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Population, territory and sustainable development in the Caribbean

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I. INTRODUCTION: RATIONALE, OBJECTIVES AND MAIN MESSAGES

A. Introduction

Given its location, the Caribbean Sub-Region has been described geographically and includes a number of insular nations and territories, all of the latter continuing to be colonies of the British, the Dutch and the French. Notwithstanding this geographical context, a geo-cultural conception of the Caribbean Sub-Region has prevailed and has been the dominant paradigm defining national spaces and territories that have been labeled Caribbean including continental countries such as Belize, Suriname and Guyana. The Caribbean is a multi-lingual region where English, Spanish, French or Dutch is a main language spoken in the different insular nations, continental countries and territories. While there are still traces of Amerindian populations in many of these Caribbean jurisdictions, many have national populations in which persons of African origin constitute the major racial group despite evidence of much smaller sub-populations of European origins. In several of the countries, East Indian sub-populations prevail though they constitute much larger proportions of the national population in countries such as Guyana, Trinidad and Tobago and Suriname. These racial groups along with small proportions of Chinese reflect the historical legacy of the Caribbean region, in particular, slavery and indentureship. These historical episodes have since shaped Caribbean culture and evident are still evident in the religions, cuisine, popular culture, apparel, sporting events and economic pursuits.

Economically, the countries and territories of the Caribbean have thrived and continue to thrive on plantation agriculture that had its roots the cultivation of sugar cane and peasant farming that was associated with the cultivation of food crops. Other countries such as Guyana and Jamaica have produced bauxite while Trinidad and Tobago has been a major producer of petroleum and gas. With regard to the services sector, tourism has been a main earner of revenues and foreign exchange for virtually every Caribbean country and territory; whether in the context of cultivation of food crops. Other countries such as Guyana and Jamaica have produced bauxite while Trinidad and Tobago has been a major producer of petroleum and gas. With regard to the services sector, tourism has been a main earner of revenues and foreign exchange for virtually every Caribbean country and territory; whether in the context of “sand and sea” tourism, eco-tourism, heritage tourism and more recently, sports tourism. In essence, every country or territory embraces more than one these disparate forms of tourism which constitutes a manifestation of the common cultural artifacts of the Caribbean Sub-Region. The services sector has also been characterized by thriving manufacturing sectors in countries

such as Trinidad and Tobago, Jamaica and Barbados. While in Trinidad and Tobago, the manufacturing sector is characterized by the production of iron and steel, fertilizers, chemicals and a host of energy-based products, the three countries have thriving manufacturing sectors that produce beverages, processed food items and apparel. Almost every Caribbean country and territory boasts of its own blend of rum which also reflects the region's heritage as a primary producer of sugar cane.

With regard to popular culture, music genres including mento, ska, rock steady, reggae, dance hall from Jamaica; calypso, soca, the various derivatives of soca and the steel pan from Trinidad and Tobago and zouk from the French Caribbean have shaped popular culture including dance, festivities and communications media in the Caribbean Sub-Region. The aforementioned music genres are central to popular culture throughout the geo-cultural space that has been associated with the Caribbean Sub-Region and its diaspora though this is not readily the case in those spaces where Hispanic culture is prevalent. Especially in the Anglophone Caribbean, music genres from Jamaica, Trinidad and Tobago and the French Caribbean thrive though in the Dutch Caribbean, especially in Aruba, Bonaire and Curacao, music genres of the Hispanic Caribbean are evident. It is also worth noting that Trinidad Style Carnival has permeated the festival calendars of several Anglophone Caribbean islands as well as the Caribbean diaspora in major metropolitan centres including New York City, Washington DC, Miami, Toronto, Montreal and London. More recently, there has been collaboration between performing artistes from different Anglophone Caribbean countries resulting in cross-fertilization and fusion across the different genres of the region. Such fusion is also evident between the music genres of the different linguistic groups of the region to the extent that the Hispanic countries have embraced reggaton – a fusion of Jamaican and Hispanic melodies.

Within the wider multi-lingual Caribbean domain, the Anglophone countries and territories sought to establish political integration in the form of the West Indian Federation in the late 1950s and CARIFTA in the 1960s. While the former failed, the latter evolved to become the Caribbean Community (CARICOM) in 1973. Today, CARICOM consists of fifteen member states - Haiti, Suriname and thirteen (13) independent Anglophone Caribbean countries including Belize and Guyana. A number of non-independent Caribbean territories such as Montserrat, Turks and Caicos and Anguilla are associate members of CARICOM. During the 2000s, there have been steps to establish the CARICOM Single Market and Economy (CSME) which strives ultimately towards in the establishment of a single currency. To date, there has only been agreement with respect to the movement of selected labour services and other services across the region. CARICOM has facilitated co-operation between member states and associated territories in activities such as the production of official statistics including census-taking, human and social development issues and the management of disasters. These are critical initiatives that

are important in the context of this study. In a narrower CARICOM context, a number of the smaller Eastern Caribbean islands including Grenada, St. Vincent and the Grenadines, St. Lucia, Dominica, St. Kitts and Nevis, Antigua and Barbuda, Montserrat and Anguilla constitute the Organization of Eastern Caribbean States (OECS) that has been established since 1981.

Given the crux of the discussion to this point, it is clear that this study should focus principally on the fifteen (15) member states of CARICOM as well as associated territories including Montserrat, Anguilla, and Turks and Caicos. With regard to CARICOM's initiatives regarding the production of official statistics including census-taking, other territories including the Cayman Island and Bermuda co-operate with CARICOM and are included in the study. In contextualizing Caribbean populations from the standpoint of variations in size, reference will be made to Cuba, Dominican Republic, Haiti and the Netherland Antilles in order to place contemporary Caribbean populations into perspective. More detailed discussions focusing on these countries are hampered by difficulty associated with obtaining the requisite data within the time frame for the study. For political reasons that treat with issues of sovereignty, the French departments of Martinique, Guadeloupe and French Guiana and Puerto Rico which is a dependency of the United States are not included in the study.

B. Rationale and Objectives

A main goal of national policy prescription in every Caribbean country is the attainment of sustainable development that does not compromise the fortunes of future generations who will occupy the respective spaces. This is especially critical insofar as there are thrusts towards greater social, economic and political integration that may transcend linguistic boundaries with the passage of time. Sustainable development is a function of the status of wide cross-section of institutional elements that prevail in the different countries of the Caribbean Sub-Region and thus shape their respective destinies. These institutional elements are manifest in the form of sub-systems that are social, economic, cultural and political, each of which mix and combine in the context of contemporary ideologies and practices to impact future well being of individuals, disparate groups of individuals including communities and regions, and national entities in their own right. Interestingly, each nation and territory has its own specific set of ideologies and practices which interact differently on respective social, economic, cultural and political sub-systems to spawn qualitatively different experiential outcomes in the thrust towards attaining sustainable development.

With regard to the social sub-systems, ideological sentiments and practices prevail to foster the provision of services such as education and training, health promotion and care, public safety, social security and transportation and communications services. Economic sub-systems are primarily concerned with the

allocation of scarce resources in domestic and international markets and in Caribbean contexts. Moreover, they are also shaped by ideologies and practices that impact the demand for labour services and labour force participation in specific economic activities, such a process varying from one territorial space to the next. To this end, demographic characteristics of the respective populations are important and ought to be considered in order to remove persistent inequalities and inequities that prevail with regard to the well being of individuals, groups of individuals and communities in order to facilitate the attainment of sustainable development. Cultural sub-systems are conditioned by belief systems that contribute toward the sustenance of norms and values that shape the ideas and practices that persist in Caribbean contexts. Though variable across territorial spaces, the history that has shaped the Caribbean and its existential being, has resulted in a distinctly Caribbean culture that is evident across territorial spaces notwithstanding obvious differences that are territory-specific. The polity is critical in ensuring that the other institutional sub-systems coalesce to facilitate territory-specific and regional policy prescriptions geared toward the attainment of sustainable development.

To this end, this study recognizes that there is variability in the extent to which the political systems in the respective territories are capable of facilitating positive outcomes with respect to the attainment of sustainable development. Notwithstanding the social, economic, cultural and political forces, that are brought to bear upon sustainable development processes, the impact of environmental factors should not be overlooked insofar as they have the potential to reverse development thrusts irrespective of levels of resilience that reside in the respective territories. At the same time, greater levels of resilience due to the contribution of the various sub-systems, is instrumental in minimizing the vulnerability of territorial spaces to environmental shocks such as hurricanes, tsunamis, earthquakes, volcanic eruptions and floods.

The thrust of this study is to examine Caribbean territories individually and as groups to gauge their vulnerability to environmental shocks due to hurricanes, tsunamis, earthquakes, volcanic eruptions and flooding. Accordingly, the socio-demographic characteristics of populations and their spatial distribution in each of the territories are critical elements that ought to be captured and analyzed in the context of their implications given the threat that persists and possible interventions to avert disaster or to effectively manage outcomes in the aftermath of such disasters. In essence, human safety and their capability to respond effectively to fast-track sustainable development in the aftermath of natural disasters is a critical aim in the context of this study. To this end, the respective demographics in the different territories and their differences in a spatial context have to be appreciated to achieve the intended purpose of this study.

C. Main Messages

This study is primarily concerned understanding the threat posed by natural disasters such as hurricanes, tsunamis, earthquakes, volcanic eruptions and floods in different Caribbean territories exposed to the risk of such events. Having such an understanding and knowledge of population and institutional characteristics

within the different territories is instrumental in the establishment of prescriptive measures to reduce losses due to such events, strengthen resilience capabilities and enhance the efficiency of recovery efforts. Thus, using population data is not without its disadvantages given the paucity of current data and in particular those that permit inter-spatial analyses within several of the Caribbean territories and conceptual inadequacies that render urban-rural classifications as either problematic or useless.

Nonetheless, with limited data, the study strives to address its principal concern bearing in mind territory-specific policy prescriptions and relevant secondary data that have been collected with a view towards operationalizing such prescriptions. In addressing, their development agendas, several Caribbean territories have subscribed to the tenets of the Millennium Development Goals (MDGs) which has outline a set of targets to be attained by 2015. Altogether, a total of eight (8) goals had been established as follows:

a) Eradicating extreme hunger and poverty

b) Achieving universal primary education

c) Promoting gender equality and empowering women

d) Reducing child mortality

e) Improving of maternal health

f) Combating HIV/AIDS, malaria and other diseases

g) Ensuring environmental sustainability

h) Embracing global partnerships for development

In order to identify populations and institutions at risk, formulate and design efficient intervention strategies, monitor outcomes and evaluate the impact of intervention strategies, a number of data collection activities to obtain data on territory-specific living standards and the status of women and children have been undertaken with a view towards improving the lot of vulnerable sub-populations including women and children.

Insofar as these data permit prescriptions that are designed to impact the future positively, they cater intrinsically to improving the lot of humankind in the future and thus functions as a medium that fulfills the sustainability criterion of development agendas. The data from the 2000 Round of Caribbean Censuses are the latest data providing comprehensive coverage of population data in spatial contexts for Caribbean territories. Such data are also worthy given that they permit some measure of harmonization to ensure that comparative assessments across territories are worthwhile. Where necessary and given that such data are available, intercensal population data are also used to provide meaningful updates of population characteristics in respective territories. Moreover, the Survey of Living Conditions targets the poor and the Multiple Indicator Cluster Survey targets children and women; two groups that are among the most vulnerable and for whom, it is important to discern attributes that threaten their resilience levels with the end result being strengthening

resilience. Within territories, these variations are extremely important in spatial domains that have higher risks of exposure to the various natural hazards especially if population density is high.

In order to satisfy the principal aims of this study the next chapter provides a comprehensive, yet critical examination of three principal concepts – population, sustainable development and vulnerability in a Caribbean context, focusing specifically on patterned associations between the concepts and their implications for similarity and differences between group outcomes within the respective territories. In this study, a major issue is territories' capabilities to be sufficiently resilient to overcome natural disasters with minimal loss and more specifically, embark upon efficient processes of recovery. To this end, Chapter 3 provides a basis for assessing the vulnerability status of the respective territories and more particularly, "at risk" spatial domains. With reference to key population attributes such as age, education and selected labour force characteristics, Chapter 5 examines interspatial differences across the spatial domains in the context of specific sets of territories. Where urban-rural classifications are possible, Chapter 6 and Chapter 7 constitute respective assessments of urban population dynamics and rural population dynamics. Finally, Chapter 8 synthesizes the discussions and observations contained in Chapter 1 to Chapter 7 with a view to providing a policy-oriented response towards attaining sustainable development in the face of extant risks associated with variable states of vulnerability to natural hazards.

II. POPULATION, TERRITORY AND SUSTAINABLE DEVELOPMENT A CONCEPTUAL REVIEW

A. Regional Differentials in Population Size

A cursory examination of population sizes of territorial spaces constituting the Caribbean Sub-Region is indicative of substantial variation. Table 2.1 shows that three countries, Cuba, Haiti and the Dominican Republic, have population sizes in excess of five million and thus can be classified as the "mega-size" territories. According to Table 2.2 which classifies territorial spaces according to population size, the next tier consists of the "large-size" territories, Jamaica and Trinidad and Tobago with population sizes ranging between one million but under five million. Despite having by far, the largest population sizes among Anglophone Caribbean territories, it is worth noting that the population size of Jamaica is still less than one-third of that of the Dominican Republic which has the smallest population among the three "mega-size" territories. Guyana's population size has hovered in the vicinity of three-quarter million to the extent that Guyana is classified a "medium-size" territory. Nonetheless, Guyana constitutes a land area that is larger than that of any of the other Caribbean territories including those with "mega-size" populations. In Guyana, overwhelmingly large proportions of the national population live within 100 kilometres from the Atlantic coast and on lands that are below sea level and prone to flooding, a risk that is real given Guyana's equatorial location and inevitable precipitation.

According to Table 2.2, the majority of the territories are classified as "small-size" territories inasmuch as their population sizes exceed 100,000 but are less than 500,000. These include a mixed array of territories ranging from islands that are very small in physical land area which is quite variable in terms of its terrain to much large continent-based

TABLE 2.1

APPROXIMATE POPULATION SIZE AND PROJECTED POPULATION SIZE, 1990S, 2000S, 2010 AND 2020

Caribbean Countries/	Approximate Population Size		Projected Population Size	
	1990s	2000s	2010	2020
Anguilla	9	11.4		
Antigua & Barbuda	59.4	76.9	90.8	
Bahamas	255	303.6	346.9	383
Barbados	260.5	268.8	274	277
Belize	189.4	240.2	296	345
Bermuda	58.5	62.1	65	66
British Virgin Islands	16.1	23.2	23	26
Cayman Islands	25.4	39.4	57	61
Cuba	10,662.10	11,146.20	11,514.00	11,743.00
Dominica	71.2	69.8	83	90
Dominican Republic			9,791.00	11,014.00
Grenada	85.1	103.1	110	127
Guyana	723.7	751.2	752	723
Haiti			9,994.00	11,677.00
Jamaica	2,380.70	2,607.60	2,702.00	2,786.00
Montserrat	11.3	4.5	5	5
Netherland Antilles		175.7	189	199
St. Kitts & Nevis	31.8	35.2	45	50
St. Lucia	133.3	156.7	167	178
St. Vincent & The Grenadines	107.6	109	122	128
Suriname	355.2	492.8	462	480
Trinidad & Tobago	1,213.70	1,262.40	1,322.00	1,346.00
Turks & Caicos Islands	11.5	19.9	29	31

Countries, Belize and Suriname in particular, with an abundance of land space and hinterland areas that provide a natural habitat for vulnerable sub-populations of Amerindian ancestry. The fifth tier consists of the "very small-size" territories which consist of only three territories, Bermuda, Antigua and Barbuda and Dominica. While the population size in each of these territories is in excess of 50,000 but less than 100,000 and thus similar, the three territories also constitute the most variable group on the

TABLE 2.2

CLASSIFYING CARIBBEAN POPULATION SIZES

Classification	Qualitative Description	Country Examples
Mega Size	Population size in excess of 5 million	Cuba, Haiti, Dominican Republic
Large Size	Population size in excess of 1 million but less than 5 million	Jamaica, Trinidad and Tobago
Medium Size	Population size in excess of 500,000 but less than 1 million	Guyana
Small Size	Population size in excess of 100,000 but less than 500,000	Bahamas, Barbados, Belize, Grenada, Netherland Antilles, St. Lucia, St. Vincent and the Grenadines, Suriname
Very Small Size	Population size in excess of 50,000 but less than 100,000	Antigua and Barbuda, Bermuda, Dominica
Micro Size	Population size less than 50,000	Anguilla, British Virgin Islands, Cayman Islands, Montserrat, St. Kitts and Nevis, Turks and Caicos Islands

Basis of performance of the domestic economy, levels of economic activity, human development, topography and governance structures.

Territories classified as “micro-size” territories do not have as many as 50,000 inhabitant. These territories include St. Kitts and Nevis, Anguilla, Turks and Caicos Islands, British Virgin Islands, Cayman Islands and Montserrat. Since the volcanic eruption of the mid-to late-1990s, the population size in Montserrat has rebounded somewhat reaching approximately 5,000 being the smallest population among the “micro-size” territories. Except for St. Kitts and Nevis, all of the other territories are non-independent being colonies of Britain. An interesting feature of the populations is their relatively high proportion of foreign-born persons, a phenomenon that increases the vulnerability of the territorial space especially in cases where foreign-born persons occupy such spaces primarily for economic reasons and in many instances are sojourners. This is especially the case in times of strife following natural disasters such as hurricanes that are more readily associated with these islands.

B. Population Growth Prospects and Implications

In order to gain insights about the impact of natural hazards on sustainable development processes in Caribbean territories, it will be worthwhile to gain insights into population growth prospects as gleaned

from population projections for the Region. For most territories, Table 2.1 highlights projected population sizes for 2010 and 2020. In almost every instance, the projections indicate that despite increases in population sizes up to at least 2020, the rate of population growth is declining. Prospects of declining rates of population growth differ across the territories dependent upon assumptions about fertility, mortality and migration patterns that have and will become manifest during the first twenty years of the new millennium.

Table 2.3 presents the total fertility rates for Caribbean territories between 1980 and 2005 and projected fertility levels towards 2015. Not surprisingly, declining fertility is commonplace in virtually every country despite the fact that variable levels of fertility persist across the countries. The observed fertility decline constitutes a continuation of the fertility decline that would have begun in the 1970s and intensified in the 1980s largely due to temporal events such as advent of family planning programmes that gained momentum especially in the 1960s and the activism associated women's movement and feminist ideologies that have evolved to facilitate greater thrusts towards gender egalitarianism. Quite apart from changes that were evident in women's conceptions of family and childbearing, the aforementioned events also resulted in greater participation in the labour force and an intensification of the pursuit of higher educational qualifications among women; these being two critical factors found to be associated with delayed childbearing, larger birth intervals and a desire for smaller families, albeit a reduction in fertility levels.

A closer examination of Table 2.3 reveals variable patterns of fertility decline for different groups of territories. For example, Cuba and Barbados are in the advance stages of below replacement fertility having assumed below replacement fertility before 1980. The Bahamas, the Netherland Antilles and Trinidad and Tobago are in the early stages of below replacement fertility having assumed such a status during the 1990s or in the early 2000s. With respect to Belize and Haiti, the fertility transition is slow and though the attainment of replacement fertility is possible before 2020, there is some ground to be covered in order to realize such an outcome. The remaining territories are in rapid transition towards replacement fertility which is projected to occur before 2020 or somewhat likely to occur by 2020.

TABLE 2.3
TOTAL FERTILITY RATE

Country	1980-1985	1990-1995	2000-2005	2010-2015
Antigua and Barbuda	…	…	…	…
Bahamas	3.16	2.6	2.11	1.95
Barbados	1.92	1.6	1.5	1.58
Belize	5.4	4.35	3.35	2.65
Cuba	1.85	1.65	1.63	1.54
Dominican Republic	4.15	3.31	2.83	2.48
Grenada	4.23	3.46	2.43	2.2
Guyana	3.26	2.55	2.43	2.22
Haiti	6.21	5.15	4	3.19
Jamaica	3.55	2.84	2.53	2.28
Netherlands Antilles	2.36	2.28	2.09	1.91
Saint Lucia	4.2	3.15	2.1	1.9
Saint Vincent and the Grenadines	3.64	2.85	2.24	2.05
Suriname	3.7	2.6	2.6	2.29
Trinidad and Tobago	3.22	2.1	1.61	1.69

TABLE 2.4
LIFE EXPECTANCY BY SEX

Country	1980-1985	2000-2005	1980-1985	2000-2005
	Male		Female	
Bahamas	64.6	68.4	72.4	74.5
Barbados	70.2	72.6	75.2	78.9
Belize	70.4	72.9	72.5	76.6
Cuba	72.6	75.3	76	79.1
Dominican Republic	62	69.2	66	74.2
Grenada	63.4	72.8	67.4	75.7
Guyana	58.2	61.1	64	67.3
Haiti	50	57.1	52.7	62.1
Jamaica	68.3	67.6	72.8	74.4
Netherlands Antilles	70.9	71.8	76.5	79
Saint Lucia	67.3	70.7	73.7	74.4
Saint Vincent and the Grenadines	64.7	68.5	68.7	72.8
Suriname	63.6	64.7	69.7	71.9
Trinidad and Tobago	64.6	64.7	71.2	72

Table 2.4 traces temporal variation in life expectancy at birth between 1980 and 2015 for a number of Caribbean territories. Across the period under review, all of the territories were characterized by more favourable experience that enhanced individuals' prospects of surviving to older ages due to observed increases in life expectancy. Nonetheless, different sets of territories are observed to be characterized by different patterns of improvements with regard to survivorship to older ages. Four territories, namely Barbados, Belize, Cuba and the Netherland Antilles were characterized by the most favourable lifetime survivorship across the period insofar as life expectancy at birth was at least 70 years during 1980-1985 irrespective of individuals' sex. In Guyana and Haiti, on the other hand, trends based on Table 2.4

suggest that lifetime survivorship could be severely given that life expectancy at birth for males and for females is below 70 years even during the early years of the new millennium. For all of the other territories, corresponding trends are consistent with potentially favourable lifetime survivorship with life expectancy of either males or females exceeding 70 years at some point in time during the new millennium. For this group of territories, it is also worth noting that the life expectancy at birth among females was notably greater than that among males.

Table 2.5 and Table 2.6 reinforce notions of Caribbean territories as ageing societies. This is not surprising given observed declines in fertility levels during the last quarter of the 20th century and more favourable survival to older ages that are reflected in increases in life expectancy at birth in virtually every territory. Both Table 2.5 and Table 2.6 show that Barbados, Cuba and the Netherland Antilles are the territories with substantially older populations where population ageing has been gaining momentum fastest. Such an outcome can be attributed due to the advanced stage of below-replacement fertility, the more favourable lifetime survivorship and net loss due to the migration of working-age population in the case of Cuba. In contrast, Haiti and Belize are characterized by substantially slow ageing processes and persistently young populations. This can be explained by the slow pace of the fertility transition in these two countries and evidence of child and adult mortality that are still somewhat worrisome. In the remaining territories, the evidence is consistent with populations that are younger than those in Cuba, Barbados and the Netherland Antilles and thus, manifest in ageing processes that are also slower. Additionally, the remaining territories are also characterized by somewhat slower fertility transition to replacement level when compared to that observed in the cases of Cuba, Barbados and the Netherland Antilles. However, notwithstanding potentially favourable lifetime survivorship chances, the child mortality status within the remaining territories is still worthy of improvement. Table 2.7 is indicative of temporal variations in the child mortality status of Caribbean territories.

Territories characterized by full-scale ageing processes have to consider the residential and human attributes of their older inhabitants and the extent to which such attributes predispose older persons to risks of being displaced or harmed due to the effects of natural disasters. Compared to younger persons, relatively larger proportions among persons 65 years or older are likely to be living alone, afflicted by disability or some kind of chronic illness, in need of medical services and medication, and physically

TABLE 2.5
MEDIAN AGE

Country	1980	1990	2000	2010	2020
Antigua and Barbuda	…	…	…	…	…
Bahamas	19.7	23.1	26.3	29.7	33.4
Barbados	24.5	28.3	33.3	37.8	41.7
Belize	16.6	17.9	19.2	22.3	25.9
Cuba	23.9	28.2	34.2	38.3	43
Dominican Republic	18.1	20.3	22.6	25	28
Grenada	18.8	20.4	21.9	25	29.3
Guyana	18.5	20.8	24	27.4	29.7
Haiti	19.1	18.5	19.1	21.6	24.1
Jamaica	19.2	21.9	24.3	26.3	28.7
Netherlands Antilles	24.3	29.2	34.5	38.4	43
Saint Lucia	17.5	21.4	24.3	27.5	31.5
Saint Vincent and the Grenadines	17.4	20.4	24.2	27.8	31.2
Suriname	18.8	23	25.7	27.6	30.7
Trinidad and Tobago	21.6	23.5	26.9	30.8	35.6

Frail thus more likely to be less resilient in combating the forces of nature. This is relevant for the vast majority of territories especially Cuba, Barbados and the Netherland Antilles.

In territories such as Belize and Haiti where fertility decline has been observed to be slow, the plight of children who are considered to be among the most vulnerable has to be considered especially in cases where higher

TABLE 2.6

PERCENTAGE OF POPULATION AGED 65 YEARS OR OLDER

Country	1980	1990	2000	2010	2020
Antigua and Barbuda	…	…	…	…	…
Bahamas	4.2	4.4	5.1	7	9.4
Barbados	10.7	10	10.1	10.4	15.1
Belize	4.6	3.9	4	4.1	4.9
Cuba	7.8	8.7	10.1	12.3	16.3
Dominican Republic	3	3.8	5	6.1	7.6
Grenada	7.1	7.9	7.6	6.9	7.4
Guyana	3.9	4.6	5.1	6.2	8.9
Haiti	4	3.8	4	4.4	4.8
Jamaica	6.7	7.2	7.5	7.7	9
Netherlands Antilles	6.7	7.1	9.2	10.5	14.3
Saint Lucia	5.1	7.5	7.6	6.8	7.7
Saint Vincent and the Grenadines	5.7	6.2	6.9	6.7	7.8
Suriname	4.4	4.7	5.7	6.5	7.7
Trinidad and Tobago	5.6	5.5	5.9	6.9	9.4

Fertility is likely to be associated with females in lower socio-economic status groups that are less likely to provide social and physical protection for children if challenged by the onset of a natural hazard of one kind or another. Such experiences are also likely to be more severe in independent than in non-independent territories especially if the former is economically stagnated. With regard to non-independent territories, there are still prospects of assistance whether in the form of providing safe havens for those who have been displaced or assistance with regard to rebuilding efforts as has been the case in Montserrat subsequent to the volcanic eruptions in the mid to late 1990s.

C. Caribbean Territories – Some Principal Features

To this point, this study has focused on Caribbean territories in the broadest sense irrespective of linguistic traditions. This section treats specifically with issues of the territory and strives to narrow the focus in accordance with territorial criteria that impact the relevance of territorial spaces to the context of ensuing discussions. Having provided a demographic profile of the population of the Caribbean in its broadest context, the remainder of the study will focus principally on the English-speaking Caribbean territories with the exception of Bermuda which is not considered to be a Caribbean country by virtue of its physical location. Despite its linguistic orientation towards Dutch, Suriname is included in this study because of its membership within CARICOM and the availability of data from the last completed round of the Population and Housing Census in 2004. Due to the difficulty associated with obtaining corresponding data, the Haitian context will not be included in the study.

For the Caribbean territories constituting the focus of this study, the main territorial criteria deemed central to this study are land area, population density, topographic character, configuration of land area and intra-spatial differences within territories.

With respect to the land area, three territories are sufficiently large to gauge differences in the context of urban and rural spaces. These include Guyana, Belize and Suriname. These three territories are substantially larger than the each of the others constituting more than 95% of the land area occupied by the territories that are central to this study. Each of these territories has substantial proportions of their resident population living and working in areas within close proximity to the ocean or along the banks of major rivers. Each also has disparate groups of indigenous populations living in communal settlements that are not easily accessible. As such, the three territories are characterized by high population densities in their respective coastal communities. In the case of Guyana, Georgetown and East Coast communities including Berbice are prime examples. In the case of Suriname, the same applies with respect to Paramaribo, the national Capital City. In Belize, Belize City is the main coastal hub of activity despite the concentration of governmental activity in Belmopan, the nation's capital which is situated inland west of Belize City. Additionally, other pockets of urban activity are evident in other districts such as Stan Creek and Orange Walk.

With regard to land area, the next largest territories are the Bahamas, Jamaica, and Trinidad and Tobago. The Bahamas consists of over 800 islands and cays with only three – New Providence, Grand Bahama and Abaco containing that vast majority of its national resident population and thus have high population

densities. The majority of the remaining islands are small in land areas and characterized by relatively low population densities. Andros is the largest of the Bahamian islands and has relatively low population density. Many of the islands are flat and thus vulnerable to hurricanes and tsunamis. In Jamaica, intra-spatial differences have been examined in the context of Kingston Metropolitan Area (i.e. Jamaica's Capital City and its urban sprawl into neighbouring parishes), Other Towns (mainly the capitals of Parishes of Jamaica, and the Rest of Jamaica. Special reference could also be made with reference to Jamaica's tourism enclaves on its north coast and in the western community of Negril. Jamaica has a mixed topography consisting of mountains, valleys and plains. In the eastern Parishes of Portland and St. Thomas, rivers that drain the Blue Mountain catchment area have been associated with disastrous floods and landslides that have displaced communities in the aftermath of adverse weather systems. Other communities across Jamaica have endured similar fate and low-lying coastal communities such as Portmore to the west of Kingston and on the eastern fringe of Kingston in the Parish of St. Andrew are at risk of storm surges and flooding in the aftermath of hurricanes or in the event of a tsunami. It is worth noting that Jamaica, in particular Kingston, is in an active seismic zone and at risk of exposure to a catastrophic earthquake of a similar magnitude to that which devastated Haiti in 2010.

Trinidad and Tobago is a twin-island Republic in the southern Caribbean located approximately 12 kilometres north-east of Venezuela. The two islands are different in terms of land area, topography and vulnerability status to hurricanes. Trinidad's landscape is characterized by a mix of mountainous areas, valleys, rolling plains and flat plains, all of which constitute areas for human settlement. Tobago, on the other hand, consists of a mountainous spine that occupies two-thirds of the island and concentrated mainly in the north-east. The remaining one-third in the south-west of the island consists of relatively low-lying terrain and constitutes the principal urban domains in the island.

Trinidad consists of two main Cities – Port of Spain and San Fernando, three Borough – Arima in the north Trinidad, Chaguanas in central Trinidad and Point Fortin in south Trinidad. Moreover, there are numerous small towns and commercial centres that traverse every municipal area in Trinidad. Thus, two main urban zones can be attributed to the island. The first is referred to as the East-West Corridor which constitutes an urban sprawl situated on the foothills and plains below the Northern Range and traversing a distance of approximately 40 kilometres between communities west and east of the Capital City of Port of Spain. The second is an extensive urban zone that stretches along the western third of the island from the Borough of Chaguanas southward through the City of San Fernando and then further south to the Borough of Point Fortin. Except for two towns – Sangre Grande and Rio Claro, the eastern two-thirds of Trinidad is largely rural in character.

Each of the two islands has been exposed to seismic threats associated with earthquakes. Both islands are at risk of exposure to hurricanes though Trinidad has on numerous occasions been spared due to its location which is somewhat south of the path of Caribbean hurricanes. Both islands are exposed to the risk of tsumanis while flash flooding due to poor drainage has often affected urbanized communities in the East-West Corridor and in the Western urbanized zones in central and south Trinidad. In mountainous terrain, landslides in the aftermath of thunderstorm pose severe threat to human settlement and commuters in both Trinidad and Tobago.

Unlike many of the other Caribbean islands, Barbados is not mountainous. Nonetheless, its hilly areas do not exceed 1,000 feet above sea level and much of the island is terraced consisting of rolling plains of limestone. The population density of Barbados is higher than that of any of the other Caribbean territories with the highest population densities being evident in the western Parishes of St. Peter, St. James and St. Michael and the southern Parish of Christchurch. Bridgetown, the Capital City of Barbados is in the Parish of St. Michael though there is evidence of urban characteristics across the aforementioned Parishes. In contrast, the northern Parish of St. Lucy and the eastern Parishes of St. Andrew, St. Joseph, St. Thomas and St. John are less densely populated and are characterized by more traditional lifestyles.The south eastern Parish of St. Philip and south-central Parish of St. George constitute a mix of urban and traditional features.

In Barbados, there is an overwhelming amount of residential and commercial activity within close proximity to the west coast. These attributes are indicative of the formidable threat faced by Barbados in the event of hazards such as a tsumani or storm surges associated with hurricanes. Insofar as Barbados is exposed to the risk of being hit by Caribbean hurricanes, these are realistic concerns particularly in the context of high density urban population domains on the western side of the island.

The Windward Islands consist of four island territories – Grenada, St. Vincent and the Grenadines, St. Lucia and Dominica. These four territories possess similar topographic features insofar as they are all mountainous and of volcanic origin. They are all divided into administrative divisions referred to as Parishes or Districts and all have primate urban regions consisting of the Capital and a number of adjacent communities. In each of the four territories, there are a number of small coastal villages scattered across the administrative divisions that do not fall within the primate urban zone, each of these villages constituting primary bases for human settlement. While major roadways are sometimes located adjacent to the coastline, they are often elevated. However, in Dominica which is perhaps the most mountainous

of the four islands, major roadways on its west and south coasts, are constructed on the waterfront and in recent times, have been reinforced to withstand threats posed by the force of nature. The construction of dwelling units that are virtually on the waterfront is also a common feature in shoreline communities along Dominica's west coast.

In each of the four Windward Island, it is possible to compare the primate urban zone with the rest of the respective territory. In Grenada, for example, the Capital of St. Georges along with communities in the Parishes of St. George and St. David constitute a primate urban zone. In St. Vincent and the Grenadines, a similar phenomenon is evident with respect to Kingstown and surrounding communities in the south-east of St. Vincent. Notwithstanding the presence of Vieux Fort as the urban domain in the south of St. Lucia, the Capital City of Castries and surrounding communities that include the rest of the Castries District and the northern District of Gros Islet constitute the primate urban zone in St. Lucia. In Dominica, the Town of Portsmouth has emerged as an urbanized zone in the north of the island though the City of Roseau and communities to its north and south, constitute the primate urban zone in Dominica. Though hurricanes are the main natural hazards threatening these four territories, flash flooding and seismic events associated with earthquakes, volcanic eruptions and tsunamis are also real prospects.

The Leeward Islands consist mainly of micro-size territories which have population sizes not exceeding 50,000. The land area of these territories is also very small being less than 75 square to the extent that it is u useless to make a distinction even in the context of primate urban zones. These territories include Antigua and Barbuda, St. Kitts and Nevis, Anguilla, Montserrat, the British Virgin Island (i.e. Tortola and Jos Van Dyke) and the Turks and Caicos Islands (i.e. Grand Turk and Providenciales). Except for Antigua and Barbuda and St. Kitts and Nevis, the remaining territories are non-independent and thus still colonies of Britain.

Montserrat and Tortola in the British Virgin Islands are mainly hilly to the extent that human settlement is interspersed across the hillsides. In St. Kitts, human settlement is evident in the low-lying areas in and around the Capital of Basseterre and on the low-lying foothills of the main ridge that occupies a major part of the island. Three-dimensionally, Nevis is a cone-shaped island with a peak in the middle with human settlement interspersed on the foothills around the entire peak. Anguilla and the Turks and Caicos Islands are relatively flat with human settlements scattered across their respective landscapes. In Antigua and Barbuda, the former is mainly low-lying terrain which occupies a considerable amount of human settlement inland and away from coastal areas which are largely the preserve of hotel establishments in

keeping with the nation's tourism thrust. Nonetheless, there is some hilly terrain which is largely uninhabited. In terms of natural disasters, hurricanes pose the greatest threat to the lives of the residents in the Leeward Islands though not diminishing alternative threats due to earthquakes and tsunamis. Montserrat, in particular, is still in recovery since the volcanic eruption of the 1990s, yet fear still abound that further eruptions are possible.

For the purpose of this study, city versus country-side differences can be presented in the context of territories with such as Guyana, Belize, Suriname, Jamaica and Trinidad and Tobago given their relatively larger land areas distinct spatial characteristics that render such analyses possible. These territories also feature in gauging the impact of spatial differences on attributes that impact sustainable development. However, such assessments are also pursued for the Bahamas, Barbados and the four Windward Islands focusing specifically on differences between primate urban zones and the remaining peripheral areas. Sustainable development is possible largely as a result of enhancing the social and economic attributes of human populations within territorial domains. Such attributes include educational and training characteristics, labour force characteristics, prospects for the attainment of improved quality of life including access to health insurance coverage and capability of attining living standard to stave off poverty.

D. Sustainable Development in Caribbean Territories

In their thrust towards facilitating development in their domestic contexts, Caribbean territories have had little choice but to embrace the notion of sustainable development. To this end, many of the territories have been guided by the MDGs and have embarked upon data collection initiatives either on the basis of their own independent volition and their urgent need to embrace development processes contingent upon evidence obtained from formal data or on the basis of encouragement and thus, financial assistance from international agencies fostering development initiatives.

Through such efforts, Caribbean territories witnessed a proliferation of novel data collection initiatives that had begun in the 1990s and continued in the 2000s. Several territories have collected and generated statistics of domestic living conditions once and a much smaller number have done so twice. However, it is worth noting that since 1998, Jamaica has produced annual estimates of domestic living standards. Additionally, Multiple Indicator Cluster Surveys (MICS) have been conducted in Suriname, Trinidad and Tobago, Jamaica and Guyana providing indicators pertaining to the status of women and children. The MICS is important in the context of MDGs particularly in the context of reducing inequalities between

boys and girls with regard to educational and training outcomes. Through its programme on Social Indicators of Development to meet the needs of the MDGs, the United Nations Economic Commission for Latin America and the Caribbean (UNECLAC) in Port of Spain had been instrumental in encouraging national statistical offices in the Sub-Region to develop and sustain such databases. With respect to the 2000 round of Population and Housing Census, all of the territories participated in census-taking initiatives spearheaded by the Regional Census Co-ordinating Committee (RCCC) under the auspices of CARICOM and produced comparable data on census parameters which are contained in a variety of sources. Notwithstanding efforts to facilitate systematic data collection, there are variable standards with respect to the range of data collected and their quality.

It is worth noting that Trinidad and Tobago and Jamaica are two Caribbean territories that embarked upon policy-driven processes to attain sustainable development. In Trinidad and Tobago, Vision 2020 was established when the PNM formed the government in the early 2000s and was deemed the vehicle through that would operationalize a set of activities to achieve "developed country" status by 2020. Formal mechanisms including the establishment of Task Forces and consultative mechanisms had been established to achieve the desired goals. In 2010, however, the PNM was replaced when the Peoples' Partnership won the national elections and formed the government. Early signals suggest that the Peoples' Partnership has not embraced the Vision 2020 paradigm with the enthusiasm as had been the case when the PNM was in power. In Jamaica, a similar paradigm entitled "Jamaica 2030" was established to propel Jamaica to "developed country" status by 2030.

In closing, it is impossible to assess the attainment of these goals based on operational indicators as outlined in respective development agendas. Nonetheless, the study does consider selected social and economic attributes such as education, labour force characteristics and living conditions in order to assess their implications for variable fortunes regarding sustainable development.

III. RISK AND VULNERABILITY TO NATURAL DISASTERS IN CARIBBEAN TERRITORIES

A. Risk and Vulnerability

This study is primarily concerned with the promotion of sustainable development processes in Caribbean territories and in the Caribbean Sub-Region as a whole. As such, it recognizes that there are differences in the exposure status of the various territories contingent upon the different natural hazards that impact institutional organs and more specifically, the lives of inhabitants in the Sub-Region. In the context of this study, risk treats with the institutional organs, infrastructural elements, the livelihoods and the lives that are negatively impacted due to the onset of some external shock. Thus, the greater the magnitude of potential loss or degradation associated with institutional organs, infrastructural elements, livelihoods and human life due to any given external shock, the greater the risk.

For the purposes of this study, the external shock assumes of a disaster that can be manifest in accordance with different kinds of hazardous events. Potter *et al* (2004:143) allude to a typology of hazardous events which are classified as seismic, meteorological, hydrological, geomorphological, biological and technological. Seismic events are further classified as earthquakes and volcanic activity and thus, are intrinsically natural disasters insofar as they are entirely determined by nature. Meteorological events which include tropical storms, hurricanes, tropical depressions and high wind, are also principally determined by nature and therefore beyond the control of human beings. To this end, disasters associated with seismic and meteorological events are beyond the control of human beings who can only build resilience to reduce risk and vulnerability to such external environmental shocks.

This reinforces the importance of thrusts toward the attainment of sustainable development insofar as such thrusts do impact positively on resilience building capabilities. The latter are critical given that seismic and meteorological events may occur irrespective of sustainable development status within the different Caribbean territories. In contrast, hydrological and geomorphological events, though precipitated by seismic and meteorological events, are much more frequently the result of some kind of interaction between natural events and human-induced activities implying that human agency can establish mechanisms to control and reduce the burden of such outcomes. Thus, characteristics that impact positively on sustainable development attributes are likely to impact positively on human agency to reduce hazards and associated risks. Nonetheless, these events are of interest insofar as they are often triggered by seismic and meteorological events. Disasters due to biological and technological events are

almost entirely the result of human activity and thus, can be controlled by human response and action. As such, such disasters will not be the main foci in this study.

Potter *et al* (2004) reinforce the importance of risk assessment in the hazard reduction process. They note that risk assessment is a quantitative undertaking that require knowledge of hazardous events and their respective magnitudes in any given location, some kind of estimation of risk and the extent of damage or loss associated with such events. More specifically, they hinge upon hazard mapping which involves the production maps that reflect the magnitude and frequency of specific events in different locations and vulnerability assessments that are dependent upon the acquisition of detailed inventories of buildings and associated infrastructural artifacts, peoples' livelihoods and peoples' lives. With reference to Caribbean territories, there is evidence suggesting that risk assessments have been done for different kinds of natural events.

The disaster management cycle is instrumental in reinforcing the critical link between sustainable development and the thrust to reduce vulnerability by virtue of building resilience. This is consistent with St. Bernard (2004) that associated declining prospects of sustainability with increasing levels of vulnerability for any given hazard level. Such a connection is realized in accordance with the notion that sustainable development processes are characterized by rationality and efficiency, conservation, participation, representation, transparency and justice (St. Bernard, 2004). Lele (1991:609) makes reference to ecological sustainability to reflect "the existence of the ecological conditions necessary to support human life at a specified level of well-being through future generations. Disastrous events are characterized by a pre-disaster phase and a post-disaster phase, the first being characterized by a resilience factor consisting of three dimensions – prevention, mitigation and preparedness. If well configured in accordance with aforementioned sustainability criteria, pre-disaster activities could soften the impact of the disaster and facilitate acceleration with regard to the recovery process. The post-disaster phase is characterized by a response dimension and a recovery dimension, both of which are also contingent upon the criteria that facilitate sustainable development.

B. Potential Hazardous Events in Caribbean Territories

Caribbean territories are exposed to a number of hazardous events classified as seismic, meteorological, hydrological, geomorphological, biological and technological. However, this study is concerned primarily with those events that are natural and thus principally, if not entirely beyond the control of humankind. This is further justified by the fact that natural events have catastrophic effects in larger spatial contexts affecting entire territories or major segments of such territories. In territories where

resilience capabilities had been somewhat compromised, the process of recovery ranges from being long term to being futile.

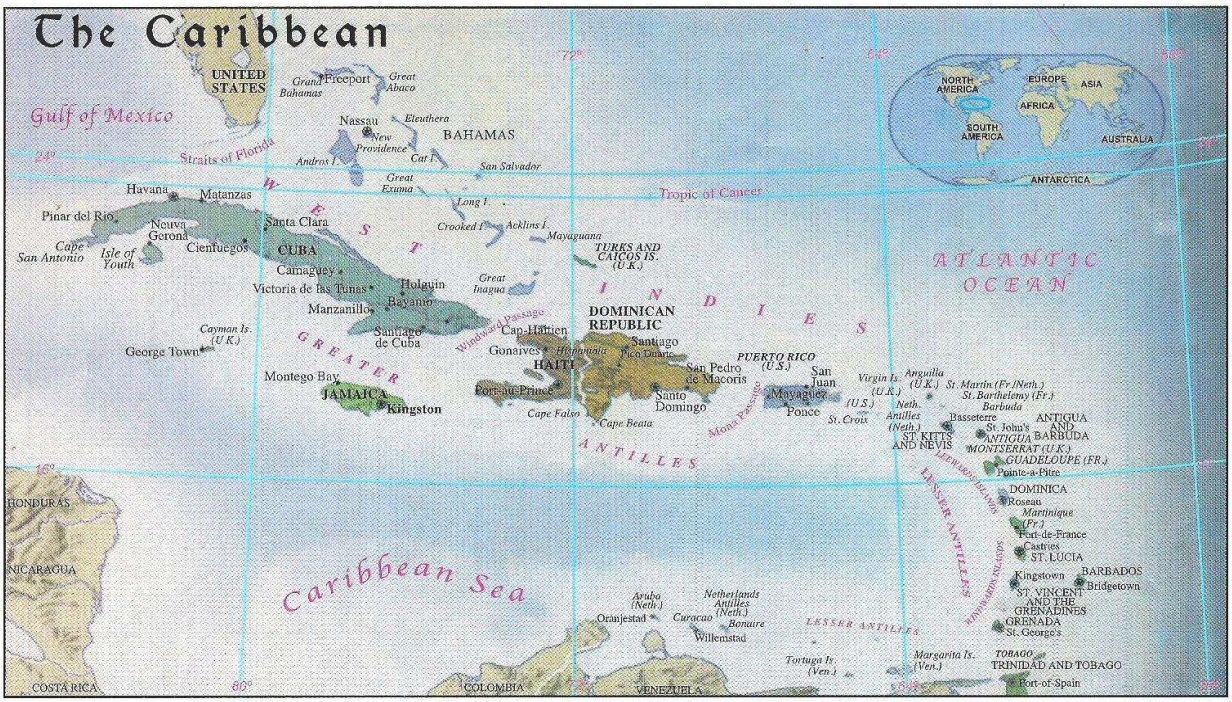
Some natural events interact with human-induced activities and precipitate disastrous outcomes that are localized affecting much smaller physical spaces. However, it is worth noting that their impact could be severe and that such spaces could be characterized by high risks in densely populated human settlements. While the main thrust of the study is to focus on those events that are mainly natural, hardly likely to be human-induced and most likely to affect entire territories or major segments of entire territories; flooding which is due to the interaction between natural events and human-induced activities will be considered as an important outcome due to natural events. To this end, seismic events and meteorological events are the principal foci of this study though noteworthy hydrological events will be covered.

1. Seismic Events – Volcanic Activity

Volcanic activity includes lava flows, pyroclastic flows and surges, lahars, ash clouds and tsunamis. Volcanic activity is mostly prevalent in the Eastern Caribbean Islands stretching Grenada in the south to St. Kitts in the north. Live volcanic systems are evident on all of the islands and during the 20th century, eruptions have occurred in Martinique and St. Vincent in 1902 and in Montserrat since the late 1990s. In the Grenadines, reports indicate that Kick 'em Jenny, a submarine volcano, has erupted at least 12 times since 1939. According to Lindsay and Shepherd (2006), ash falls and tsunamis are not likely to result from any eruption of Kick 'em Jenny at this point in time.

In the Eastern Caribbean, the remaining volcanic systems are onshore. In Grenada, Robertson (2006) notes that Mt. St. Catherine is the only live volcano that could result in pyroclastic flows and surges, lahars and ash fall affecting villages to the east and west in the northern half of Grenada. Robertson (2006) also claims that a more explosive eruption, though not likely in the near future, is likely to negatively impact the northern two-thirds of Grenada. With respect to St. Vincent, Robertson (2006) identifies the Soufriere volcano as the only live system for which there is some likelihood of eruption in the future. Accordingly, communities in the northern half of St. Vincent will be classified as being within the high or very high hazard zones experiencing pyroclastic flows and surges, lahars and high levels of ash fall.

FIGURE 1
MAP SHOWING LOCATION OF COUNTRIES OF THE ENGLISH SPEAKING CARIBBEAN AND CARICOM REGION



In St. Lucia, the Soufriere Volcano in the southern part of the island is still alive and has the potential to erupt in the future. Lindsay (2006) provides an illustrative account of the two worst eruption scenarios, the least destructive of the two indicating that the south-west of St. Lucia between the Towns of Soufriere and Vieux Fort as being the spatial areas with high or very high hazard levels. With regard to the worst-case scenario, this is likely to be the case for virtually all communities in the southern two-third of St. Lucia. Dominica has nine live volcanic systems which increase the island's susceptibility to volcanic eruptions. Thus, Lindsay et al (2006) indicate that "future eruptions are highly likely, possibly within the next 100 years". When the six most likely scenarios are taken into account, the southern third of Dominica exhibits high or very high hazard levels with the highest being in the south-western triangle formed between the City of Roseau, Grand Bay and Scotts Head in the vicitinity of Morne Plat Pays. In the vicinity of Morne aux Diables, the northern tip of Dominica including the Town of Portsmouth constitutes another zone characterized by high hazard levels.

In the Leeward Islands, Robertson (2006) notes that St. Kitts has one live volcanic system in Mt. Liamuiga which can increase its activity level posing sever threat to north-western communities on the

island. The worst-case scenario will result pm the entire north-west of the island including Basseterre of the island being exposed to high hazard levels. In Nevis, the prospect of a major volcanic eruption is probable resulting in high hazard levels for the entire island.

2. Seismic Events – Earthquakes

Earthquakes are primarily associated with ground shaking, soil liquefaction and ground failure, tsunamis and landslides. Seismic hazard maps (Return Period=475 years) for the Caribbean show areas with significant and moderate hazard levels (Tanner and Shepherd, 1997). Significant hazard levels are observed for Trinidad and Tobago, the Leeward Islands, the Dominican Republic and the south of Cuba in the vicinity of Santiago. For the remaining Caribbean territories, moderate hazards are observed. Seismic maps from the Seismic research Unit, the University of the West Indies in St. Augustine also indicate that Trinidad and Tobago and the Leeward Islands including Dominica, Antigua and Barbuda, Montserrat and St. Kitts and Nevis have higher hazard levels than the other Caribbean territories. Within specific territories, north Trinidad and Tobago appear to exhibit consistently higher hazard levels when compared to other parts of Trinidad. Antigua and Barbuda and Dominica also appear to have higher hazard levels than the other territories in the Leewards.

3. Meteorological Events

Such events include hurricanes, tropical storms, tropical depressions and strong winds. Johnson and Watson (1997) provide estimates of hurricane hazards based upon 25 year 90 percent prediction limits for wind. They show that patterns reveal probabilities of Tropical Storms for Trinidad only. With respect to Tobago and Grenada, the hazard level is consistent with the probability of Category 1 Winds. Barbados, Belize and St. Vincent are characterized by probable Category 2 Winds. Wind hazard levels categorized as Category 3 are probable in St. Lucia, the French territories of Martinique and Guadeloupe, Dominica, the Dominican Republic and Jamaica especially the eastern two-thirds of Jamaica. Wind hazard levels categorized as Category 4 are probable in Antigua and Barbuda, Western Jamaica and the southern part of Cuba. Such a profile is insightful in providing some indication of the hurricane hazards likely to be encountered in different Caribbean territories.

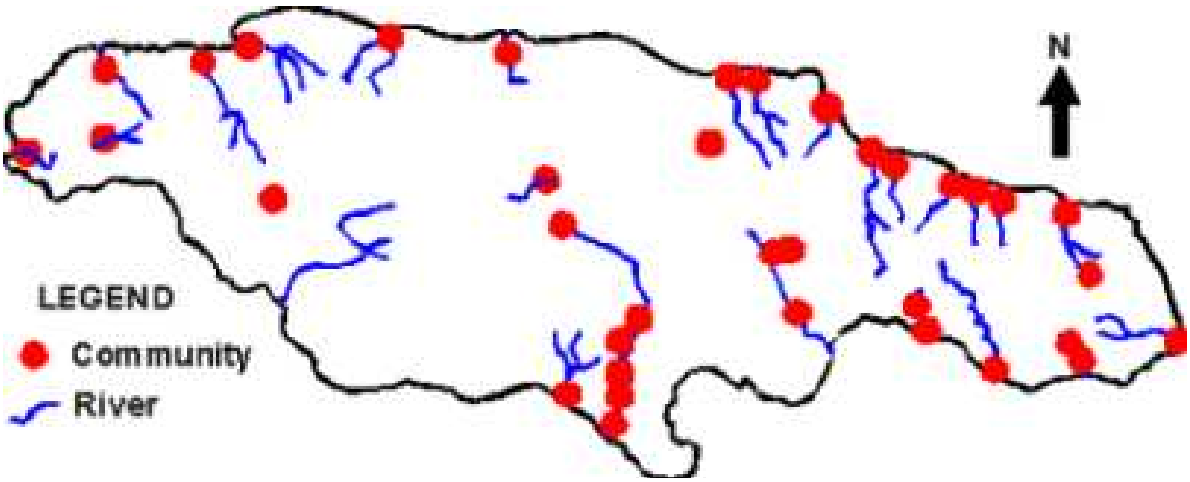
4. Hydrological Events

These events assume the form of storm surges, flash flooding, riverine flooding and coastal flooding. According to Opadeyi et al (2003), factors such as lack of resources and experience have place limitations on the execution of flood mapping exercises in the Caribbean Sub-Region. They opine that fold hazard

maps for the region reflect areas that have experienced floods and not those that are prone to flooding. Nonetheless, there is evidence of coastline flooding along Guyana's east coast where major sections of the terrain are below sea level. In January and February 2005, the Capital City of Georgetown and coastal communities were inundated due to the effect of heavy rainfall, malfunctioning drainage systems and high tides which collectively contributed to between 3 and 5 feet of water in some communities. More than 37% of the country's population were affected and direct and indirect damage to the agricultural sector as a result of this event amounted to at least US$54 million.

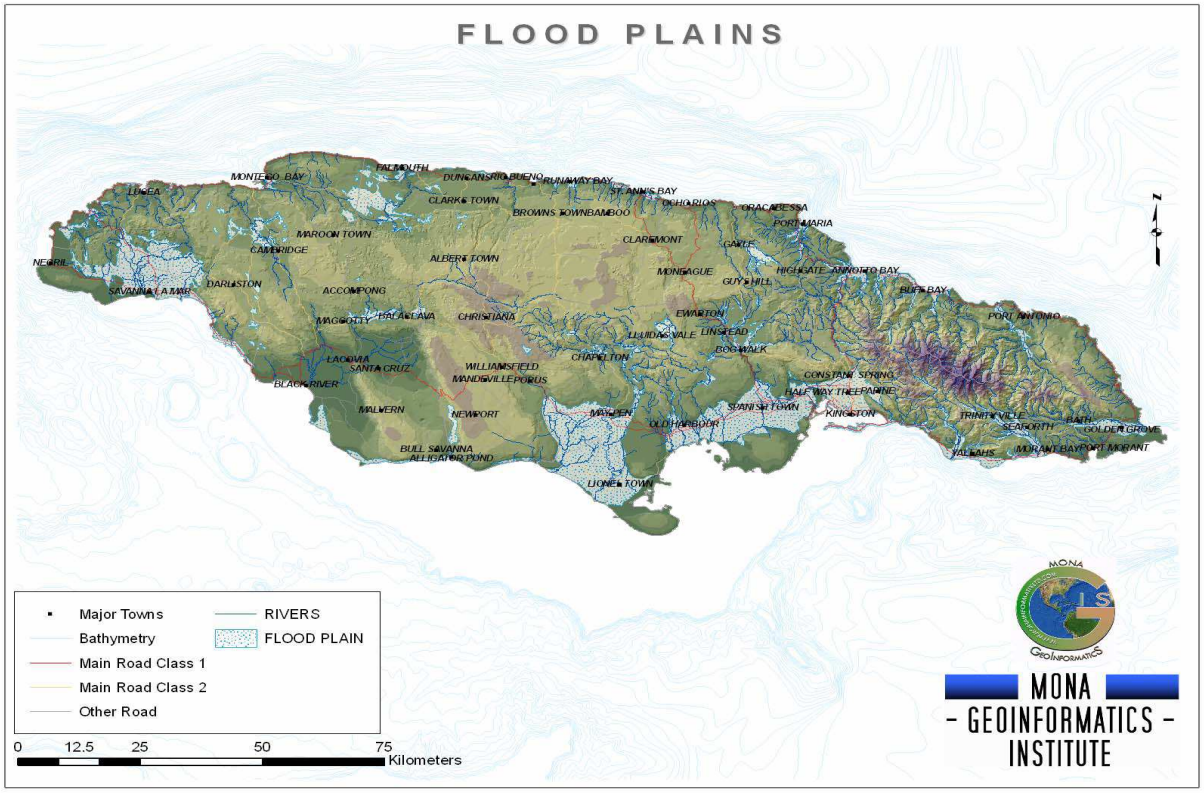
In Jamaica, there has been evidence of riverine flooding across the entire island as borne out in Figure 2 summarizing flood prone communities in the vicinity of the many rivers that drain Jamaica. Based on evidence from Mona Geomatics Institute, The University of the West Indies, Mona, Jamaica, Figure 3 shows flood plains that are observed in the south of Jamaica, principally in the Parishes of St. Catherine and Clarendon and in the west of Jamaica. In terms of persons killed and affected due to the top-ten natural disasters that occurred in Jamaica prior to 30th October 2004, Ahmad (2004) used data from the OFDA/CRED International Disaster Database and revealed that past floods have been documented

FIGURE 2
FLOOD PRONE COMMUNITIES IN JAMAICA
SOURCE: WATER RESOURCES AUTHORITIES



Source: Water Resources authorities

FIGURE 3
FLOOD PLAINS OF JAMAICA



Four times, affecting as many as 551,000 persons in May 1991 and smaller numbers amounting to 40,000 persons in April 1979, 210,000 in June 1979 and 40,000 in May 1986. Williams and Garcia (2009) make reference to 263 populated places in Belize claiming that 163 are "at risk" flooding areas of which 149 are flood plains that flood annually. A Belize Flood Risk Map shows some potential for riverine flooding in the central portion along Belize's east coast.

C. A Review of Spatial Vulnerabilities

This section sets the stage for analyses that will be pursued in the following chapters in the context of vulnerability to potential hazardous events that have been identified in selected Caribbean territories. With respect to seismic events that are volcanic in nature, the Eastern Caribbean islands are the principal foci. In Grenada, St. Vincent and St. Lucia, areas beyond the primate urban zones are the principal spatial domains in which hazard levels are high. In Dominica, high hazard levels
are evident in domains that are considered to be within the primate urban zone. Thus, it is not surprising that hazard levels are high in accordance to the overwhelming level of volcanic activity on the island. The entire land area in St. Kitts and in Nevis is exposed to high hazard levels in the event of a volcanic

eruption. With regard to seismic events assuming the form of earthquakes, Trinidad and Tobago, Dominica and Antigua and Barbuda have the highest hazard levels. In particular, the northern third of Trinidad and the island of Tobago exhibit higher hazard levels than the rest of Trinidad.

With regard to meteorological events, all Caribbean territories north of Trinidad and Tobago exhibit hazard levels with regard to hurricanes with islands such as Jamaica and Antigua and Barbuda having probable exposure to the strongest hurricanes, followed perhaps by St. Lucia and Dominica. Nonetheless, the entire region is exposed to hazards associated with tropical storm including heavy winds and rainfall. To this end, each territory in its entirety is exposed to the hazards associated with these conditions. Though flash flooding is evident throughout the Caribbean Sub-Region, large scale flooding associated with coastal areas and river basins in densely populated areas are worthy of attention. Special reference has been made to east coast Guyana, in particular Greater Georgetown, flood plains of Jamaica and river basins in Belize; regions where studies have been undertaken using hazard mapping procedures to systematically understand the spread and magnitude of the problem.

Having identified the spatial domains, this chapter is instrumental in steps toward determining the characteristic features of “at risk” populations in the different Caribbean territories dependent in the nature of the event that impacts the vulnerability status of institutions, communities, livelihoods and lives. This is especially important in the quest to make pronouncements and prescriptions that impact positively on sustainable development within the respective jurisdictions, especially since such an outcome is contingent upon the social, economic and demographic characteristics of the respective populations.