IMPLEMENTATION OF THE MODEL SAFE SCHOOL PROGRAMME IN THE CARIBBEAN

HAZARD RISK ASSESSMENT REPORT AND COSTED ACTION PLAN

GRANDBAY PRIMARY SCHOOL

DOMINICA

An initiative of the African, Caribbean and Pacific Group, funded by the European Union, and implemented by:

SUBMITTED BY:
Environmental Solutions Limited

TO:
The Caribbean Disaster Emergency Management Agency Coordinating Unit

Hazard Risk Assessment Report and Costed Action Plan – Grandbay Primary School, Dominica for the Consultancy to Develop National Safe School Policies, Assess School Vulnerability to Hazards and Develop School Costed Action Plans in Six Borrowing Member Countries

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1. INTRODUCTION

Environmental Solutions Ltd. (ESL) has been contracted by the Caribbean Disaster Emergency Management Agency (CDEMA) to develop/enhance National Safe School Polices in four Caribbean Development Bank (CDB) Borrowing Member Countries (BMCs), conduct hazard assessments of 33 schools across six BMCs, and prepare costed action plans for each of the schools based on the results of the assessments.

This document presents the Hazard Risk Assessment Report and Costed Action Plan for **Grandbay Primary School, one of ten (10) schools assessed in Dominica**. The report forms a part of the second and fourth deliverables (D2 and D4) under this Consultancy and has been divided into eight main sections. Section 1 describes the method and approach the consultants used to undertake the assessment. Section 2 outlines the Country Risk Profile which presents the natural hazards each country and school is exposed to. Sections 3 to 6 summarize the vulnerability analysis of the identified hazards and Sections 7 and 8 present the summary findings, proposed recommendations and the Costed Action Plan. The results of the school safety and green assessments are presented in the Appendices.

The assessments were conducted during the period May 15 to 31, 2019 (Table 1-1) on regular school days, and as such the consultants were able to assess the schools during normal operational hours. All the schools assessed are designated emergency shelters that may be used during a hurricane or other hazard event.

TABLE 1.1: LIST OF SCHOOLS ASSESSED IN DOMINICA

SCHOOL NAME	DATE VISITED
Grandbay Primary	May 15 & 17, 2019
Pierre Charles Secondary	May 15 & 17, 2019
Dominica Community High School	May 15 & 17, 2019
Campbell Primary	May 16 & 17, 2019
Massacre (Canefield) Primary	May 16 & 17, 2019
Castle Bruce Secondary	May 17, 2019
Belles Primary	May 17, 2019
Colihaut Primary	May 17 & 31, 2019
Morne Prosper Primary	May 17 & 31, 2019
Isaiah Thomas Secondary	May 17 & 31, 2019

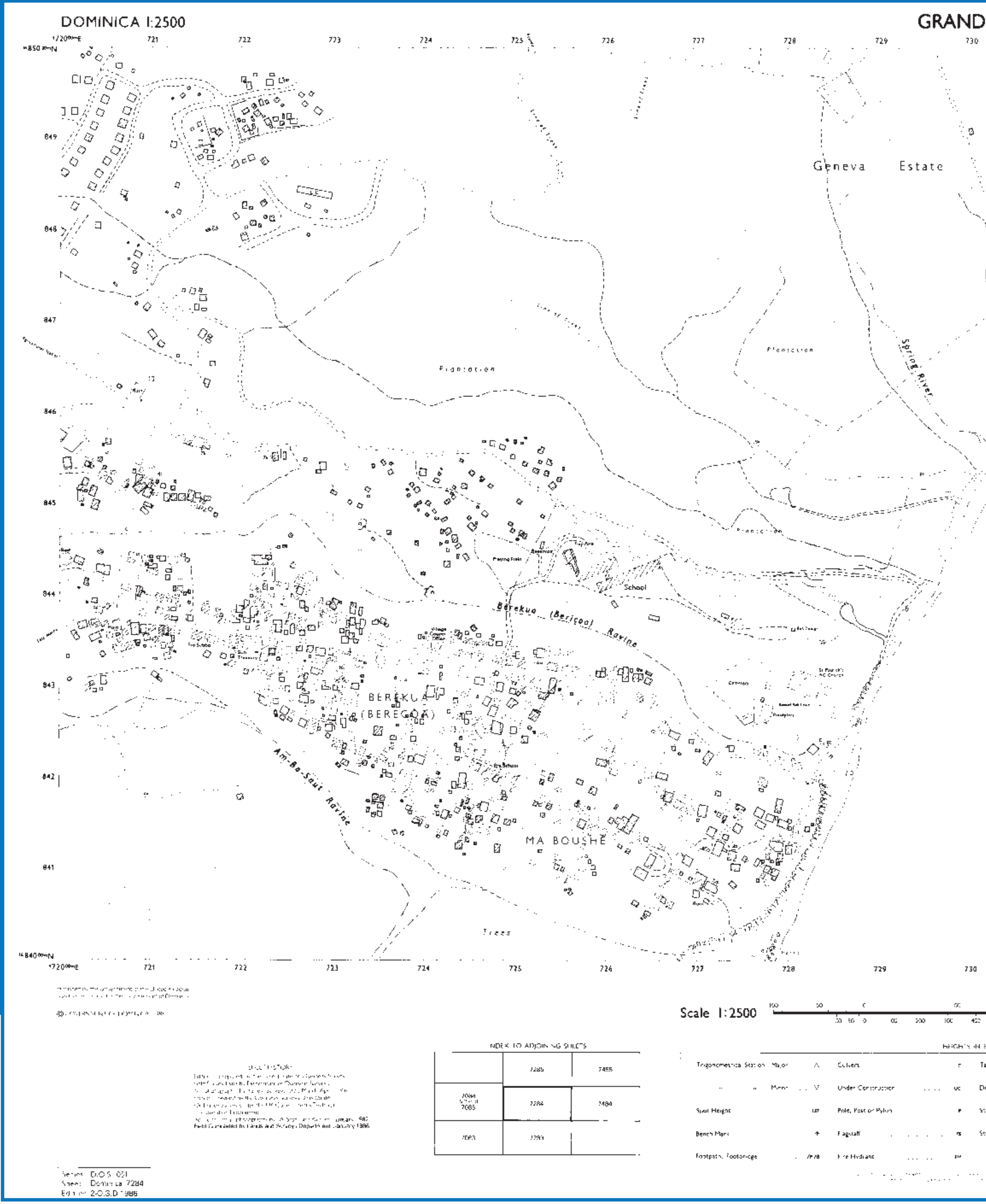
The assessments consisted of interviews with senior administrators, a site walk-through to make general observations and take pictures, as well as a building condition survey described below.

The results of the school assessments are found in the Appendix.

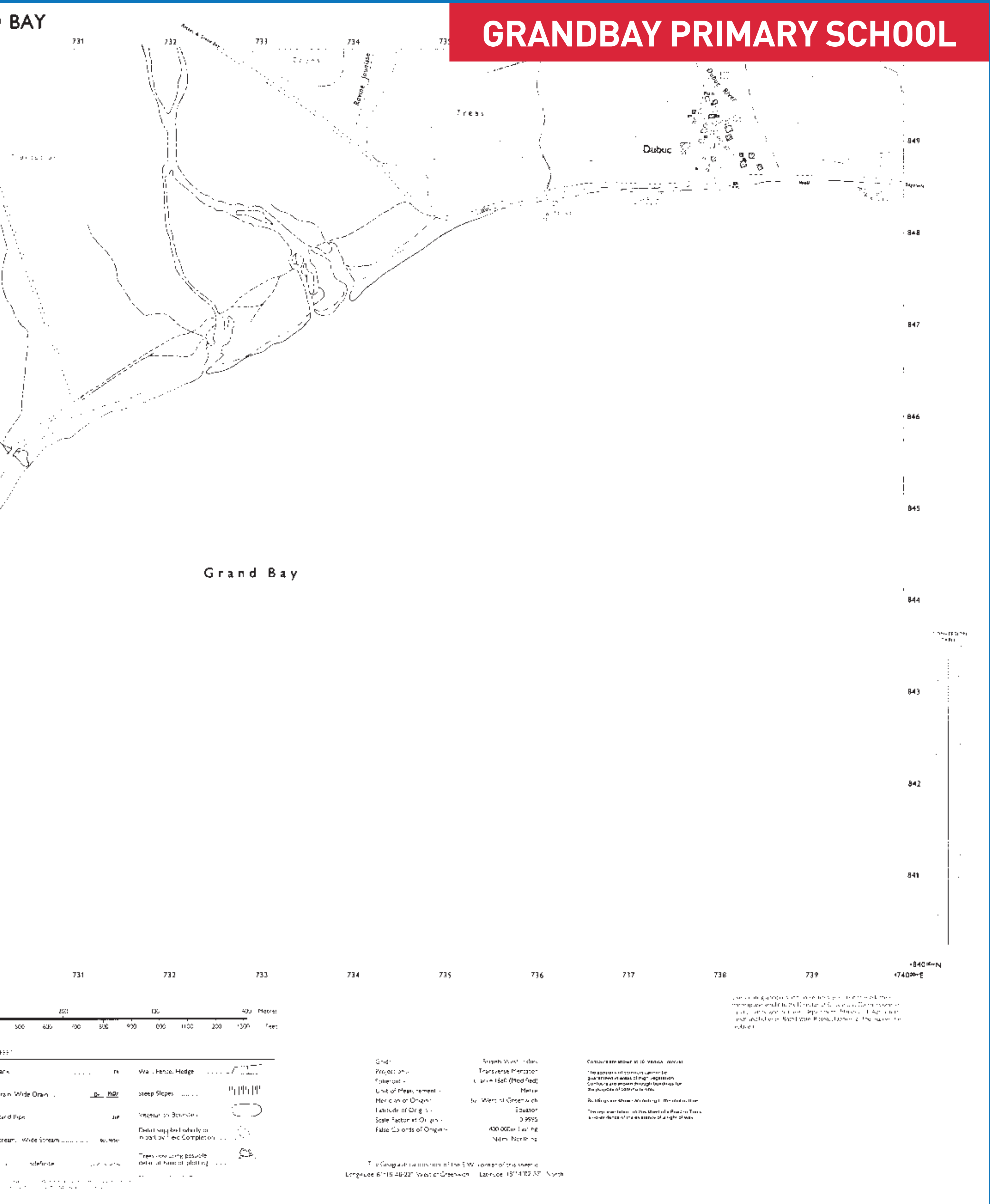
These deliverables have been prepared for the Project Implementing Agency, CDEMA, as well as the National Safe School Programme Committee (NSSPC) and national focal point in Dominica. The list of NSSPC members are included in Appendix.

The team of assessors visited Grandbay Primary School on May 15 and 17, 2019. The school is located in the parish of St. Luke (Figure 1-1) in the south-eastern region of Dominica. It is reported that the school is to be reconstructed under the Dominica Climate Resilience and Restoration Project. Additional general information on the school and the scores based on the MSSP Assessment Toolkit Checklists can be found in the Appendix.

FIGURE 1.1: GRANDBAY PRIMARY SCHOOL


DOMINICA 1:2500
GRAND
Geneva Estate
Spring River
Plantation
Playing Field
School
Berekua (Bericoa) Ravine
BEREKUA
(BEREGOA)
Am-Ba-Saut Ravine
MA BOUSHE
Trees
Scale 1:2500
INDEX TO ADJOINING SHEETS
7285
7485
7284
7484
7283
Trigonometrical Station Major
Culvert
Under Construction
Spot Height
Pole, Post or Pylon
Bench Mark
Flagstaff
Footpath, Footbridge
Fire Hydrant
Series D.O.S. 051
Sheet Dominica 7284
Edition 2-O.S.D 1986

GRANDBAY PRIMARY SCHOOL



1.1 PURPOSE

The Model Safe School Programme (MSSP) Toolkit states that "in a region that is prone to various hazards, many schools may be located in hazardous locations. Wherever possible, Hazard and Vulnerability Assessments should be performed for schools to guide the inclusion of preparedness and mitigation measures in the design, construction and operational phases. Disaster and emergency planning should be founded on a thorough understanding of the specific hazards faced by the education sector in general and at the individual institutions."

The purpose of this hazard assessment report is to identify and analyse the hazard vulnerability of **Grandbay Primary School** and to make recommendations to inform decision-making.

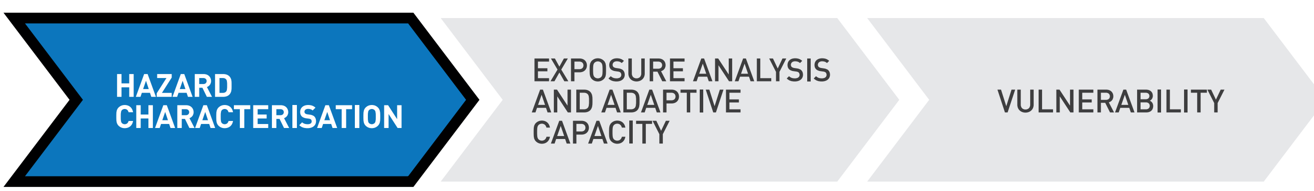
1.2 METHODOLOGY

The vulnerability assessment tool (VAT) draws on the methodology developed by the National Oceanic and Atmospheric Association (NOAA). Some adaptations were made to consider the local situation as well as data quality and availability.

1.2.1 HAZARD RISK ASSESSMENT

The consultants undertook the hazard risk assessments through a 3-step process elaborated below.

1.2.1.1 STEP 1 - CHARACTERIZING HAZARDS

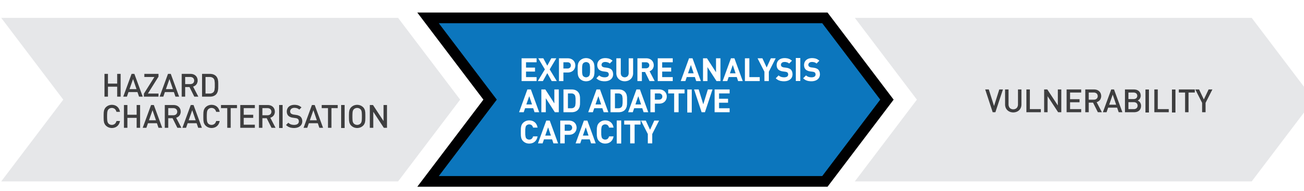


The first step involved the identification of the hazards (hydro-meteorological, geological, etc.) to which each of the countries, and by extension each school, may be exposed. To characterise hazards for each country, the Consultants conducted comprehensive desk research and stakeholder consultations with key agencies and various stakeholder groups to acquire the necessary information, which included but was not limited to:

- Existing spatial data from local and regional Geographic Information Systems (GIS) databases e.g. Caribbean Risk Information System, CHARIM Handbook & Geo-node, PITCA, CARDIN etc.
- Multi-hazard maps, including:
  - Wind and cyclone hazard maps
  - Seismic zoning
  - Flood hazard maps
- Location of critical infrastructure and supporting infrastructure
- Historical and projected information on hazards for each country
- Damage history of each institution
- Previously conducted studies or country reports

Site visits were also conducted to the respective schools. These visits focused primarily on collecting physical infrastructure data and assessing the vulnerability of the facilities as they relate to the various hazards.

1.2.1.2 STEP 2 - EXPOSURE ANALYSIS AND ADAPTIVE CAPACITY



EXPOSURE ANALYSIS

Exposure analysis involved accessing various databases, including geospatial mapping using GIS, to identify the hazards to which the schools were exposed, as well as site assessments and discussions with stakeholders to ascertain history of hazard events.

Mapping hazard exposure enables stakeholders to visualise individual hazardous settings and identify cumulative hazard scenarios. This mapping also provides an effective tool to anticipate, plan and manage resources effectively in advance of these hazards. This geospatial framework is the foundation of the vulnerability assessment process.

The Consultants used the assessment tools from the MSSP toolkit to gather relevant information to help to inform exposure.

ADAPTIVE CAPACITY ASSESSMENT

The adaptive capacity for each school was determined by examining the characteristics that influence the school's capacity to prepare for, respond to and recover from hazards and disasters. The interaction between natural processes and the built environment is intrinsically linked, and it is the adaptive capacity that determines the risks and burdens created by hazards.

Some of the major factors assessed that influence adaptive capacity included:

- Are the proposed systems associated with each asset/facility designed to anticipate a hazard, cope with it, resist it and recover from its impact?
- Conversely, are there barriers to the ability to anticipate, cope, resist or recover?
- Are the systems associated with the school's assets/facilities already stressed in ways that will limit their capacity to anticipate, cope, resist or recover?
- Is the rate of impact from hazards likely to be faster than the adaptability of the systems?
- Are there efforts already underway to address impacts of hazards of interest related to the school's assets/facilities?

These variables outlined above were adopted for this project along with other indices. A systematic examination of building elements (as elaborated below), facilities, population and other components was carried out to identify features that are susceptible to damage from the effects of specific hazards. A qualitative scoring method was developed to determine the vulnerability of specific structures, exposed population and selected geographic areas. This data was analysed and used to prioritize mitigation activities and to guide disaster risk management within the schools.

The Consultants conducted targeted interviews with school administrators to identify gaps and needs for each school (institutional framework, physical infrastructure, human and financial resources). During the adaptive capacity analysis, the Consultants used the MSSP toolkit to identify gaps, needs and recommendations for capacity building measures and other interventions. Additionally, the Consultants provided a qualitative summary for each school.

Building Condition Assessment Methodology

The structural condition assessment was limited to visual observations and included both non-structural and structural-related issues. No finishes were removed to reveal hidden conditions, and no material or load tests were conducted to ascertain the structural capacity of the buildings' components. Moreover, the survey was limited to cursory inspection of electrical and mechanical systems such as ventilation, water services, plumbing and sewer utilities; egress, fire-suppression, or fire rating of the building components.

As such, any comments offered regarding concealed construction are the professional opinions of the Consultants based on analyses, and our joint engineering experience and judgment, and are derived in accordance with the standard of care and practice for evaluations of building structures.

The following standard conditions assessment definitions were used in describing the general state of the elements.

Good condition:
- It is intact, structurally sound and performing its intended purpose.
- There are a few or no cosmetic imperfections.
- It needs no repairs and only minor or routine maintenance.

Fair condition:
- There are early signs of wear, failure or deterioration, although the feature or element is generally structurally sound and performing its intended purpose.
- There is failure of a sub-component of the feature or element.
- Replacement of up to 25% of the feature or element is required.
- Replacement of a defective sub-component of the feature or element is required.

Poor condition:
- It is no longer performing its intended purpose.
- It is missing.
- It shows signs of imminent failure or breakdown.
- Deterioration or damage affects more than 25% of the feature or element and cannot be adjusted or repaired.
- It requires major repair or replacement.

The above was used qualitatively in conjunction with CDEMA's Enhanced Building Condition Assessment Tool (EBCAT) and the findings are contained in Section 5.1.

1.2.1.3 STEP 3 - VULNERABILITY ASSESSMENT

The data and information collected from Step 1 (Hazard Characterisation) and Step 2 (Exposure Analysis and Adaptive Capacity) were combined to determine how and where each school is vulnerable to hazards using the following formula:

HAZARD EXPOSURE + ADAPTIVE CAPACITY = VULNERABILITY

1.3 LIMITATIONS

This assessment represents a one-day snapshot of the school that may or may not be the total depiction of what occurs daily. The team based its findings on the data provided and individual observations made during this one- day time frame. Please be mindful that this assessment is not binding but is merely an independent review to assist school officials in their quest to examine practices and procedures to better serve their student population. It is therefore incumbent upon the Ministry of Education, education officers and school staff to consider the report and determine what they believe is legitimate and critical to address when considering school safety management issues.

Comments in this report are intended to be representative of observed conditions. The consultants have made every effort to reasonably inspect and analyze the main structural components as well the non-structural components which form part of the building envelope. If there are perceived omissions or misstatements in this report regarding the observations made, we ask that they be brought to our attention as soon as possible so that we can address them fully and in a timely manner.

2. COUNTRY RISK PROFILE / SITUATIONAL CONTEXT

Dominica, officially the Commonwealth of Dominica, is the largest, most northerly island of the Windward Islands in the Easter Caribbean Sea, located northwest of Martinique and south-southeast of Guadeloupe. The island occupies an area of 750.6 km^2 (48km long and 24km wide) and is characterised as mountainous and volcanic island with steep terrain features. The cone of highest point on the island, Morne Diablotin (1,447m), dominates the topography of the north. A chain of mountains including Morne Tros Piton (1,424m), Morne Micotrin, Morne Anglais and Morne Plat Pays covers the southern half of the island (ECU 2001). The more gently sloping areas of flat land are restricted to the northeastern coast, in river valleys and in the Belle's Wet Area in the centre of the island (ECU 2000). The island is known as "The Nature Island" of the Caribbean, hosting several perennial streams, rivers, waterfalls and lakes including the world's second largest hot spring, Boiling Lake.

The population of Dominica is estimated to be 71,293 (2011 census) and has experienced net zero growth or declines in population over the past three decades due largely to emigration. steeply dissected, mountainous terrain found in Dominica's centre means most population centres are located along mountain tops and stream valleys, with nearly 90% of the population found in settlements along the coastal fringe of the island (GFDRR 2010). Approximately 67% of the population resides in urban areas (ECLAC 2010) and it estimated that 28% lived in the capital Roseau, 5% in Portsmouth and 4% in Marigot (Poverty Research Unit, 2006), all coastal settlements.

3. HAZARD IDENTIFICATION/ASSESSMENT

As with many other countries in the Caribbean, there are two broad categories of hazards that can cause potentially minor to significant impacts at any given time in Dominica:

- Hydro-meteorological hazards
  - Hurricanes and Tropical Storms
  - Flooding
  - Drought
  - Storm Surge
  - Landslide

- Geological hazards
  - Earthquake
  - Volcano
  - Tsunami

Based on a review of reports, site visits and consultation with the key stakeholders at each school and the Ministry of Education, Dominica is at risk to impacts from all of the above hazards and is ranked as one of the 10 most susceptible countries in the Caribbean relative to total number of events (CRED 2000). The steep slopes of the volcanic hills pose the risk of landslides and volcanic eruption, and with 90% of the population living within 5 km of a live volcano, that risk is quite extreme (GFDRR, 2010). Dominica has 9 of the 16 active volcanoes in the Caribbean making the risk of volcanic event quite serious (Kairi Consultants Ltd, 2010). In addition, the tropical climatic conditions on the island mean that heavy rainfall and flooding is possible any time of year. Heavy rainfall associated with tropical storms and hurricanes can, and has, also caused significant flooding damage and high wind damage. Additionally, storm surge and coastal erosion pose significant threats to the dense, developed coastal areas, not only during hurricanes but also from regular storm activity. This is compounded by the poor roads and high frequency of landslides which can and has isolated persons living in major centres.

3.1 HYDROMETEOROLOGICAL

3.1.1 TROPICAL STORMS AND HURRICANES

Dominica is in the Caribbean, one of the most disaster-prone regions in the world. Since 1950, over 13 named tropical storms have passed within 40km of the island. Since 1979, Dominica has been impacted by over 15 tropical systems including 12 hurricanes. Given that most of Dominica's population and infrastructure are located along the coast, they have experienced severe damage and losses in the past from strong winds and high seas (ODI 09/2001). Several hurricanes are notable as they required humanitarian assistance for recovery:

- **Hurricane Maria (September 2017):** a category 5 hurricane, Maria produced wind speeds of 160mph (with higher gusts), intense storm surges and rainfall and overflowing of rivers that resulted in 31 people deaths, 37 missing people and major destruction of critical infrastructure. It is estimated that over 90% of the population was directly affected; up to four months following the hurricane, approximately 450 people were still in shelters, 15% of children has not yet returned to school and 90% of the population remained without electricity.

- **Tropical Storm Erika (August 2015):** Dominica suffered major infrastructural damage in the wake of Erika, primarily related to transportation, households and agriculture. The island experienced heavy rainfall of up to 850mm in less than 12 hours. The mountainous terrain, excessive moisture and ground saturation from previous rains caused river basins to overflow and triggered flooding and landslides that displaced thousands and killed up to 30 people (CDEMA 30/08/2015).

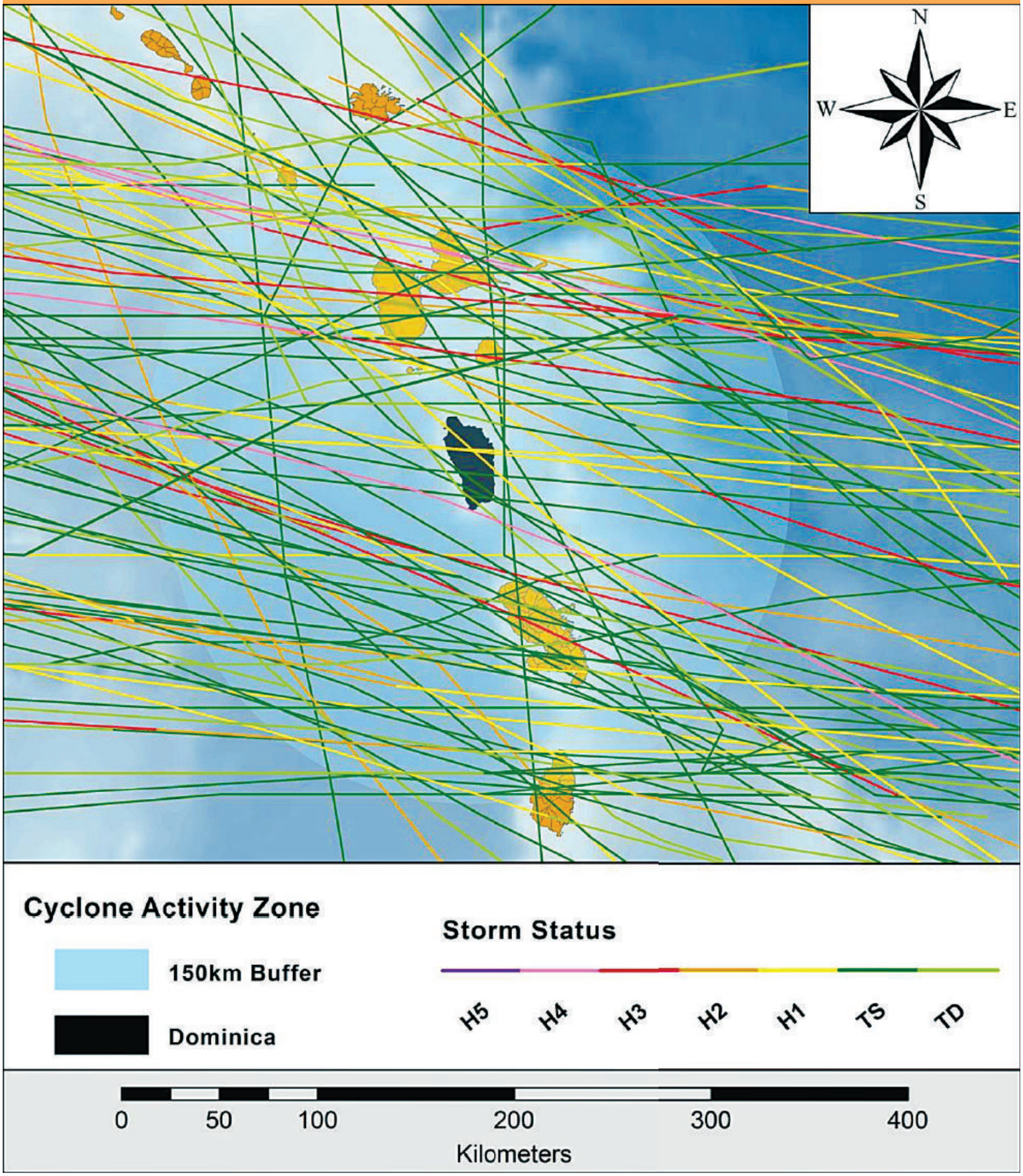
- **Tropical Storm Ophelia (September 2011):** the country experienced more than 80mm of rainfall in six hours, damaging the towns of Massacre, Canefield, Mahaut, Cochrane, Coulibistrie and Campbell most severely (Dom hazard profile).

- **Hurricane David (August 1979):** this category 5 storm produced heavy rainfall and major landslides causing the most damage in areas in the southwest and the capital of Roseau. Most of the country's population was displaced following the hurricane as more than 80% of homes on the island were destroyed.

TABLE 3.1: HISTORICAL HURRICANES DIRECTLY AFFECTING DOMINICA SINCE 1979 (SOURCE: ACAPS 2018)

NAME OF EVENT	YEAR	AFFECTED	DEATHS
Maria	2017	65,000	31
Erika	2015	15,951	13
Ophelia	2011	240	0
Dean	2007	7,530	2
Marilyn and Luis	1995	5,001	2
Hugo	1899	710	0
David and Frederick	1979	72,100	40

FIGURE 3.1: TRACKS OF TROPICAL CYCLONES MOVING WITHIN 150KM OF DOMINICA SINCE 1851 (SOURCE: CCRIF 2013)



3.1.2 FLOODS

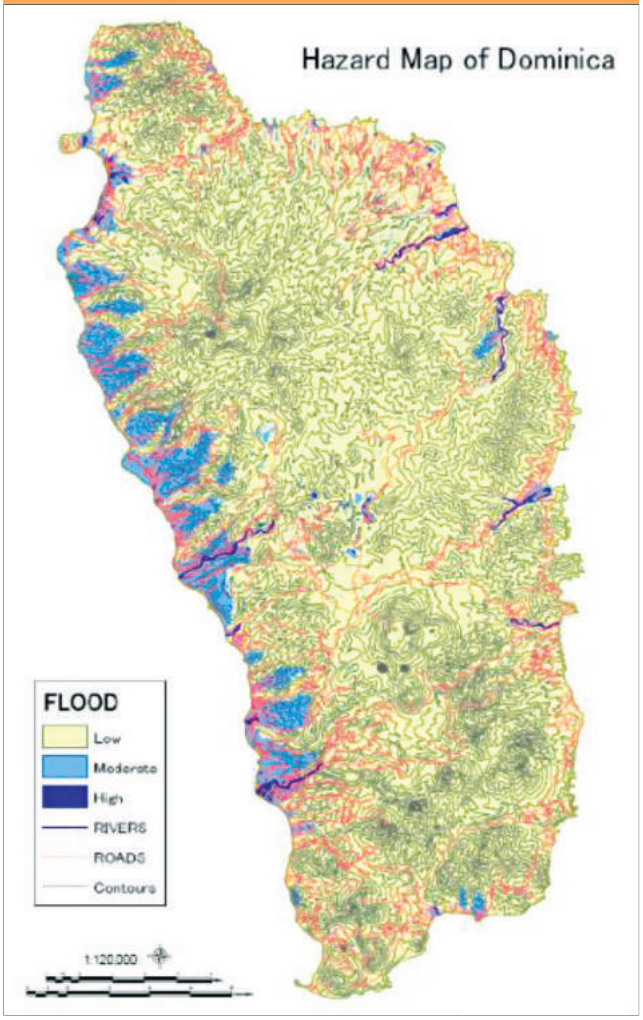
Flooding is a recurrent, annual problem in Dominica particularly as most development has occurred along the coast. Heavy rainfalls associated with tropical storm and hurricanes can trigger flooding. The island also experiences some of the highest annual rainfall amounts in the region, heavily influenced by orographic effects. Dominica is characterized as one of the wettest islands in the Caribbean and humidity is generally above 85% in the interior. The average annual rainfall in the driest section of the island (central west coast) is 1,270mm while the central peaks can receive over 7,620mm (ECU 2001). The combination of rainfall, steep, mountainous terrain and the island's geology means flash floods are also a constant threat, as materials and debris from landslides and soil erosion compromise the hydraulic capacities of river channels.

During the 1998 – 2015 period, eleven (11) significant excess rainfall events impacted Dominica, all caused by hurricanes and tropical storms. In December 2013, a low-level trough produced severe rains and high winds that caused flooding and landslides on the island, affecting hundreds of people, mainly in the south. Hurricane Dean in 2007 caused flooding in Dominica particularly in Roseau, where there was a 1 in 4-year, 24 hour rainfall event (risk atlas).

TABLE 3.2: HISTORICAL STORM EVENTS THAT HAVE CAUSED FLOODING IN DOMINICA

NAME OF EVENT	CATEGORY	YEAR
Maria	Category 5 Hurricane	2017
Erika	Tropical Storm	2015
Chantal	Tropical Storm	2013
Isaac	Tropical Storm	2012
TC5	NA	2011
Emily	Tropical Storm	2011
Dean	Category 1 Hurricane	2007
Iris	Tropical Depression	2001
Lenny	Tropical Storm	1999
Jose	Category 1 Hurricane	1999
Georges	Category 3 Hurricane	1999

FIGURE 3.2: INLAND FLOOD HAZARD MAP OF DOMINICA (SOURCE: CIPA 2006)



Settlements along the Layou River, the longest and deepest river in Dominica, are highly susceptible to flooding as the river is prone to flooding. In 1997, landslides due to heavy rainfall effectively blocked the discharge of the Matthieu river to the Layou, some 6km northeast from the mouth of the Layou. The subsequent failure of the Matthieu dam resulted in major flooding and damage of the downstream portions of the Layou river, particularly along the Layou Valley to the western coast. Since then, a lake known as Miracle Lake has formed due to a stabilization effect of the landslide over time, however this large volume of water still presents a flood threat to the Layou Valley.

3.1.3 DROUGHT

Drought is a potential hazard facing Dominica as the country depends almost entirely on rain-fed surface water for its freshwater supply. Hence, variations in rainfall can lead to dry spells and periods of drought. The country has experienced severe drought conditions in 2001 and between October 2009 – January 2010 (Simpson 2014).

As a result of a strengthening El Niño contributing to reduced rainfall, a drought warning was issued for Dominica in 2018 and 2019. During these dry spells, stream flow can be as low as 30% of the average rainy season flows, which can adversely impact the country's economy. During dry spells and periods of drought, the increased risk of forest and brush fires can intensify land degradation and affect the quality of water catchments, while increased temperature in rainforest can reduce catchment flows.

3.1.4 STORM SURGE

Dominica's coastline is exposed to storm surge where storm waves can produce major damages. During Hurricane Maria (2017), wind speeds reached 160mph with higher gusts producing intense storm surges.

3.1.5 LANDSLIDE

Similar to flooding, Dominica's combination of rainfall, geology and severe topography makes the island particularly favorable to the development of various types of landslides (GFDRR). The most common landslides are debris flows and roads and villages are under constant threat from rock falls and debris slides presented by the island's steep cliffs. Landslides typically occur along river courses which can lead to temporary pooling of water, which contribute to flood risks. At least 2% of the total land area has been disturbed by landslides (ODI 09/2001) while 35 people lost their lives due to landslides that occurred between 1925 and 2015.

The Good Hope landslide on Dominica is one of the larger identified debris slides (DeGraff, 1987). The community located on the east coast had experienced several days of rainfall, which triggered nearly 17000 m3 of soil and weathered rock to slide from the hillslope above Castle Bruce-Petit Soufriere road. The landslide resulted in major damages to roads, schools, critical infrastructure, injured several residents and caused one fatality. In 2010, heavy rainfalls produced a landslide in Bayside, San Sauveur, claiming the lives of 3 persons. According to a large-scale landslide inventory conducted by the University of Twente in 2018, Hurricane Maria triggered a total of 9,960 landslides (8,576 debris slides, 1,010 debris flows and 374 rock falls). As discussed previously (Section 3.1.2), the 1997 landslide in the Layou River Valley was a major landslide and presently remains active at the confluence of Matthieu and Layou rivers.

FIGURE 3.3:
LANDSLIDE IN THE LAYOU RIVER VALLEY, 1997 (SOURCE: OAS)

FIGURE 3.4:
IMAGE OF LANDSLIDE IMPACTS IN DOMINICA

3.2 GEOLOGICAL

3.2.1 EARTHQUAKE

Dominica is considered to be the most geologically active island in the Caribbean and is located in a moderately active sector of the eastern Caribbean Plant margin. Earthquakes originate from plate movements (tectonic) and/or magma displacement (volcanic activity) – in Dominica's case, earthquakes are common and typically linked to volcanic activity. The island suffers from numerous shallow, potentially damaging volcano-tectonic earthquake swarms and trends indicate that earthquakes on the island are trending towards being stronger and shallower. This suggests that Dominica is at increased risk of magmatic eruption(s). Earthquake risk is considered moderate (CRIFF 2013), with the potential for local amplification for coastal areas. Dominica's capital city, Roseau, is also prone to shallow volcano seismic swarms.

The island is also exposed to impacts from earthquakes associated with plate activity. During the period 1998 – 1999, 183 movements were recorded in one day on October 23, 1998 (ECU, 2001). Earthquakes in 2004 and 2007 were located offshore but were of sufficient magnitude (6.3 and 7.4 respectively) to be felt throughout the entire region. The event in 2004 coincided with a three-day period of heavy rainfall and triggered several landslides throughout the island.

Seismic activity also has the secondary risks of landslides, particularly given Dominica's steep terrain.

3.2.2 VOLCANO

Dominica is the only Caribbean island that has more than one volcano, with 9 of the 16 potentially active volcanoes in the region found there: Morne au Diable, Morne Trois Pitons, Morne Diablotins, Morne Watts, Morne Anglais, Wotten Waven Caldera, Valley of Desolation, Grande Soufriere Hills and Morne Plat Pays. It is estimated that over 90% of the population live within 5 km of a live volcano (ECU, 2001). As such the entire island is susceptible to volcanic hazards however studies indicate that the capital Roseau is situated in one of the most hazardous areas of the island[1].

In the past there have been two steam explosions in the Valley of Desolation (Morne Trois Pitons National Park), one in 1880 and subsequently in 1997. Following a volcanic alert in 1998-9, its susceptibility to future volcanic activity is also currently a major cause for concern. Volcanic activity can also trigger earthquakes as discussed in Section 3.2.1.

3.2.3 TSUNAMIS

Tsunamis are not considered a major recurrent risk for the Caribbean region, however the low-lying nature of coastal developments and the concentration of the population and critical infrastructure in coastal settlements make them vulnerable to tsunami activity (GFDRR 2010).

1 http://caribbeanvolcanoes.com/dominica-geology/

3.3 CLIMATE PROJECTIONS

In 2017, Dominica was listed as one of the countries most affected by impacts of weather-related loss events (storms, floods, heat waves etc.) (Germanwatch Global Climate Change 2019 Risk Index.3) mainly due to two factors: (i) the impact of global warming on rising sea levels which are associated with an increased risk of storm surges, and (ii) the increase in the intensity of hurricanes. Similar to the rest of the Caribbean region and consistent with the projected global median, climate change models project that Dominica will trend towards warming and drying and is expected to suffer more frequent heat waves and droughts, increased high intensity rainfall and rising sea levels. The Government of the Commonwealth of Dominica has identified seal level rise (SLR), changes in temperature and precipitation, and impacts from hurricanes and extreme events as the major issues of climate change facing Dominica.

In summary the following is noted about the climate of Dominica (ECU, 2012):

- There is evidence to suggest that the climate of Dominica is changing. Both maximum and minimum temperatures have increased in the recent past.
- The warming trend is expected to continue. The country is projected to be warmer by up to 1.3°C by the 2050s, and between 2 and 3 degrees by the end of the century.
- Winter months will see marginally larger increases in temperature than summer months.
- The frequency of very hot days and nights will increase, while the number of very cool days and nights will decrease.
- The country is likely to be drier in the mean. Projections are for up to 20% drier by midcentury when models show more consensuses about the trend, and up to 50% drier by 2100.
- July-August will likely be drier.
- The seasonality of Dominica will be largely unchanged. The cooler (with respect to late season temperatures) dry early months and wet hotter late months will still prevail.
- Hurricane intensity is likely to increase (as indicated by stronger peak winds and more rainfall) but not necessarily hurricane frequency.
- Caribbean sea levels are projected to rise by up to 0.24 m by midcentury.
- Sea surface temperatures in the Caribbean are projected to warm, up to approximately 2°C by the end of the century.
- ENSO's impact on Dominican rainfall (early and late season) will likely continue, given projections of the phenomenon's continued occurrence in the future.

4. EXPOSURE ANALYSIS

The term exposure is used to indicate those elements-at-risk that are subject to potential losses. Important elements-at-risk that should be considered in analysing potential damage of hazards are population, building stock, essential facilities and critical infrastructure. Critical infrastructure consists of the primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency (UN-ISDR, 2009).

This exposure analysis involves developing a hazard profile for the school by assigning ratings (from 0 to 3) to the parameters listed in Table 4-1 below and averaging the parameter scores for each hazard. Based on the average scores, the school is characterized by the degree of exposure to each hazard and further assigned an **Overall Exposure Index** (sum of the average scores for all hazards).

The objective is to quantify the school's level of exposure and subsequently the potential impact (direct or indirect) of a specific hazard on people, essential facilities, and property. This will enable school administrators, the Ministry of Education and other key decision makers to have a better understanding of the hazards that present the highest risk to the school and focus planning efforts on making schools safer in this context.

The consultants used existing data and available hazard maps to determine the level of exposure of the school to specific hazards. Table 4-2 presents the findings of the exposure analysis.

Based on the hazard identification (Section 3) and the exposure analysis, the Grandbay Primary School has a high degree of exposure to hurricanes (and associated wind), flooding, earthquakes and volcanic activity. Additionally, the school is highly likely to be affected by the climate change projections made for the area and the region (Section 3.3). Based on this analysis, the school has been assigned an exposure index of **13.8** (**Moderate**; Table 4-2). It would be prudent for the school to prioritise all hazards that have been given a rating of high or moderate.

OVERALL EXPOSURE INDEX		
0 - 4	VERY LOW	
5 - 9	LOW	
10 - 14	MODERATE	
15 - 19	HIGH	
20 - 24	VERY HIGH	

TABLE 4.1: PARAMETERS AND RANKINGS USED IN EXPOSURE ANALYSIS (SOURCE: ADAPTED FROM FEMA HAZARD ANALYSIS WORKSHEET)

PARAMETER	RANKINGS	SCORE
Frequency	**Highly Likely:** Near 100% probability in next year.	3
	Likely: Between 10 and 100% probability in next year, or at least one chance in 10 years.	2
	Possible: Between 1 and 10% probability in next year, or at least one chance in next 100 years.	1
	Unlikely: Less than 1% probability in next 100 years.	0
Warning (potential speed of onset)	Minimal (or no) warning.	3
	6 to 12 hours warning.	2
	12 to 24 hours warning.	1
	More than 24 hours warning.	0
Severity	**Catastrophic:** Multiple deaths; Complete shutdown of facilities for 30 days or more; More than 50%of property is severely damaged.	3
	Critical: Injuries and/or illnesses result in permanent disability; Complete shutdown of critical facilities for at least two weeks; More than 25%of property is severely damaged.	2
	Limited: Injuries and/or illnesses do not result in permanent disability; Complete shutdown of critical facilities for more than 1 week; More than 10%of property is severely damaged.	1
	Negligible: Injuries and/or illnesses are treatable with first aid; Minor quality of life lost; Shutdown of critical facilities and services for 24 hours or less; Less than 10% of property is severely damaged.	0

TABLE 4.2: FINDINGS OF THE EXPOSURE ANALYSIS FOR THE GRANDBAY PRIMARY SCHOOL

HAZARD	COMMENTS	FREQUENCY		WARNING TIME		SEVERITY		DEGREE OF EXPOSURE	
		RANKING	SCORE	RANKING	SCORE	RANKING	SCORE	RANKING	AVERAGE SCORE
Hurricanes and Tropical Storms	This school like the entire island and region was found to be exposed to the Wind Hazard. While hurricanes are a natural part of the region's climate system, the recent increase in intense hurricane activity has redefined the meaning of Extreme Wind or Hurricane Exposure. More intense hurricanes that carry higher wind speeds and more precipitation or expected (Figure 4-1).	**Likely**	**2**	**12-24 hrs**	**1**	**Catastrophic**	**3**	**HIGH**	**2.0**
Flooding (from hurricanes, storms or extreme rainfall events)	The school is located in a flood prone zone (Figure 4-2).	**Likely**	**2**	**6-12 hrs**	**2**	**Critical**	**2**	**HIGH**	**2.0**
Drought	Drought impacts the entire island of Dominica, with ranging severity but high likelihood.	**Likely**	**2**	**24+ hrs**	**0**	**Limited**	**1**	**MODERATE**	**1.0**
Storm Surge	While the school is in a coastal location, it's elevation alleviates the impacts of storm surge (Figure 4-3).							**NOT EXPOSED**	
Landslide	The school is exposed to landslides (Figure 4-4) and has experienced land slippage in the past.	**Likely**	**2**	**6-12 hrs**	**2**	**Critical**	**2**	**MODERATE**	**1.7**
Earthquake	Seismic activity is a risk for all Caribbean islands. The lack of warning and potential for catastrophic impacts suggest that the school has a high exposure to earthquakes. (Figure 4-5).	**Likely**	**2**	**Minimal (or no warning)**	**3**	**Catastrophic**	**3**	**HIGH**	**2.7**

TABLE 4.2: FINDINGS OF THE EXPOSURE ANALYSIS FOR THE GRANDBAY PRIMARY SCHOOL

HAZARD	COMMENTS	FREQUENCY		WARNING TIME		SEVERITY		DEGREE OF EXPOSURE	
		RANKING	SCORE	RANKING	SCORE	RANKING	SCORE	RANKING	AVERAGE SCORE
Volcano	The island has very high exposure to volcanic hazards, and an eruption is expected in the next 100 years. The school is not in the immediate zone of the volcano; however, the level of exposure persists (Figure 4-6).	**Likely**	**2**	**Minimal (or no warning)**	**3**	**Catastrophic**	**3**	**HIGH**	**2.7**
Tsunamis	The school is moderately exposed to tsunamis.	**Possible**	**1**	**Minimal (or no warning)**	**3**	**Limited**	**1**	**MODERATE**	**1.7**
						OVERALL EXPOSURE INDEX		**MODERATE**	**13.8**

FIGURE 4.1: DOMINICA WIND HAZARD MAP SHOWING LOCATIONS OF SCHOOLS ASSESSED (MAY 2019)

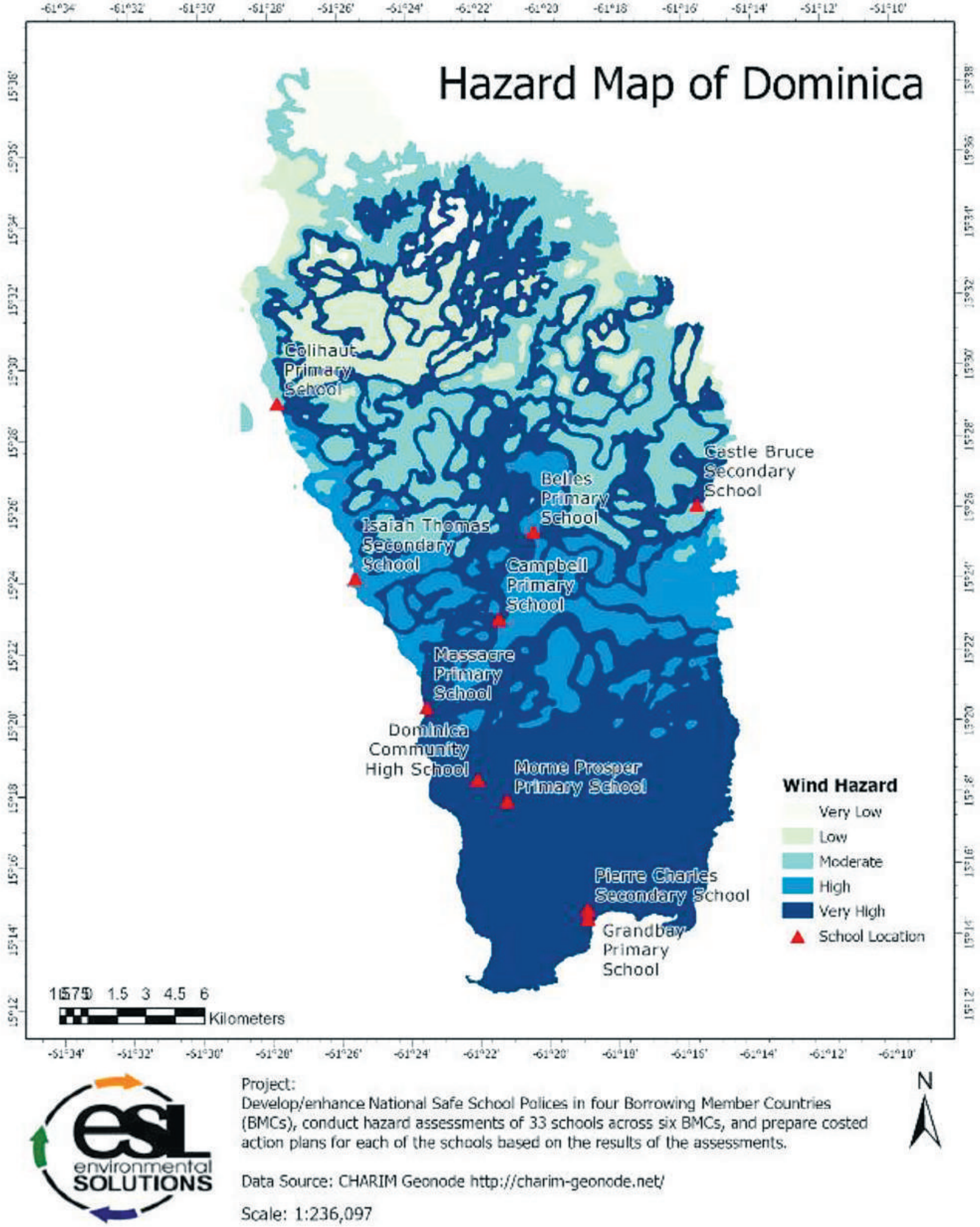
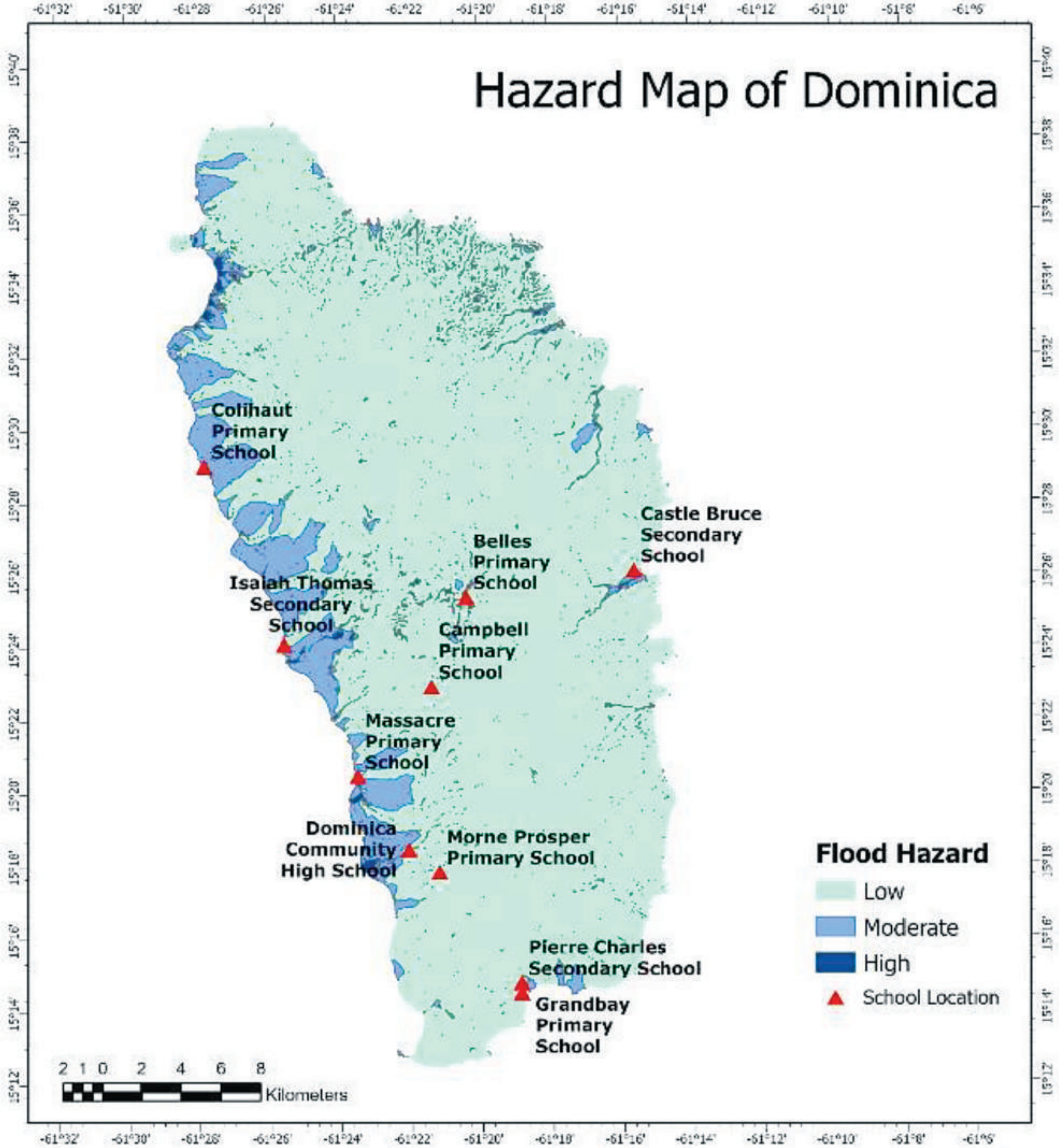


FIGURE 4.2: DOMINICA FLOOD HAZARD MAP SHOWING LOCATIONS OF SCHOOLS ASSESSED (MAY 2019)



Project:
Develop/enhance National Safe School Polices in four Borrowing Member Countries (BMCs), conduct hazard assessments of 33 schools across six BMCs, and prepare costed action plans for each of the schools based on the results of the assessments.

Data Source: CHARIM Geonode http://charim-geonode.net/

Scale: 1:250,000

FIGURE 4.3: DOMINICA STORM SURGE HAZARD MAP SHOWING LOCATIONS OF SCHOOLS ASSESSED (MAY 2019)

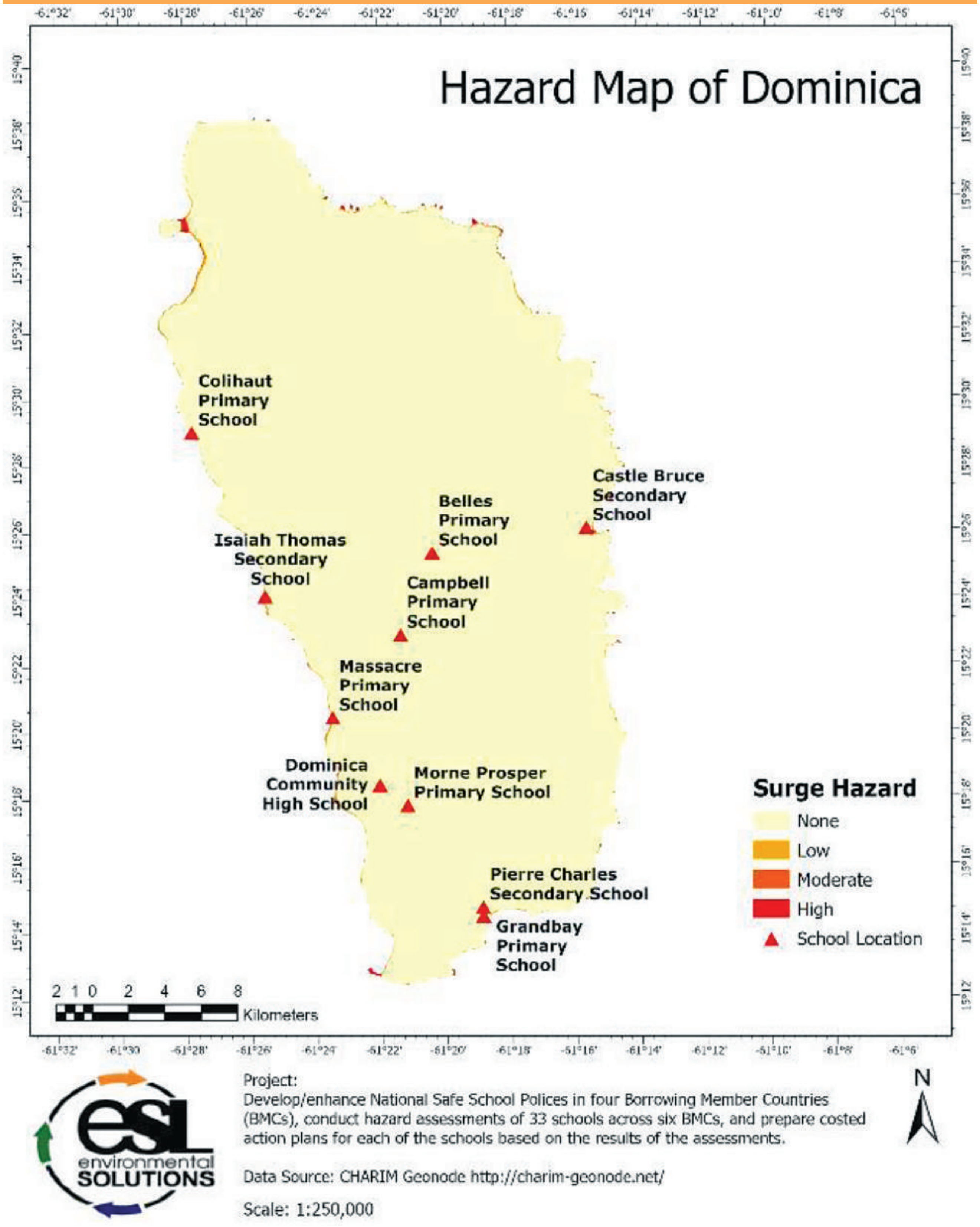


FIGURE 4.4: DOMINICA LANDSLIDE HAZARD MAP SHOWING LOCATIONS OF SCHOOLS ASSESSED (MAY 2019)

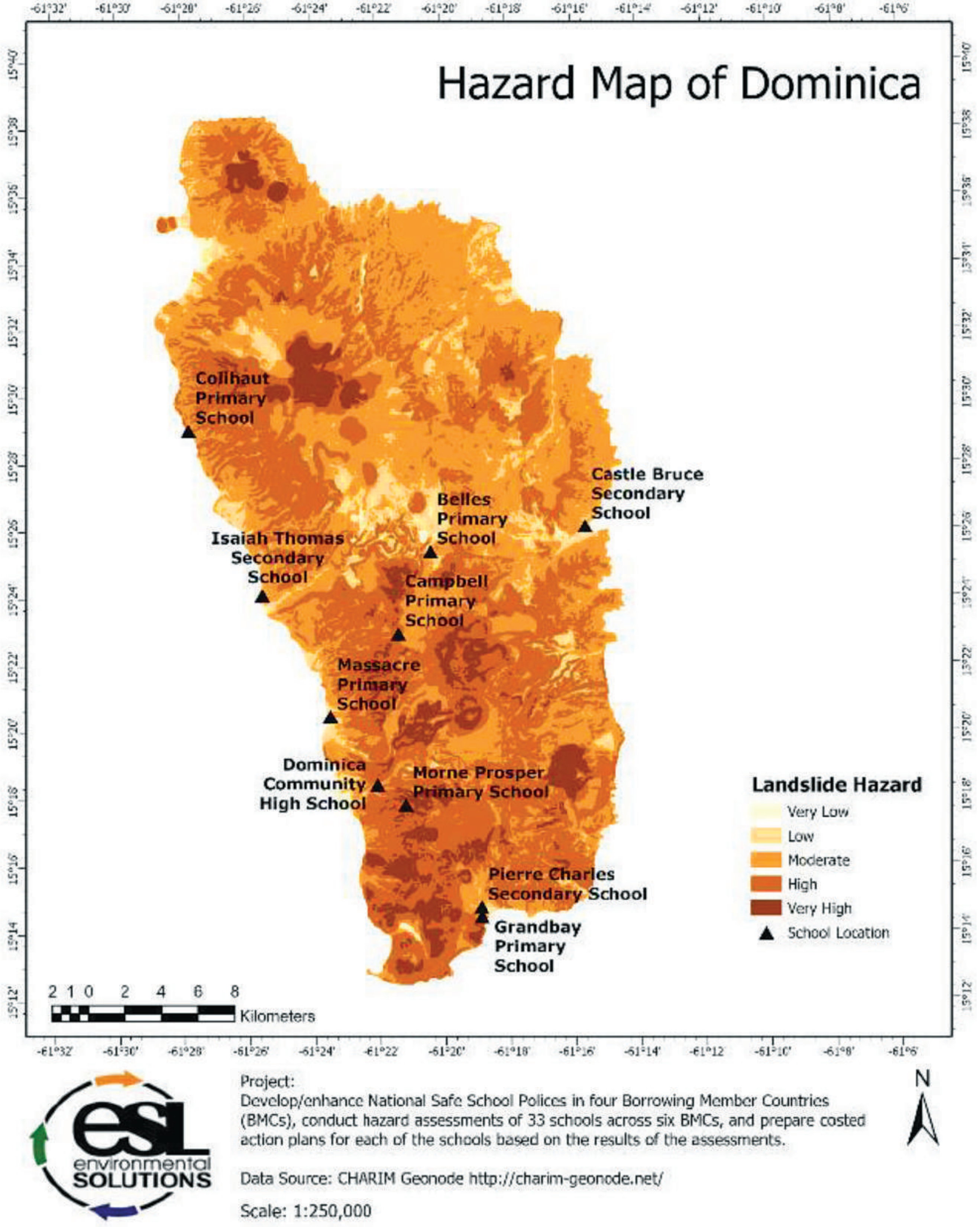


FIGURE 4.5: DOMINICA EARTHQUAKE HAZARD MAP SHOWING LOCATIONS OF SCHOOLS ASSESSED (MAY 2019)

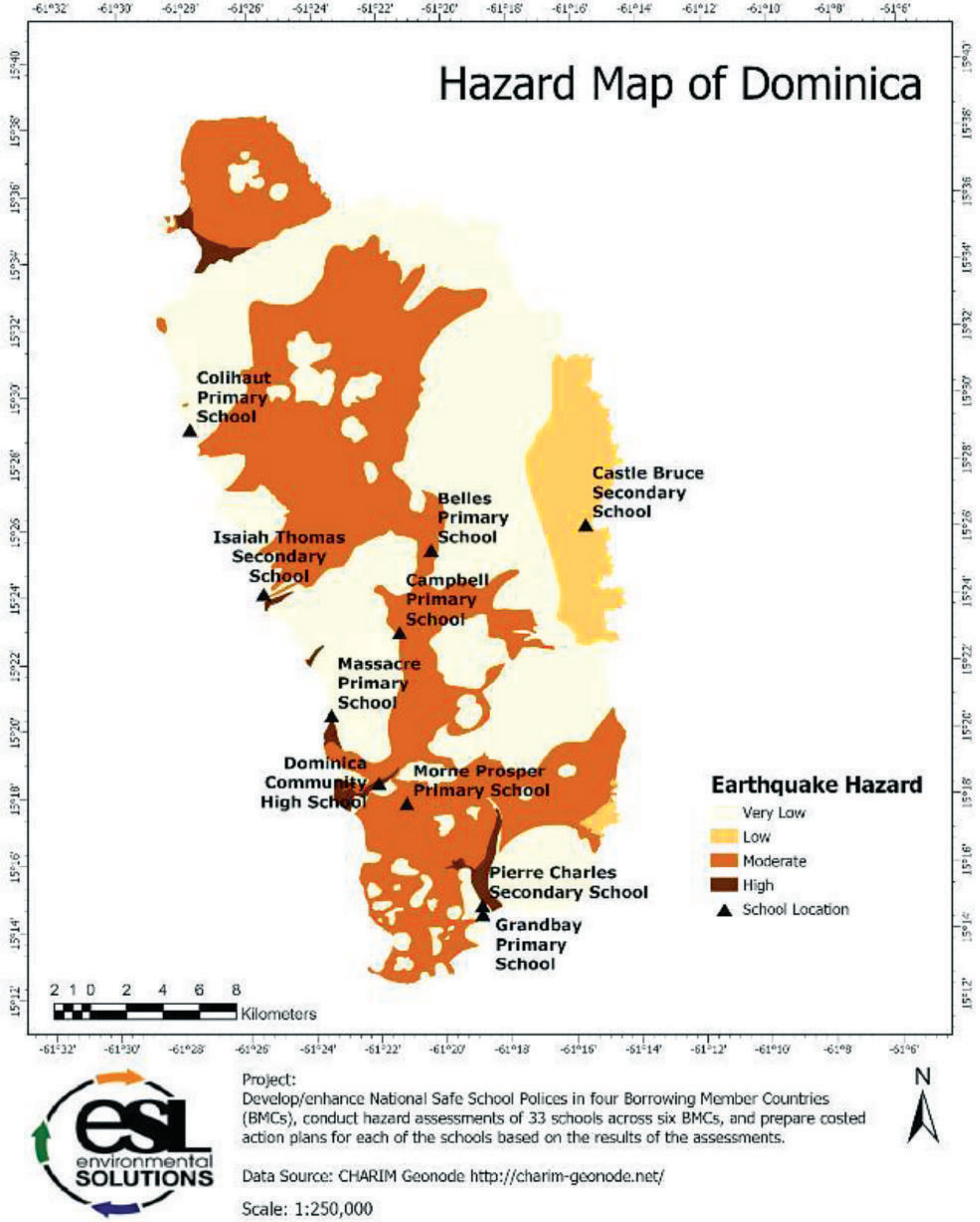
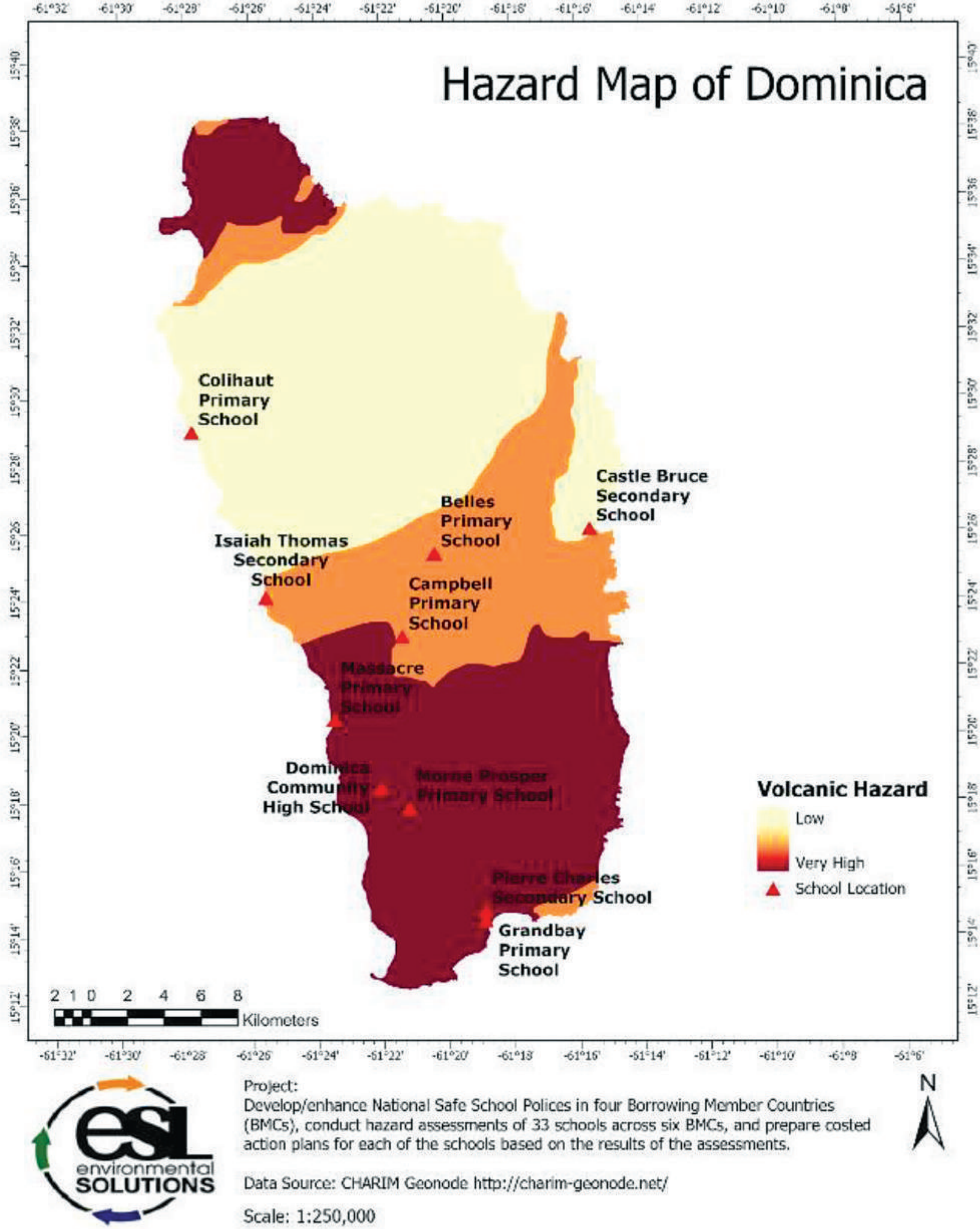


FIGURE 4.6: DOMINICA VOLCANO HAZARD MAP SHOWING LOCATIONS OF SCHOOLS ASSESSED (MAY 2019)



4.1 OTHER HAZARDS

Comprehensive school emergency planning utilizes an "all-hazards" approach, which considers a wide range of possible threats and hazards. It includes those that might take place in the community and surrounding area that could impact the school. Examples include:

1. Technological Hazards

- Hazardous materials in the community from industrial plants, major highways or railroads
- Hazardous materials in the school e.g. gas leaks, sewage breaks or laboratory spills
- Infrastructure failure e.g. dam, electricity, water, communications or technology systems

2. Biological Hazards

- Infectious diseases
- Contaminated food outbreak
- Water contamination
- Toxic materials present in schools e.g. mould, asbestos, substances in school science laboratories

3. Adversarial, Incidental and Human-Caused Hazards

- Fire
- Medical Emergency
- Intruder
- Active shooter/Threats of violence
- Fights
- Gang violence
- Bomb threat
- Child abuse
- Cyber attack
- Suicide
- Missing student or kidnapping
- Off-site emergencies
- Dangerous animal
- Riots

The Grandbay Primary school sustained significant damages during Hurricane Maria (2017) – at the time of this assessment, the school had only regained electricity on the previous day (May 14, 2019). Persons interviewed reported that classes were previously held in large tents provided by UNICEF (given the unsafe condition of the building) however students frequently exhibited behavioural issues in these environments. This highlights the importance of addressing psychosomatic disorders that may arise from experiencing traumatic events.

It was also reported and observed that pooling water was a challenge, particularly in restrooms and dark classrooms, resulting in mosquitoes breeding. This can lead to additional issues with pests including vector-bore illnesses and potentially mould. Additionally, it was noted that the perimeter fence was damaged in several places – squatters have also settled on the school's land and commonly walk through the premises even on weekends, which presents a considerable security risk.

It is recommended that the school determine which of the above are priority hazards to be included in the revised EMP.

5. ADAPTIVE CAPACITY

The adaptive capacity analysis describes the ability of the school to accommodate potential damage, to take advantage of opportunities, or to respond to consequences with minimum disruption or minimum additional cost (Climate Impacts Group, King County, Washington, and ICLEI-Local Governments for Sustainability, 2007). It describes the capacity of the school to learn from previous experiences and to apply those lessons to cope in future.

In the context of what the school may be exposed to (Section 3), the analysis below seeks to determine (among other things):

- If the school is already able to accommodate changes
- If there are any barriers to the school to accommodate changes
- If the rate of the projected change is likely to be faster than the adaptability of the school
- If there are efforts already underway to address impacts of various hazards in the school

To develop an overall index of adaptive capacity, 24 indicators were selected and grouped according to five determinants of adaptive capacity (Table 5-1) in the context of the hazards that may impact each school (Section 3). The indicators were selected using information garnered using the MSSP toolkit checklists, interviews and desk review of other existing data and information (Smit et al 2001, Yohe and Tol, 2002). The index was calculated by first aggregating the scores for the individual indicators to obtain a determinant value, which were then aggregated to an overall score to obtain an **Overall Adaptive Capacity Index**.

OVERALL ADAPTIVE CAPACITY INDEX		
0 - 4	VERY LOW	
5 - 9	LOW	
10 - 14	MODERATE	
15 - 19	HIGH	
20 - 24	VERY HIGH	

This approach provides a holistic perspective on the school's ability to plan for, design and implement effective adaptation strategies or to react to evolving hazards and stresses which may ultimately reduce the likelihood of the occurrence and or the severity of harmful outcomes resulting from hazards. It considers all elements of Comprehensive Disaster Management (Preparedness, Mitigation, Response and Recovery)[2]. The analysis is presented in Table 5-2.

2 https://www.cdema.org/cdm

TABLE 5.1: DETERMINANTS OF ADAPTIVE CAPACITY USED IN SCHOOL ASSESSMENT (ADAPTED FROM SMIT ET AL. 2001)

DETERMINANT	RATIONALE
Economic	■ Greater economic resources increase adaptive capacity ■ Lack of financial resources limits adaptation options
Information and skills	■ Lack of informed, skilled and trained personnel reduces adaptive capacity ■ Greater access to information increases likelihood of timely and appropriate adaptation
Infrastructure and Technology	■ Lack of technology limits range of potential adaptation options ■ Less technologically advanced regions are less likely to develop and/or implement technological adaptations ■ Greater variety of infrastructure can enhance adaptive capacity, since it provides more options ■ Characteristics and location of infrastructure also affect adaptive capacity
Institutional	■ Well-developed social institutions help to reduce impacts of climate- related risks and therefore increase adaptive capacity ■ Policies and regulations may constrain or enhance adaptive capacity
Natural/Ecological /Climate	■ Elements of the natural, physical or ecological environment of a region may enhance or limit the possibilities for adaptation (including projected climate change impacts)

TABLE 5.2: SUMMARY OF ADAPTIVE CAPACITY ANALYSIS FOR GRANDBAY PRIMARY SCHOOL (2019)

DETERMINANT	INDICATOR	SCORE	COMMENTS
Institutional	**1.** Is there a national policy on climate change adaptation and/or comprehensive disaster management (or related) for the education sector? **[YES = 1; NO = 0]**	**0**	Dominica has addressed climate adaptation at the policy level through the preparation of a national climate change adaptation strategy, and through the "Economics of Climate Adaptation Initiative", the Mainstreaming Adaptation to Climate Change (MACC) Project, and the Pilot Programme for Climate Resilience (PPCR). While education is not listed as a vulnerable or priority sector with regards to climate change in the Second National Communication. Dominica has requested support from the OECS to increase climate change resilience of the education sector through a regional approach. The reason is that there is a priority to reduce the impacts of climate change-related extreme weather events, including the disruption of education services and high costs of damages, in their national plans. Dominica is also signatory to the Antigua and Barbuda Declaration on School Safety and is in the process of implementing the Model Safe School Programme.
	2. Have there been additions to the curriculum that integrate climate change/disaster preparedness/emergency management? **[YES = 1; NO = 0]**	**0**	At the time of this assessment, there was no curriculum integration.
	3. Is an updated emergency management or disaster management plan in place? **[YES = 1; NO = 0]**	**1**	Yes, there is a plan in place however it needs to be updated.
	4. Do the plans address priority hazards based on previous assessment(s)? **[YES = 1; NO = 0]**	**1**	Yes, the plan addresses priority hazards.
	5. Is there a designated environmental/health & safety officer, emergency response team or related position/team? **[YES = 1; NO = 0]**	**0**	At the time of this assessment, there was no officer or related position in place.
Information and Skills	**6.** Has the school done a walk through to identify and prioritize hazards for the population and visitors? **[YES = 1; NO = 0]**	**1**	Yes the school has done previous assessments and has someone on staff able to conduct. It was previously a designated shelter however has been deemed unsafe and is slated for reconstruction though no timeframe has been provided.

TABLE 5.2: SUMMARY OF ADAPTIVE CAPACITY ANALYSIS FOR GRANDBAY PRIMARY SCHOOL (2019)

DETERMINANT	INDICATOR	SCORE	COMMENTS
Information and Skills	**7.** Are all teachers and school staff assigned roles in the overall response, pre-, during and post-hazard event? **[YES = 1; NO = 0]**	1	Yes, all persons are assigned roles and responsibilities for disaster/emergency management.
	8. Have staff received training in emergency/disaster management? **[YES = 1; NO = 0]**	1	Yes, teachers are trained.
	9. Are there regular drills with staff, parents and students? **[YES = 1; NO = 0]**	1	Yes, the school conducts drills and simulation exercises with teachers, staff and students.
	10. Is the school able to manage an event independently if help is not immediately available? E.g. fire extinguishers, first aid kits, triage? **[YES = 1; NO = 0]**	0	While there is a strong culture of risk management at the school, the physical plant has not been fully repaired following damages from Hurricane Maria in 2017.
Infrastructure and Technology	**11.** Does the school have reserve water storage with adequate supply for at least 3 days? **[YES = 1; NO = 0]**	0	No, there isn't sufficient storage.
	12. Does the school employ water conservation strategies to adapt to current usage or plan for future changes to water supply? **[YES = 1; NO = 0]**	0	No, there are no initiatives underway or planned.
	13. Does the school actively harvest rainwater? **[YES = 1; NO = 0]**	0	No, rainwater is not harvested.
	14. Does the school employ energy conservation/efficiency mechanisms? **[YES = 1; NO = 0]**	0	No mechanisms in place.

TABLE 5.2: SUMMARY OF ADAPTIVE CAPACITY ANALYSIS FOR GRANDBAY PRIMARY SCHOOL (2019)

DETERMINANT	INDICATOR	SCORE	COMMENTS
Infrastructure and Technology	**15.** Is there back up electrical power? [YES = 1; NO = 0]	0	This is an area for improvement as there is no back up electrical power.
	16. Does the school employ other green practices? E.g. recycling, greenhouse/garden, green policy etc? [YES = 1; NO = 0]	1	Yes, has a small garden.
	17. Can the building withstand the impacts of a hazard in its current condition? [YES = 1; NO = 0]	0	The steel structure is in fair condition however there are portions without essential elements e.g. roof, windows and doors.
	18. Have school buildings/plant been repaired or retrofitted to the building code? [YES = 1; NO = 0]	0	No repairs have been done. Repairs and retrofit are recommended in Costed Action Plan (Section 8).
ARE THERE ANY EXISTING BARRIERS TO ADAPTATION?			
Natural / Ecological / Climate	**19.** Physical or ecological limits? E.g. landscape/physical location limits range of adaptation options to priority hazards? [YES = 1; NO = 0]	1	No, there are no physical limits imposed by location or otherwise.
	20. Is climate change likely to exacerbate any of the current hazards? [YES = 1; NO = 0]	0	Based on climate projections, the current hazards are projected to be exacerbated.
	21. Is the rate of climate change likely to outpace adaptation efforts? [YES = 1; NO = 0]	0	Dominica has been cited as one of six Caribbean countries listed in the world's top-40 climate "hot spots". The impacts of certain hazards are already being experienced islandwide.

TABLE 5.2: SUMMARY OF ADAPTIVE CAPACITY ANALYSIS FOR GRANDBAY PRIMARY SCHOOL (2019)

DETERMINANT	INDICATOR	SCORE	COMMENTS
Infrastructure and Technology	**22.** Technological limits? Availability of technological options for adaptation e.g. warning systems/ impacts of disruptions on any technology-based emergency communication resources; electronic data storage. [YES = 1; NO = 0]	0	There are no technological adaptations in place.
Economic	**23.** Financial barriers? E.g. Lack of resources may limit the ability of some schools to afford proposed adaptation mechanisms. [YES = 1; NO = 0]	0	The school is funded by the government.
Information and Skills	**24.** Information or cognitive barriers (individuals tend to prioritize the risks they face, focusing on those they consider – rightly or wrongly – to be the most significant to them at that point in time)? E.g. concern about one type of risk is heightened while worry about other risks decreases; lack of experience of climate-related events inhibits adequate responses. [YES = 1; NO = 0]	1	Based on interviews with school officials, there is an acknowledgement of the range of natural and man-made hazards facing the school. They are cognizant of the climate-related hazards.
OVERALL ADAPTIVE CAPACITY INDEX		**9**	**LOW**

5.1 DESCRIPTION OF STRUCTURE

The investigation consisted of a visual review of the exterior and interior elements such as walls, slab, columns and beams as well as a general walk-through to examine the existing cracks and other defects which may exist.

Based on our observations, the buildings are not fully repaired from damage sustained during recent hurricane (Hurricane Maria in 2017). Some parts of the building are still without basic components such as roof, windows, electricity etc. Major rebuilding works will be required - It is reported that the school is to be reconstructed under the Dominica Climate Resilience and Restoration Project.

TABLE 5.3: RESULTS OF BUILDING CONDITION ASSESSMENT (MAY 2019)

	BUILDING 1 & 2	BUILDING 3	BUILDING 4
Number of Storeys per Building:	**2**	**3**	**1**
Floor Type:	**Description:** Reinforced concrete. **Observation:** Floor slab in generally good condition with spalling concrete at some areas.	**Description:** Reinforced concrete. **Observation:** Floor slab in generally good condition with spalling concrete at some areas.	**Description:** Reinforced concrete. **Observation:** Floor slab in generally good condition.
Wall/ Partition Type:	**Description:** Reinforced masonry and timber in fair condition.	**Description:** Reinforced masonry and timber in fair condition.	**Description:** Reinforced masonry and timber in fair condition.
Roof Structure:	**Description:** Structural Steel in generally fair condition.	**Description:** Structural Steel in generally fair condition.	**Description:** Structural Steel in generally poor condition.
Roof Covering:	**Description:** Aluzinc Sheets in generally poor condition.	**Description:** Aluzinc Sheets in generally poor condition.	**Description:** Aluzinc Sheets in generally poor condition.
Repairs/ Retrofitting Conducted:	**None**	**None**	**None**
Is there Disabled Access/ Special Needs Access to the Building?	**None**	**None**	**None**
Approx. Age of Each Building	**More than 40 years**	**More than 40 years**	**More than 40 years**
Building Use	**Classrooms, Toilets**	**Classrooms, Toilets**	**Storage**
Overall Condition	**Fair**	**Fair**	**Poor**

5.1.1 SITE OBSERVATIONS / DISCUSSION

The below presents a summary of the observations made of the physical plant:

EXTERIOR

WALLS
There were some signs of water ingress through the external walls that may be porous, and the affected areas can be corrected by re-plastering of defective areas.

SLAB & BEAMS
Found to be in generally good condition with some isolated areas of spalling concrete.

COLUMNS
Found to be in good condition generally.

INTERIOR

WALLS
Interior walls were of both masonry and timber. Masonry walls were in good condition as were the timber panels.

WINDOWS
Several broken windows were also observed the timely repairs of which will be critical in order to ensure that the building envelope is not compromised during an extreme wind event.

DOORS
Doors were all of timber in conditions varying from good to poor. The problems ranged from termite infestation to broken or missing ironmongery and for which the timely repairs will be critical in order to ensure that the building envelope is not compromised during an extreme wind event.

GENERAL CONDITION

The summary of our 3 main observations is as follows:

- Historically, the issue of water ingress is normally not associated with structural assessments, however in recent times a direct link between water ingress and structural deterioration has been established. Generally, water ingress through inadequate seals around windows are doors as well as wall flashing need to be addressed. Water ingress around windows was identified as the main defect to be addressed.
- There is also the need to repair roof and roof drainage as there are signs of deterioration, crude repairs and in some cases leaks.
- There were some signs of water ingress through the external walls that may be porous and the affected areas can be corrected by re-plastering of defective areas.

Photographs obtained during our inspection are provided in the Appendix.

6. VULNERABILITY ASSESSMENT

The final step in the vulnerability assessment process is to combine the findings of exposure and adaptability to determine how and where the school is vulnerable. It is important to note that the vulnerability assessment does not remain static, it can improve or worsen with time. Changes can occur within the school, such as implementation of preparedness activities, and/or new threats may emerge. These can all influence the school's overall vulnerability.

The Grandbay Primary School has been classified as having an **overall moderate exposure**. The analysis of the adaptive capacity revealed that the school has several barriers and limitations, as such their capacity to adjust to change (induced by the hazards to which they are exposed), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences is **low**. There are additional strategies that the school can employ to improve their adaptive capacity, however these may come at significant cost (presented in Section 8). As the school is government funded, this may further constrain the school's ability to adapt. As such, the Grandbay Primary School can be characterised as having **moderate to high vulnerability**.

7. SUMMARY FINDINGS

Overall, the persons interviewed at Grandbay Primary School had a good understanding of the hazards that need to be addressed at the school as priority, particularly as the school has experienced recent damage (Hurricane Maria in 2017). Our team's assessment suggests that major remediation works are required to attain an appropriate level of safety for the school population, however it is our understanding that the school is slated to be reconstructed under the Dominica Climate Resilience and Restoration Project. Here, our team has outlined key strengths and areas for improvement that relate to operational management and/or other relevant considerations.

Note: The number of students broken down by sex is included in Appendix A.

KEY STRENGTHS:
Grandbay Primary School possesses some of the key elements to ensure quality education for children:

- The school has an up-to-date emergency management plan (EMP) that addresses some of the priority safety hazards. Teachers and staff are all assigned respective roles and responsibilities and have been trained on the plan. Evacuation routes and assembly areas have also been defined in the plan.
- The school was equipped with fully stocked first aid and emergency kits.
- At the time of the assessment, teachers had received some level of training in first aid, fire suppression or emergency response. The Ministry of Education holds workshops for the principals and other staff officials of the schools on preparedness and response.
- While the physical plant of the school was in need of urgent repairs/remediation, there was a clear culture of safety among teachers and staff to manage daily risks given the working environment.
- Safety simulation exercises and drills have recently been conducted at the school.
- In speaking with students, they were aware to report any hazards to teachers/administration.
- The principal maintains a list of repairs to be done and priority issues for safety that is submitted to the District Education Officer of the Ministry of Education.

AREAS FOR IMPROVEMENT:

- The School Safety Plan needs to critically examine information about the student population (such as number of students broken down by age group and sex), as the number, age, and ability of the students can make a significant difference in the event of an emergency.
- At the time of the assessment, all fire extinguishers needed to be serviced and refilled.
- Safety signage around the school was limited.
- Perimeter fence is in need of repairs.
- Lighting in classrooms was insufficient, particularly on overcast/rainy days.
- Access for persons with disabilities (PWD) is limited throughout the school, particularly for those who are wheelchair bound. This is of critical importance as the school is a designated emergency shelter.
- A designated area for storage of chemicals and hazardous materials should be considered. Additionally, debris management/maintenance is an area for improvement.
- Some repairs required to the physical plant to ensure safety before or during a hazard event. For example, in the food preparation area, there were shards of broken glass hanging from the ceiling. One third of the school was closed off to students at the time of this assessment, and portions of the roof were covered in tarpaulin.

FIGURE 7.1: IMAGES SHOWING SAFETY HIGHLIGHTS AT GRANDBAY PRIMARY SCHOOL (MAY 2019)

FIGURE 7.2: IMAGES HIGHLIGHTING POOLING WATER IN RESTROOMS AT GRANDBAY PRIMARY (MAY 2019)



FIGURE 7.3: IMAGES HIGHLIGHTING SECTIONS WHERE PERIMETER FENCE IS NEEDED AT GRANDBAY PRIMARY (MAY 2019)


Section 8 – Improvement Plan and Costed Action Plan provided specific actions and timelines for recommendations on improving the overall safety of the school. Additional selected photographs can be found in the Appendix.

8. IMPROVEMENT PLAN AND COSTED ACTION PLAN

The table below summarizes our opinion of recommended improvements and budgets for capital expenditures (remedial works, repairs, retrofitting) identified by this report. Expenditures that are expected to be managed as part of normal operations are not shown. The budgets assume a prudent level of ongoing maintenance. It should be noted that costs excluded engineering indirect costs. Opinions of cost also excluded any local taxes.

The proposed estimated cost to undertake the remedial work is **One Million, One Hundred and Ten Thousand, Three Hundred Dollars Eastern Caribbean Currency (XCD$1,110,300.00)**.

TABLE 8.1: IMPROVEMENT PLAN AND COSTED ACTION PLAN FOR GRANDBAY PRIMARY SCHOOL (MAY 2019)

RECOMMENDATION	TASK	RESPONSIBLE PARTY	FUNDS REQUIRED	TIMEFRAME SHORT-MEDIUM -LONG TERM	RESULT
Emergency Planning and Management	Erect safety signage around the school premises.	School administration in coordination with Disaster Management Agency(ies) and other relevant entities.		Short	Improved Emergency Planning and Management
	Include in the school safety plan disaggregated date on student population (age, gender) as this will better inform disaster and emergency planning. This can be updated as needed and appended to the plan.	School administration in coordination with Disaster Management Agency(ies) and other relevant entities.		Short	
	Run drills and simulations to sensitize teachers and students.	School administration in coordination with Disaster Management Agency(ies) and other relevant entities.		Short	
	Complete Emergency First Response (EFR) or First Aid Training for all teachers and staff.	School administration in coordination with Disaster Management Agency(ies) and other relevant entities.		Short	

TABLE 8.1: IMPROVEMENT PLAN AND COSTED ACTION PLAN FOR GRANDBAY PRIMARY SCHOOL (MAY 2019)

RECOMMENDATION	TASK	RESPONSIBLE PARTY	FUNDS REQUIRED	TIMEFRAME SHORT-MEDIUM -LONG TERM	RESULT
Sustainability and Greening	Create an environmental club for students to lead on the development of various activities/initiatives aimed at "greening" the school i.e. increasing environmental sustainability through awareness and action.	Principal and/or Safety Committee.		Short	Increased awareness and sensitization.
On-site drainage of water (rainwater, wastewater from sinks, etc.) needs to be addressed	Upgrade of storm drains to include additional flood protection from adjacent existing waterway.	Ministry of Education in collaboration with Department of Works.	XCD$40,000	Medium	Improved drainage
Other Infrastructural upgrades	Repair roof covering, ceiling and roof drains with current Building Code Standards.	Ministry of Education in collaboration with Department of Works. *some smaller projects can be undertaken by school/community/ private organization as a special project.	XCD$262,500	Medium	Increased building resilience; improved school plant.
	Upgrade toilet block to include renewal of septic and soak-away.		XCD$165,400	Long	
	Upgrade of doors and windows to hurricane resistant standards.		XCD$240,000	Medium - Long	
	Construct new water storage.		XCD$84,000	Medium - Long	
	Repairs to electrical wiring complete with new fixtures.		XCD$120,000	Medium	
	Painting to affected areas.		XCD$72,200	Short	
	Repair defective or damaged external and internal walls and slabs.		XCD$76,400	Medium	
	Repair perimeter fence.		Quotations to be solicited by the Ministry of Education and other relevant Ministries /agencies.	Medium	

TABLE 8.1: IMPROVEMENT PLAN AND COSTED ACTION PLAN FOR GRANDBAY PRIMARY SCHOOL (MAY 2019)

RECOMMENDATION	TASK	RESPONSIBLE PARTY	FUNDS REQUIRED	TIMEFRAME SHORT-MEDIUM -LONG TERM	RESULT
General Safety and Security	■ Review contractual obligations of current security service providers – particularly performance clauses ■ Explore options for other service providers by issuing a new request for proposal	Ministry of Education.	Quotations to be solicited by the Ministry of Education and other relevant Ministries /agencies.	Medium Term	Improved safety and security.
	Contingency		XCD$50,000		

NOTE:
The recommended actions should commence in the following time periods:
Short term= 1-3 yrs; Medium term= 3-5 yrs; Long term= > 5 yrs

9. REFERENCES

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10. APPENDICES

APPENDIX A: MSSP ASSESSMENT TOOLKIT RESULTS

GENERAL INFORMATION

TABLE 10.1: VITAL INFORMATION FOR SCHOOL SAFETY

NAME OF SCHOOL	GRANDBAY PRIMARY SCHOOL
Type of school (Pre-school, Primary, Secondary, Tertiary)	**PRIMARY**
Is facility private and public?	**PUBLIC**
Location	**GRANDBAY**
Name of Head Teacher or Principal	**CHARLENE WHITE-CHRISTIAN**
Telephone	**(767) 266-3262**
Email	**-**
Year building(s) constructed	**1971**
Buildings contained on the school compound	**4**
Number of classrooms	**-**
Total school population	**257**
Students	**226**
Teachers	**26**
Non-teaching Staff	**4 Cooks, 1 Watchman**
Number of first aid kits available	**1**
Number of fire extinguishers throughout the buildings?	**3**
Natural disaster in the past	**YES**
The type of event and the time it occur	**HURRICANE - September 2017. Damage to roof, windows and doors.**
Repairs as a result of the event	**NO**
School designated as an emergency shelter	**NO**

OVERALL SCORES

TABLE 10.2: SCHOOL SAFETY ASSESSMENT SUMMARY		
CHECKLIST	SCORE (%)	CRITICAL STANDARDS MET
Safety	49%	NO
Green	20%	NO

The above scoring is calculated based on the questions and Critical Standards applying to secondary schools only.

SAFETY ASSESSMENT SCORES

TABLE 10.3: SAFETY ASSESSMENT SUMMARY SCORES		
SAFETY THEME	SCORE (%)	CRITICAL STANDARDS MET
Disaster Planning	79%	YES
Emergency Planning	53%	NO
Safety Admin	42%	
Medical Emergencies	50%	NO
Physical Plant	43%	NO
Physical Safety	49%	
Protection of the Person	15%	
Hazardous chemicals and materials	0%	NO

GREEN ASSESSMENT SCORES

TABLE 10.4: GREEN ASSESSMENT SUMMARY SCORES		
SAFETY THEME	SCORE (%)	CRITICAL STANDARDS MET
Sustainability Management	0%	NO
Natural Resources	19%	NO
Indoor Environment	11%	NO
Hazardous Chemicals and Materials	11%	NO
Facility and Grounds Management	30%	NO
Food Service	86%	YES

APPENDIX B: SELECTED PHOTOGRAPHS

STRUCTURAL STEEL FRAME BUILDING IN REASONABLY GOOD CONDITION

STRUCTURAL STEEL FRAME BUILDING IN REASONABLY GOOD CONDITION

STRUCTURAL STEEL FRAME BUILDING IN REASONABLY GOOD CONDITION

STRUCTURAL STEEL FRAME BUILDING IN REASONABLY GOOD CONDITION

VENT BLOCKS AROUND MAIN ENTRANCE

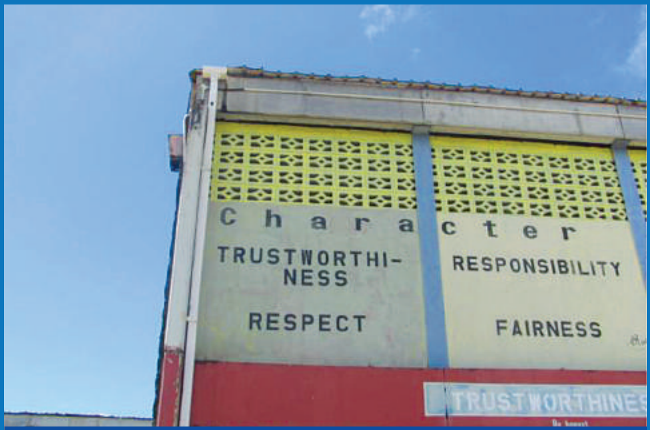
FRONT FAÇADE OF BUILDING

FRONT FAÇADE
OF BUILDING

FRONT FAÇADE
OF BUILDING

FRONT FAÇADE
OF BUILDING

DETACHED BUILDING
USED AS STOREROOM



ROOF DRAINS DESTROYED
BY HURRICANE, MARIA IN 2017

SOLID GABLE END
STONEWALL

- SOLID GABLE END STONEWALL

- SOLID GABLE END STONEWALL

- SOLID GABLE END STONEWALL

- BUILDING WHOSE EXTERNAL WALL FAILED UNDER HURRICANE FORCE WINDS

- RECREATIONAL AREA

- SECTION OF SCHOOL NOT IN USE DUE TO HURRICANE DAMAGE TO ROOF AND WINDOWS

SECTION OF SCHOOL NOT IN USE DUE TO HURRICANE DAMAGE

EXPOSED CORRODED STEEL REINFORCEMENT IN FLOOR SLAB

DRINKING TROUGH

STORM DRAINS

STORM DRAINS

STORM DRAINS

■ CORRODED STRUCTURAL STEEL MEMBERS

■ CORRODED STRUCTURAL STEEL MEMBERS

■ CORRODED STRUCTURAL STEEL MEMBERS

■ CORRODED STRUCTURAL STEEL MEMBERS

■ CORRODED STRUCTURAL STEEL MEMBERS

■ VIEW OF MULTI-LEVEL, COVERED, ENCLOSED LINK-BRIDGE BETWEEN CLASSROOM BLOCKS

DIFFERENT WINDOW TYPES WITH BURGLAR BARS

REAR ELEVATION OF BUILDING

DAMAGED WINDOWS

DAMAGED ROOF

SECONDARY ACCESS GATE

CRACKS IN STONE MASONRY WALL

CRACKS IN
STONE MASONRY WALL

MAIN ENTRANCE
TO SCHOOL COMPOUND

MAIN ENTRANCE
TO SCHOOL COMPOUND

MAIN ENTRANCE
TO SCHOOL COMPOUND

Please note that the photographs are not an illustration of all defects at the property.
They are to give you guidance on its general condition. The photographs should not be viewed in isolation.

Please note that there may be some defects in the photographs which are not referred to in the main text.

APPENDIX C: NSSPC - DOMINICA

COUNTRY: DOMINICA						
#	**FIRST NAME**	**LAST NAME**	**GENDER**	**JOB TITLE**	**ORGANIZATION**	**CONTACT EMAIL**
EG.	Jane	Doe	Female	Education Officer - South Division	Ministry of Education	jane.doe@moe.eg.org
1	Melina	Fontaine	Female	Current Education Officer (CEO)	MOE	chiefeduoff @education.gov.dm
2	Dr. Jeffery	Blaize	Male	ACEO	MOE	blaizej@yahoo.com
3	David	Maximea	Male	DEO	MOE	earl31@hotmail.com
4	Cynthia	Joseph	Female	DEO	MOE	ceanjayy@gmail.com
5	Queen	Thomas	Female	DEO	MOE	felixia21@gmail.com
6	Magaret	Jules Royer	Female	DEO	MOE	margoroyer2007 @hotmail.com
7	Octavia	Timothy	Female	Coordinator/ Special Education	MOE	octimj98@gmail.com
8	Mervin	Alexander	Male	President DAT	DAT	-
9	Dionne	Durand Smith	Female	Communication Specialist	MOE	dionnedurand @gmail.com
10	Veda	George	Female	Coordinator Early Childhood	MOE	coordinatorecd @dominica.gov.dm
11	Donaldson	Frederick	Male	ODM	-	donalsonfrederick @gmail.com
12	Andy	Prosper	Male	Engineer	Public Works	andpros@hotmaill.com
13	Natalie	Murphy	Female	President	Dominica Association of Persons with Disability	-
14	Sawana	Fabien	Female	Program Director	IsraAid	sfabien@israaid.org

APPENDIX D: ORGANISATIONS CONSULTED

Organizations consulted:

- Ministry of Education
- Physical Planning Division
- Ministry of Public Works
- Principals
- National Safe School Committee
- Isra-Aid
- Early Childhood Unit
- Special Education Unit
- Dominica Association of Local Govt
- Engineers Without Borders
- Office of Disaster Management (ODM)
- Climate Resilience Execution Agency for Dominica (CREAD)