

Emergency and Disaster Reports

ISSN 2340-9932

Vol 6, Num 1, 2019



Monographic issue

Disaster Risk Profile of Guatemala

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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 above 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 monographic issue is about disaster risk profile of Guatemala.

Guatemala is a country located in the central-american isthmus. The geographical location, the generation of tropical cyclones both in the Pacific and Atlantic Ocean, the geomorphology of the territories or the confluence of active tectonic plates in the region are some of the main factors contributing to the wide range of hazards faced by the region and Guatemala.

The present monographic issue gives an overview of the various hazards and corresponding vulnerabilities across the country and the national disaster risk management.

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ACRONYMS

ECLAC	Economic Commission for Latin America and the Caribbean
CEPREDENAC	Coordination Center for the Prevention of Disasters in Central America
CONGCOOP	Coordinator of Cooperatives and NGOs of Guatemala
CONRED	National Coordinator for Disaster Reduction
CRG	Guatemalan Red Cross
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EWS	Early Warning System
FONAPAZ	National Peace Fund
HFA	Hyogo Framework for Action
IDB	Interamerican Development Bank
IGGS	Guatemalan Institute of Social Security
INACIF	National Institute of Forensic Sciences
INAP	National Institute of Public Administration
INSIVUMEH	National Institute of Seismology, Volcanology, Meteorology and Hydrology
MAGA	Ministry of Agriculture, Cattle and Food
MARN	Ministry of Environment and National Resources
MDN	Ministry of National Defense
MEM	Ministry of Energy and Mines
MICIVI	Ministry of Infrastructure, Communications and Housing
MIDES	Ministry of Social Development
MINEDUC	Ministry of Education
MINEX	Ministry of Foreign Relations
MINGOB	Ministry of Internal Affairs
MSPAS	Ministry of Public Health and Social Assistance
OCHA	Office for the Coordination of Humanitarian Affairs
SEGEPLAN	Secretary of Planning and Programming of the Presidency
SESAN	Secretary of Food and Nutrition Security
SISMICEDE	Information Management System in Emergency or Disaster
SOSEP	Secretary of Public Works of the Wife of the President
UNDP	United Nations Development Programme
UNISDR	United Nations International Strategy for Disaster Reduction
WHO	World Health Organization

1. INTRODUCTION

Guatemala is a multiethnic and multilingual developing country, still immersed in a myriad of problems that hinder the realization of a full life by its citizens. The conditions of poverty and extreme poverty of a large portion of the population along with the prevailing high levels of inequality are among the top pitfalls present in the country. Moreover, some of the effects of 36 years of internal armed conflict that devastated the country until the signing of the Peace Accords in 1996 remain, as reflected in a broken and divided society by wounds that will still take to heal. Although the war ended, other violence, street violence, gang, drug trafficking claim a high number of lives every year, placing the country as one of the most unsafe in the world. The high levels of impunity and corruption and the lack of state presence are also an obstacle to the country's progress. Apart from this, Guatemala is very prone to suffer the effects of natural hazards due to the country's location as well as various anthropogenic factors, which often become disasters leaving every year a variable number of fatalities, people affected and economic damage. This work focuses precisely on natural disasters in Guatemala and their impact.

In this sense, the objective of this paper is to describe and analyze the natural risk profile of Guatemala. To do so, the main threats and natural hazards to which the country is exposed will be addressed, detailing some of the major natural disasters in the last fifty years and their most notable impacts. Then, underlying risk factors (anthropogenic) that contribute to increase the likelihood of a disaster will be also analyzed. In the second part, the country's legal and regulatory framework on disaster risk reduction at national, regional and international level will be described and also deepen in the existing structure to respond to emergencies. Finally, progress and setbacks of the country in disaster risk reduction according to the priorities of action of the Hyogo Framework for Action will be discussed.

The methodology for the elaboration of this work consisted in the consultation of various documents freely available on the Internet. Consulted documents have been mainly issued by governmental and non-governmental organizations, international agencies and news portals. Regarding the history of disasters in Guatemala, data provided by the EM-DAT database has been used according to the specific information needed. Based on the analysis and study of this information coming from more than sixty sources, the present risk profile has been prepared.

2. COUNTRY PROFILE

Guatemala is a country located in the central-american isthmus. It is bordered on the north and west by Mexico, on the east by Belize and the Caribbean Sea, on the southeast by Honduras and El Salvador and by the Pacific Ocean on the South. It has an extension of 108.889 km² which make it to be in the position 106 at the world level in terms of area. Administratively the country is divided in 22 departments and 331 municipalities and the capital is Guatemala City.

Geology: The territory of Guatemala is located on three tectonic plates or parts of them: the Mayan block of the North American Plate, the Chortis block of the Caribbean Plate (both continental) and the northern part of the Cocos Plate (Oceanic). In this sense, the territory is part of a subduction zone between the Caribbean and the Cocos plate which explains the volcanic activity along the pacific area of the country and its seismic prone nature¹.

Orography: The country is mainly mountainous (aprox. 60%) except in the south coast and the department of Peten (plains) in the north. It has two mountain ranges that cross the territory from west to east: Sierra Madre which extends from Mexico up to Honduras and El Salvador and is parallel to the Pacific coast; and Sierra de Cuchumatanes more at the north. These two ranges divide the country in three areas clearly different: the highlands, the pacific coast which is the most seismic and the region of Peten in the north. Tajumulco volcano with 4220 meters is the highest point of Guatemala as well as of Central America.

Climate: the location of Guatemala not too far for Equator does not allow the typical four seasons, in fact, there is a rainy season between May and October and a dry season from November to April. However, there is a diversity of climates depending on the region which are mainly influenced by the altitude. The central meseta (between 300 and 1400m) has an average of 15-17°C during the year, low-land and coastal areas (0-300m) are more tropical with averages between 20°C and 30°C and finally the areas beyond 1400m present the lowest temperatures and in some parts reach peaks of 0°C and lower during the colder months. Regarding rain levels, these may vary from 500mm up to 6,000mm so they are not homogeneous in all the territory².

Demographics: Guatemala has a population of 16.176.133 people (according to estimation for 2015) of which 48.9 would be men and 51.1 women. In terms of age distribution, 38.4 percent falls between 0 and 14 years, 56.9% is between 15 and 64 years and 4,7% is beyond 65³. Using the population projections available, the population growth rate for the period 2010-2015 is 2.5%⁴ what makes it to be the country with the highest growth rate in the region. Birth rate in 2013 was is 31 births per 1,000hab, with a fecundity of 3.8 sons/woman, both the highest in the region. Mortality rate of for this year was 5.5 deaths/1000hab, the second highest of the region⁵. Population density is 138hab/km² and there is a 49% living in urban areas versus 51% living in rural³. The area which have more population is the department of Guatemala with 21.4%⁴. It should also be noted that out of American countries, Guatemala has the second largest proportion of indigenous people among its population with 40% of the total (Bolivia is in the first place) having in some departments higher proportions. Furthermore, there is approximately 40% of mestizos, 19% are creole and 1% of Garifunas⁴.

Socio-political context: Guatemala is a unitary presidential republic with one camera, the Congress of the Republic, as the legislative body. General elections are held every 4 years. The country is member of the United Nations, the Organization of American States and the Central American Integration System (SICA). It gained its independence from Spain in 1821 and the most important episode of its recent history was the 36-year civil war (1960-1996) which devastated the country in many spheres: social, economic, environmental, etc. and whose effects still remain and influence the progress of the country in different spheres and with special emphasis in the indigenous people.

Guatemala is a multilingual and multicultural state with the Spanish as the official language but coexisting with other 21 mayan languages, Xinca language and Garifuna language. However, there is still a high proportion of population among these, mainly in rural areas, who only communicates in their indigenous language and barely understand Spanish.

Economy: Guatemala has the biggest economy in Central America and the 9th in Latin America. According to the last national human development report of 2012, Guatemala had a GDP of USD46,744,000 and a GDP per capita of USD3,176⁶. The GDP has been increasing at an average of 4% per year the last three years, there is has a relatively low public debt (24.3%) and the public deficit is 2.8%⁷. Agriculture sector covers 13.6% of the GDP, two-thirds of the exports and approximately half of the total work force. Among the agricultural products stands cardamom with Guatemala as first exporter in the world and also sugar and coffee being the country the fifth and seventh world producer respectively. Big extension of crops of fruit and vegetables are also present except in the 'dry corridor' whose aridity make it very vulnerable to droughts implying a high prevalence of food insecurity. Regarding fishing activity, this is relatively important in the south coast from where mainly shrimp, squid and lobster are exported abroad. Mining is also an extractive activity of relevance although its contribution to the GDP is not high (0.6% of GDP) with nickel as the main exported metal followed by gold, silver, jade and copper. In terms of industry, manufacturing and construction make up around 20% of GDP. The main industries are related to food processing, vehicle assembly, electrical appliances, paints, pharmaceuticals, beverages, publishing and textiles, among others. Remittance of money from emigrants is the main currency generator followed by tourism⁸. Finally unemployment rate is 3.1% according to national statistics, however more than half of the population economically active (3.3million) is sub-employed or with an informal employment⁸.

Human Development: Guatemala has a medium human development (0,628) which situates the country in the post 125 at world level⁹. It is a lower-middle income country with 53.71% living under the poverty line. Among these, 40.38% of the citizens live in poverty conditions and 13.33% live in extreme poverty, highlighting that poverty and extreme poverty incidence concentrate in rural areas and among indigenous people⁴. Furthermore when analyzing poverty by sex the prevalence is higher on women. Finally, the levels of inequality are considerable high as reflected by a Gini coefficient of 0,565 according to the family income per capita⁶.

Education: in 2011, the percentage of the GDP devoted to education, science and culture was 3.2%. This same survey reflects that 76.7% of the population over 15 know how to write and read. However this varies significantly based on gender or ethnicity and age. Literacy rates are specially high (91%) in the group between 15 and 24 years while comparing the rate for people over 15 years 76.7% which suggest that literacy programs implemented the last years are having a meaningful impact. However, literacy rates are still considerable lower among indigenous people and women at the different age levels although data show that these differences reduce among new generations. According to the net enrollment rate, at primary level there is almost full enrollment (95,8%), followed by pre-primary (54,9%), secondary level (42,9%) and finally pre-university with the lowest proportion of enrollment (22,3%). As with the literacy levels, this levels are lower among indigenous girls which in turn have higher retention rates at school and high school⁶.

Health: the proportion of the GDP spent on Health in 2012 was 2.4%⁵ the lowest in the region. Overall life expectancy at birth in Guatemala is 72 years, which is the lowest in Central America, and by sex 68,5 for men and 75,6 for women. Maternal mortality ratio experienced a sustained decrease from the 90s when it was 270 (per 100,000 live births) until 2005 where it stabilized in around 140 until now (2013) being the highest of the Central American region. The mortality rate of children under five decreased steadily from the 81 per 1,000 live births in the 90s till 31 in 2013. Both indicators have considerable higher levels comparing the average of the continent. Last available data from 2012 show that lower respiratory infection was the leading cause of death, killing 9,600 people in 2012 (12%), followed by interpersonal violence with 9,200 deaths (11.5%) and at a distance Ischaemic Heart Disease with 5,800 deaths (5.8%). In 2012 and according to information of 2010 there were 0.6 hospital beds/hab, 7.6 doctors/10,000hab and 5 nurses/10,000hab. In all these data the country had the lowest values⁵. Finally, around 80% of the population used improved sanitation facilities and 90% improved drinking-water sources¹⁰.

Population (estimated 2015)	16,176,133
Population Density	138 hab/km²
Human Development Index (2014)	0,628
GDP/per capita	USD 3,176
Population under poverty line	53,71%
Life expectancy at birth	72 years
Literacy (population over 15)	76,70%
Birth rate	31 per 1,000hab
Maternal Mortality Ratio	140 per 100,000 live births
Under Five Mortality Rate	31 per 1,000 live births
Access to improved sanitation facilities	80%
Access to improved drinking-water sources	90%

Table 1. Country indicators for Guatemala^{3,4,5,6,7,8,9,10}.

3. NATURAL HAZARDS

Central America in general and Guatemala in particular are exposed to one of the largest variety of hazards in the world, only surpassed by the Southeast Asian region. The geographical location, the generation of tropical cyclones both in the Pacific and Atlantic Ocean, the geomorphology of the territories or the confluence of active tectonic plates in the region are some of the main factors contributing to the wide range of hazards faced by the region and Guatemala. To all this, various anthropogenic factors that contribute very significantly to these threats to become disasters as the historical series corroborate must be added. In the case of Guatemala and just as an example we could mention either the lowest socioeconomic indicators of most of the population or the poor and sometimes lacking presence of the state in some areas of the country.

The table below shows the proportion of the different types of disasters during the last fifty years in Guatemala as well as their contribution to the deaths, affected people and damage caused.

DISASTER	% Events	% Deaths	% Affected	% Damage
Geophysical	28.7	84.3	50.9	27.6
Hydrometeorological	62.1	13.4	48.8	72.4
Others	9.2	2.2	0.3	0.0

Table 2. Proportion of different types of disasters happened in Guatemala the last 50 years and their contribution to number of deaths, affected and damage caused. Prepared from data of EM-DAT¹¹.

*Note: Climatological disasters are included in the Hydrometeorological group.

According to the information provided by this table, the present profile will focus on the situation of Guatemala regarding hydrometeorological and geophysical events as these are the main natural hazards the country faces (>90% of the total) and also the most important in terms of deaths, people affected and damage caused.

3.1 HYDROMETEOROLOGICAL HAZARDS

Hydrometeorological hazards in Guatemala are partially influenced by the events of El Niño and La Niña. El Niño is primarily associated with ocean water temperature higher than normal resulting in increased rainfall. La Niña on the other hand generally generates lack of rainfall because of the cooling of the sea surface. Both phenomena are part of a cycle called "El Niño Southern Oscillation" -ENSO- which has a duration period of about four years. In this profile we will only focus on tropical cyclones, floods, landslides and droughts. In this paper climatological hazards such as droughts have also been included under this classification as they are also related to the atmospheric conditions.

3.1.1 Tropical cyclones

Hurricanes, tropical storms and tropical depressions are usually grouped as tropical cyclones, this is also the case of the EM-DAT. However the present risk profile will make a distinction between hurricanes and tropical storms just to be more concrete at the time of naming the events.

Hurricanes

Guatemala is in the path of many hurricanes, most of which originating in the Caribbean Sea where the warm water cause low pressure centers around which air masses spin at high speed over large areas and which occasionally hit the Guatemalan territory. On the side of the Pacific Ocean, the occurrence of hurricanes affecting Central America was substantially lower than on the side of the Caribbean Sea. However, in recent years an increasing number of hurricanes in the Pacific Ocean has been recorded.

Looking at the historical series, the category-five hurricane called Mitch has been the most important hydrometeorological episode registered in Central America in the past fifty years in numbers of deaths, affected and total damage. Although the most affected country was Honduras, the death toll of this hurricane in Guatemala was 384 to which about 105.700 affected were added and a damage worth of USD748 million. However the most deadly hurricane that struck Guatemala in recent decades was Stan, category one, which in October 2005 left 1513 dead, 475,314 affected and damages quantified in around USD988 million¹¹.

Storms

Storms, and especially tropical storms, due to the large amounts of rain they generate and the strong winds commonly associated with them, are a threat that spans the entire Guatemalan territory and as hurricanes, trigger other potential hazards such as landslides or flooding from overflowing rivers and streams (detailed later).

In Guatemala, the largest storm recorded the last fifty years was Agatha which crossed the country on 29 May, 2010. It was particularly damaging because it came up together with the volcanic eruption of Pacaya volcano on May 27 and caused numerous landslides, floods of rivers which flow into the southern coast and the related flooding and landslides, as well as the destruction of many houses. In total 174 people died and 397.962 were affected. The damage was considerable (USD650 million), mainly in roads and bridges (more than 300 bridges were affected¹²) being the storm with the most abundant rain after hurricane Mitch¹³.

3.1.2 Floods

As noted above, many of the floods are associated with hurricane and storm events but sometimes simply the persistence of heavy rainfall leads to increased water flow in the river beds and exceeds their capacity causing the corresponding flood of vast territories in their margins. This is the case of the lowlands of the Motagua river basin or among many rivers flowing into the south coast. The south coast basin, is where more flood have been recorded out of three basins of the country¹⁴. There is also a large number of human factors that increase both the risk of occurrence of floods and the vulnerability of people to them and which will be detailed later. In this sense, the areas identified with higher recurrence of floods are those located at the altitude of 0-500 meters above sea level which are part of mighty rivers of a long journey, in areas of major industrial crops (bananas, sugar cane, oil palm) and with quite presence of livestock as the case of the south coast.



Figure 1. Map of floods in Guatemala¹⁴.

Flooding caused by Tropical Depression 12-E in October 2011 affected 20 of the 22 departments of the country, causing 43 deaths, more than 500,000 affected and economic losses of 62 million dollars. However, in terms of deaths caused, this episode was far outweighed by the floods of 1949 that killed 40,000 people¹¹. After these, other important floods happened in 1982 and 1987 and left 620 and 84 deaths respectively¹¹.

3.1.3 Landslide

The particularly mountainous orography of Guatemala (60% of the territory is mountainous) along with other factors such as the high seismicity and more often, the hydrometeorological phenomena make the mountainous areas and the northwestern highlands of the country to be prone to landslides that sometimes affect individuals, facilities or even entire populations. Furthermore, an endless number of anthropogenic factors are critical either to promote these episodes to happen, and for them to become a disaster. Some of these circumstances will be presented in subsequent sections.

Regarding the top ten of landslide events during the last fifty years, according to the database of EM-DAT, the deadliest one happened in the village of San Lucas Tolimán, department of Sololá in September, 2002, and left 68 dead and 474 affected. In June 2005, there were 63 deaths and 1,535 affected in Senahú, department of Alta Verapaz¹¹. It is worth to mention that there have been other landslides which caused more deaths and people affected but they are considered as associated disasters of others more important. This is the case of a landslide derived from the struck of Stan Hurricane that affected two indigenous communities of Santiago Atitlán (Sololá) which caused more than 800 deaths¹⁵. In this case, these number of victims are counted as deaths of the hurricane. Finally, on October 2015 there was an important landslide in Santa Catarina Pinula, department of Guatemala which left at least 274 deaths and more than 353 disappeared so far¹⁶.

In general, there are more recurrence of landslides along the volcanic chain which is parallel to the pacific coast, areas of the central highlands and the mountain range in the north which comprises several departments and around 1.5 million people.



Figure 2. Map of landslides in Guatemala

3.1.4 Drought

Guatemala's location makes the country particularly vulnerable to the action of climate whose effects have resulted in severe droughts affecting crops in recent years¹⁷. These droughts, in occasions, have become in disasters and emergency situations due to the failure to ensure food security of the population because of the reduction or disappearance of agricultural production as well as the inability to satisfy essential services for people as a result of the lack of water¹⁸. According to a report from OXFAM, in 2014¹⁹ 87.5% of the territory was vulnerable to drought. The area known as "Dry Corridor" which includes territories of seven departments of central and southeast of the country, is where more drought episodes have been recorded with around 700.000 people living in the most affected areas²⁰.

Regarding periods of drought, the only case where deaths were reported was in 2001 and affected the department of Chiquimula resulting in 41 deaths from starvation. In terms of number of affected, the most devastating is the 2009 drought that extended throughout eight departments and left 2.5 million people affected because of food shortages. After this, stands one in 2014 and another in 2012 which affected 1,180,000 and 266,465 people respectively¹¹. These data demonstrate that drought episodes are increasing in both number and magnitude even affecting areas which are not part of the "Dry Corridor".

3.2 GEOPHYSICAL HAZARDS

3.2.1 Seismic activity

As described in the country profile, the territory of Guatemala covers three tectonic plates: the Mayan block of the North American Plate, the Chortis block of the Caribbean Plate (both continental) and the northern part of the Cocos Plate (Oceanic). The displacement of 5-9 cm/year of these plates, generates a situation of subduction between the Cocos plate and Caribbean plate making the crust to be very unstable and leading to episodes of common seismicity which sometimes causes earthquakes that reach 7 to 8 degrees on the Richter scale. The three major fault lines in the country are also coincident with the boundaries of these plates: the Chixoy-Polochic and the Motagua fault in the North American Plate and the Jalpatagua fault in the Caribbean plate²¹. The whole territory is susceptible to seismic activity but in a more direct way the volcanic range, the fault system Chixoy-Polochic-Motagua and the south coast. The approximate population living in this influence area is around 7.5 million people (60% of the population)²⁰.

The most devastating earthquake happened in the country in the last fifty years took place on February 4, 1976 in Guatemala City leaving a balance of 23,000 deaths almost five million affected and damages of USD1,000 million. The earthquake had a magnitude of 7.5 degrees on the Richter scale and reached grade IX in Mercalli scale in some places

of the capital. After this, the following in importance was the one that happened on November 7, 2012 which mainly affected the department of San Marcos (northwest) although its effects were felt in eight other departments. This 7.2-degree earthquake caused 44 deaths, 1,321,742 affected and a damage amounting USD210 million¹¹. In general, Guatemala experiences tremors of considerable magnitude sporadically, and most frequently earthquakes of lesser magnitude that barely have consequences or swarm of earthquakes (seismic events in a specific area for a short period of time) as the one happened in 1988, are recorded²¹.

Tsunamis: these are an added threat to which Guatemala is exposed and whose origin is mainly derived from the seismic activity in the adjacent area to the Pacific coast of the country but also all seismic activity in general and specially this of great magnitude in the Pacific Ocean is likely to cause tsunamis which may affect the Central American coast. In general, earthquakes above magnitude seven could cause tsunamis with waves of variable height but this not a norm. As stated in the index for risk management INFORM 2015²², the second natural hazard to which Guatemala is more exposed are tsunamis. However, neither in the last century nor in this any tsunami become a disaster in the coasts of the country.

3.2.2 Volcanic activity

The subduction zone of the Cocos plate with the Caribbean plate, apart from increasing the seismic instability, it also generates a frequent volcanic activity that makes Guatemala to be also part of the Ring of Fire. In this sense, the country has one of the largest concentration of volcanos in the world and the largest of Central America. Out of the 324 eruptive points existing in the country, 11 are classified as active volcanos and among these, three of them have been active the last ten years (Santiaguito, Fuego and Pacaya)²³. The most important volcanic hazards in these tree areas are lava flows, burning clouds and explosions generation, lahars and mudflows and the fall of incandescent material and ashes which might affect directly to 150,000 people living near the volcanoes and potentially up to 5 million in the whole country²⁰.

After the eruption of the Santa María volcano in 1902 and Santiaguito volcano in 1929 that left 6,000 and 5,000 dead respectively no more records of deaths from volcanic eruptions are registered, but a significant number of affected in certain episodes. Among others, Fuego volcano eruption in 2012 that left 10,000 affected, the eruption of Pacaya volcano in 1992 with 5,000, and eruptions of 1983, 1984 and 1987 which affected 3,000 to 3,500 each¹¹. In terms of damage, which is very difficult to quantify, these have to do principally with the loss of crops and damage to homes in the areas near to the volcanoes.

4. IMPACTS OF NATURAL DISASTERS

The tables presented below shows the top ten of major disasters in Guatemala over the past fifty years, according to three different classifications: number of deaths, number of affected and damage in millions of dollars.

DISASTER	DATE	TOTAL DEATHS
Earthquake	04/02/1976	23,000
Storm	01/10/2005	1,513
Flood	20/09/1982	620
Storm	26/10/1998	384
Storm	05/09/1969	269
Epidemic	ene-92	206
Epidemic	ene-90	200
Epidemic	jul-91	180
Storm	28/05/2010	174
Flood	30/09/1987	84

Table 3. Top ten natural disaster happened in Guatemala the last 50 years in terms of the number of deaths they caused¹¹.

DISASTER	DATE	TOTAL AFFECTED
Earthquake	04/02/1976	4,993,000
Drought	mar-09	2,500,000
Earthquake	07/11/2012	1,321,742
Drought	ago-14	1,180,000
Flood	12/10/2011	528,753
Storm	01/10/2005	475,314
Storm	28/05/2010	397,962
Drought	jun-12	266,485
Flood	22/10/2008	180,000
Drought	sep-01	113,596

Table 4. Top ten natural disaster happened in Guatemala the last 50 years in terms of the number of affected they caused¹¹.

DISASTER	DATE	TOTAL ECONOMIC DAMAGE (,000 US\$)
Earthquake	04/02/1976	1,000,000
Storm	01/10/2005	988,300
Storm	26/10/1998	748,000
Storm	28/05/2010	650,000
Landslide	04/09/2010	500,000
Earthquake	07/11/2012	210,000
Drought	ago-14	100,000
Flood	20/09/1982	100,000
Flood	12/10/2011	61,913
Storm	05/09/1969	15,000

Table 5. Top ten natural disaster happened in Guatemala the last 50 years in terms of the economic damage they caused¹¹.

As the shown in the tables, there is an event that stands out in first place in any of the classifications and which gives us an idea of the vast devastation it caused. That is why its consequences will be discussed in depth. We are referring to the earthquake that devastated a big proportion of the territory of Guatemala on February 4, 1976, especially the capital and small villages in the highlands and in the Motagua river basin. It caused around 23,000 deaths and affected nearly five million people. According to ECLAC, the earthquake destroyed about 222,000 homes mainly in small villages and hamlets of rural areas (113.906) and also in the capital, where a third of the buildings became debris (58.760).

Damage to the infrastructure of basic services such as health and education were considerable. About a quarter of a million schoolchildren were affected by the partial or total destruction of schools, leading to a delay of around one month and a half to return to the school course. Damage in the health sector was reflected in the total destruction of five hospitals, including the largest and most important in the country, three health centers and two health posts. Moreover, there was also considerable damage in 6 hospitals, 6 health centers and 53 health posts. This derived in an acute decline of the installed capacity in the area of provision of preventive and curative health services, which added to the large number of casualties caused by the earthquake, led to the collapse of health services, requiring external assistance for the installation of provisional hospitals as the one settled in the department of Chimaltenango by the United States. Many other health facilities also continued to operate. There were also multiple damages in the sewage system and drinking-water sources of 75 villages and also damage in the water treatment system of the capital.

Regarding infrastructure of transport, several roads were affected and all bridges leading to the capital were destroyed, which also hampered the delivery of humanitarian assistance. As for productive infrastructure, the damage was greater in industry than in agriculture and a sector which was particularly affected was handicrafts industry which made around 50,000 artisans to lose their main source of income because of the destruction of their workshops. In comparison, trade and the service sector experienced significantly less damage. Overall, the damages caused by the earthquake were more of social nature with the 23,000 dead as the greatest impact and then the effects in the provision of basic services, particularly health and education²⁴.

The total damage caused by the earthquake (USD 1,000 million) corresponded to 27.4% of GDP²⁵ and also the expected GDP growth for this year was significantly lower²⁴. Other economic consequences were the stagnation of foreign direct investment in the industrial sector²⁶. Finally the total reconstruction of the country to previous levels took about ten years.

As it can be noted, the consequences of a future event with the characteristics of the earthquake in Guatemala may be catastrophic either in victims and number of people affected as well as in economic impact. However, as reflected in the above table, aside from this earthquake, large potentially catastrophic events during the last fifty years have presented a relatively "low" number of victims compared with the great numbers of people affected and damage caused.

The second most important event in terms of victims was Hurricane Stan which crossed the country on October 1, 2005, and whose damage estimated at about 988,300 million¹¹ also places it the second among the events that have caused more economic damage. As reflected in the list, the hydrometeorological events are the most present in this top ten, indicating that their impact on the country is important. In this sense hurricanes and tropical storms that often lead to episodes of flooding or landslides that greatly increase the impact of the primary events, are the most common.

That is the case of Hurricane Stan (2005) or tropical storm Agatha (2010) among others, which caused landslides in the highlands of Guatemala and severe flooding on the south coast that left tens of thousands of affected and widespread damage whose main impact fell at the social level as evidenced by the statistics, because of the losses and damage in housing and infrastructure related to health, education and water and sanitation services as well in the different productive sectors such agriculture^{27,28}. Similarly, and as mentioned by Ricardo Zapata Martí, former focal point for Disaster Assessment at ECLAC, "the social impact, the largest in quantitative terms, has in turn a qualitative impact on individuals, particularly the most vulnerable population groups: rural people, farmers women and small traders, in whose "patio" economy damage and losses are hardly visible but have negative consequences for their welfare"²⁸.

In fact, the said groups are the most affected to such events due to their special situation of vulnerability as it will be discussed in the next section. From the environmental point of view, the impact of hydrometeorological events results in relevant losses of natural capital and environmental losses, 26.7% of the total in the case of the storm Agatha. This is mainly due to the loss of soil, silting of rivers, watershed degradation, sedimentation events, etc. In the case of volcanic eruptions as the one which was

associated with the storm Agatha, the negative impact on ecosystems and soils is increased by the presence of volcanic ash and other products²⁹.

All these factors contribute, in turn, to increase the environmental fragility, a fact that negatively affects the welfare of society and lags the advance of growth and development, that is, perpetuate and sometimes accentuates the already existing vulnerability of people and territories. Finally, although it is true that the impact on GDP of these meteorological events individually is not very significant, the cumulative effect of various disasters like these represents a drag on growth²⁸.

The table also shows a very worrying situation emerging in Guatemala which is the occurrence of episodes of extreme droughts. Out of the ten episodes of disasters that more balance of affected left in the last fifty years, four correspond to droughts. Besides, as it is shown, these events have become more frequent and damaging in the past ten years, indicating the clear influence of the climate change and specifically El Niño as a risk factor in the occurrence of these events, as it will be described in the next point.

In the case of Guatemala, although it is true that droughts have not caused victims except in one case, they do have an impact on health, economy and development of mainly rural communities. In Guatemala, drought affects about 10% of the productive areas of the country and a loss of about 6% is estimated in the national production of corn, which affects a total of between 128,000 and 150,000 families³⁰. The productivity of corn and bean crops during the 2014 drought was 38.7% and 44% lower than the national average³¹. Furthermore, the crop losses of the 2014 drought reached up to 100% in some affected areas, which are already areas with high poverty levels³².

The effect of droughts in recent years is cumulative and has considerably increased the rates of food insecurity in the affected areas (mainly dry corridor) and chronic malnutrition in a country that already has one of the highest rates in the world in this regard with 50% of children experiencing a situation of chronic malnutrition³³. The lack of access to basic grains and thus increasing rates of malnutrition primarily affects families in rural areas devoted to subsistence farming. However, the logical increase in the price of corn or bean is another major impact of droughts which may also complicate the access to these staples by very low-income people not only in rural areas but also in urban areas. Moreover, as a result of the reduction of the need of workforce to harvest crops, as many of them were lost, unemployment rates increase among rural population³¹.

All these effects are reflected in the statistics left by these events. For example, the drought in 2009 affecting mainly the departments El Progreso, Zacapa, Jalapa, Chiquimula, Baja Verapaz, Santa Rosa, Jutiapa and Quiche (almost all located in the dry corridor) reduced the production of beans, sorghum, corn and cassava by more than 50% made an impact on around 2.5 million people. 24% of the female population aged 10 to 19 years was severely malnourished and 25.6% of households reported job loss as a result of drought³⁰.

Apart from all the mentioned negative consequences that lead to a decrease in quality of life of affected populations who already live under difficult conditions, the effects of droughts among groups highly dependent on agricultural activity also result in higher dropout rates because of malnutrition, deterioration of various indicators of public health and a general reduction of hygiene conditions This sometimes leads in turn, to frequent

episodes of diarrhea and vector-borne diseases, which along with child malnutrition and poor water storage, can be fatal^{34,35}.

Another effect of disasters in Guatemala, mainly hydrometeorological type is also migration. Worldwide, the number of migrants for climatic reasons is growing every year³⁶ and Guatemala is no exception. In this sense, the loss of crops due to drought coupled with the subsequent drop in agricultural productivity or even the disappearance of entire fields lead to the mobility of many people from the rural areas to the capital and the department capitals or out of the country to the United States and Canada seeking job opportunities. Destructive livelihood events such as floods or landslides also cause these migratory situation, although on a smaller scale. Although statistics concerning environmental migration flows do not exist yet in Guatemala it is predictable that these will increase in parallel with the likely increase of potentially catastrophic meteorological events.

Finally, in terms of impacts on different groups of population, it is worth mentioning at one of the most vulnerable to disasters: children. As mentioned, the impact of disasters on the education sector in Guatemala is high given the already-existing precarious situation of education in the country. This, coupled with the loss or harm in the livelihoods of families after a disaster, entails rising dropout rates, the decline in enrollment, malnutrition or predisposition to diseases of pediatric populations due to food shortage. Although in Guatemala there is little data on the specific impact of disasters on children, some organizations such as UNICEF have been focusing on statistics including child populations as for example the Agatha-Pacaya disaster which left 229,734 affected children³⁵.

5. UNDERLYING DISASTER RISK FACTORS

According to UNISDR³⁷, vulnerability is the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. Given the variety of circumstances and risk factors that determine vulnerability, this can be classified in several ways. In this section the most important factors which contribute to increasing the level of vulnerability of the population and the country will be analyzed.

POVERTY

With 40.38% of people living in poverty and 13.33% under extreme poverty⁴, this together with inequality, is one of the main disaster risk factors in Guatemala. Apart from being in itself a risk factor, it is in turn the breeding ground for the development of other risk factors that will be detailed below. Unfortunately some of the poorest areas of the country are also the most prone to disasters, in some cases to more than two different natural hazards.

In the event of a disaster, the neediest families are less well prepared to face it as they no longer have the financial resources to recover after the disaster. In extreme cases they even lack the ability to obtain food due to the isolation of their communities and the shortage of care facilities for the treatment of their illnesses. In addition, after the incident, these families usually have to cope with the loss of assets on which they counted, especially their livelihoods, which could be a small store at home, backyard-related economy (agriculture, poultry or livestock) or their small workshop to make handicrafts.

URBANIZATION

In Guatemala, with a population density of 138 habitants/km² and rising, is common the location of individuals or populations in places particularly prone to be affected by the occurrence of natural events, isolated but intensive or recurrent events of middle and small intensity. The migration from rural to urban areas, mainly to the metropolitan area of the capital, by people of very limited resources who go in search of job opportunities is substantially increasing the population density of urban areas³⁸. This internal migration along with the housing shortage affecting the country and the minimum existing urban planning creates a disjointed and disorganized growth of the urban area of Guatemala³⁹.

This is highlighted in the emergence of peripheral and marginal settlements in unfit areas for urbanization as cliffs, slopes and floodplain areas. These slums apart from being made up with low resistant materials, they often lack the provision of basic services such as drinkable water, electricity, sewage system or health services, which along with the high physical vulnerability they already present by its location, places them in a situation more prone to disaster which has to do with earthquakes, landslides or floodings^{40,41}. This also happens in rural areas where populations are often displaced from their ancestral lands due to agricultural, forestry, mining or hydroelectric exploitation and are forced to migrate to large population centers or other rural areas under conditions similar to those described above, as they cannot afford having a dwelling with minimum security conditions⁴². In Guatemala, approximately 60-70% of the urban population live in such

slums and more than 300,000 people live in an informal situation regarding land titles (2006)⁴³.

Apart from the location, as discussed, it is important also to note the type of housing that exist and the materials that the roofs, walls and floor are built. In this sense, nine out of the twenty-two departments have more than 50% of homes built with inadequate materials, reaching 60% or 70% in some of them⁴. And while it is true that the majority of materials for construction are brick and iron columns it is also true that less than 20% of the buildings are guided by a professional and more than 40% is overloaded so new housing construction also have to be seen as a risk factor, in this case specially to earthquakes²⁰.

SOCIOECONOMIC ASPECTS

The limited quantity and inadequate quality of public services is also a risk factor that increases the vulnerability of certain populations in Guatemala, both in urban and rural areas. Lack of access to clean water and the inadequate waste management systems both liquid and solid affects the health of the population and deteriorates the environment which in turn contributes to increase the vulnerability to disasters of people living in these conditions. Besides, the still existing illiteracy rates, the low quality of education and the high drop-out rates among certain population groups is an obstacle when conducting environmental education, education for sustainable development or education for disaster prevention programs that have an effective impact in the population. These programs are important to raise awareness on the protection of the environment which is directly related to the greater or lesser risk to disasters, as well as to build capacities on prevention, mitigation and preparedness, thus integrating the population in risk management. Regarding the provision of health services, the statistics showed in the first section reflect that they are insufficient and therefore a risk factor that increases the vulnerability of people, especially considering availability and functionality of health services following the occurrence of an event of great magnitude. Similarly, the low deworming and vaccination rates, and the presence of diseases such as measles are an indirect indicator of the lack of access to health services. This circumstance is a major risk factor in drought situations for example, with a potential impact on the nutritional status of children belonging to the most vulnerable families³¹.

ENVIRONMENTAL DEGRADATION

Environmental degradation is related to the model of economic system prevailing in the country and the inadequate land use, which promote a series of situations that contribute to increase disaster risk in most of the Guatemalan territory⁴¹.

First, it is estimated that the widespread deforestation in Guatemala causes the disappearance of 73,000 hectares of forest every year having already lost almost 69% of total forests in the last fifty years⁴⁵. Factors that increase the pressure of deforestation in the country are the increasing global demand for wood, increased areas of monoculture like african palm, the development of extractive industries such as mining as well as the need of new land for urbanization. In addition to deforestation, lack of programs for soil conservation and agricultural activities also contribute to overuse,

erosion and land degradation causing soil erosion and events of surface run-off due to rain, which can result in flooding. The loss of soil cohesion may also derive to big mass movements and landslides which are increasingly frequent especially in the highlands of the country^{20,41,45}.

Secondly, the inadequate or sometimes non-existing watershed management and their environmental degradation is also a very recurrent problem in the country. In that sense, the existence of illegal dumps, the lack of water treatment plants and the presence of constructions that prevent water streams to circulate properly along with deforestation again are all factors that increase vulnerability to flooding^{41,46}. It is also important to highlight the increase of risk associated with the agricultural export sector which implement illegal interventions to modify the path of watercourses in order to protect private farms but without considering the consequences in terms of floods in neighboring rural communities other than the consequent environmental degradation⁴⁷.

In third place, oil and mineral extractive activities are also a risk factor insofar they cause displacement of populations to vulnerable places and ecosystems deterioration due to deforestation and water pollution⁴⁵. In the case of the areas affected by drought, the increase of the agricultural surface is promoting the excessive use of water resources and making aquifers running dry very quickly affecting environment and exacerbating the situation of food insecurity in these areas²⁰.

Finally, both water and air pollution significantly damage the health of the population and therefore their living conditions. This is exacerbated in areas such as metropolitan Guatemala for example, an area with high population density and industrial concentration which generate high levels of pollution aggravated by the lack sewage systems, illegal dumping of garbage and precarious settlements. All this is a major environmental and health threat which contributes to increase the vulnerability of the population to catastrophic events^{41,45,47}.

GOVERNANCE

In Guatemala, especially in certain areas, state institutions are not strong enough to effectively regulate and coordinate the development of territories either because of the security situation in the country or the lack of material, human or financial resources. This obviously also includes the entire disaster management cycle. This institutional vulnerability is also appreciated at the level of local authorities as they still have insufficient capacity in disaster risk management.

This contributes to the inadequate adoption of measures to reduce disaster risk in land use planning at local level, as well as the public investment for that purpose. Along with this, Guatemala has a very unstable political situation marked mainly by the insecurity in the country and the high levels of corruption (32 points over 100⁴⁷). In this sense, although successive governments and parliaments have legislated on risk management, vulnerability and environmental protection, these laws and policies cannot be developed in their fullness because they need considerably more effort to be undertaken. All this becomes a risk factor that also increases the vulnerability of the population to disasters⁴¹.

CLIMATE CHANGE

According to the Global Climate Risk Index 2016 elaborated by Germanwatch⁴⁹, Guatemala is the tenth most affected country in the world to the effects of climate in the period 1995-2014. This index is calculated based on four indicators: number of deaths, number of deaths per 100,000 inhabitants, sum of losses in US \$ in purchasing power parity (PPP) as well as losses per unit of Gross Domestic Product (GDP). This data evidences the great susceptibility of the country to climate and therefore climate change and its unpredictable effects is also a major concern. As most of the developing countries, Guatemala has not contributed significantly to the appearance of climate change.

In the case of Guatemala, climate change is risk factor especially for the occurrence of droughts as discussed in previous sections. In an optimistic scenario it is expected a rise of 1.5°C in temperatures (4.5°C in a pessimistic scenario). Furthermore rain level are expected to decrease⁵⁰. This decline of rain will be concentrated not only in arid and semi-arid areas of dry corridor but also adjacent territories leading to a likely increase of the area of this corridor. For 2016 there is a 90% of probabilities that El Niño remains and cause another water shortage, thus affecting for the fourth year the production of food of families with subsistence crops³¹.

Climate change effects, therefore entail a black panorama for the agricultural sector of basic grains such as corn or beans which is the main livelihood of tens of thousands of people who could see reduced their production by 10% which what that means for food security in the region. In Guatemala 11.8% of the dry corridor area is classified as severe damage potential and corresponds to 54 villages³¹. Furthermore heatwaves are expected to increase the risks of cholera, pulmonary viruses, leptospirosis, encephalitis, dengue, malaria, etc.¹⁹. Finally, although in principle in Guatemala the prediction is that climate change reduces rain level it is not ruled out that in some areas of the region frequency and intensity of other hydrometeorological events such as hurricanes or tropical storms might increase.

As noted, Guatemala presents a context of structural vulnerabilities generated by inequality and high rates of poverty, lack of adequate public infrastructure, urban crowding, weak social structures or high environmental degradation, among others. While these factors have much to do by the pattern of development in the country, others such as climate change, a factor of particular importance in Guatemala, have little to do with the actions of the country. The fact is that it can be said that the country is under permanent risk.

In this sense, we can say unfortunately that almost all the territory and population are at risk as reflected on data from the World Bank where 92% of the population and the same amount of GDP are exposed to two or more risks⁴¹. Finally, the most revealing statistic of such continuous risk situation the country is experiencing is the World Risk Report 2015 which places Guatemala as the fourth country in the world with the highest risk to natural disasters⁵¹. This risk index takes into account other than risk exposure and vulnerabilities of the country, other indicators such as installed capacities, something that will be detailed in the following sections. This situation is also reflected in the INFORM index²², which takes into account exposure to natural and human hazards, vulnerability

of the country and lack of capacity to cope and recover from a disaster. In 2015 Guatemala presents an index of 5.2 (out of 10) being the third country in Latin America and the Caribbean with the highest index, only behind Haiti and Colombia. Although this index takes into account the risk to human-induced events such as conflicts, in the case of Guatemala the highest weight at the moment is due to the natural events.

6. DISASTER PREVENTION AND RESPONSE STRATEGIES

INTERNATIONAL FRAMEWORK

At the international level, Guatemala is signatory of both the Hyogo Framework for Action (2005-2015) and the new strategy of Sendai (2015-2030) recently approved. With regards to the fight against climate change, Guatemala is also a signatory of the Kyoto Protocol. Like many other countries especially vulnerable to natural disasters in general and the effects of climate change in particular, Guatemala has adopted these international commitments and frameworks as an umbrella under which articulate instruments that allow Integral Disaster Risk Management with a strategic and systematic approach to reducing vulnerability to threats and the risks they involve.

In words of Executive Secretary of CONRED Alejandro Maldonado during the third conference of Sendai, "the Hyogo Framework for Action represented an opportunity to work as it has allowed to develop intervention priorities, have improved the regulatory instruments, mechanisms and capacities to ensure that the development of the country is made in conditions of resilience to the multiple threats and vulnerabilities that the country has" and "integrated risk management must be understood as the large umbrella that sustains development"⁵². This shows the importance that for Guatemala has to be part of these agreements, as somehow "forced" the country to adopt and/or update their public policies, laws and regulations in relation to DRR as will be discussed below. In addition to these treaties, Guatemala has been a signatory of other international agreements and participated in the creation of international working spaces for disaster risk management (DRM).

REGIONAL FRAMEWORK

At the regional level, that is, Central American, from the disaster caused by Hurricane Mitch in 1998, the countries of the region have taken on the DRM as the fundamental reference which in turn has led to the generation of regional mechanisms, mandates and guidelines for countries in the region, all them supported by the Center for the Prevention of Natural Disasters in Central America (CEPREDENAC) of which Guatemala is also a member and harbors the headquarters.

Born in 1987 as an instance for regional cooperation in disaster prevention, CEPREDENAC became in the nineties in an intergovernmental institution of the SICA which promotes and coordinates international cooperation and exchange of information, experience and technical and scientific assistance in prevention, mitigation, and disaster

response. In this sense CEPREDENAC was established as the political expression of a coordination center that performs important regional projects and sponsors and promotes forums, spaces and mechanisms for coordination and exchange of knowledge and experiences that contribute to a better understanding of DRR.

The Central American Policy for Integrated Risk Management -PCGIR- (2010)⁵³, which has represented a joint and articulated effort and of the countries of the region to address risk management in an integrated way, has become the framework for the policies and strategies implemented in each country as it strengthens the links in this area with international commitments under the MDGs and the HFA. The Strategic Framework for reducing vulnerability and disasters in Central America (1999), The Regional Plan for Disaster Reduction (2006-2015) and the Strategic Framework for Integrated Climate Risk Management (2011) are also especially important. Finally, a milestone sponsored by CEPREDENAC was the establishment in 2012 of the Central Fund for the Development of Comprehensive Disaster Risk Management -FOCEGIR-, a finance facilitator instrument for national and regional projects on prevention and preparedness who strengthen the capacities of countries to deal with and manage the threats of climate change and minimize or avoid all those endogenous actions that promote vulnerability⁵³.

NATIONAL LEGISLATION

LEGAL FRAMEWORK²⁰

As a starting point, the supreme law, the Constitution of the Republic of Guatemala is the most important. Article 1 states: "Protection of the Person: The State of Guatemala is organized to protect the person and the family; its ultimate goal is the realization of the common good." Article 2 about duties of State mentions: "It is the duty of the State guarantee to the inhabitants of the Republic life, liberty, justice, security, peace and the integral development of the person." Based on these articles it is a task of the State to adopt the necessary measures in order to reduce disaster risk and thus prevent human, social and economic losses and guarantee the necessary organization to ensure sustainable, safe and solidary development. From the Constitution and what has been mentioned therefore derives a whole package of laws and codes that take into account disaster risk reduction within their objectives and which are detailed below.

Public Order Law (Decree 1-86):

In the Chapter IV, Article 14 authorize executive to establish the State of Public Calamity, at the time of calamities caused by random events and thus gives legal provisions defining the specific measures that the President of the Republic can take to when these events occur to safeguard the welfare of the population. In subsection 6) of Article 15 states "Order the evacuation of the inhabitants of the affected regions or who are in danger," and in subsection 8) "Take the necessary measures to ensure that the calamity does not spread to other areas for the protection of persons and their property".

Development Councils Law (Decree 52-87):

It aims at the creation and regulation of the Councils of Urban and Rural Development whose main function is to promote the participation of the population in the development of the country at the community, municipal, departmental and national levels. With regard to operating funds, the law defines a constitutional percentage (8%) percentage to be distributed by the National Council to the municipalities. All this benefits any initiative of work and coordination of disaster risk reduction within the framework of the implementation of policies on integrated risk management at local, municipal and departmental level coordinating actions of intergovernmental institutions and civil society.

Protected Areas Law (Decree 4-89):

It regulates all the related to the preservation of protected areas and how they should be adequately managed. For this, the National Protected Areas Council (CONAP) is created and through its Executive Secretariat is the regulator and manager of all the areas declared protected. Its importance for Disaster Risk Reduction resides in that the more preserved these protected areas are, the more increase of resilience conditions vulnerable places will have.

Forestry Law (Decree 101-96):

Its main aim is the conservation and reforestation of forests and the sustainable management of forest resources across the country. Through this law, the National Forest Institute (INAB) is created as a governing and regulatory body which manage everything concerning forestry in the country. In the case of the Forest Law, the relation with disaster risk reduction is based on the mission of INAB which must ensure not only the conservation of the existing forest but also promote reforestation mainly in those areas prone to landslides and mass movements.

Social Development Law (Decree 42-2001):

Section V is directly related to the matter of Risk Management: "Development and Social Policy in the Field of Population Dynamics and Location in natural risk areas", stating in article. 37, as per the population at risk, that SEGEPLAN will conduct updated studies and diagnostics on the dynamics and location of the population in areas of natural hazards, (...) for the definition of strategies for prevention and attention to the population, focusing on those living in precarious and vulnerable to disaster settlements. Furthermore, in this same section article 38 states regarding Protection Strategy and mentioning SEGEPLAN, that this institution will develop a social protection strategy for the population in case of disaster and public calamity, in compliance with the provisions of the Constitution of the Republic.

Municipal Code (Decree 12-2002):

It refers that in terms of citizen participation, although the mayor is the one who takes the decisions, the Municipal Development Councils -COMUDES-, will facilitate the widest representation and guide the actions on governance, apart from being a space of information on the activities of municipal work. It is at this level where a better transfer of knowledge on disaster prevention and response can be given, as well as identify the most vulnerable areas of the territory and direct actions to increase the capabilities there.

General Law for Decentralization (Decree 14-2002):

This law aims to achieve all the related to the transfer of responsibility for management and implementation of public policies at local level including municipal governments and other government institutions with territorial representation. A decentralized system allows CONRED to implement the National Policy for Disaster Risk Reduction - PNRR - that seeks to increase resilience and reduce the vulnerability of the Guatemalan population.

Law for National Security System (Decree 18-2008):

Chapter I defines that the National Security System has the objective to establish organic and functional legal standards necessary to coordinate national security activities, and to facilitate intelligence information, so that state institutions are able to participate in an integrated manner, and respond to the risks, threats and vulnerabilities to which is exposed the country, being prepared to prevent, confront and counteract any emergency that occurs, thereby complying with the Constitution of the Republic, human rights and other international treaties ratified by Guatemala.

Law for the Regulation of the Reduction of Vulnerability, the Mandatory Adaptation to the Effects of Climate Change and the Mitigation of Greenhouse Gases (Decree 7-2013)

The purpose of this recently approved law is that "the State of Guatemala through the Government, decentralized and autonomous government entities, municipalities, organized civil society and general population, adopt practices that promote conditions to reduce vulnerability, adaptation capacities and allow to develop proposals of mitigation of the effects of climate change caused by emissions of greenhouse gases". The Act establishes the Climate Change National Fund, which will be managed by the Ministry of Environment and Natural Resources, and whose function will be to finance plans, programs and risk management projects.

REGULATORY FRAMEWORK

The national regulatory framework ruling the management of disaster risk in Guatemala is mainly based on the National Policy for Disaster Risk Reduction (PNRRD), the Policy on Social and Population Development (PDSP) and the National Policy of Climate Change and is set in other rules derived from them. The actions agreed in the HFA are also a reference as well as de various guidelines from CEPREDENAC like the PCEGIR.

National Policy for Disaster Risk Reduction⁵⁵

Enacted in 2011, PNNRD's overall objective is to "increase the resilience and reduce the vulnerability of populations and peoples (cultures), production processes and territories in disaster risk as a basis for improving the quality of life and safe development from Guatemala". This policy emanates as one of the strategies of the National Program for Disaster Prevention and Mitigation (2009-2011). According to the new intervention approach more focused on the risk that in response, the policy is structured around four strategic areas:

1. Identification, analysis and risk assessment: considering that the risk is the product of a complex combination of vulnerability and threat in the interaction of society and nature, it is necessary to establish a process of coordination between the four towns (Garifuna Maya, Xinca and Ladino), territories and resources around the concepts of threat, vulnerability and risk.
2. Preparation of capacities and conditions for disaster risk management and disasters: In this sense, it is started from the premise that in order to build resilient communities, existing capabilities must be recovered, strengthened and enhanced as well as create other capabilities (knowledge, tools, practices) and conditions (structures, rules and regulations, perceptions). This is the way to incorporate preparedness as a holistic concept of disaster in which disaster management and disaster risk are part of the same whole.
3. Management: mitigation, transference and adaptation: as a process, risk management should be considered as a comprehensive and functional component of the global, sectoral, regional, urban, local, community and family development of the management process; and of the environmental management, in the pursuit of sustainability.
4. Post-disaster Recovery: it is recognized that the process of post-disaster recovery is a proposal to re-focus the actions to save the lives and recovering livelihoods, reducing risks and ensuring conditions for further development, that is, by applying the recovery approach, the dynamics of the population and the territory are transformed while the damage caused by the disaster is repaired.

Social development and population policy (PDSP)⁵⁶

PDPS enacted in 2002 defines five areas on which it bases its guidelines which are: health, education, employment and migration, disaster risk and social communication in population. As it relates particularly to the matter of disaster risk, the policy defines the following general objectives:

1. To prevent and reduce disaster risk among population, especially those living in precarious human settlements which are also threatened by natural and socio-natural events.
2. Rehabilitate, reconstruct and respond in case of a disaster, through actions involving risk management which increase the capacity to respond to a disaster.

To achieve these objectives, the use of two policy instruments is proposed: the National Program for prevention, mitigation and disaster response and the Social Protection Strategy for the population in case of disaster and public calamity which in turn have their respective specific objectives.

Climate Change National Policy⁵⁷

Enacted in 2009, the aim of this policy is that Guatemala adopt risk prevention, vulnerability reduction and adaptation to climate change practices and contribute to reduce the emissions of greenhouse gases on the territory. In this sense, one of its

specific objectives is to reduce vulnerability and improve adaptation to climate change, among other things, by increasing and reinforcing prevention and risk management programs to minimize loss of life and infrastructure.

INSTITUTIONAL FRAMEWORK

CONRED whose complete name is National Coordinator for Disaster Reduction, was established in 1996 by Decree 109-96 of the Congress, and is the entity responsible to prevent, mitigate, attend and participate in the rehabilitation and reconstruction of the damage arising from the occurrence of disasters. Moreover, it is not merely engaged in executive duties but is also an action coordinating body and develops plans and strategies in coordination with the institutions responsible to ensure the restoration and quality of public services and lifelines in case of disaster⁵⁸. The following section will deep into the structure of CONRED and its competences.

As mentioned, CONRED is not only the coordinating institution of the disaster response, but also it has been strengthened for a better integrated risk management that focuses apart from the response, in the prevention and mitigation through the respective the departments. Hence the institution plays an important role in capacity building throughout the country, especially in the municipalities most at risk. However, the availability of funding remains a problem and the support of international cooperation is very important⁵⁹. Furthermore, apart from all the safety regulations for construction prepared by CONREDⁱ, the institution has continued making efforts in comprehensive disaster management with the development of national plans for response, recovery and reducing disaster risk in periods of temperature decline in the country or the rainy and hurricanes seasonⁱⁱ.

Apart from the CONRED, the National Table on Managing for DRR (MNDGRRD) is an interagency effort with a definite programmatic framework where different sectors of the country gather to achieve structural disasters risk reduction. This space of convergence monitors operations under HFA as well as the strategies defined in the PCGIR. The table is composed of four working committees: risk identification and monitoring, risk mitigation, planning and institutional strengthening and financial strategy.

ⁱSafety Standard No1: Structural requirements for essential, important and critical works.

Standard No2: Minimum building and safety standards for public infrastructure.

Standard No3: Technical specifications for construction materials.

ⁱⁱ National Response Plan National plan for the integral management risk reduction in drop temperature season in the Republic of Guatemala 2014-2015. National plan for the integral management risk reduction in the rain and hurricane season in the Republic of Guatemala 2015. Recovery National Framework

7. STRUCTURE AND CHARACTERISTICS OF THE EMERGENCY RESPONSE SYSTEM IN THE COUNTRY

The precedents of the current CONRED back to the year 1969, date in which the National Emergency Committee (CONE) was created with the objective of assisting the victims of the devastation caused by Hurricane Francelia. Guatemala was a pioneer in this respect in the region being the first country to have a committee of this kind. Then in 1971 this committee was granted permanent status through a regulation, which established norms for its operation. It was intended to provide attention to emergencies and assistance to the population in case of disasters, that is, it had a clearly-based disaster response approach. It is not until 1996 with the decree 109-96 that current CONRED is born. Below the structure of the institution is detailed.

CONRED National Council: is the superior authority of CONRED and is comprised of representatives from the public, private sectors and autonomous entities. It is responsible for approving policies and regulations to enforce compliance of the responsibilities granted by the Law as well as compliance with all the provisions that in case of emergency, are provided the Government of the Republic.

CONRED Executive Board: is the national body responsible for making immediate and urgent implementation decisions, in case of risks and impending disasters. The Executive Board is comprised of: The Coordinator of the National Council, the Executive Secretary of CONRED and any non-state worker who is member of the National Council of CONRED, other than official. It is the faculty of the Executive Board the declaration of anywhere in the country on high-risk.

CONRED Executive Secretariat (SE-CONRED): is the implementing body of decisions taken by the National Council and the Executive Board and is responsible for the management and general administration of the CONRED, without prejudice to the competences and functions of the National Council and its Coordinator. The head of SE-CONRED is the Executive Secretary, who is appointed by the President and reports directly to the National Council.

CONRED has a decentralized structure that goes from the national to the local. After the executive secretariat with a nationwide mandate, the second level is the regional coordination (CORRED) with five offices around the country. The third levels is based in each of the twenty-two departments (CODRED), then the municipal level (COMRED) and finally locally (COLRED). The various sub-commissions, in order to be validated, must go through an accreditation process that entails from personnel training to operational planning, including the development of response plans⁶⁰.

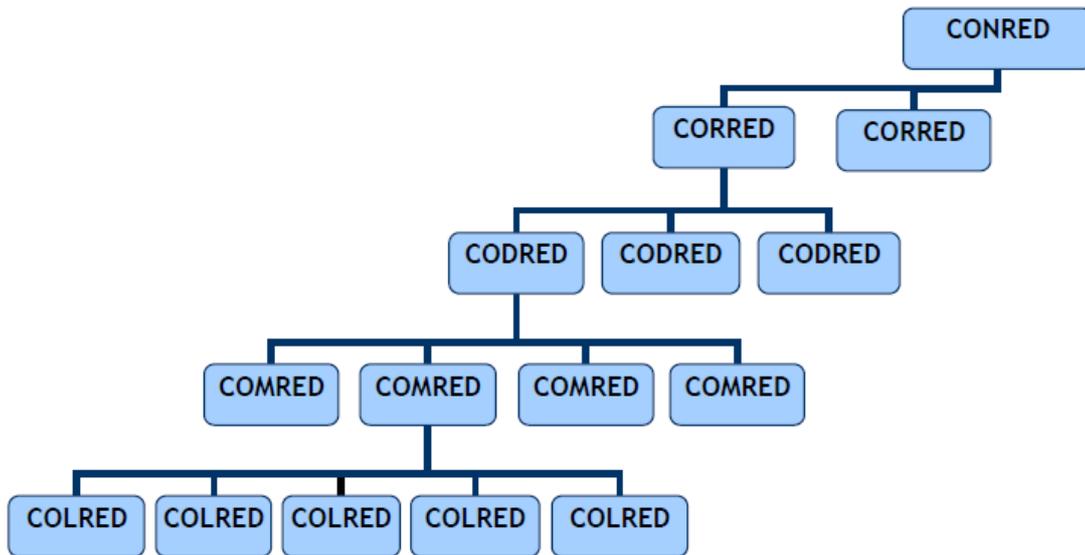


Figure 3. Decentralized System of Coordinators for Disaster Reduction⁶⁰.

The law creating the CONRED also establishes National Emergency Operations Centers (COE) which function as information centers specializing in emergencies and as coordinators with directions, agencies or other ministerial and institutional units that meet emergencies pertaining to their own role, and will support them in those areas that, due to the severity or extent of the disaster, cannot cope with their own institutional resources. Additionally, CONRED has strategically located throughout the country 27 Rooms of Immediate Reaction (CRI), for the objective of meeting any need to support a population after a disaster. CRIs have a minimum of products and basic supplies. These rooms operate support mainly shelter sector and are activated with the consent of the mayor and the governor of the department and with the previous activation of the specific response plans.

Interinstitutional liasons

CONRED has a network of institutions in both the public and private sectors that are grouped into nineteen different support functions. When an emergency occurs CONRED relies on the institutions belonging to the support functions that have been activated and works in coordination with them for the response in the different sectors.

Humanitarian Country Team

In Guatemala, SE-CONRED, United Nations System, international cooperation, the International Federation of Red Cross and more than thirty civil society organizations and humanitarian aid comprise since 2009 the Humanitarian Country Team. This is a space for coordination of humanitarian actors in Guatemala, working together in disaster response at the national level in the different stages of preparedness, mitigation, response and rehabilitation.

		ROLE	LEADING INSTITUTION	SUPPORT INSTITUTION
SITUATION ROOM		PLANNING	SE-CONRED	SEGEPLAN
		INFORMATION	SE-CONRED	DEPARTMENT OF SOCIAL COMMUNICATION OF THE PRESIDENCY
SECTOR I EMERGENCY SERVICES	1	Fighting of structural fires	Fire Department	Fire Departments
	2	Fighting of forest fires	SE-CONRED	MAGA-INAP, CONAP-Presidency
	3	Search and rescue	Fire Department	Fire Departments
	4	Pre-hospitalary attention	Guatemalan Red Cross	Fire Department Voluntary Firemen
	5	Response and assistance on hazardous materials	Fire Department	Fire Department MEM
	6	Management of temporary morgues	INACIF	Public Ministry Judiciary Body
	7	Security and public order	MINGOB	MDN
SECTOR II ATTENTION TO THE POPULATION	8	Food	SESAN	MAGA MIDES
	9	Management of emergency and temporary collective shelters	SOSEP	MINEDUC
	10	Management of transitional shelters	MSPAS	MICIVI-FONAPAZ
	11	Attention on physical and mental health	MDN	IGGS
SECTOR III LOGISTICS	12	Transport and equipment	SE-CONRED	SOCIAL SOLIDARITY FUND
	13	Coordination Center for Humanitarian Aid	SE-CONRED	MINEX
	14	Human Resources	SOSEP	MICUDE
	15	Administration and Support Centers	SOSEP	MINEDUC
SECTOR IV INFRASTRUCTURES AND SERVICES	16	Water and Sanitation	MSPAS	INFOM
	17	Telecommunications	SIT	TELGUA
	18	Public Works and Engineering	MICIV CAMINOS	FONDO SOCIAL DE SOLIDARIDAD
	19	Energy	MEM	CNEE
	20	SIG	CONRED	

Table 6. Interinstitutional Liason System of CONRED²⁰.

8. PROGRESS AND SETBACKS IN NATIONAL DRR IN RELATION TO THE PRIORITIES OF ACTION OF THE HYGO FRAMEWORK FOR ACTION (HFA)

This analysis was based in the periodic national reports made by CONRED, especially the last report 2013-2015 and country notes from the Global Facility for Disaster Reduction and Recovery GFDRR^{61,62}.

Priority Action 1: Ensure that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation

Progress:

As described, Guatemala has a legal basis, regulations and policies fairly robust for DRR, with decentralized responsibilities and capacities at all levels. Furthermore, in the Municipal Code there are specific guidelines for local governments with a mandate for DRR. In addition, the incorporation of risk management analysis in public investment projects (AGRIP) and in the projects generated by the Development Councils System has been incorporated.

Setbacks:

Firstly, despite the existence of legislative and regulatory provisions for DRR there is no explicit inclusion of DRR in the National Development Plan and sectoral strategies and plans yet. Secondly and more important, there are few resources to execute actions on DRR at different administrative levels. There is only a minimum allocation for "Emergency Response and Public Calamities" which obviously has little to do with DRR. In third place, although the decentralized system gives Mayors the power to take the actions they consider for disasters or high risk situations, there is not obligation on the inclusion of DRR management in development investments related to prevention, mitigation or recovery, that is, it is up to the mayors. So it can be said that although there is some progress, there is no systematic policy or institutional commitment at all levels. Finally, although national institutions, civil society and the productive sector are represented and participate in the National Table on Managing for DRR -MNDGRRD- there is still few group coordinated strategies and initiatives to make them cross-sectoral within government and different sectors agendas.

Priority Action 2: Identify, assess and monitor disaster risks and enhance early warning

Progress:

Progress has been made in carrying out certain assessments of national and local risks with special emphasis on those most likely. For example, MAGA has conducted risk identification activities using geographic information systems (GIS) that have supplemented the systems for recording and monitoring of INSIVUMEH as their historic landslide inventory, producing for example risk maps for volcanic eruptions.

Assessments in areas of resettlement for families who have been displaced by other disasters such as hurricane Stan were also made and hazard and vulnerability assessment disaggregated by sex already exist. Furthermore, there have also been advances on identifying risks at the municipal level in disaster-prone areas especially as a tool to help in land use planning. Finally flood and landslide hazard maps in four basins of the country were elaborated.

Regarding availability of information, there is a system of communication, monitoring and analysis of the losses caused by disasters in the form of databases and other IT tools (SISMICEDE) that are daily updated and are used at government level by ministries and areas of planning and finance. Moreover, these tools supply other institutional and international systems such as the National Land Information System (SINIT) created by SEGEPLAN to share territorial information in order to help in the planning of projects and programs. A Spatial Data Infrastructure (IDE) with aerial orthophotographs, statistics database of events as well as material losses in case of an adverse event also exists.

As for early warning systems (EWS), there is a permanent system places at Fuego volcano and there is also a constant monitoring of the four existing active cones in the country. Flood EWS are present in seven river basins (five in the Pacific). There is also a EWS for hurricanes in the Atlantic Ocean that alert villages in the coast. Furthermore, Guatemalan Red Cross, build capabilities in communities across the country to improve their early warning and communication with each other and with CONRED, through the base radio systems the institution has in many communities as communication system.

Finally, the country participates in regional and sub-regional level actions for DRR on hazard monitoring, risk assessments, information sharing and resourcing for strategies and policies, mainly under the framework of CEPREDENAC.

Setbacks:

There are not multi-hazard risk assessments and agreed national standards for multi-hazard risk assessments yet. Moreover, although there is a tool for evaluating risks at the educative sector, only 18.18% of schools (and hospitals) have been evaluated until 2015, determining that 877 schools are not safe from disasters.

In terms of EWS, although there is an increasingly investment on them from public and private sectors there is still little participation of indigenous peoples in their development and in the incorporation of ancestral data in scientific knowledge when implementing development and emergency response projects. This way would be more inclusive. In this sense, a department of CONRED is beginning to recover ancestral knowledge of the Maya, Xinca and Garifuna peoples.

Finally, the prioritization of integrated risk management in Central America in the form of policies, funding mechanisms and committees should result in concrete actions that reduce the risk effectively. Communication platforms in Central America should also expand their mandate to not only report the occurrence of a disaster but also to be information managers regarding disaster risk management.

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

Progress:

there is a disaster information system that is accessible and public information is provided with proactive guidance towards DRM using new ICTs. Similarly, the department of social communication of the SE-CONRED establishes the needs of different social groups, carrying out seasonal awareness campaigns to prevent forest fires, and be prepared for rainfall season or temperatures drop. These campaigns, allow to inform, educate and communicate the management of disaster risk reduction.

The topic of DRR is included in the curricula of education at different levels: primary, secondary, university and professional studies. The National Curriculum Base (CNB) at the primary level has a component which includes natural and social risks, prevention of disasters, insecurity and vulnerability. Basic Cycle (secondary education) and other created professional degrees have a component on environmental social security which includes natural and social risks, disaster prevention, insecurity and vulnerability. At the university level there is also a master in Integrated Risk Management (IRM) at USAC and various elective courses on IRM among certain degrees. Moreover, INAP develops the certification program on IRM for Development and SE-CONRED instituted the School of Integral Risk Management Studies as a result of an agreement with the Universidad San Pablo de Guatemala. It offers, Bachelor degrees and a Master on Integrated Risk Management.

Regarding the scientific field, the DRR is included in the research agenda in the form of projects and programs. For example through INSIVUMEH which do constant monitoring and research on seismic, volcanic, hydrological, meteorological and air quality projects. In the private sector institutions such as the Climate Change Institute has programs that include DRR to reduce the vulnerability of the towns through mitigation works in rivers or EWS calibration for example. Finally, SENACYT has a line of credit for emergency activities Research and Technological Development (ACECYT).

Finally, regarding public awareness at local and community level, there are public education campaigns with a focus on risk prevention, training of local governments and communicators and guidelines for disaster risk reduction at the community level as well as materials for this purpose which also include gender approach. International cooperation plays an important role in the developing of these programs and others to building resilient communities,

Setbacks:

Although training efforts have been made at the educational level, teachers are not yet sufficiently trained and updated to properly teach subjects on education for DRR which in fact reduces the effectiveness of these contents at the time of training and raising awareness among the younger generations. Furthermore, in the field of non-formal and informal education, especially in processes of adult literacy, education for DRR has little inclusion and workers do not have the minimum training that is needed to work DRR in their sessions. In the field of research, as the country invests few resources in science, research on DRR is not all the extensive that the vulnerability of Guatemala requires.

Equally, the different drills and prevention and disaster response campaigns are not permanent and there is no initiative in this direction covering the entire national territory. Finally a systematization of good experiences and lessons learned at the local and community level that could help in future efforts to promote DRR is missing.

Priority Action 4: Reduce the underlying risk factors

Progress:

Guatemala has a legal and regulatory framework that promotes, programs and projects to protect and restore ecosystems and adapt to climate change. Also make possible mechanisms such as payment for environmental services. Besides, environmental impact assessments apart from being mandatory and punitive they must contain environmental management plans.

With regards to construction, SE-CONRED introduced rules and construction standards in accordance with risk assessment methodologies. These risk assessments are also being implemented in the planning of recovery and reconstruction processes, form both before and after a disaster, as in the case of the earthquake in 2012. As for the construction of public works, apart from the rules of the SE -CONRED, there are also national regulations for the construction of hospitals and schools as well as efforts to prevent landslides in transport infrastructure such as roads (construction of walls and strengthening of slopes) or for integrated watershed management.

Setbacks:

Risk management is still not an explicit part or the management of the territory and not in the rules of land use and zoning. In addition there are no investments to reduce the risk of vulnerable urban settlements in the form of construction of drainage infrastructure in flood-prone or slope stabilization in areas prone to landslide. There is no transference of safe lands to families and low-income communities. There is barely control on the compliance with CONRED building regulations in private construction and low technical qualification on construction regarding measures for DRR.

In regards to the impact of development projects on disaster risk generation no previous evaluations by national or regional authorities have been made. By the part of SE-CONRED and SEGEPLAN certain risk and environmental impact assessments exist where public infrastructure will be built. However, this is not yet widespread and private construction projects have a greater lag in this matter. In the same way, there are not costs/benefits of DRR planning in public investment which results for example in the absence of investments for the reinforcement of key structures like schools and hospitals despite the existing regulations.

Finally, there is no budget for DRR in the process of resilient reconstruction nor support or social protection networks or systems to increase the resilience of communities in the form of crop insurance, microcredit, microinsurance, conditional transfers or schemes for temporary guarantee jobs, among others.

Priority Action 5: Strengthen disaster preparedness for effective response at all levels

Progress:

As discussed earlier, programs and policies for preparedness, contingency planning and disaster response already exist. There are 27 immediate reaction rooms managed by CONRED at strategic points in the country. Moreover, several training programs on preparedness exist both at the school and the health level. Schools have school response plans and school response committees and conduct drills periodically. In the area of health and hospitals, there are contingency plans for mass events, as well as for the rainy and low temperatures seasons and El Niño. Furthermore, the Ministry of Health has a specialized technical team that in an emergency or disaster is activated according to the alert level.

Plans, procedures and contingency resources to cope with a major disaster are also established. Such plans have been developed on a gender-sensitive basis and are mainly focused on establishing operations and communication centers, search and rescue teams and storage of aid supplies.

In the case of the capital, the Municipal Fire Department has an operations center together with the Municipality of Guatemala. When COMRED is activated, the communication activates for all the units. At national level, SE-CONRED has a rapid response team which addresses the first response. Finally, the CRG is an important actor in a disaster because they also have their own contingency plans as well as institutional warehouses for immediate response.

Finally, CONRED has improved systems of rapid damage and needs assessments (EDANES) and designed a recovery protocol, validated by other government institutions. In the same way, monitoring systems on the conditions of specific groups after a disaster also exist. This is the case of women in shelters where the Secretariat for Women has developed monitoring tools to prevent sexual violence.

Setbacks:

Preparedness plans are not yet updated periodically according to future risk scenarios. There is no very much focus on preparedness plans regarding shelters, safe medical facilities or exclusive supplies for people with disabilities. In addition, private sector is not yet an active partner in the planning and response.

Finally, although CONRED manages a permanent fund for DRR, this is subject to financial availability. In addition DRR is not covered by the funds for calamities.

Priority Action 1: Ensure that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation	
National institutional and legal frameworks for disaster risk reduction exist with decentralized responsibilities and capacities at all levels.	3
Dedicated and adequate resources are available to implement disaster risk reduction plans at all administrative levels.	1
Community participation and decentralization is ensured through the delegation of authority and resources to local levels.	2
A national multi-sectoral platform for disaster risk reduction is functioning.	3
Priority Action 2: Identify, assess and monitor disaster risks and enhance early warning	
National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors.	2
Systems are in place to monitor, archive and disseminate data on key hazards and vulnerabilities.	3
Early warning systems are in place for all major hazards, with outreach to communities.	2
National and local risk assessments take account of regional/ trans-boundary risks, with a view to regional cooperation on risk reduction.	2
Priority Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels	
Relevant information on disasters is available and accessible at all levels, to all stakeholders (through networks, development of information sharing system.	3
School curricula, education material and relevant trainings include risk reduction and recovery concepts and practices.	4
Research methods and tools for multi risk assessments and cost benefit analysis are developed and strengthened.	4
Country wide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	4
Priority Action 4: Reduce the underlying risk factors	
Disaster risk reduction is an integral objective of environment-related policies and plans, including for land use, natural resource management and climate change adaptation.	4
Social development policies and plans are being implemented to reduce the vulnerability of populations most at risk.	1
Economic and productive sectoral policies and plans have been implemented to reduce the vulnerability of economic activities.	1
Planning and management of human settlements incorporate disaster risk reduction elements, including enforcement of building codes.	2
Disaster risk reduction measures are integrated into post-disaster recovery and rehabilitation processes.	2
Procedures are in place to assess disaster risk impacts of all major development projects, especially infrastructure.	2
Priority Action 5: Strengthen disaster preparedness for effective response at all levels	
Strong policy, technical and institutional capacities and mechanisms for disaster management, with a disaster risk reduction perspective are in place.	4
Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	4
Financial reserves and contingency mechanisms are in place to enable effective response and recovery when required.	3
Procedures are in place to exchange relevant information during disasters and to undertake post-event reviews.	4
Indicator weighting sum	60
Total weight of indicators	110
Percentage of progress on the indicators	55%

Table 7. Progress on the indicators of the Hyogo Framework for Action. Prepared from data of Government reports⁶².

9. CONCLUSIONS AND RECOMMENDATIONS

As seen throughout the profile, the location of Guatemala makes it to face a multi-threat scenario mainly derived from hydrometeorological and geophysical risks. In this sense, and according to INFORM open source, earthquakes, tsunamis, floods and droughts are the most important hazards for Guatemala in terms of exposure²². Besides, the trend is that apart from possible high intensity isolated events there will be also an increased occurrence of meteorological events of medium and low intensity influenced in part by the effects of climate change to which Guatemala is particularly vulnerable. In other words, there is a more likely scenario of extensive risk for Guatemala in the upcoming years. Moreover, these events of low and medium intensity, as a whole, leave more economic losses and people affected than the less frequent events of greater intensity. Although the rural area is particularly affected by disasters in Guatemala, increasing catastrophic events in urban and suburban areas are not less important and they are in fact being more frequent in recent years mainly due to the increasing number of people living in areas of high risk and under conditions of precarious housing and public services. Thus, the greatest impact of disasters in Guatemala is social since apart from affecting the homes and livelihoods of the population, the already precarious education and health sectors are also specially affected in the occurrence of a disaster, as the statistics show.

Guatemala faces this multi-threat scenario in a condition of vulnerability that is far from the optimum. To the existing physical vulnerability due to the location of the population in high-risk areas, it must be added the social vulnerability of a multiethnic and multilingual country in which the cohesion of society is still a challenge as well as the economic vulnerability which increases even more after a disaster due to the loss of livelihoods, hampering the recovery of the population. Similarly, environmental vulnerability as a result of environmental degradation in Guatemala increases the risk of disasters. The inadequate land use planning in general and deforestation as one of the most prominent activities are the main drivers of environmental vulnerability. No less important is the technical vulnerability on public and especially private constructions, as this is a factor that substantially increases the risk of disasters. Finally, both political and institutional vulnerability in the country generates in turn conditions of weakness in the state that prevents for instance the compliance of environmental legislation or building regulations. Unfortunately, the trends for Guatemala show that these vulnerabilities are increasing and this is also the reason in the increasing levels of risk of disasters and humanitarian crises for the country.

The increased vulnerability in general, whatever kind it may be, has to do largely with all the underlying risk factors that are present in the country, some of which such as poverty require political will and structural changes on development to contain them and make them disappear in the medium and long term. In what has to do strictly with disaster risk management, in recent years there has been significant progress, especially in legislation, regulations and organizational structures. It can be recognized that in Guatemala CONRED has a good system of disaster response with a network of institutional support with quite clear mandates. However, regarding prevention, mitigation and preparedness there is still way to go. Advances in control, financing, regional integration, early warning, capacity building or awareness are necessary just to name some of the outstanding issues. This is also reflected in the still poor progress on

the achievement of the indicators of the priority actions of HFA which show a 55% of achievement overall⁶².

Firstly, it is essential to provide the different laws and policies with funding, because if not all the effort made on legislation is futile and no significant changes will be achieved. The budget of CONRED to work on prevention and mitigation should be significantly increased. This should also be accompanied by a strengthening of CONRED and the interagency links in DRR, which involves the training and retraining of technical personnel. Moreover, apart from CONRED, ministries, departments and other national systems must appropriate, disseminate and apply the tools on disaster risk management as a way to mainstream integrated risk management.

At the municipal level, the integrated risk management should be part of the local development plans and not simply a framework which in practice is not taken into account, as for example regarding the issue of land use and watershed management. On the other hand, the standards for disaster risk reduction elaborated by CONRED should have the force of law or municipal ordinance in order to be binding in all the municipalities of the country, especially in the most vulnerable and be adopted by local corporations and civil society. Similarly, structural assessments of health and education infrastructure should extend to all buildings belonging to these areas and then take the necessary measures that are required in cases of structural vulnerability discovered.

Secondly, EWS must be expanded and the efficiency of the existing ones must be improved with a greater involvement and training of the authorities and local people. With regard to floods, meteorological stations must be increased and EWS must be implemented in other basins that do not have yet. It is also necessary to increase the investment in national research on DRR and apply all the ancestral knowledge on prevention and mitigation systems, as a more effective way to build capacities among the indigenous population. Besides, all areas and municipalities exposed to different hazards should have multi-hazard risk maps which serve as a tool for local development planning.

Efforts to raise awareness at the local and community level need to be redoubled and promoting a culture of drill mainly to improve the processes of evacuation, rescue and assistance, especially in areas most prone to earthquakes, landslides and flooding. This also has a lot to do with improving the organizational structure of response at departmental and local level.

At the educational level, teacher training on education for prevention and disaster response must be expanded as well as disaster prevention and mitigation campaigns at school making them permanent year after year. The education of new generations in disaster prevention and preparedness is one of the cornerstones in the construction of an aware and trained country to deal with a multi-threat scenario as is the case of Guatemala.

Regarding the problem of drought it is necessary to diversify the livelihoods of the population in the areas prone to drought so that they are not solely dependent on agriculture and thus can increase their levels of resilience. Furthermore, surveillance of the nutritional status of these especially vulnerable populations should be strengthened

and studies and projections on the effects of climate change must also continue in order to implement preventive actions on areas susceptible to low rainfall in the coming years.

Finally the resilience focus as well as the build back better approach should be applied in a more real way after a disaster because during recovery and rehabilitation there is a tendency to repeat the same mistakes, as for example in the construction by the government of new infrastructure in the same places of high risk or with low quality materials.

However as stated above, all these measures are necessary, but not sufficient to reduce the country's vulnerability and increase the resilience of the Guatemalan people. As long as poverty levels and inequality do not descend, and with them the people living in precarious settlements located in cliffs just to put an example, the country's vulnerability and thus high levels of disaster risk will not be significantly reduced. These structural changes require a more long term vision, but it is urgent to start addressing them. In this sense, a gradual change of the model of development towards another more focused on sustainability is a necessary condition to achieve a proper integrated risk management in Guatemala.

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