

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Author: Aisha Andrewin

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Acronyms

BPoA	Barbados Programme of Action
CAPRA	Central American Probabilistic Risk Assessment
CARICOM	Caribbean Community
CCCCC	Caribbean Community Climate Change Centre
CCRIF	Caribbean Catastrophe Risk Insurance Facility (CCRIF)
CDEMA	Caribbean Disaster Emergency Management Agency
CDERA	Caribbean Disaster Emergency Response Agency
DFID	Department for International Development
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EM-DAT	Emergency Database
EPI	Expanded Programme on Immunization
GFDRR	Global Facility for Disaster Risk Reduction
JICA	Japanese International Cooperation Agency
MDGs	Millennium Development Goals
MICS	Multiple Indicator Cluster Survey
NEMO	National Emergency Management Organization
NHMP	National Hazard Management Plan
NOAA	National Oceanic and Atmospheric Administration
PHEIC	Public Health Emergencies of International Concern
UNCCC	United Nations Convention on Climate Change
UNISDR	United Nations International Strategy on Disaster Reduction
USGS	United States Geological Survey
WHO	World Health Organization
WB	World Bank

Introduction

Belize is a small middle developed Central American nation in the Caribbean Region, a region which faces a number of hazards which are primarily natural in nature - particularly earthquake and hurricane risks, volcanic risks in certain areas as well as secondary risks from flooding and landslides, storm surge and wave impacts, and tsunamis.[1]

The following report is a descriptive account of the disaster risk profile of the country of Belize. The main purpose of compiling this document is in order to give a comprehensive description of the current situation as relates to disaster risk and risk reduction, highlighting improvements and identifying areas for further work.

This report is essentially a desk review utilizing the following main secondary sources of information: Historical review of flood events primarily utilizing the Emergency Database (EM-DAT) of the Centre for Research on the Epidemiology of Disasters (CRED); reports from the National Emergency Management Organization of Belize (NEMO) and Preventionweb; a comprehensive desk review of the key national documents including policies, plans, previous assessments and reports; and Internet searches for disaster-related research conducted on the country including PubMEd and using key words plus the Boolean "AND" Belize.

Additionally one key informant discussion was conducted with the national coordinator of the National Emergency Management Organization (NEMO) of Belize. The disaster terminology used is based on definitions from the United Nations International Strategy on Disaster Reduction (UNISDR) *Terminology on Disaster Risk Reduction (2009*).

Belizean context and vulnerabilities

Geography[1]

Belize is a small country located on the Caribbean coast of the Central American península [2] lying between 15°45'and 18°30'north latitude and 87°30' and 89°15' west longitude. Belize is bordered to the north by Mexico (and forms a portion of the Yucatan Peninsula), to the west and south by Guatemala and to the east by the Caribbean Sea.

The country occupies a total land mass of 8,867 square miles (22,960 km^2) - 95% of which is registered mainland and the remaining 5 % distributed among more than 1,060 coastal cayes[3]. Belize's coast extends for 386 km (240 miles) and is host to the largest barrier reef in the northern hemisphere and the second largest in the world.[4] The total national territory, including the territorial sea is 46,620 km2 (approximately 18,000 square miles). It measures 174 miles at its longest point and 68 miles at its widest point. The country has a

diverse geography including forests, flat swampy coastal plains, and low mountains in the south.

Topographically the landscape is divided into two main physiographic regions. The first region comprises mountainous territory, 1,124m (3688 ft) above sea level at the highest point, and the associated basins and plateaus. The second region comprises the northern lowlands, along with the narrow coastal plain in the southern half of the country. Additionally, Belize has a total of 18 major river catchments with another 16 sub-catchments, which drain the Maya Mountains and discharge into the Caribbean Sea as well as numerous freshwater and brackish water lakes or lagoons across the country's low lying coast.

Approximately 67.4 % of the country remains under natural vegetation cover with 34.9% of its terrestrial area is protected forest, much of it incorporated into the Mesoamerican Biological Corridor in which it occupies a key place due to Belize's abundance of terrestrial and marine species and diversity of ecosystems.

The country's total land mass is divided into six administrative districts, namely Corozal and Orange Walk (North), Belize (East and Central) and Cayo (West and Central) and Stann Creek and Toledo (South).

Climate

Belize's climate is influenced by three large global/regional climatic systems inclusive of the Atlantic Ocean Climatic System, the Pacific Ocean Climatic system and also periodically by changes in the North American weather systems and despite its subtropical location, Belize's climate is classified as being tropical to extra-tropical. This is attributable to the intrusion of cooler continental air from the north during winter months facilitated by the large landmass of neighboring Mexico.

The climate is characterized by distinct wet-rainy and dry seasons separated by a cool transitional period and temperatures ranging from 21 to 32 degrees Celsius. Approximately 60% of the annual rainfall occurs in the rainy season which typically begins in early May[5] in the southernmost district of Toledo moving northward to Corozal by mid-June.

Most rainfall occurs between the months of June and November. During intense drought conditions over the Northwestern Caribbean region, the rains are not seen in June or even July and the onset of the rainy season is delayed until late August or September as were the case in 1974 and 1975, which were significant dry years.[6]

Annual average rainfall ranges from 60 inches in Northern Belize to 150 inches in the south with the difference attributable to the effect of warm moist tropical air moving in from the east and rising over the Maya Mountains that increases the intensity of the rainfall in the south.

The annual mean humidity is 81.1% and can reach as high as 98%; the average temperature in Belize is approximately 80 degrees Fahrenheit with average highs of 85° and a mean low of 73°. On average, 12 cold fronts cross the country

each year lowering temperatures into the 40s. January is the coldest month and May the month with highest temperatures.

Figure 1: Belize geographical location and administrative Districts[7]

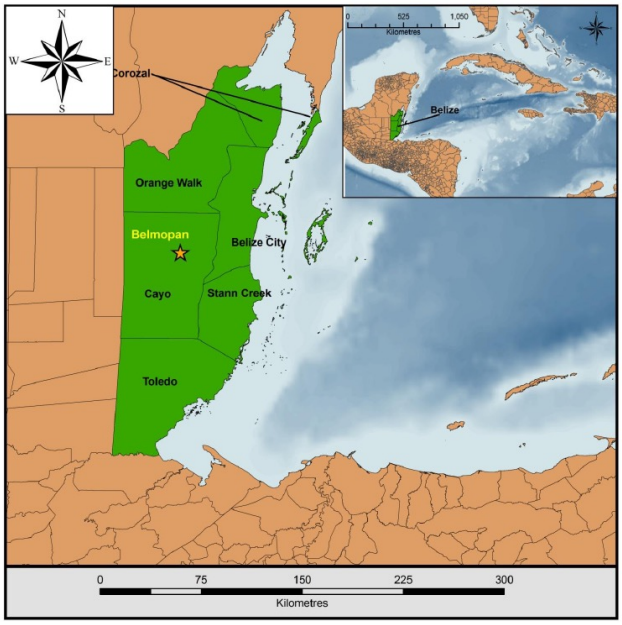
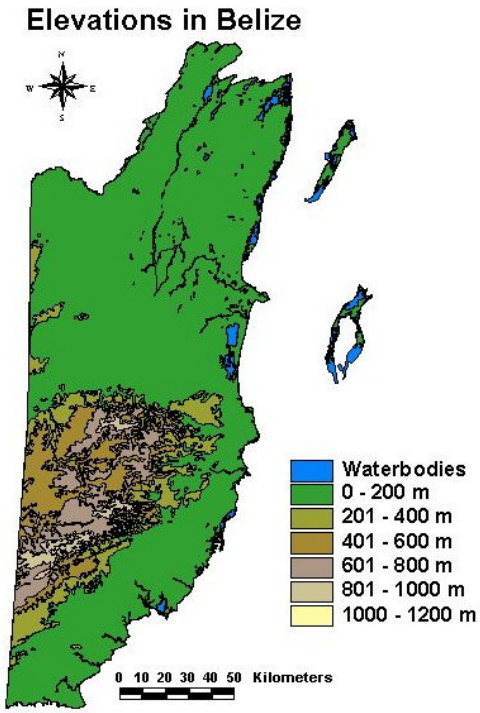


Figure 2: Topography of Belize[8]



Population demographics

The annual average growth rate of the Belizean population between 2000 and 2010 is stated as being 2.65%. The mid-year population of Belize was estimated at 340,792 in 2012[9]. The country's population growth rate of 1.97% per year (2013) is the second highest in the region and one of the highest in the western hemisphere and is characterized by both ethnic and cultural diversity within a relatively young population with Mestizo 49%, Creoles 25%, Maya 11%, Garifuna 6%, Other 10% and more than 55% under age 25 years and less that 5% 65 years and older. The ratio of males to females is roughly 1 to 1. Approximately 45% of Belize's population is classified as urban.

Belize is has the lowest population density in Central America at 37.5 persons per square mile (14.5/km^2) [2]. Approximately 35% of the population live along the coastline and constitute the most densely populated areas including Belize City which is located in the most populous Belize district. In fact almost 30% of residents live in the Belize District followed by Cayo (23.91%), and Orange Walk (15%); Toledo is least populated district with a reported 30,100 residents (9.34%).

Political Context

Belize is a former British colony which gained constitutional independence in 1981 but remains a member of the British Commonwealth of Nations. English is the official spoken language making the Belize the only country on the Central American isthmus where this is the case. It is a practicing democracy with a political system of parliamentary democracy modelled after the British 'Westminster' model of constitutional monarchy, with the queen of the British Commonwealth as the titular head of state. A governor general is appointed by the Queen of England as her representative in the country.

The National Assembly is a bicameral legislature with an elected House of Representatives and an appointed Senate. Ministers of government are appointed from among the members of the House and the Senate. The Cabinet, which consists of the Prime Minister and the Ministers, directs the policy of the Government and is collectively responsible to the National Assembly. General elections are held every five years.

Belize is also a member of the Caribbean Community (CARICOM)[10] as well as several other numerous international organization entities including the Central American Integration System (SICA), the Organisation of American States (OAS) and the Group of African, Caribbean and Pacific Countries (ACP).

Data and ranking on the democratic index[11] or other objective assessments of the degree of democratic governance are lacking. However, the country scored 1 for political rights and 2 for civil liberties on scales of 1-7 and 22 on a scale of 0-150 for freedom of the press, with the lower rankings considered preferable to higher rankings[12]. On the other hand the country continues to be plagued by perceptions of significant corruption; the *Control of Corruption* score in 2010 according to Transparency International was -0.077677797.[13]

Economy

Belize is classified as a lower middleincome country[14]. Belize is a small open economy supported primarily by its natural resource base. Although Belize's GDP per capita reportedly grew by 36% between 1999 (USD $3,045.6) and 2010 (USD $4,153), on a per capita basis, Belize remains one of the poorest of the Caribbean nations on a per capita basis and according to the World Bank's 2014 World Development report. [3] Of the 14 Caribbean countries for which information was gathered, Belize was the third lowest, with a per capita income of $4,180.00 US dollars compared for example with the Bahamas at $21,280 . Only Guyana and the US Virgin Islands were lower than Belize.

The Belizean economy derives most of its foreign exchange from tourism and the export of marine and agricultural products (such as sugar, bananas, and citrus); approximately 10% of the labour force is involved in agriculture, 18% in industry and 72% in services. The Belizean dollar per US dollar exchange rate has been retained at 2:1 for more than 30 years.

Debt service represents almost 10% of exports and the total public debt burden remains at over 80% for 2010 and 2011 at 83.5% and 82.8% respectively albeit down from a peak of 129.9% in 2009.[15] In September 2012, the government defaulted on a $23 million payment on its global bond and is in talks with international bondholders to restructure the debt. Additionally, most accounts are of limited economic freedom and the country ranked 102 (out of a total of 177 countries that received a ranking) on the economic freedom index [16]

The 2009 Poverty Assessment indicated several indicated several important constraints, including vulnerability to disasters, facing the Belizean economy as well as a number of positive features, including proven resilience to natural disasters that may facilitate future growth. [4]

Poverty

The CPA also found Belize to have some of the highest levels of poverty in the Carribean and indicated increased levels of poverty from a previous assessment conducted in 2002 with more than 40% of the population classified as por. The highest proportions were recorded for the Toledo and Corozal Districts with 60% and 57% respectively and for rural populations versus urban populations at 55% and 28% respectively. Furthermore 16% were classified as indigent[17] with a further 14% classified as vulnerable to poverty and around 43% were not poor. Nonetheless, the majority of households were found to be able to obtain sufficient food and widespread hunger is not apparent although 10% of households demonstrated a lack of sufficient food.

Unemployment for 2010 was 23.1% overall, 16.7% of males and 33.1% of females. The dependency ratio was 66.3% overall, ranging from 56.9% in the Belize District to 88.1% in the Toledo District. The assessment concluded that the groups particularly vulnerable to poverty include large families, rural households in general, the indigenous Maya of southern Belize and children.

Additionally, poverty increased in the Corozal District due to the devastating impact of Hurricane Dean in 2007.

A report by UNICEF in 2011 corroborated this unequal burden and vulnerability in children for whom poverty rates were estimated at 50%. The report linked the immediate causes of poverty to low incomes, insecure livelihoods, unemployment, and deficiencies in the capabilities and assets of the poor to respond to changing economic opportunities. [5]

Developmental indicators and education

Belize ranks 96 out of 187 countries on the Human Development Index (HDI)[18].[6] Between 1980 and 2012 Belize's Human Development Index rose by 0.5% annually from 0.621 to 0.702 in 2012 and its current ranking. Notwithstanding this improvement, Belize's HDI is still below the regional average of 0.741 for the same year. Belize has a Gender Inequality Index (GII)[19] value of 0.435, ranking it 79 out of 148 countries in the 2012 index. According to the Millennium Development Goal (MDG) Scorecard assessment report of 2010, progress has been made in the areas of gender equality and women's empowerment. [7]

In Belize, 13.3 percent of parliamentary seats are held by women, and 35.2 percent of adult women have reached a secondary or higher level of education compared to 32.8 percent of their male counterparts. Female participation in the labour market is 48.3 percent compared to 81.8 for men. The proportion of women employed in the non-agricultural sector has increased from 38.7 per cent in 1995 to 41.7 per cent in 2007, signalling the opening up of labour markets to women. The Labour Amendment Act No. 3, approved in 2011, grants for the equitable treatment of women in the labour force. An estimated 94.7% of the population have primary education and is considered literate.

Health, health care and health systems

Health care system in Belize is primary health based with approximately 75% of the public accessing health care via the public system which consists of number community health workers (CHWs), health posts, health centres and polyclinics, community hospitals and referral hospitals and one tertiary level institution in Belize City.

In general, health indicators show improved life expectancy and survival, but improvements in quality of life and decreases in some preventable causes of death and illness remain major health challenges (PAHO/WHO-Belize estimates in 2011). Life expectancy at birth for 2011 was 74.9 years overall and 77.1 and 72.2 years for males and females respectively. Maternal mortality has seen a decreasing trend for more than the past ten years with a shift from obstetric to non-obstetric causes. Since 1999 fewer than 10 maternal deaths (corresponding to 134/100,000 live births in 2005) have been reported annually and in 2011 there were no reported maternal deaths in the country. Infant mortality maintains under 20/1000 live births annually. Underweight and stunting have been estimated to be around 4 and 22% respectively with

variations by district. Immunization coverage rates as per the Expanded Programme on Immunization (EPI) have been historically high maintaining >95% for the childhood illnesses including measles and the country, like several in the Americas where Measles elimination has been sustained since 2002[8], is in the process of verification of measles eradication.

Belize continues to undergo an epidemiological transition in which non-communicable diseases (NCDs) have become increasingly prominent in the disease profile and have been increasing in their share of the disease burden for well over a decade. Cardiovascular diseases (CVDs), cancers, diabetes and chronic respiratory diseases are responsible for around 40% of deaths annually. In 2011, for example, were 681 out of a total of 1555 (44%) of deaths for that year were attributed to NCDs. This is compared with 28% for injuries and external causes; and 20% for communicable diseases including HIV and acute respiratory tract infections and "other" causes combined in that same year.

Access to safe drinking water and basic sanitation

The 2006 Multiple Indicator Cluster Survey (MICS) report showed that 98.8% of urban dwellers and 95.4% of rural dwellers have access to safe drinking water. Adequate sanitation coverage at a national level has increased from 41% in the late 90s to roughly 70% by 2008 although 30% of Belizeans, largely rural, still relied on systems classified as inadequate. [8]

Table 1: Summary of selected basic indicators for belize

Indicator	Value
GDP per Capita (USD) ('12)	8400
% Below Poverty Line	43
Unemployment (%)	23.1
Human Development Index ('12)	.702 (96/189)
Gender Inequality Index ('12)	0.435 (79 /148)
Safe Drinking Water (U/R)	98.8/,95.4
Adequate Basic Sanitation (%)	70
Literacy (%)	95
Life expectancy T,M,F('11)	74.9,72.2, 77.1 years
Maternal Mortality Ratio (/10^5) '11	0 (<134 since '99)
Infant Mortality (/1000 live births)	< 20
Immunization Rates	>95%

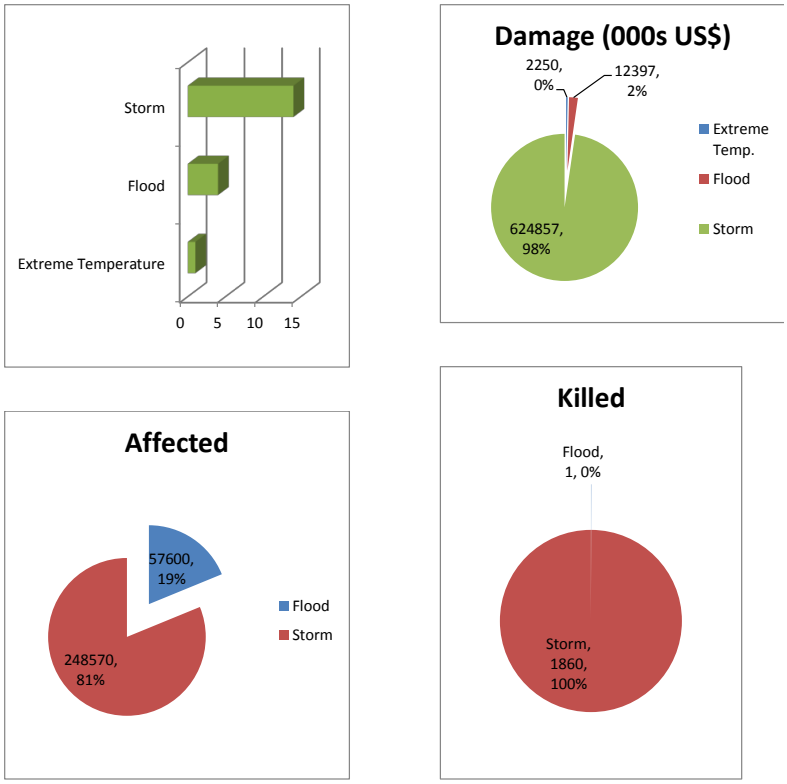
Disaster risks and hazards by origin

Natural hazards and disasters

Historically and officially, natural disasters are the only type of disaster on record to have impacted the country significantly. Like the rest of the region to which it belongs geographically, Belize's natural hazard risks include cyclones/hurricanes in particular, tidal waves, floods, landslides, fire disasters and wind damage.

Based on the CRED criteria for disasters[20], Belize has experienced 19 natural disasters between 1900 and 2013 which cumulatively have been responsible for a total of 1860 deaths, affected 306,170 people and have cost an estimated 639,304,000USD in damages. According to data from the EM-Dat, floods and hurricanes accounted for 18/19 (roughly 95%) of which tropical cyclones/hurricanes were responsible for 14 of those 18 events (78%). In terms of impact, these events were therefore responsible for 100% of the deaths and affected persons and 99.6% of damages.

Figure 3: Summary of disasters in belize from 1900 to 2013



The following tables illustrate the top ten disasters experienced by the country between in terms of deaths, persons affected and estimated economic costs of damages[21].

Table 2: Total number of persons killed in disasters in Belize, 1931-2010

Disaster	Date	No Killed
Storm	10/9/1931	1500
Storm	30/10/1961	275
Storm	8/10/2001	30
Storm	28/09/1955	16
Storm	30/09/2000	14
Storm	25/10/1998	9
Storm	31/05/2008	7
Storm	18/09/1978	5
Storm	14/11/2005	3
Flood	19/10/2008	1

Table 3: Total number of persons affected in disasters in Belize, 1931-2010

Disaster	Date	No Affected
Storm	2/9/1974	70000
Storm	30/09/2000	62570
Storm	25/10/1998	60000
Flood	19/10/2008	38000
Storm	8/10/2001	20000
Storm	21/08/2007	20000
Flood	Dec-79	17000
Storm	31/05/2008	10000
Storm	18/09/1978	6000
Flood	Oct-95	2600

Table 4: Total estimated damage costs of disasters in Belize, 1931-2010

Disaster	Date	Damage (000 US$)
Storm	30/09/2000	277460
Storm	8/10/2001	250000
Storm	30/10/1961	60000
Storm	21/08/2007	14847
Flood	19/10/2008	9697
Storm	10/9/1931	7500
Storm	18/09/1978	6000
Storm	28/09/1955	5000
Storm	02/09/1974	4000
Extreme Temperature	1990	2250

Hydrometerological

As noted, in terms of disaster type, cyclones and flooding are overwhelming the main causes of disaster losses with the former having had the most devastating effects largely due to damage caused by high winds and storm surges especially to coastal areas which are particularly exposed; the extensive barrier reef which covers the entire coastline facilitates the development of storm surges due to the shallow bay.

The 2013 Caribbean Risk Assessment Profile indicates that contributors to the country's hurricane hazard risk include the high concentration of economic activity in low lying coastal areas such as around Belize City and coastal tourism that has increasingly become an income earner for the country notwithstanding a less exposed and vulnerable agricultural sector; generally vulnerable infrastructure due to generally poor building standards.

With regards to the specific and most memorable storms, the category 4 cyclone of 1931 was the most devastating in terms of deaths – 1500 according to CRED data (as many as 2500 by other accounts). According to the National Emergency Management Organization (NEMO) historically, 90 percent of all hurricane casualties have occurred from drowning and 10 percent from other causes.

Hurricane Hattie, a category[22] 5 cyclone is another of the most prominent in the nation's history responsible for the second highest number of people killed which destroyed the former capital, Belize City and which necessitated the establishment of a new administrative capital city, Belmopan 50 miles to the west and inland from Belize City.

The late sixties and most of the seventies and eighties were relatively quiet but the country has seen an increase in the number and severity of storms since the late nineties with Hurricane Mitch in 1998 and 2000s. Hurricanes Keith (2000) and Iris (2001) struck Belize causing damage reaching 45 percent and 25 percent of GDP, respectively. [9] More recently the country suffered the impacts of Tropical Storm Arthur in May 2008 and Category 1 hurricane, Richard in October 2010 which caused widespread flooding and extensive damage to infrastructure and the agricultural industry.

In addition to the disrupted lives and national economic processes in the Belizean context, these events have also caused major alteration of the natural environment and significant resource degradation. In 2010 Hurricane Richard damaged some 410,000 acres (11%) of Belize's forests.[9]

Based on analysis of satellite metrics of canopy greenness, 140,000 acres were estimated to have suffered low levels of damage, while 215,000 suffered moderate levels of damage and 54,000acres suffered high levels of damage. In 1998, Hurricane Mitch caused significant damage to the Belize Barrier Reef Complex, reducing coral recruitment by as much as 80% in exposed areas.[10]

Additionally, with regards to flood risk, because the land is drained by relatively fast-moving rivers, flash floods often occur particularly in the western and southern regions.

Climatological

Belize is also at a constant risk of fires which may start by natural causes such as lightening or indiscriminate human actions usually, cause damage to grassland and forest areas. The milpa system[23] of farming has previously identified as a risk factor. Historically, dating as far back as 1802, Belize City due to relative congestion and abundance of wooden buildings and poor housing quality and general building practices has seen the brunt of fires the destruction of entire neighborhoods, and in some instances loss of life.

Geophysical

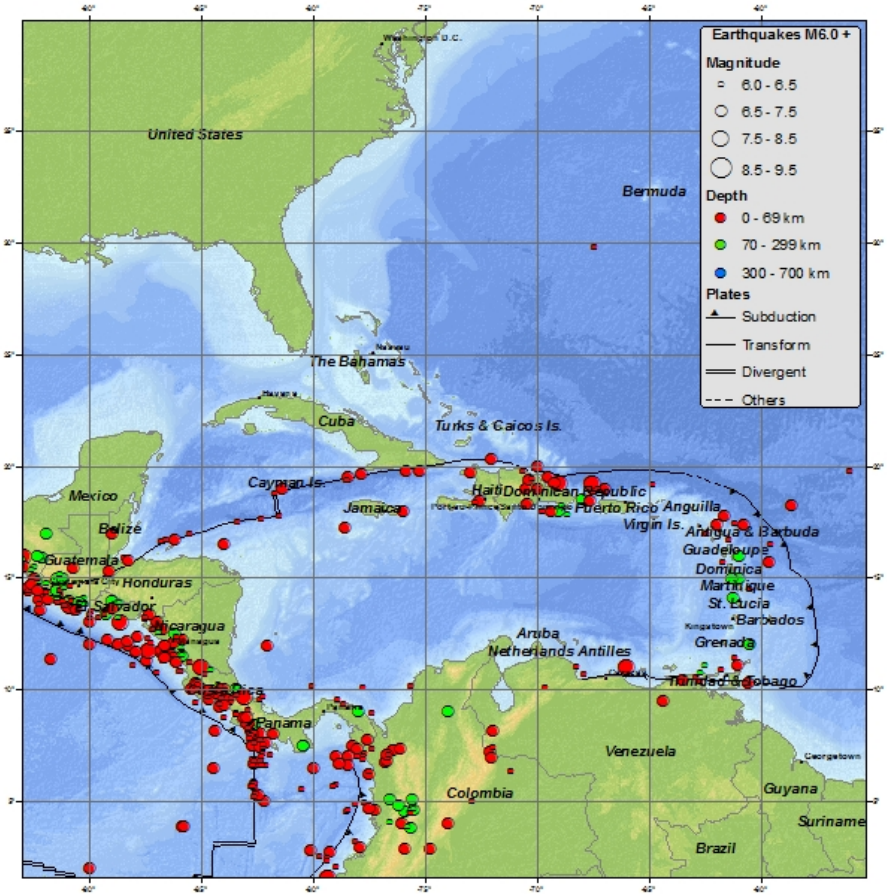
Although the Pacific Coast of Central America is far more susceptible to earthquakes than the Caribbean Coast, Belize is close to the tectonically active northern margin of the Caribbean plate and as a result, earthquake risk is concentrated in the south-eastern region of the country, albeit away from the main population centres.

According to the U.S. Geological Survey, the entire nation of Belize falls within the 0.2 to 2.4 m/s^2 range of peak ground acceleration which is quite low in the regional context. For reference, both Mexico and Guatemala experience shocks in excess of 4.0 m/s^2.

The country has not been subject to any major earthquake events in recorded history. However, large earthquakes do occur in the area offshore to the southeast of Belize where the Caribbean Plate margin runs and these have the potential to be damaging to Belize City and Belmopan as well as the more southern towns as was seen in 2009 when aftershocks of an earthquake of magnitude 7.1 in Honduras resulted in structural damage in villages in the southern Belize and Stann Creek Districts. [24]

There are no known volcanoes in Belize, but the territory is exposed to ash falls from neighbouring volcanoes. In 1982, for instance, the eruption of the Chichón volcano, in the Chiapas region of Mexico, covered much of the country with ash.[11] Landslides are relatively rare.

Figure 4: Caribbean tectonic plate[25]



Biological

To date, Belize has no history of having experienced any devastating epidemics. However, with the modern-day travel the risk of pandemic is recognized e.g such as with the Influenza Pandemic preparedness efforts. The country is a signatory to the International Health Regulations (2005)

[26] with the mandate to develop core capacities to detect and control public health events of international concern (PHEIC) in the areas of surveillance, preparedness and response towards all public health threats. Competencies have yet to be met and in 2012 Belize was one of the 102 countries worldwide that requested an extension of the June 2012 deadline to June 2014 to meet the requirements. Preparedness for radiation and chemical emergencies are among weakest areas whereas the strengthening of surveillance for the laboratory and at ports of entry are among areas of priority identified. [12]

Technological

Belize has no history of technological disasters and historically Belize has been considered at low risk of technological disasters. This notwithstanding however, the most current accounts admonish that advancements in technology and developments such as increased marine traffic and recent discovery of oil in 2006 and the developing oil industry may pose attendant risks not heretofore experienced by the country and underlie the need for periodic risk and vulnerability assessments.

Man-made

Civil Disorder and War - Central American Refugees

During the 1970s and 1980s Central America was plagued with conflict and the ensuing violence and repression created an estimated two million refugees. Belize was not one of the countries embroiled in the turmoil and became a safe haven for an estimated 30,000 refugees, the majority of which reportedly came from rural areas of El Salvador and Guatemala, as a result of conflict within those two states. [13] Most arrivals to Belize were farmers or farm labourers.

According to the United Nations High Commission for Refugees (UNHCR)[27] accounts despite massive forced displacement, combined with economic migration, an open-door policy was upheld by most countries in the 1970s and 1980s. In 1982, the Belizean government began to resettle refugees on more than 6,000 hectares of uncleared forest in the upper Belize River Valley. [14]

The project, named the Valley of Peace, was initially funded with US$910,000 from the United Nations and no resulting complex emergency is on record as a result of this situation in Belize. Moreover, the further integration of displaced people in the 1990s is considered to have contributed to the overall stability of the region.

Territorial Dispute with Guatemala

Belize has itself never been involved in any major conflicts or wars. However, the country has been involved in a territorial dispute with

Guatemala since 1940. At the core of Guatemala's claim to Belizean territory is the Anglo-Guatemalan Treaty of 1859. When the Latin American countries became independent from Spain in 1821, they established the rule that the boundaries of these new republics would be the same as when the territories were ruled by Spain. Guatemala claimed that Belize had been part of the Spanish territory. However, the British argued that they had been in control of the area before 1821 and so this rule did not apply to Belize. [15]

Guatemala at has at various points has threatened invasion claiming either part or the entire country. Referenda have been proposed for the citizens of Belize and Guatemala, asking whether they support referring the issue to the International Court of Justice (ICJ) and a special agreement on submitting the issue to the ICJ was signed on 8 December 2008, with a referendum to be held on the issue simultaneously in Belize and Guatemala on 6 October 2013.

Climate Change

Belize is the 8th ranked country from 167 for climate risk, according to the World Bank and is highly vulnerable to the effects of climate change mainly for the following reasons: (i) long, low-lying coastline; (ii) over 1,060 small islands; (iii) its second-longest barrier reef in the world and 17,276 km2 of forest cover, each of which support fragile ecosystems; and (iv) the fact that it is very prone to natural disasters, especially hurricanes.

Initial studies for Belize have uncovered an alarming find in that the temperature in Belize is rising faster than the global average with the rate of increase in Belize for the past 40 years has being 0.40 per decade along the coast and 0.45 in the interior thereby exceeding both the global 50-year and 25-year trends of 0.23 per decade for the past 50 years and 0.32 degrees for the past 25 years.

Effects of climatic change are already in evidence as seen with coral bleaching and mortality and the impact on biodiversity and ecosystem function. Storm hazards are expected to become stronger and develop more rapidly, greater variations in precipitation are predicted to affect droughts and floods, and rising sea levels to threaten much of Belize's low-lying territories where most infrastructure and settlements are located i.e on the coastal plains and on low-lying cayes of the country. Projected sea level rises and extreme weather events are expected to jeopardize the country's coastal tourism, fisheries and aquaculture industries, and agriculture base, as well as undermine availability of water resources [16]

Like other developing countries this implies significant untoward economic impacts as a result of declining agricultural incomes, higher costs of natural disasters, and a greater risk to human health from vectorborne illnesses, malnutrition, heat stress, and water-related diseases.[17]

An assessment on the potential economic impact of climate change if crucial adaptation measures are delayed was commissioned by the United Nations Development Programme (UNDP) [17] and was primarily focused on estimating and the focusing on the vulnerabilities of three key economic sectors: agriculture and fisheries, energy and tourism. Conclusions included the following:

- Projected shorter growing seasons as well as decreases in yields of 10% to 20% across the various scenarios for beans, rice and maize - important staple crops in terms of Belize's food security as well as export income, which would represent BZ$13-18 million in lost revenue. Sugar and banana production are likely to face risks from encroachment of salt water in nearby river streams.

- Costs of additional electricity demand in Belize due to climate change estimated at BZ$1.7 million in the low scenario and BZ$59.7 million in the high scenario, with an estimate economic impact of climate change for the electricity sector of BZ$58 million by 2080.

- Economic impact of climate change for the tourism sector in Belize are estimated at BZ$48.3 million, which included the effects of reduced tourism demand, loss of facilities (from sea level rise), loss of beaches (from coastal erosion), and loss of reef-based ecotourism.

- Additional threats to coastal communities, infrastructure, public health, water availability and forests.

Disaster management and risk reduction contexts

International disaster risk manahement context

At the international level, the country has aligned its plans and strategies with the United Nations International Strategy for Disaster Reduction (UNISDR) and Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters[28]. Additionally, the country is also a member of the Global Facility for Disaster Reduction and Recovery (GFDRR) partnership was established with 41 countries and 8 international organizations including UNISDR with the committment to helping developing countries reduce their vulnerability to natural hazards and adapt to climate change.

The partnership's mission is to mainstream disaster risk reduction (DRR) and climate change adaptation (CCA) in country development strategies by supporting a country-led and managed implementation of the Hyogo Framework for Action (HFA). [29] Belize is also a signatory to the United

Nations Framework Convention on Climate Change (UNFCCC) and other global and regional Multilateral Environmental Agreements.

As relates to potential epidemics and other public health emergencies of international concern (PHEIC), the country is also a signatory to the International Health Regulations (2005) which have been in implementation since 15 June 2007 globally. This legally-binding agreement significantly contributes to global public health security by providing a new framework for the coordination of the management of events that may constitute a public health emergency of international concern, and will improve the capacity of all countries to detect, assess, notify and respond to public health threats IHR States Parties had until 15 June 2012 to meet their IHR core surveillance and response requirements, including at designated airports, ports and certain ground crossings. A majority of States Parties, however, including Belize, have requested and obtained a two-year extension to this deadline to 2014.

As relates to potential man-made disasters, Belize is a also signatory to most international conventions related to human rights issues such as the Convention against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment (1986), Convention Relating to the Status of Refugees (1990) and International Covenant on Civil and Political Rights (2000).

Regional disaster risk reduction (DRR) context

The Barbados Programme of Action (BPoAof 1999) has been adopted by several Caribbean small islands states and countries including Belize and calls for the integration of natural and environmental disaster policies into national development.[18]

Other relevant regional frameworks include Climate Change and the Caribbean: A Regional Framework for Achieving Development Resilient to Climate Change (2009-2015). This framework envisages that the financing of disaster risk reduction initiatives will be treated as a development priority within the budgeting process, and that all government entities will advance the goals and objectives of the framework by ensuring that disaster risk reduction is taken into account in the design of development programmes and projects.

With regards to regional institutional mechanisms, in 1991 the member states of the Caribbean Community (CARICOM) established The Caribbean Disaster Emergency Response Agency (CDERA). In addition to conducting coordinated responses to disastrous events, CDERA was also responsible for disaster management and mitigation initiatives. In September 2009 CDERA underwent a name change to the Caribbean Disaster Emergency Management Agency (CDEMA) in part signifying paradigm shifts, expanded roles and responsibilities[30] as relates to DRM in the region.

CDEMA espouses the full embracement of the principles and practice of Comprehensive Disaster Management (CDM) with an integrated and

proactive approach to disaster management which seeks to reduce the risk and loss associated with natural and technological hazards and the effects of climate change to enhance regional sustainable development. CDEMA also intends to achieve an expanded mandate, a broader stakeholder base; and an improved governance structure.

Other agencies at the regional level with specific mandates and programmes in disaster management at the regional include the Pan American Health Organization (PAHO), the Japanese International Cooperation Agency (JICA), the Department for International Development (DFID) of the United Kingdom, and the World Bank (WB).

With regards to regional risk transfer mechanisms and insurance, the Caribbean Catastrophe Risk Insurance Facility (CCRIF)[31] is a multi-country risk pooling facility, owned, operated and registered in the Caribbean for Caribbean governments. It is designed to limit the financial impact of catastrophic hurricanes and earthquakes to Caribbean governments by quickly providing short term liquidity when a policy is triggered. It is the world's first and, to date, only regional fund utilising parametric insurance, giving Caribbean governments the unique opportunity to purchase earthquake and hurricane catastrophe coverage with lowest-possible pricing.

CCRIF represents a paradigm shift in the way governments treat risk, with Caribbean governments leading the way in pre-disaster planning. CCRIF was developed through funding from the Japanese Government, and was capitalised through contributions to a multi-donor Trust Fund by the Government of Canada, the European Union, the World Bank, the governments of the UK and France, the Caribbean Development Bank and the governments of Ireland and Bermuda, as well as through membership fees paid by participating governments.

Sixteen governments are currently members of CCRIF. These are: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Trinidad & Tobago and Turks & Caicos Islands.

Belize currently participates with an annual premium of US$500,000. Although this represents a major advancement and paradigm shift in DRR however, one national assessment report conducted in 2010 purports that the instrument is not well understood by the public or within the government, that at its inception it covered only windstorm hazards and had only one national trigger point (Belize City). Thus, in 2007 when Hurricane Dean struck north of Corozal, it failed to trigger a payout. Subsequently the CCRIF has explored additional attachment points and the possibility of flood insurance for Belize.

National disaster risk reduction (DRR) context

Legislation[32]

The following is a brief summary of the main pieces of legislation that are of import to DRR.

The Disaster Preparedness and Response Act

Revised in 2003, it is the primary legislation governing DRM in Belize. The Act established the National Emergency Management Organization (NEMO) as a Department of Government, headed by a National Emergency Coordinator. It assigns broad responsibilities for "coordinating the general policy of the government related to the mitigation of, preparedness for, response to and recovery from emergencies and disasters". The Act is skewed toward preparedness and response and is silent on risk transfer. It states that the Governor-General may, by an official proclamation, declare that a state of public emergency exists.

The Belize Building Act of 2003

Amended in 2005, this act is purportedly devised "*to control building operations in the interest of public health and safety and to enable the introduction of regulations prescribing standards relating to the use of materials and methods of construction, repair, maintenance and demolition of buildings, and the control of building development*…".

The Land Utilization Act

Revised in 2000, it provides for the subdivision and utilization of land; and for the National Emergency Coordinator (NEC) to be a member of the Land Subdivision and Utilization Authority.

The Environmental Protection Act

This act assigns to the Department of the Environment the authority to conduct its own environmental impact assessment where deemed necessary, and to approve environmental impact assessments subject to consultation with the NEC. This provision enables the NEC to incorporate disaster risk considerations into the project cycle.

The Coastal Zone Management Act of 1999

This act mandates the Coastal Zone Management Authority and Institute to address cross-sectoral sustainable development of coastal resources.

The Insurance Act (No. 11 of 2004)

This act makes provisions for domestic insurers and to strengthen the regulatory framework for the insurance industry and provides for risk coverage for government and private sector-financed infrastructure, up to the duration of the mortgage.

The Reconstruction and Development Corporation Act

This act facilitated the relocation in 1970 of the Government's main administrative centre from Belize City to Belmopan, following damage from Hurricane Hattie in 1961. The Act has not been applied since, and has no current functioning administering unit.

Policy/Planning/Strategic Frameworks[33]

The two main overarching policy and strategic documents for addressing DRR and DRM in the country are the *National Hazard Mitigation Policy* and *National Hazard Mitigation Plan* respectively. In addition a number of sectoral operational plans which are intended for annual revision also exist. The following is a brief summary of these main guiding restricted to the national level.

National Hazard Mitigation Policy

The National Hazard Mitigation Policy (2004) is considered to be the most comprehensive policy attempt in addressing DRR to date within a policy framework previously assessed to be fragmented *with several sectoral policies but no overarching policy in place as a more comprehensive measure.*

The policy, which was drafted in 2004, aims to integrate hazard risk reduction into national development processes and national institutional strengthening for DRR and was policy was prepared through a concerted effort by the Government of Belize, the Caribbean Disaster Emergency Response Agency (CDERA) and the Caribbean Development Bank (CDB) to provide an integrated approach to hazard risk management and sustainable development, at national, sectoral and community levels. It is seen as an important benchmark for stakeholder cooperation, forming the national platform for addressing hazard reduction issues within a broader national development framework.

National Hazard Mitigation Plan

Subsequent to the development of the national mitigation policy, *the National Hazard Mitigation Plan* (2006) was drafted with the involvement

of the key actors in DRR and technical and financial support as from CDERA and CDB as with the policy. Following on the policy direction, it emphasizes the need for the integration of hazard risk reduction into national development and sector policy planning, pointing to the symbiotic relationship between hazard mitigation, environmental protection and sustainable development and climate change.

The plan also points out that comprehensive hazard mitigation policy notwithstanding, that the country lacks an equally comprehensive disaster management policy. In its contextual analysis a main challenge identified was that hazard mitigation, although a key aspect of DRM, was perhaps the least well addressed and incorporated into the disaster management cycle in Belize.

Another main challenge is the country's primary focus is on natural hazards and the need to broaden and deepen the concept of hazard mitigation to adequately address the other disaster. The threat of existing vulnerabilities such as poverty and the close link with environmental degradation as well as the need to recognize gender sensitivity in the assessment, planning and programming stages were also highlighted.

Key recommended strategic areas for action included legislative strengthening and capacity building at the institutional and individual level, the establishment of hazard risk reduction information management systems, community empowerment and mobilization, public outreach and education and access to adequate financial resources.

The plan attempts to outline strategic interventions and actions from which the relevant sectoral operational plans would be guided to enable Belize to mitigate against the devastating effects of disasters and was intended to serve as a guide to all the actors in DRR including decision makers, government agencies, developers and contractors, design professionals and citizens. At the operational level, the main plans include the following:

Foreign Assistance Committee Hazard Response Plan

The Foreign Assistance Committee Hazard Response Plan presents activities at the local and international level l to respond to the event of a disaster in Belize. It establishes the Chief Executive Officer of the Ministry of Foreign Affairs as Chairman of the Committee with general authority for plan activation and deactivation, and lists the responsibilities for several aspects of preparedness and response. It establishes guidelines for coordination of assistance, and sets procedures for the transportation of supplies and transfer of funds from abroad. This plan is in accordance with the guidelines provided by the National Emergency Management Organization Secretariat.

The National Medical Care and Public Health Plan (NMCPH PLAN)

This plan serves as the guide for Medical Care and Public Health Response in Belize. It outlines procedures and structures for coordination of NMCPH response to events in Belize. The Goal of the Plan is to mobilize and coordinate timely and effective medical care and public health response to the effects of disasters, manmade or naturally occurring.

National Plan-Relief and Supplies Management

This operational plan is developed the Relief and Supplies Management Committee for the purpose of ensuring that adequate food and other relief supplies are available in the event of a disaster are available for the affected population. The plan also entails a supplies management component for receiving, distributing and accounting for all relief supplies used in an event, whether acquired locally or donated from abroad.

National Plan-Search, Rescue and Evacuation

This plan covers national arrangements for coordination of warning and evacuation of residents in response to a threat, and their return to their homes once the threat has subsided. It provides for integrated use of resources of public and private origin, and assigns roles responsibilities of actors.

Public Utility Company Emergency Plans-BECOL

This plan addresses disaster preparedness for the Mollejon Hydroelectric Facility, located in the West of the country and which has been in operation since 1995.

Links with Sustainable Development Initiatives

At the national level, disaster risk albeit mainly from natural hazards is now firmly established and recognized as a threat to sustainable development and poverty alleviation and the current paradigm has been to couch disaster risk reduction within the sustainable development initiatives. A number of developmental documents currently explicitly identify disaster risk reduction as a priority strategic area. These include the Horizon 2030 Development Strategy, the 2009-2013 and the National Poverty Elimination Strategy and Action Plans (NPESAP). Other national policies and strategies that have direct relevance to disaster risk reduction include the following:

- Agriculture Development Management and Operational Strategy
- Belize Rural Area Development Strategy

- National Sustainable Tourism Master Plan
- National Land Use Policy and Planning Framework
- National Environmental Action Plan
- National Environmental Policy and Strategy,
- Sustainable Chemical Management Action Plan
- National Protected Areas Policy and Systems Plan
- Land Suitability Mapping System for Belize
- National Energy Policy
- Comprehensive Climate Change Adaptation Policy

National Energy Policy which was recently adopted and has among its goals the mitigation of the impacts of uncontrollable events including natural disasters on the cost of energy and on the reliability of energy supply

Institutional arrangements

National level - National Emergency Management Organization - NEMO

Belize's national framework for disaster management is a comprehensive one that deals with all the various levels of the disaster cycle. All sectors play a vital role in the process, each participating in emergency management. The National Emergency Management Organization (NEMO) is the national coordinating and implementing entity mandated by law for DRM.

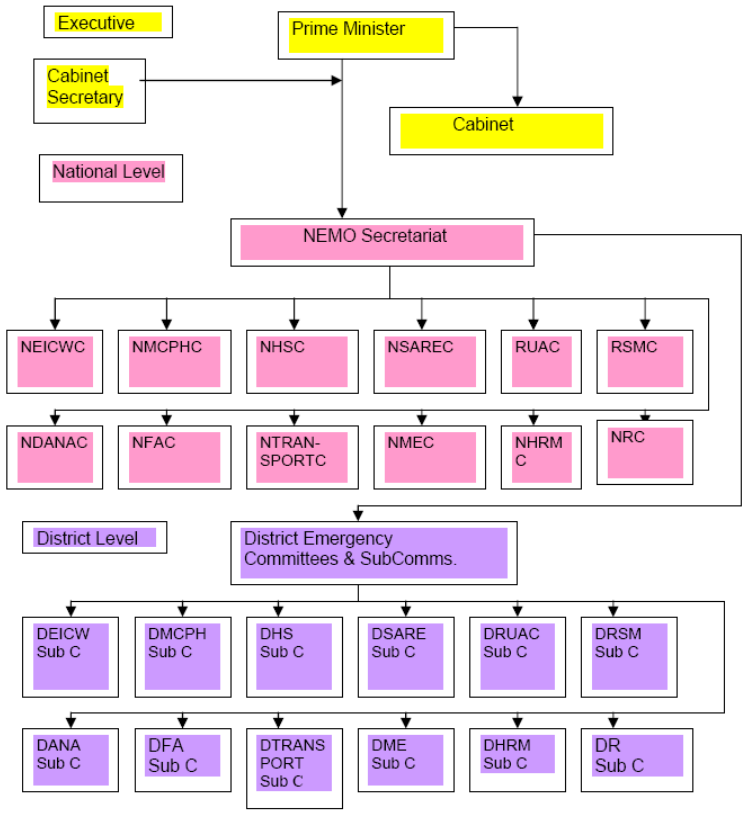
Formerly the Central Emergency Committee, NEMO was created in the year 2000, a main impetus being the devastating effects of Hurricane Mitch in 1998. NEMO has the legal authority to act as the only DM institution for Disaster related matters for the Government and People of Belize *established to preserve life and property throughout the country of Belize in the event of an emergency, threatened or real, and to mitigate the impact on the country and its people.*

The Department initially was placed in the Office of the Prime Minister and is now part of the *Ministry of Labour, Local Government, Rural Development, Nemo and Immigration and Nationality*. NEMO comprises the Cabinet, with the Prime Minister as the Chairperson and a Minister with responsibilities for the NEMO portfolio, the Cabinet Secretary, as Secretary, the NEMO Secretariat and the 13 Operational Committees and nine District and Special Committees[34] designed to manage specific areas as the names imply.

The operational committees are as follows: Education, Information, Communication Warning, Search, Rescue and Evacuation; Restoration of Utilities and Access; Transport; Housing and Shelter, Medical Care and Public Health; Relief and Supplies Management; Damage Assessment and

Needs Analysis; Foreign Assistance; Human Resources Management; Recovery; The Environment; Mitigation and Infrastructure Work. These committees are designated leads in their given areas of expertise. For example, the designated Lead Agency for medical care and public health response in Belize is the Ministry of Health.

Figure 5: Belize hazard management structure - NEMO[35]



KEY:

DANAC – Damage Assessment and Needs Analysis Committee
EICWC-Information, Communication and Warning Committee
FAC – Foreign Assistance Committee
HRMC – Human Resource Management Committee
HSC – Housing and Shelter Committee
MCPHC – Medical Care and Public Health Committee
MEC – Mitigation and Environment Committee
NEMO – NEMO Secretariat

RC – Recovery Committee
RSMC – Relief and Supplies Management Committee
RUAC – Restoration of Utilities and Access Committee
SAREC – Search, Rescue and Evacuation Committee
TP – Transport Committee

SubC – Sub-Committees
N = National Level
D = District Level (Letters added to distinguish between levels)

The Belize Red Cross Society which was formed in the 1940s is also a permanent member of NEMO and has established a high degree of visibility and gained appreciation for its work from the public. The Red Cross' mission is to improve the lives of vulnerable people by mobilizing the power of humanity.

The Society focuses work on four core areas: promoting humanitarian values, disaster response, disaster preparedness and health and community care. The other permanent members are the Belize Teachers Union, the Chief Meteorological Officer, the Commandant BDF and the Commissioner of Police.

In addition to its large coordination and response function, NEMO technical advisory role to other ministries in work pertaining to risk reduction e.g in ensuring that buildings and bridges are built according to acceptable standards.

NEMO also engages in capacity building at the district and local levels and public education and awareness including survival guidelines and maintains an information website which can be accessed by the public and an early warning system which utilizes broadcast band compatible with both televisión and radio.

NEMO also engages in hurricane forecasting, tracking and also oversees the national early warning system for hurricanes which is a four phase alert system[36] based on a four-flags used to depict the various stages of alert.

Disaster risk management – costs & financing mechanisms

The Government of Belize primarily through it's the Ministry of Labour, Local Government, Rural Development, Nemo and Immigration and Nationality and the NEMO coordination mechanism supports the implementation of programs and activities related to the DRR through its annual budget. This support is primarily for administrative purposes in the form of employees' salaries – noting the expansion of NEMO staff over the years - in addition to infrastructure and equipment purchases and the logistic support necessary execution of extension and field activities.

It should also be noted that NEMO and NEMO secretariat presides over the coordination mechanism for DRM in the country and is, as such, not a coordinating body. Many activities are cross-cutting and subsumed with those of other Ministries and sectors[37] and this therefore poses a challenge in terms of isolation and quantification. One main example is with the Ministry of Works whereby technical advice is sought form NEMO regarding the erection of sound structures that meet disaster standards, for example in the building of the New Kendall bridge[38] such as bridges

with the actual building being done by the Ministry of Works. Another major example is financing for sustainable development.

The main ministry responsible for sustainable development is the *Ministry of Forestry, Fisheries and Sustainable Development* and collectively, investments for sustainable development are captured under the Public Sector Investment Programme (PSIP). The Government of Belize via its departments and institutions also supports the implementation of programs and activities related to the sustainable development through its annual budget. Most project and capital programs are supported by various external donors namely, WWF Belize, WCS, TNC, MARFUND, Oak Foundation, Summit Foundation, Government of Netherland, UNDP/GEF, EU, FAO, JICA/JOCV, World Bank etc. Significant funding is also secured by the local NGOs. Additionally, the Protected Areas Conservation Trust provides funding to various conservation programs in protected areas management, research, capacity building in institutions and organizations with mandates in natural resource management and conservation and education and advocacy programs. Belize has also forged strong partnership arrangements with institutions such as the Smithsonian, WCS, Oceanic Society and Earth Watch who have maintained permanent research stations and programs in Belize with focus on biodiversity and conservation.

Another example is with the cross-cutting issues related to Climate Change. The Global Climate Change Alliance (GCCA) project initiated by the European Commission which has contributed 2.9 million Euros to the Government of Belize to address climate change which includes strengthening institutional cacities to address climate change. An additional challenge is posed by the difficulty in capturing all the costs[39]. For example, in the case of the Kendall bridge in the southern part of the country, the cost of implementing interim measures which are outside of the actual replacement of the structure are seldom accounted for entirely.

In terms of external support, since 1994, the European Community Humanitarian Office (ECHO) has been financing disaster prevention, mitigation and preparedness operations throughout the developing world. Seeking to achieve a better match between its prevention activities and priority needs, and to give its activities a more coherent framework, ECHO began to take a more regional approach in 1996.

The regional programme, called DIPECHO (Disaster Preparedness-ECHO), is intended to increase the impact and improve the effectiveness of ECHO operations. In the first phase of the programme, the three regions selected were Central America, the Caribbean and Southeast Asia.

Belize also benefits from financing provided through bi-lateral assistance from governments of the United States of America, the United Kingdom, Cuba and the Republic of China. Most recently, on July 2013, the Minister of NEMO, on behalf of the Government of Belize accepted a grant of $213,188.00 Belize Dollars (approximately 106,594 USD) from Taiwan, Republic of China for the purpose supporting Belize in the establishment of a disaster management information system. The funds will be used for

training technical personnel and purchasing equipment and acquiring critical data and information related to natural hazards including critical facilities, rivers, vulnerable areas and lifelines.

Advancements in Disaster Risk Reduction (DDR): Pre and Post Hyogo Framework of Action - Implementation at National Level

Pre Hyogo Framework

One of the first and a major initiative in the effort to population vulnerability to natural disasters in the country's history was in the establishment of the new settlement, Hattieville, immediately following Hurricane Hattie in 1961 some 18 miles to the west of and inland from coastal Belize City. Additional planning resulted in the relocation of the country's capital to Belmopan City 50 miles inland from Belize City in 1970. More recently, in the late 1990's was the government-led establishment of other new settlements away from flood-prone coastal areas such as Mahogany Heights approximately 30 miles inland and to the west of Belize City.

Belize has also participated in several national and sub-regional projects related to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, including the Central American Climate Change Vulnerability Analysis in 1995.

As previously noted, the country also passed the *Disaster Preparedness and Response Act of 2000 and drafted* drafting of the *National Hazard Mitigation Policy in 2003*

Activities under Hyogo Framework for Action (HFA)[40]

The following summary is taken mainly from the 2010 *Disaster Risk Management in Latin America and the Caribbean Region: GFDRR Country Notes Belize*

HFA Priority 1: Policy, institutional capacity and consensus building for disaster risk management

Key achievements under this priority include the following:

- The development of the ten-year National Policy Mitigation Plan to implement the National mitigation policy and previously described.

- Disaster Preparedness and Emergency Response Capacity project with the United Nations Development Programme (UNDP) intended to: "assist the country of Belize in the strengthening of its framework for disaster co-ordination as well as the strengthening

of national capacities allowing for effective disaster preparedness, risk reduction and emergency response." The project focuses on strengthening both human resources and government structures, and technical instruments for proper disaster planning and management in the country.

Substantial and ongoing efforts on the part of the NEMO Secretariat such as the following:

- Development and institution of the National Mitigation Policy and Plan.

- Institutional restructuring through the development of its headquarters and the strengthening of its human resources which has now evolved to include a larger team of specialists that attend on-going training in the fields of disaster management.

- Ongoing efforts to move away from the traditional limited response to hurricanes and with the ongoing development of the capability to deal with a wider range of natural and technological hazard emergencies.

- Development of a modern national communication network including the new emergency early warning system using a broadcast band compatible to both T.V and radio.

- Completion of a comprehensive national plan, which focuses on disaster preparedness training across all sectors.

- Development and ongoing evolution of the operational committees that reflect which develop plans of action for times of emergency and engage in regular refinement as an on-going process.

HFA Priority 2: Disaster risk assessment and monitoring

Belize has conducted several vulnerability assessments including the following:

- In the areas of national storm surges and wind with the assistance of the Caribbean Disaster Mitigation Project (CDMP) and an inland and coastal flooding assessment map conducted by the Inter-Development Bank through the Hurricane Reconstruction and Rehabilitation Project in Belize.

- Under the auspices of Climate Change vulnerability assessments have also been conducted for the Agriculture, Fisheries and Aquaculture, Health and Tourism sectors.[19]

- With regards to critical facilities, the Karl Heusner Memorial Hospital[41] (KHMH) was assessed in November 2000 and again in February 2010, this same hospital along with Orange Walk Regional Hospital using the PAHO/WHO hospital safety index. The assessments provided an estimate of the hospitals' capacities to continue providing services during and after a large-scale disaster or emergency and guided necessary intervention actions to increase the hospital's safety in case of disasters. The recommendations addressed structural, nonstructural and functional aspects of the facility.

- Through participation in the CCRIF risk assessments and profiling are conducted on an annual basis with the reports distributed through the office of NEMO. CCRIF utilizes the Multi-Peril Risk Evaluation System (MPRES) platform which entails hazard modelling based in part on historical data, and a real-time forecasting system(RTFS).

- Additionally efforts have been made in a number of risk assessment improvement initiatives such as the UNDP-supported Global Risk Identification Programme's (GRIP) Risk Assessment Package with methodology and software for recording disaster events – known as DesInventar and the Central American Probabilistic Risk Assessment (CAPRA) platform which is intended to utilize the information provided by DesInventar.

- The country, along with 16 other Latin American and Caribbean countries has also been participating in an innovative system of Indicators of Risk and Risk Management financed by the Inter-American Development Bank as part of the CAPRA project. [20] These indicators are useful for both national policy formulation and country comparisons as well as awareness raising, monitoring of progress and risk management resource allocation. They cover the consequences of major disaster impacts (Disaster Deficit index), local small-scale and frequent events.

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

The NEMO continues to spearhead ongoing efforts in technological advancement and transfer of knowledge such as in geographic information systems (GIS) and the development of high resolution maps. Most recently, on July 2013, the Minister of NEMO, on behalf of the Government of Belize accepted a grant of $213,188.00 Belize Dollars (approximately 106,594 USD) from Taiwan, Republic of China for the purpose supporting Belize in the establishment of a disaster management information system. The funds will be used for training technical personnel and purchasing equipment and acquiring critical data and information related to natural hazards including critical facilities, rivers, vulnerable areas and lifelines.

At the community level, the International Federation of Red Cross (IFRC) has previously engaged in an initiative to assist avulnerable communities in three northern villages with community vulnerability and capacity assessments. This methodology focused on community contingency planning exercises

HFA Priorities 4 & 5: Reduction of the underlying risk factors (reduction of exposure and vulnerability and increase of resilience) & Disaster preparedness, recovery and reconstruction at national, regional, and local levels

Many of the advancements in this regard have been achieved through the regional DRR mechanisms previously described including CDEMA and the CCRIF and Belize continues to be an active participant. Examples include the development of a policy for safer building practices, which focuses on safer building construction training and certifications and the development and institutionalization of the Building Code, which is being developed in collaboration with The Caribbean Disasterand Emergency Response Agency (CDERA) and the Caribbean Development Bank (CDB); the Central American Center for Disaster Coordination (CEPREDENAC) which has offered training in vulnerability reduction, risk management, and support to development planning and the strengthening of institutional response. Belize attends the training sessions; however, only on an observer status.

At the national level, the 2009 work plan of NEMO is focused on improving capacity for preparedness, emergency management and response. Programmatic activities focus on improved communication and alerting system; improved preparedness, mitigation and response capabilities; testing and updating of emergency plans; strengthened district offices; management and capacity building and support.

Additionally a lot of work in risk reduction is being done through efforts to address Climate Change. Major advancements in reducing exposure, risks and vulnerabilities due to climate change include the following: [21]

- Belize has been the host country for the Caribbean Community Climate Change Centre since August 2005 and this has assisted greatly in addressing challenges posed by climate change, in the first instance, in raising the visibility to the highest political level.

- Drafting of a national policy framework on adaptation to climate change; and the accreditation of the Protected Areas Conservation Trust by the Adaptation Fund as the National Implementing Entity (NIE) for Belize has strategically positioned the institution to directly access Climate Adaptation Funds and manage projects for the country. This should strengthen the country's role in the financing of climate change initiatives both at the national and regional levels[42].

- In 2011, the Belize National Climate Change Committee (BNCCC) was established as a broad-based multi-stakeholder committee comprised of *non- state* public and private sector members, to coordinate the implementation of policies and measures designed to mitigate the adverse effects of climate change on the environment and to adapt to such changes. It is expected that the BNCCC will facilitate the mainstreaming of climate change policies in the various sectors and address the gaps highlighted in the National Communication to the UNFCCC.

As relates to the improvement of early warning systems, a watershed floods management project has been supported by JICA to improve management of the Belize River Watershed. This initiative was the first step in the establishment of an early warning system for communities along the Mopan and Belize Rivers. In addition, JICA also subsequently supported the Belize Electricity Company Limited (BECOL) in the development of a sister initiative for the improvement of the early warning system along the Macal River. The Macal River plays host to BECOL's three hydroelectric generating facilities and is a tributary of the Belize River.

Discussion

A major limitation of this report is the apparent lack of "current" assessments related to the subject matter. For example the key and more analytical documents which were accessed such as the NDMP which entailed a more comprehensive analysis of the gaps and challenges as

relates to DRR and also the report on DRR Latin America and the Caribbean Region were written in 2006 and 2010 respectively. Since much has happened and continues to happen in DRR, the picture may not be the most accurate or current as a result, especially in terms of the advancements since the signing of the Hyogo Framework.

Secondly, little research appears to have been done on the subject matter in Belize including epidemiological and global/overall impact analyses (especially as relates to capturing costs and expenditures related to DRR as a whole) which has resulted in a less informed picture as to true vulnerable groups and the interplay between known influencing characteristics such as gender and poverty and disaster outcomes within this specific context and consequently limitations for the discussion, conclusions or any recommendations that might be derived particularly as relates to more targeted interventions and assessments of their impact.

Additionally, the latter will logically result in an underestimate of the true disaster impact as well as precluding a truly comprehensive picture of costs and expenditures related to DRR and DRM.

DRR & the Disaster Management Cycle in Belize

Methodological limitations notwithstanding, it is evident that Belize is a country that faces substantial hazards of disaster mainly from natural occurring events such as storms including cyclones and flooding. In terms of vulnerability, which according to the UNISDR terminology refers to the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard,[43] the following factors underlie and/or increase the country's vulnerability: the country's geographical location within the Caribbean, its topographical features and climate; an apparent predilection for coastal settlement of the population with much economic activity still concentrated in these low-lying coastal areas; increasing poverty and economic hardship; historically poor building practices and structural quality.

This impression is corroborated by several assessments including of the 2006 National Disaster Mitigation Plan; the 2010 *GFDRR Country Notes* and the most recent report by the World Bank which explicitly surmises that Belize's developmental challenges are rooted in its high vulnerability to external shocks including terms of trade, natural hazards and impacts of climate change. [21]

It further highlights the particular vulnerability of the country's natural resource base, which holds the key to its developmental prospects in terms of sustainable growth and poverty reduction, to these shocks citing the examples of hydrometereological events in recent years among the examples which contributed to increase in poverty levels by 10 percentage points over and a surge in crime and violence as accepted consequences.[44]

On the other hand, Belize as a middle-income, medium-developed country still has the benefit of relative political and social stability and good

developmental indicators in health, water and sanitation and education which should reduce vulnerability in some aspects. The low population density of the country is also likely a protective factor.

In terms of DRM, the country continues to make considerable strides and indications are for example the creation and funding of the National Emergency Management Organization (NEMO) as the legally mandated coordination mechanism for DRM; ratification of several international conventions; active membership in regional bodies including the Caribbean Disaster Management Agency and the Caribbean Climate Change Centre; participation in numerous initiatives at national and regional levels and numerous unilateral and bilateral agreements- that DRR/DRM is of high priority in the country.

Looking at DRM in terms of the disaster management cycle,[45] a definite paradigm shift is occurring in terms of more holistic approach to DRM with more efforts apparently being committed to prevention, mitigation and preparedness, including in the area of early warning systems, than previously seen. Illustrations of this major paradigm shift include the relocation and establishment of new areas away from the flood-prone coast; the participation in the regional risk sharing/risk transfer insurance initiative embodied by the CCRIF. Moreover, the couching of DRR within larger developmental issues such as sustainable development and poverty reduction measures symbolizes a deeper understanding risk mitigation and the true reduction of vulnerabilities.

The country, through the NEMO mechanism, also continues to develop its disaster response, arguably the best aspect in terms of the disaster management cycle and historically more so for hydrometereological than other types of events. This is evidenced in part by the extremely low mortalities, as a hard endpoint, associated with the natural events as early as after the 1931 and 1961 disasters. The emphasis on this type of event and the need to broaden the scope was also a gap noted by the NHMP of 2006. Subsequent to this there appear to have been efforts to address this at least at planning and activity levels e.g with the efforts to develop a national all-hazards management plan.

Part of the discussion needs to be striking the balance between a more comprehensive approach and resource allocation bearing in mind the brunt of the burden based on disaster type but also taking into consideration the smaller but real risks posed by the other disaster types including the biological, epidemics in particular, and man-made.

The phase of the management cycle for which progress is less clear however is that of the reconstructive phase and the concept of building back better. One of the few indications of this was with the development of the policy to bring about better building standards but it is unclear how effectively this policy has been implemented and what the impacts have been. Similarly it was seen that since the devastating Hurricane Hattie of 1961, the Reconstruction and Development Corporation Act has not been applied.

This alludes to one of gaps observed in the apparent lack of identified indicators for monitoring DRR and this is notwithstanding the adoption of the HFA and other international and regional frameworks. This was also alluded to in the National Hazard Mitigation Plan which indicated the need for a comprehensive disaster management plan, which intuitively would include a comprehensive monitoring and evaluation framework. Indeed the country would benefit from a more streamlined approach to DRR with clearly defined indicators and periodic evaluations against these indicators. The impression is that such assessments to date have been somewhat piecemeal and largely driven by external impetuses e.g national communications regarding climate change and the GFDRR and not captured within one national framework for DRR and DRM.

Conclusions

It is clear that Belize has made and continues to make substantial progress in DRR and that DRR is very visible in the political agenda. This momentum needs to be maintained and more needs to be done. It also evident that achieving true disaster risk reduction and the reduction of vulnerabilities is not only a long-term process, that will continue to require broad social participation, education, cultural shifts, policy reform, institutional capacity, financial resources, and political will.

The country must continue to recognize DRR as a developmental issue and a threat to the broader developmental agenda and to embrace the pillars of sustainable development and poverty reduction as well as benefit from the collective wisdom of the existing international and regional frameworks.

The country would benefit from more research in the area including a national assessment on spending for DRR, retrospective epidemiological research looking at vulnerable groups and how they might been impacted by past disasters; programmatic evaluation research looking to the implementation of the national mitigation policy and plan. Moreover, the plan is a ten-year plan and mid-term review, which could have been conducted after 2011/2012 would be apt and prudent.

Furthermore any future policy and planning for DRR, such as the development of a national national disaster management policy and/or national all-hazards plan, should entail better consideration of the other types of disasters as well as vulnerability characteristics e.g gender & poverty.

Additionally due efforts and emphasis should be placed on the simultaneous developments of comprehensive M&E frameworks, with explicitly defined indicators, to accompany such policies or plans by which they can be better and more easily monitored and evaluated.

The country would also probably benefit from an improved documentation of activities and achievements. This would not only be

beneficial in capturing and crediting efforts but also capturing practices that may be useful as lessons that could be emulated regionally in the first instance in the areas of early warning and communication, coordination, gender mainstreaming and capacity building at the sub-national levels. A strong impression is that much is happening that is well aligned with the current global paradigm direction in looking more towards mitigation and risk reduction and the first phase of the disaster management cycle.

Notes

[1] Main source of the geographical description: Environmental Technologies. *Government Of Belize IV National Report To The United Nations Convention On Biological Diversity* . Ministry of Natural Resources and the Environment. 2010

[2] Central America is the central geographic region of the Americas and the southernmost, isthmian portion of the North American continent, connecting it with South America on the southeast

[3] Caye, also spelled **cay** or **key**, is a small, low-elevation, sandy island formed on the surface of a coral reef

[4] The Belize Barrier Reef System was designated a World Heritage Site in 1996 and it makes up almost 80% of the Mesoamerican Barrier Reef System.

[5] Belize Weather Bureau, Leyton Research, Hydrology Unit. *Belize Climate Summary*. http://www.hydromet.gov.bz/climate-summary (accessed 20 December 2013)

[6] Criterion used for the onset of the rainy season is two consecutive days of rainfall accumulation of 30 mm or more, and four of the following seven days are rain days of 1 mm rainfall accumulation or more.

[7] Source: Caribbean Catastrophic Risk Insurance Facility- Belize Risk Profile Report 2013

[8] Source: Belize Tropical Forest Studies. *Biodiversity and Environmental Resource Data System of Belize*: *Elevations in Belize*. http://www.biodiversity.bz/belize/topography/ (accessed 18 December 2013)

[9] Statistical Institute of Belize 2012 mid-year population estimate

[10] Taken from Caribbean Community Secretariat. Objectives of the Community. http://www.caricom.org/jsp/community/objectives.jsp?menu=community (accessed 21 November 2013). CARICOM is an organisation of 15 Caribbean nations and dependencies. CARICOM's main purposes are to promote economic integration and cooperation among its members, to ensure that the benefits of integration are equitably shared, and to coordinate foreign policy. Its major activities involve coordinating economic policies and development planning; devising and instituting special projects for the less-developed countries within its jurisdiction; operating as a regional single market for many of its members (Caricom Single Market); and handling regional trade disputes.

[11] The **Democracy Index** is an index compiled by the Economist Intelligence Unit, that measures the state of democracy in 167 countries, of which 166 are sovereign states and 165 are United Nations member states. The index is based on 60 indicators grouped in five different categories: electoral process and pluralism, civil liberties, functioning of government, political participation, and political culture. In addition to a numeric score and a ranking, the index categorizes countries as one of four regime types *full democracies*, *flawed democracies*, *hybrid regimes*, and *authoritarian regimes*.

[12] World Audit. *Belize World Democracy Profile*. http://www.worldaudit.org/countries/belize.htm (accessed 18 December 2013)

[13] Estimates range from about -2.5 to 2.5. with higher values corresponding to better governance outcomes.

[14] World Bank. *Country Belize*. http://data.worldbank.org/country/belize (accessed 20 December 2013)

[15] Source: World Bank Data available at http://databank.worldbank.org/data. Accessed 06/11/2013

[16] The Heritage Foundation. *2013 Index of Economic Freedom Country Rankings*. http://www.heritage.org/index/ranking Accessed 20 December 2013): Economic freedom is the fundamental right of every human to control his or her own labor and property. In an economically free society, individuals are free to work, produce, consume, and invest in any way they please, with that freedom both protected by the state and unconstrained by the state. In economically free societies, governments allow labor, capital and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself.

[17] Halcrow Group Limited. *Belize National Country Poverty Assessment.* Government of Belize*.* 2009

[18] The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. As in the 2011 HDR a long and healthy life is measured by life expectancy. Access to knowledge is measured by: i) mean years of schooling for the adult population, which is the average number of years of education received in a life-time by people aged 25 years and older; and ii) expected years of schooling for children of school-entrance age, which is the total number of years of schooling a child of school-entrance age can expect to receive if prevailing patterns of age-specific enrolment rates stay the same throughout the child's life. Standard of living is measured by Gross National Income (GNI) per capita expressed in constant 2005 international dollars converted using purchasing power parity (PPP) rates.

[19] The Gender Inequality Index (GII) reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activity. Reproductive health is measured by maternal mortality and adolescent fertility rates; empowerment is measured by the share of parliamentary seats held by each gender and attainment at secondary and higher education by each gender; and economic activity is measured by the labour market participation rate for each gender. The GII replaced the previous Gender-related Development Index and Gender Empowerment Index. The GII shows the loss in human development due to inequality between female and male achievements in the three GII dimensions.

[20] According to CRED an event must fulfill at least one of the following criteria to be considered a disaster: ten (10) or more people reported killed; hundred (100) or more people reported affected; declaration of a state of emergency; call for international assistance

[21] Events recorded in the CRED EM-DAT. First Event: Sep/1931, Last Entry: Sep/2010

[22] Categories based on Saffir-Simpson Hurricane Scale as used and reported by National Oceanic and Atmospheric Administration (NOAA), United States of America

[23] Milpa system is a crop-growing system used throughout Mesoamerica in which typically a small field is cleared from the jungle, cropped for a few seasons, and then abandoned for a fresh clearing.

[24] National Emergency Management Organization. *Belize: NEMO press release no 1 earthquake off the coast of Honduras* . Government of Belize. May 28th 2009

[25] Source: United States Geological Survey (USGS)

[26] The International Health Regulations (2005) provide an international legal and operational framework for WHO Member States to better protect the health of their populations. The IHR (2005) specifically require all Member States to develop core capacities for surveillance, preparedness and response towards all public health threats. Countries should also have the capacity to rapidly share and access relevant information within the country and with the global community.

[27] Fielden A. Unhcr New Issue In Refugee Research Research Local Integration: An Under-reported Solution to Protracted Refugee situations. *United Nations High Commission for Refugees Publications*. No. 158, ISSN1020-7473. June 2008

[28] adopted in January 2005 at The World Conference on Disaster Reduction in Kobe, Hyogo, the framework provides a unique opportunity to promote a strategic and systematic approach to reducing vulnerabilities**1** and risks to hazards underscoring the need for and identifying ways of building the resilience of nations and communities to disasters. The scope of this Framework for Action encompasses disasters caused by hazards of natural origin and related environmental and technological hazards and risks. It thus reflects a holistic and multihazard approach to disaster risk management and the relationship, between them which can have a significant impact on social, economic, cultural and environmental systems, as stressed in the Yokohama Strategy (section I, part B, letter I, p. 8).

[29] Details available at the organization's website: https://www.gfdrr.org/about_gfdrr

[30] Caribbean Disaster Management Agency. *What is CDEMA*. http://www.cdema.org/index.php?option=com_content&view=article&id=89&Itemid=79 (accessed 20 November 2013)

[31] Anon. *Belize Country Risk Profile*. Caribbean Catastrophic Insurance Facility. 2013

[32] The pieces of legislation may be accessed on the Ministry of the Attorney General Belize's website. The Laws of Belize. bhttp://www.belizelaw.org/ (accessed 20 Dec. 13)

[33] The proceeding policies and plans are available on the National Emergency Management Organization of Belize's website at http://site.nemo.org.bz/publication.

[34] National Emergency Management Organization. *About Us*. http://site.nemo.org.bz/about-us (accessed 20 December 2013)

[35] National Emergency Management Organization. *Belize National Evacuation Plan.* Ministry of Labour, Local Government, Rural Development, Nemo and Immigration and Nationality. 2003

[36] Four-flag hurricane alert system: **Preliminary:** First phase. May threaten within 72 hrs. *red flag* **Red 1 – Watch**: Second phase. May threaten within 36 hrs. *red flag with black dot in center;* **Red II – Warning**: Third phase. Likely to strike within 24 hrs. *two red flags with black disks above each other***All Clear**: Fourth Phase. Hurricane has passed. *green flag*

[37] Paraphrased and summarized from key informant telephone discussion with the National Disaster Coordinator NEMO 24/11/2013

[38] The Kendall bridge is a key bridge that critical to road access between southern Belize and the rest of the country that has undergone flooding on numerous occasions in the county's history resulting in significant disruption of activites.

[39] Paraphrased and summarized from key informant telephone discussion with the National Disaster Coordinator NEMO 24/11/2013

[40] Taken and summarized mainly from the 2010 *Disaster Risk Management in Latin America and the Caribbean Region: GFDRR Country Notes Belize*

[41] The KHMH is the country's flagship healthcare institution. Located in Belize City, it is the only tertiary level institution in the country.

[42] This should have positive spinoffs for DRR.

[43] United Nations*. 2009 UNISDR Terminology on Disaster Risk Reduction.* Geneva: United Nations International Strategy for Disaster Reduction; 2009 - UNISDR guidance notes that there are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited o"cial recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies signicantly within a community and over time.

[44] Anon. *The World Bank Country Partnership Strategy (FY2011-FY2015) for Belize*. The World Bank. Report number: 63504-BZ , 2011

[45] According to UN terminology, this refers to the complete set of phases related to disasters and their management (prevention, mitigation, preparedness, response, rehabilitation, reconstruction and recovery).

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Annexes

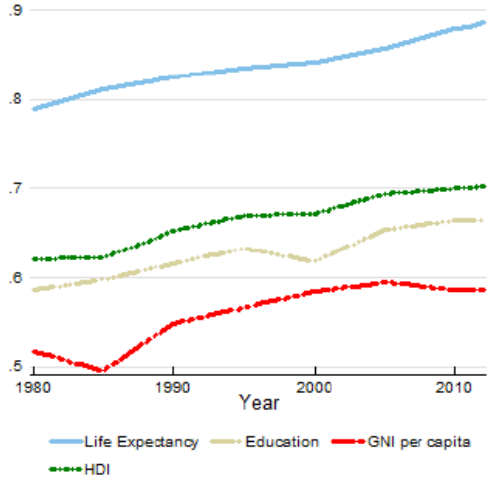
Annex 1. Belize HDI Trends

Table A: Belize's HDI trends based on consistent time series data, new component indicators and new methodology

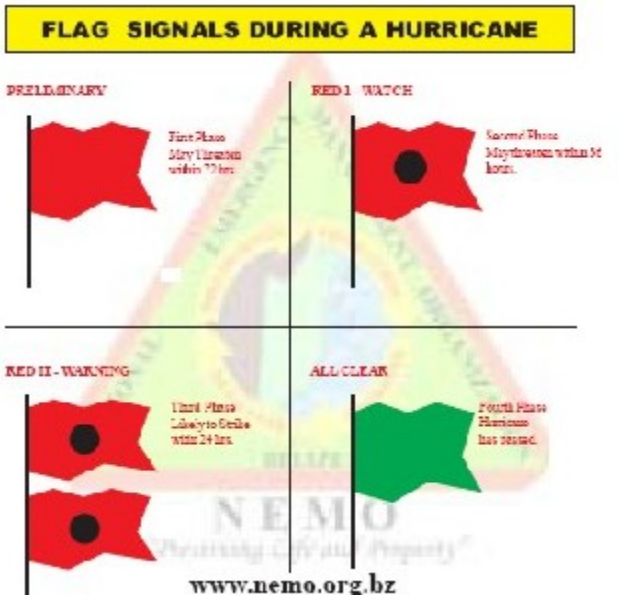
	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2005 PPP$)	HDI value
1980	70.2	10.7	7.3	3,309	0.621
1985	71.5	10.7	7.6	2,858	0.622
1990	72.5	10.7	8	4,112	0.653
1995	73.1	10.7	8.5	4,671	0.67
2000	73.5	10.7	8.1	5,242	0.672
2005	74.5	12.5	7.7	5,610	0.694
2010	75.9	12.5	8	5,307	0.700
2011	76.1	12.5	8	5,324	0.701
2012	76.3	12.5	8.0	5,327	0.702

Figure 1 below shows the contribution of each component index to Belize's HDI since 1980.

Figure 1: Trends in Belize's HDI component indices 1980-2012



Annex 2. Hurricane Flag Warning System of Belize



Annex 3. The Disaster Management Cycle