

Community Profile
and Livelihood
Baseline Assessment

Colonaire

St. Vincent and the Grenadines



Acknowledgements

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The success of this community profile and Livelihood Baseline Assessment (LBA) can only be attributed to the many individuals who contributed their valuable input toward the preparation of the document. Many thanks also to the residents as primary stakeholders within the community of Colonaire for their support, encouragement, and constructive criticisms in making this profile a success. Also, the community leaders who participated in the focus group discussion and accompanied the facilitators are the engagement the wider community in discussions across various locations.

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Executive Summary

Pre-disaster information is always a key resource in post disaster response (which includes post disaster assessments). When disaster strikes, it is critical to know how many people are likely to have been affected by the event and how. This requires knowledge of the demographic breakdown of the population and the vulnerability of different people to the disaster. Vulnerability will determine how badly they will be affected, how quickly they can be expected to recover and what kinds of assistance they are likely to need.

In many instances however, pre-disaster planning focuses on immediate response and action to protect human life and infrastructure, but without giving sufficient attention to damage and loss to livelihoods. Yet in the post-disaster period, if people are to recover, they need to restore their livelihoods as quickly as possible. This can only happen if detailed and quantitative information has been collected in advance of potential disasters so that livelihood based contingency plans, can be created and planned for.

In 2019, the Livelihood Based Assessment and Contingency Planning approach was applied in St. Vincent and the Grenadines to provide pre-disaster livelihood information for eleven communities involved in the Volcano Ready Communities in St. Vincent and the Grenadines (VRCin SVG) project.

This assessment was conducted to gain an understanding of the various livelihoods in the town of Colonaire.

Colonaire is a small and relatively dense rural community in the Parish of Charlotte. It is located on the north eastern side of the island of St. Vincent and the Grenadines at coordinates 13°14'N 061°07'W. It stands on the banks of the Colonaire River and is five (5) kilometres south of nearby town Georgetown. It is approximately 16 miles away from the capital of Kingstown and the estimated terrain elevation above sea level is -9999 metres. “Top Village”, “Bottom Village”, “Friendly Village” and “Long Stretch” are the subdivisions of Colonaire. To date, the correct pronunciation of the village’s name, continues to be a debate in many circles.

The data in this document provides a solid ‘before’ picture of normal livelihood patterns that are most at risk for disasters. In this report there is information on the most common livelihoods in Colonaire and the required skills and equipment to carry out the various activities involved in these livelihoods. There are also seasonal calendars which identify when these activities are carried out and how hazards affect the livelihood outputs.

According to the Population and Housing Census completed in 2012, the total population of the Colonaire census division was 6,849 persons, of which 3494 persons were male and 3355 females. The population density of the division was 511 persons per square mile. The town of Colonaire and Friendly Village combined have a total number of 354 households and a total population 1074, of which 535 persons were Male and 539 Female. The average household size of the division is 3.2 persons. The socio-demographic overview of the community is presented in Chapter 3 while Chapter 4 provides an overview of the governance structure of the community.

Chapter 5 highlights levels of employment and the occupational groups in the Colonaire Census Division, as an indication of the economic profile of the community. Chapters 1 through 5 form the Community Profile for the village of Colonaire.

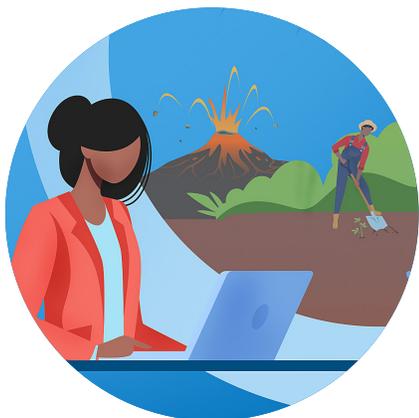
Chapter 6 is a profile of the main hazards that impact the community most directly while Chapter 7 outlines the impact of the April 2021 volcanic eruption.

In Chapter 8, the outcome of the Livelihood Baseline Assessment is detailed and includes a profile of community livelihoods and resources. The focus is primarily on agricultural livelihoods. Chapter 9 looks at the type of coping strategies that are employed to deal with hazard impacts on agricultural livelihoods.

Chapter 10 outlines the key response typologies and contingency measures that should be put in place in the event of any disaster.

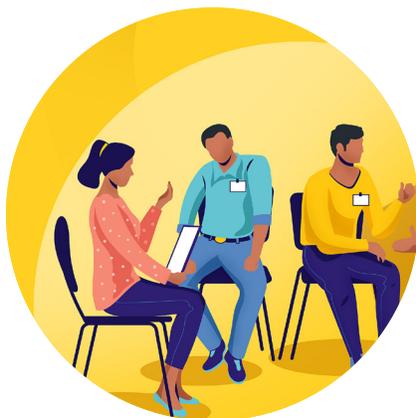
The Annexes present the damage and loss cost estimates for the agricultural assets, should a disaster occur, as well as the sources of information that were consulted.

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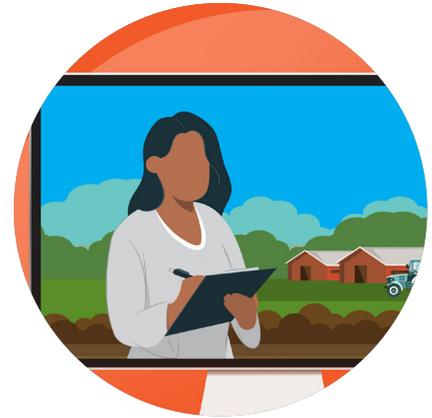
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Acronyms

BMC	Borrowing Member Countries
BVI	British Virgin Islands
CARDI	Caribbean Agricultural Research & Development Institute
CARIFORUM	Caribbean Forum
CBO	Community Based Organisation
CC	Climate Change
CCA	Climate Change Adaptation
CCR	Community Climate Resilience
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CCRS	Community Climate Resilience Specialist
CCVA	Community Climate Vulnerability Assessment
CD	Census Division
CDO	Community Development Organisation
CDB	Caribbean Development Bank
CDERA	Caribbean Disaster Emergency Response Agency
GDP	Gross Domestic Product
CDRRF	Community Disaster Risk Reduction Fund
CDS	Community Development Specialist (CDRRF)
CDS	Community Development Supervisor (SVG)
CES	Community Engagement Survey
CEWS	Community Early Warning System
CHARIM	Caribbean Handbook on Risk Information Management
CP	Community Profile
CPA	Country Poverty Assessment
CS	Climate Smart
CVA	Climate Vulnerability Assessment
CWSA	Central Water and Sewerage Authority
DDC	District Disaster Committees
DaLA	Damage and Loss Assessment
DLA	Detailed Livelihood Assessment
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
ECLAC	Economic Commission for Latin America and the Caribbean
ED	Enumeration Division
EU	European Union
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
GAD	Gender Affairs Division
GBV	Gender Based Violence
GEF	Global Environmental Fund
GIS	Geographic Information System
GOSVG	Government of St. Vincent and the Grenadines

GPS	Global Positioning System
HH	Household
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IICA	International Institute for Cooperation on Agriculture
ILIA	Initial Livelihood Impact Assessment
ILO	International Labor Organization
IWCAM	Integrated Watersheds and Coastal Areas Management project
J-CCCP	Japan-Caribbean Climate Change Program
LAS	Livelihood Assessment Specialist
LAT	Livelihood Assessment Toolkit
LBA	Livelihood Baseline Assessment
LGBTQ	Lesbian, Gay, Bi-Sexual, Trans, Queer
LPG	Liquified Petroleum Gas
M&E	Monitoring and Evaluation
MMI	Modified Mercalli Intensity
MoA	Ministry of Agriculture
MoNM	Ministry of National Mobilisation
NDVI	National Difference Vegetation Index
NEMO	National Emergency Management Organization
NGO	Non-Governmental Organization
NVEP	National Volcanic Emergency Plan
OECS	Organisation of Eastern Caribbean States
PAD	Project Appraisal Document
PM	Project Manager
PVC	Polyvinyl Chloride
RC	Red Cross
RCCVA	Rapid Community Climate Vulnerability Assessment
RDVRP	Regional Disaster Vulnerability and Reduction Project
RR	Risk Reduction
SAP	Social Assistance Programme
SD	Sustainable Development
SDC	Social Development Commission
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
SMART	Specific, Measurable, Achievable, Realistic, Time-bound
SRC	Seismic Research Centre
STREVA	Strengthening Resilience in Volcanic Areas
SVG	St. Vincent and the Grenadines
UN	United Nations
UNFPA	United Nations Population Fund
UNISR	United Nations Office for Disaster Risk Reduction
UWI	University of the West Indies
VCA	Vulnerability and Capacity Assessment
VINLEC	St. Vincent Electricity Company
VRCinSVG	Volcano Ready Communities in St. Vincent and the Grenadines
VRCP	Volcano Ready Communities Project
WAD	Women's Affairs Division

1 Introduction



1.1 THE NEED FOR A LIVELIHOOD BASELINE AND CONTINGENCY PLAN

Pre-disaster information is always a key resource in post disaster response (which includes post disaster assessments). When disaster strikes, it is critical to know how many people are likely to have been affected and how. This requires knowledge of the demographic breakdown of the population and the vulnerability of different people to the disaster. Vulnerability will determine how badly they will be affected, how quickly they can be expected to recover and what kinds of assistance they are likely to need.

In many instances however, pre-disaster planning focuses on immediate response and action to protect human life and infrastructure, but without giving sufficient attention to damage and loss to livelihoods. Yet in the post-disaster period, if people are to recover, they need to restore their livelihoods as quickly as possible. This can only happen if detailed and quantitative information has been collected in advance of potential disasters so that livelihood based contingency plans, can be created and planned for.

In 2019, the Community Disaster Risk Reduction Fund (CDRRF) of the Caribbean Development Bank (CDB) partnered with the Food and Agriculture Organization of the United Nations (FAO) to introduce Borrowing Member Countries (BMC) in the region to the Livelihood Baseline Assessment (LBA) process which was pioneered by FAO and the International Labour Organisation (ILO).

The Livelihood Assessment Tool-kit¹ provides well-defined guidelines for the preparation of baselines that can be used to:

- analyse and respond to the impacts of disasters on the livelihoods;
- develop and update contingency plans.

¹ *The Livelihood Assessment Tool-kit* was published by the Food and Agriculture Organisation of the United Nations and the International Labour Organisation in April 2009.

In March 2019, a one-week training and capacity building session was held in Belize and introduced persons from Belize, British Virgin Islands, Jamaica and St. Vincent and the Grenadines on the use of the LBA methodology for their own planning purposes.

1.2 OBJECTIVES OF THE LBA PROCESS

The objectives of the LBA approach are:

- a) To make it possible for countries to compare the livelihood context and activities for residents in the communities and local economies before and after a disaster
- b) To establish a robust basis for making estimates of the impact of disasters on livelihoods, in particular vulnerable groups, that can feed into various appeals for aid required for reconstruction and rehabilitation of the sector(s) affected.
- c) To provide a reliable basis for immediate post-disaster assessments including the initial Livelihood Impact Appraisal (Volume 3 of the Toolkit) and the more in-depth detailed Livelihood Assessment of the impact of disasters on livelihoods and identify opportunities and recovery capacities at the local, community and household levels (Volume 4).

1.3 THE LBA PROCESS IN ST. VINCENT & THE GRENADINES

Following the February 2019 capacity building, a total of eleven (11) Community Profiles and Livelihood Assessment reports were prepared in St. Vincent & the Grenadines. These communities included:

1. Colonaire
2. Chateaubelair
3. Rose Hall
4. Fitz Hughes
5. Fancy
6. Owia

7. Magum and Overland
8. Park Hill
9. Sandy Bay
10. South Rivers and
11. Spring Village

This report presents the findings that resulted from the Livelihood Baseline Assessment (LBA) and Community Profile (CP) process that was conducted for the community of **Colonaire**, St. Vincent & the Grenadines.



2 Methodology



The Community Profile (CP) and Livelihood Baseline Assessment (LBA) for Colonaire was compiled in October 2019 using both qualitative and quantitative data collection methods. For the community profile sections, data were gathered from government reports and datasets made available to the public.

The LBA component was compiled using the Livelihood Assessment Toolkit developed by the International Labour Organisation (ILO) and the Food and Agriculture Organization of the United Nations (FAO) and which provided guidelines on documenting the existing vulnerabilities of each community, the main livelihood activities, the projected impact of various hazards on livelihoods and contingency planning. Community representatives and external stakeholders also provided reviews and validation of the information presented in the document.



2.1 PRIMARY SOURCES

Field work for the livelihood assessment was conducted in October 2019 and included a focus group discussion, a transect walk for field observations and a livelihood baseline survey. Responses from focus group discussion were used to generate the following tools:

- Livelihood profile
- Hazard calendar
- Seasonal calendar
- Coping Strategies Inventory
- Response Typology Matrix

Data were collected during the hours of 8:00 a.m. and 4:00 p.m. October 1st, 2019 using a convenience sample of residents of the community. Twenty-four persons participated in the survey in Colonaire. Data were collected and analysed using the Kobo Toolbox² application. Responses from the livelihood baseline assessment survey were analysed and presented separately.

Data from a Community Engagement Survey (CES) conducted in Colonaire in 2018 which utilized a sample size of 50 residents was also used to triangulate the findings from the LBA and CP exercise. This data was collected and analysed utilizing Excel and SPSS.



2.2 SECONDARY SOURCES

Secondary data were reviewed in order to provide the environmental, social and economic context of the community. Sources reviewed included the 2012 Population and Housing Census, 2007/2008 Survey of Living Conditions and Hazards maps provided by the National Emergency Management Organisation (NEMO) and the Physical Planning Unit.

Additionally, qualitative information was also obtained from both the preliminary Rapid Community Climate Vulnerability Assessment (RCCVA) that was conducted in 2016 and the detailed RCCVA that was completed in 2020.

² Kobo Toolbox is a free open-source tool for mobile data collection. It allows users to collect data in the field using mobile devices such as mobile phones or tablets, as well as with paper or computers.

It allows for faster data collection because data does not need to be transcribed from paper to computers before it can be analysed. Some analyses can be applied within minutes of the data being collected. It is more accurate. Enumeration errors are minimised because of the data validation that can occur in real time as data is collected. Transcription errors are entirely eliminated. It is optimised for humanitarian work. It also works offline and is easy to use (requires no technical knowledge to manage and enumerators can be trained within minutes. If all else fails, paper forms can be used as a backup and integrated with other data. (Source: https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/unhcr_kobo_guidelines_may2016.pdf)

3 Description of the Community



3.1 LOCATIONAL DATA

Colonaire is a small and relatively dense rural community in the Parish of Charlotte. It is located on the north eastern side of the island of St. Vincent and the Grenadines at coordinates 13°14'N 061°07'W. It stands on the banks of the Colonaire River and is five (5) kilometres south of nearby town Georgetown. “Top Village”, “Bottom Village”, “Friendly Village” and “Long Stretch” are the subdivisions of Colonaire. To date, the correct pronunciation of the village’s name, continue to be a debate in many circles.

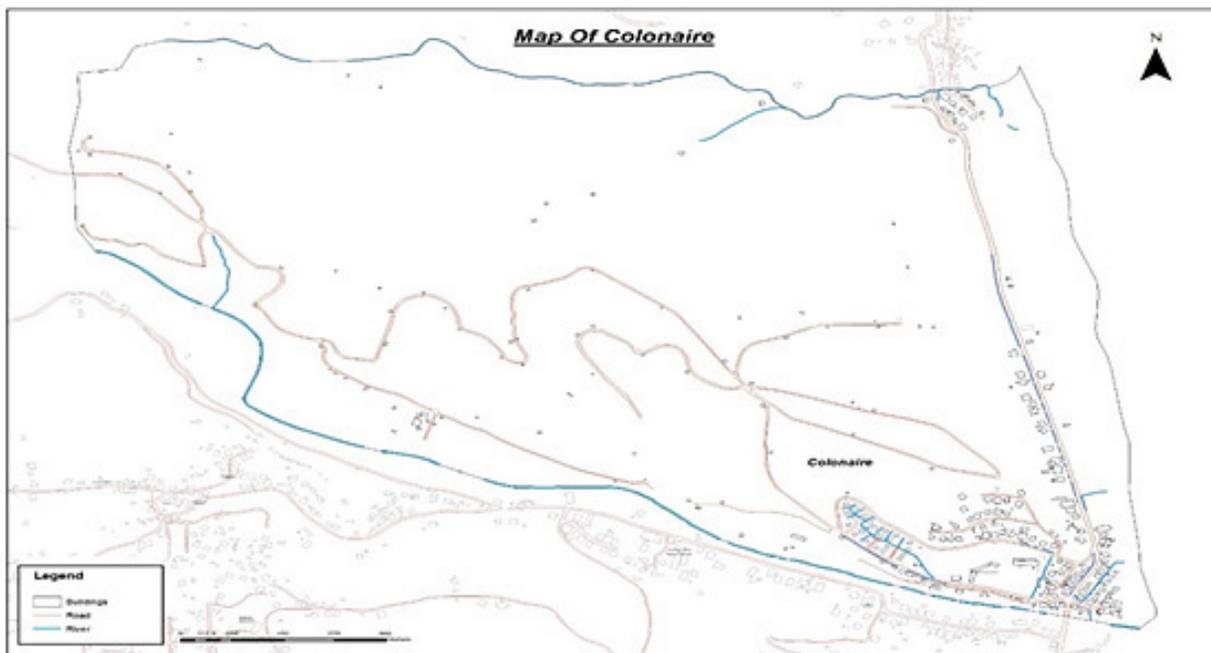
Charlotte is the largest parish in Saint Vincent and the Grenadines situated on the eastern coast of the island of Saint Vincent. With an area of 149 km², its size is comparable to that of the British Virgin Islands. The parish has the longest coastline of all the parishes and is also larger than the three smallest parishes combined. The parish possesses a very rough and rugged topography with very little flat lands along the coast. Colonaire is one of over 20 main communities which comprise the Parish of Charlotte and one of six

in the North Central Windward Constituency. Colonaire is part of Census Division Number 06 which extends from Grand Bonhomme along the Main Ridge Hill 3404, then along the eastern spur (and along Mt. William Estate northern boundary) to Byrea Ridge on the Windward highway and along the stream to the sea.

Colonaire is distinguished by its two hills and low-lying areas along the Atlantic Ocean.

Its environmental conditions provide livelihood opportunities for its residents as majority of the families within the community are actively involved in farming. Bananas, vegetables and ground provisions are among the crops planted by majority of the farmers. Additionally, men practice spear fishing in the Atlantic Ocean as a means of providing for themselves and their families. The seasonal catching of “tri tri” (*Sicydium punctatum*) provide substantial income for residents especially women in Colonaire and nearby surrounding communities.

Figure 1: Community Map Chateaubelair (Source: GIS Unit, Physical Planning Division, Ministry of Transportation, Works, Lands and Physical Planning, Kingstown)



Whereas the majority of the residents occupy the hilly terrain, there is still a considerable number of individuals living along the coastline. This is also where a majority of the businesses are located which make both the residents and investors exposed to the risks of high winds and flooding due to sea surges/strong waves. Despite the vulnerability of the location, there has been a considerable increase in the number of persons from neighbouring communities relocating to Colonaire. This may be due to government's relocation programme and providing access to affordable land for sale to locals.

3.2 HISTORY/HISTORICAL DEVELOPMENT

Colonaire is located in the parish of Charlotte which is bounded on the south by St. George's and northerly by uncultivable lands. It contains 11,849 acres in cultivation, and that part of it called the Carib country, which was only partially settled in 1804, is the most productive in the island. The southern part consists of a portion of General Monckton's grant of 4,000 acres, which he sold for £30,000, and which was subsequently sold in lots by the speculators.

This parish is very well supplied with rivers, notwithstanding the fact that several were absorbed at the time of the 1979 eruption of the Soufriere Volcano. All of the mills are powered by water; and the estates are generally larger than in the other parishes.

In 1813, a tunnel of 200 feet long was cut through Mount Young, which greatly improved the means of communication within the newly settled country. Another work effort was afterwards undertaken by the owner of Grand Sable Estate in cutting another tunnel through the same mountain lower down and nearer to the sea for the convenience of shipping the produce. The material to be perforated proved to be solid rock instead of hard soil (light brown) as was expected. As a consequence, 360 feet of tunnel had to be blasted by drilling into solid rock at a cost of about £5,000.

3.3 NATURE OF COMMUNITY (CULTURE, TRADITIONS)

Colonaire is the birthplace of Mrs. Susan Dougan (nee Ryan), the first female Governor General of St. Vincent and the Grenades who was born on March 3, 1955 to Walden and Dorothy Ryan. Colonaire is also the home of Honorable Dr. Ralph E. Gonsalves, current Prime Minister of St. Vincent and the Grenadines. The name Colonaire was derived from the Colonaire Estate which was known for its rich vegetation which included sugar cane, banana and cotton. In the post-independence era, this community remained a major source of employment for residents from the adjoining communities and parishes. Mr. Basil Balcombe, who acquitted ownership of several estates including Sans Souci and Colonaire, later became the wealthiest man in St. Vincent.

The abandoned Colonaire Police Station (Figure 2) was a barracks that was utilized in colonial era for over a century. The roof of the middle section of the structure was made of timber and galvanized roofing is now nonexistent. The middle section was modernly designed compared to the two other wings (barracks) which were constructed of stone perimeter walls and a barrel concrete roof. Up to mid-2000, prisoners were kept in these barracks awaiting trial. The Colonaire District Magistrate Court and Postal service were also dispensed from this location.

Seventy (70%) of the inhabitants of St. Vincent are descendants from Africa who were enslaved and brought to work on sugar plantations. Another roughly 25% is of mixed African, European, and Carib ancestry. A mixture of all these groups of people is evident within the community of Colonaire with the African ancestry being the most dominant.

English is the official language, however, an English patois is commonly spoken and referred in some academic quarters as the "national language". Patois is English that incorporates some of the words and language codes used by the original African slaves who were suppressed and not allowed to speak their own

Figure 2: Colonial era barracks



traditional languages. , As a result, Patois is a mixture of both English and African words. For example, in English one would say “come here”. In Patois, one says “cum yah”.

Colonaire is the home for the longest stretch of black sand beach on the island sharing it with neighbouring community Byrea. This beach is a haven for turtle egg laying. There is also a prominent tourist photo shot opportunity at Chester Cottage of the stretch of beach (Figure1-3). Chester Cottage is approximately 1 mile north of South Rivers. On November 26th 2016, His Royal Highness Prince Henry of Wales unveiled a monument declaring the Colonaire/Byera beach as a protected turtle nesting habitat.

Figure 3: Colonaire/Byrea Beach (Source: Sam’s Taxi Tours. Photo taken from Chester Cottage guard rail)



Figure 4: Monument of Colonaire /Byera beach turtle nesting habitat.



The Colonaire River is one of the longest watercourses in St. Vincent and the Grenadines flowing from Grande Bonhomme from the central east coast into the Atlantic Ocean. The St. Vincent Electricity Company (VINLEC) harnesses water from this river to power one of its two (2) hydro power plant located in South Rivers. Lands along the upper river course are currently used for nature conservation and research. These areas are considered a forest reserve in St. Vincent and there is no human settlement on the proposed site. Figure 5 shows all of the rivers on mainland St. Vincent.

The natural resources found within all of the communities on mainland St. Vincent are in some way or the other linked to the watersheds they are located in. A watershed is defined as the land area that drains to a stream, wetland, lake or sea. It is the sloping land area over which water from rainfall flows downhill to the coast. On mainland St. Vincent, there are sixteen (16) watersheds (Figure 7) with forests that protect them. These forests are important to protecting terrestrial biodiversity and marine biodiversity through reduced soil erosion. Four (4) of these watersheds are considered to be the key ones as a result of the contribution they make to the socio-economic development of the country (see Figure 8).

Figure 5: Rivers in St. Vincent Saint Vincent (Source: GEF-IWCAM Proposal, No Date)

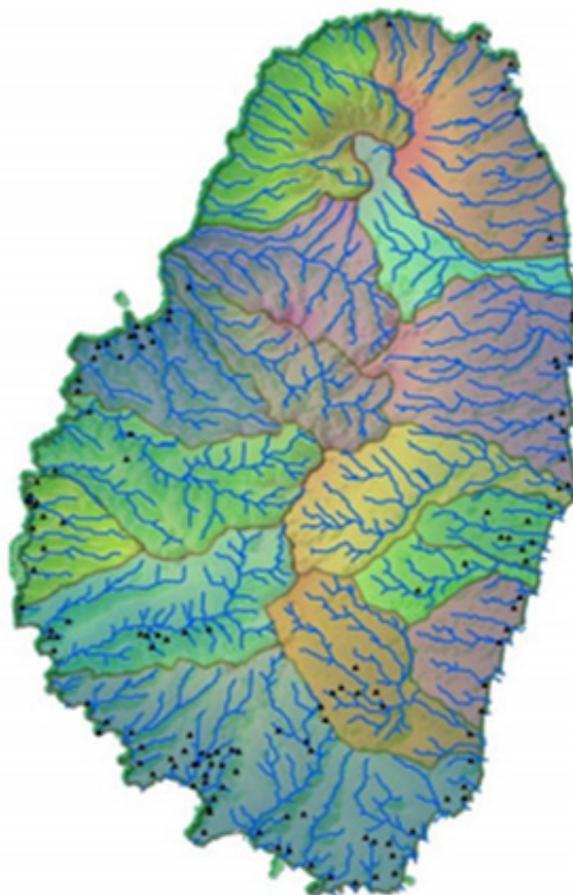


Figure 6: Vincent Topographic Map (Source: SPCR Proposal, 2011)

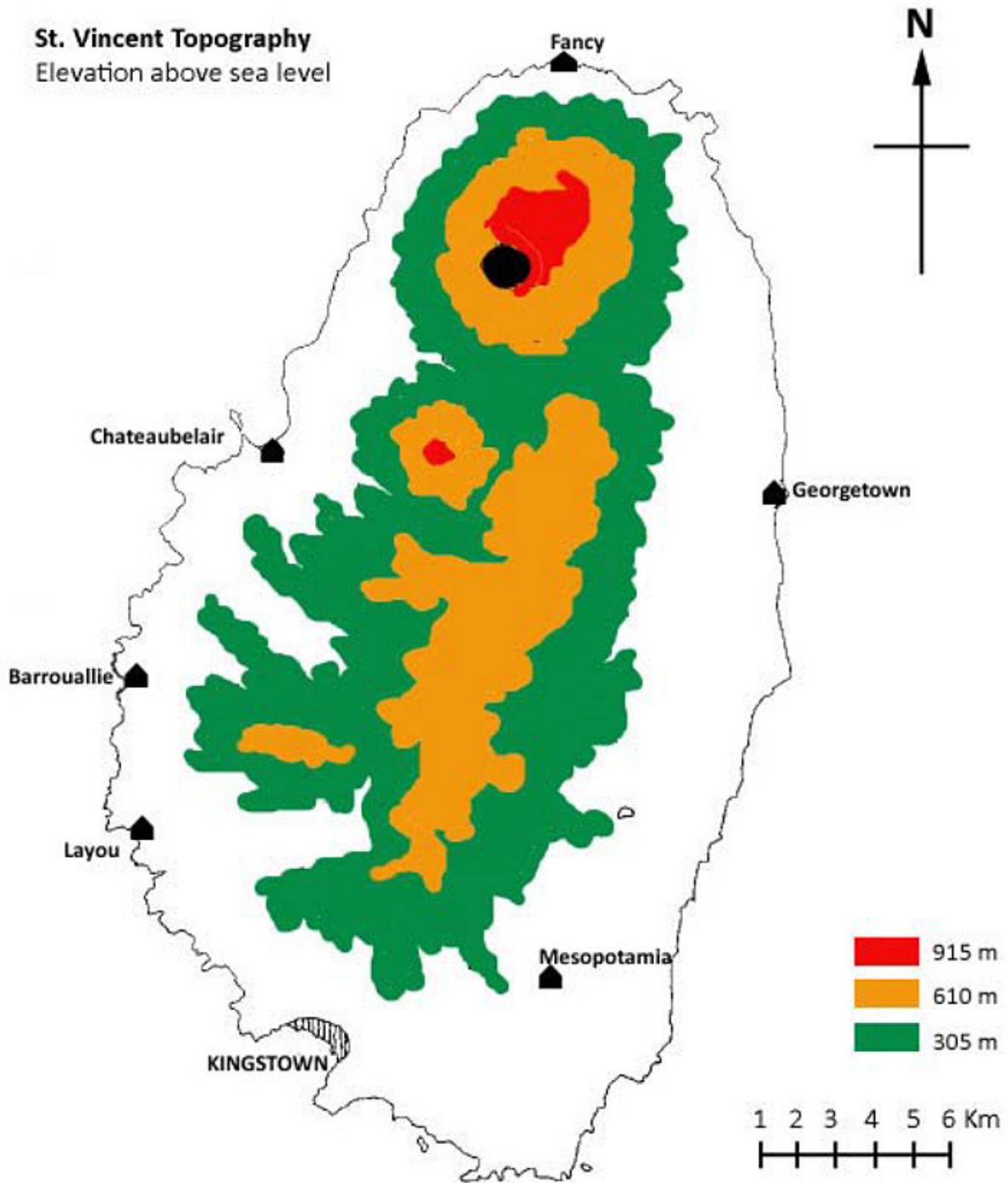
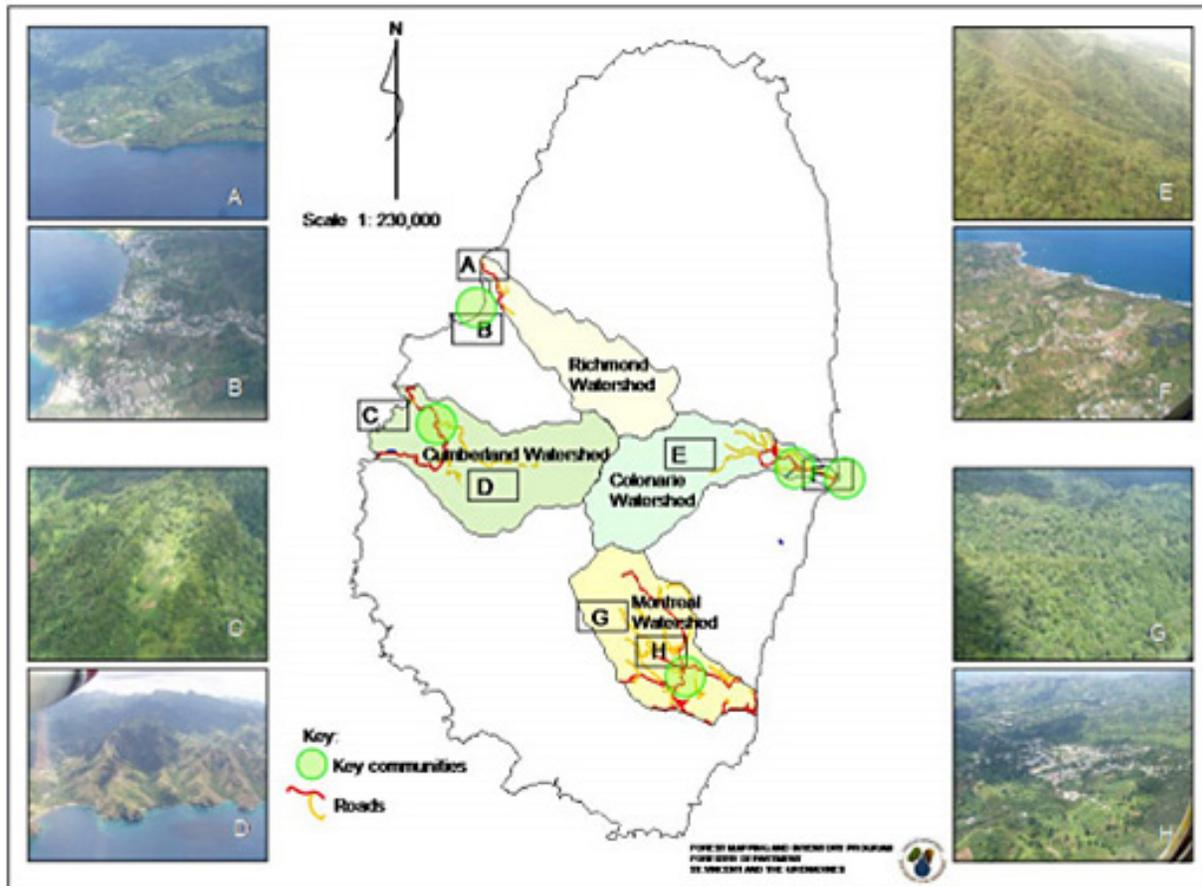


Figure 7: The Sixteen (16) Watersheds of Saint Vincent (Source: GEF-IWCAM, No Date).



Figure 8: Key watersheds and communities in St. Vincent (Source: Forestry Dept. 2005).



These key watersheds provide 120,000,000 cu.m/yr. of the country’s total surface water to meet the varying demands (see Table 1).

Table 1: Water Statistics for SVG (Source: FAO 2005, GOSVG 2002)

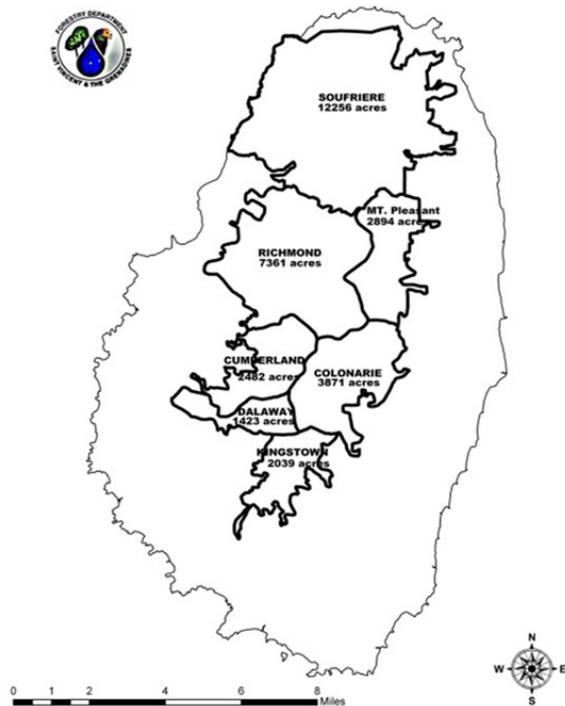
	M ³
Total surface water	120,000,000
Storage capacity	5,000,000
Consumption patterns	
Government institutions	1,600,000
Domestic	5,300,000
Unaccounted for water	1,800,000
Leakages	500,000

Most of the watersheds on St. Vincent run from the centre of the island all the way to the coast and provide 100% of the water supply to the mainland to support livelihoods and provide habitat for flora and fauna. The flora found in these watersheds include “coconuts breadfruit, bananas and aroids for food, forest species provide homes for birds and other wildlife; others provide stabilization to the land, are used for traditional medicines, fuel, ornamentals, craft and construction purposes” (Lennie. D. Adams 2013).

The fauna found in these watersheds include “birds (whistling warblers, parrots, black hawks swift and wren), reptiles (black snakes, lizards and Congo snakes). Others like pigs, cattle, small ruminants, fowls are domesticated and iguanas, tattoo, crustaceans and

mullets are hunted and harvested for food (Lennie. D. Adams 2013). The specific numbers of flora and fauna that has been identified on St. Vincent are as follows “more than 1,150 species of flowering plants, 163 species of ferns, 4 species of amphibians, 16 species of reptiles, 111 species of birds, and 15 species of mammals” (Draft SPCR SVG 2011).

Figure 9: Protected Areas on Mainland St. Vincent
(Source: GEF-IWCAM, No Date).



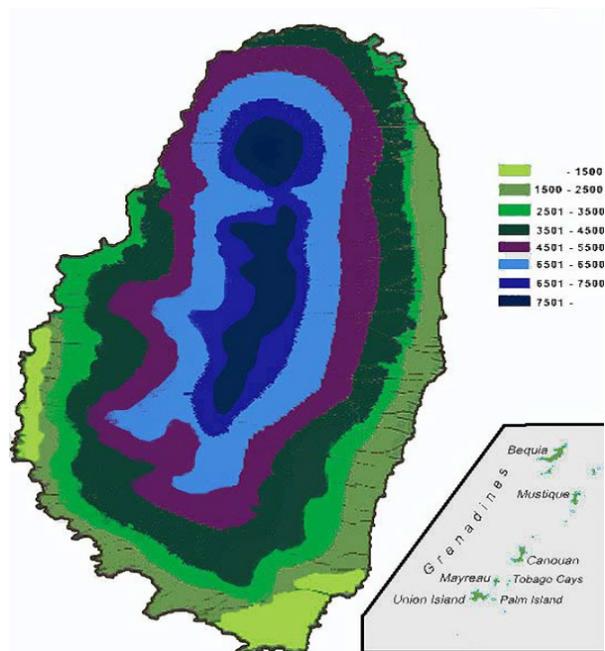
Watersheds are therefore very important to the health and well-being of Vincentians. Three (3) of the main areas in a watershed are the streams and lakes, land and coasts. The free fresh water they provide is used to sustain several sectors in St. Vincent and the Grenadines, such as, Water, Tourism, Health, Agriculture, Fisheries, Energy, and Critical Infrastructure. In 2015, data from the CWSA revealed that the average annual rainfall across the mainland was 2063 mm with the Grenadines recording 589 mm. Figure 10 presents the rainfall map for the island. Two thirds or 70% of that rainfall occurs annually during the rainy season - June to November (Joslyn, 2008).

Most of the watersheds are located in forest reserves which are protected areas by law (Figure 9). All of the Central Water and Sewage Authority’s (CWSAs) catchment areas and the St. Vincent Electricity Services Limited (VINLEC) Hydro-power stations are located in watersheds. In recent years however, the watersheds have been under threat as a result of climate related events and human actions, for example, mudslides resulting from hazard events and also due to increased and poor farming techniques have occurred within the watersheds. Additionally, there continues to be an issue of pollution resulting from the location of pig pens on river banks.

The Forestry Department, the National Parks Authority and the CWSA are responsible for managing the forests specifically regarding conservation and protection.

The possibility of the current water supply on the mainland drying up is considered to be quite low; as a result, alternatives such as desalination and drilling for underground water are not given serious consideration.

Figure 10: Rainfall Map of the Island of St.Vincent
(Source: Joyette, 2006).

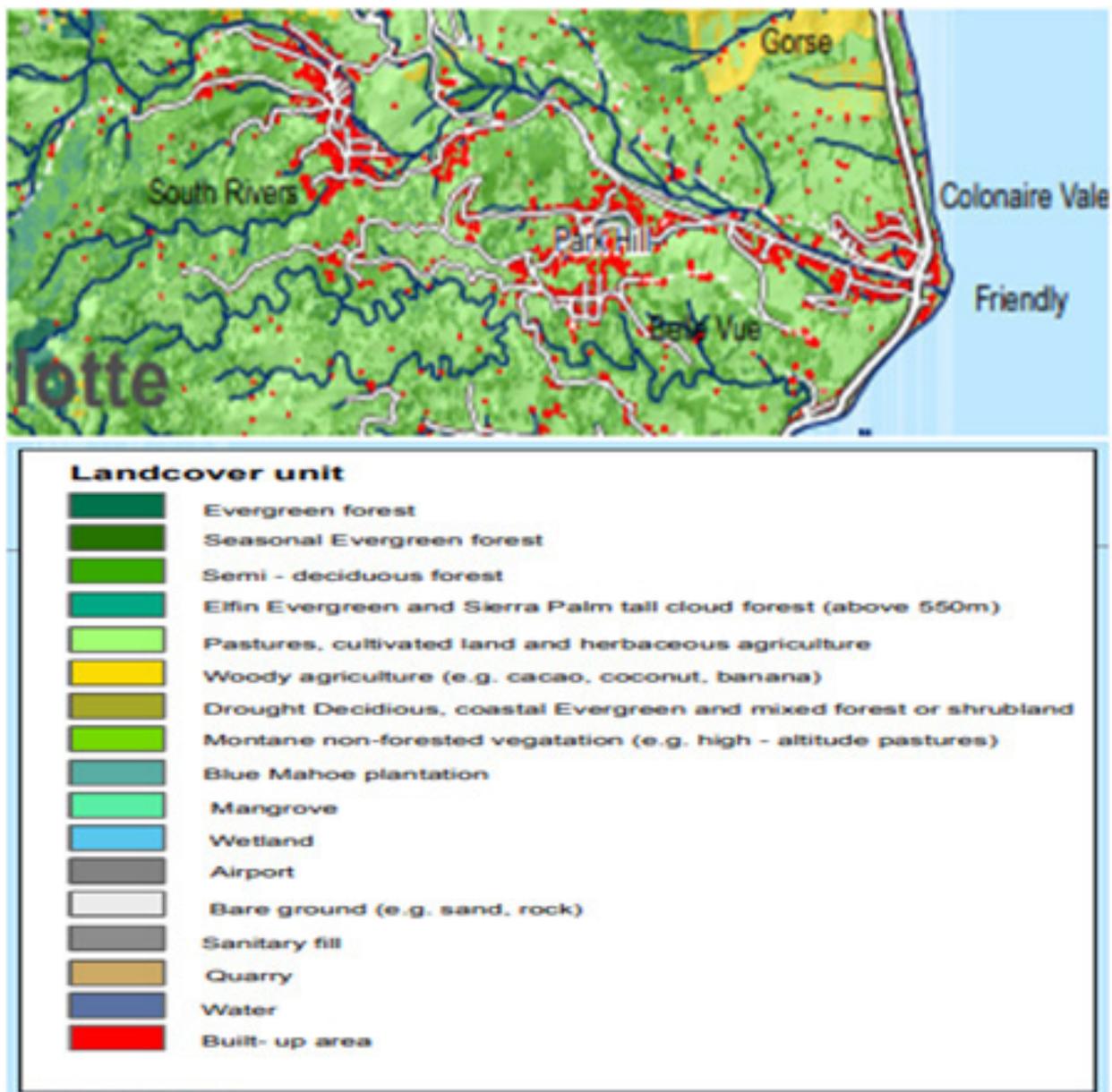


Over the past ten (10) or more years, attempts were made to put an integrated water resource management system in place to protect terrestrial and marine ecosystems, with limited success. Efforts were geared towards involving communities in empowerment activities so that they can map hotspots in local watersheds and monitor the level of land degradation and water quality (GEF- IWCAM no date).

3.4 LAND USE AND DISTRIBUTION

Most of the lands in Colonaire are comprised of evergreen and seasonal evergreen forests and are predominantly either agricultural lands or housing areas to the north and south of the Colonaire River. There are no huge areas of “woody” agricultural production such as coconut.

Figure 11: Land Use and Distribution in Colonaire (Source: Westen, C.J. and Sijmons, Koert. 2016).



3.5 POPULATION AND AGE STRUCTURE

According to the Population and Housing Census completed in 2012, the total population of the Colonaire census division was 6,849 persons, of which 3494 persons were male and 3355 females. The population density of the division was 511 persons per square mile. The town of Colonaire and Friendly Village combined have a total number of 354 households and a total population 1074, of which 535 persons were Male and 539 Female. The average household size of the division is 3.2 persons.



3494
Males



3355
Females

3.6 EDUCATIONAL ATTAINMENT

Within Colonaire, there is one privately operated preschool, Gail's preschool; one primary school, the Colonaire Primary School and one secondary school, the George Stephens Secondary School.

Table 2: Educational Institutions (Source: SVG Educational Statistical Digest 2017/18)

Name of School	Enrolment	No. of Girls	No. of Boys	Repeaters	No. of Teachers	No. of Trained Teachers	Pupil/Teacher Ratio	% Pass Rate CSEC & Technical 2018
Gail's Preschool	12	6	6		2		6	
Colonaire Government School	107	59	48	9		10	11	8
George Stephens Secondary	243	93	150		22	6	11	52

The Percentage Pass Rates of the George Stephens Secondary School at CSEC Examinations, General and Technical Proficiency in 2016 was 46.8% and in 2017 was 51%.

Table 3: Percentage of students benefitting from the school feeding programme in primary schools 2017/18. (Source: SVG Educational Statistical Digest 2017/18)

School	Enrolment	Benefitting	% benefitting
Colonaire Government	107	106	99.07

3.7 HOUSING QUALITY

Dwellings in the past were constructed from traditional materials such as trash and board with an average size of 100 square feet comprising mainly sleeping areas. Bathrooms and kitchens were both unattached to the main building.

Today, modern building materials are widely utilized, these include: galvanize sheeting, concrete, treated lumber, windows and doors. Home sizes have increased over the years to accommodate indoor bathrooms and kitchens and are roughly over 600 square feet in area. Home designs and layout are diverse keeping with modern trends. In 2006, twenty-two (22) low/no income homes were constructed. These were for residents who were relocated from the low-lying coastline.

3.8 HEALTH

There is one health centre located in the community which provides basic services to the community. The condition of the facility is good and is easily accessible by all residents. There is adequate parking and a designated area for emergency vehicles. The health centre is currently without an ambulance to respond to medical emergencies and therefore relies on the unit at the neighbouring Georgetown Health Centre approximately two (2) miles away.

³ Known elsewhere as zinc sheeting

Table 4: Health Care Institutions

Name of Facility	Services offered	Condition of Building
Colonaire Health Centre	Primary health care services	Good
Georgetown Hospital	Secondary health care services	Good
Georgetown Modern Medical Complex	Renal Dialysis, Intensive Care, Endoscopy, Ophthalmology, Ultrasound, Laboratory and General Medical and Surgical Consultations	Excellent

Table 5: Number of Persons Utilizing Medical Facilities within Previous Month by Census Division, 2012 Main Medical Facility

Census Division	Public Hospital	District Health Centres/ Health Clinic	Private Doctor's Office	Pharmacy	Family Planning Clinic	Private Clinic/ Hospital	Not Stated	Total
Colonaire	126	1,081	381	12	3	21	25	1,649

Table 6: Colonaire Health Centre Weekly Schedule

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8-9 a.m.	Injection Dressing	Injection	Injection Dressing	Injection	Injection Dressing
9-12 a.m.	Antennal Clinic	Doctor Clinic	Child Welfare	Diabetic & Hypertensive Clinic	Postnatal Clinic
12-1 p.m.					
1-4 p.m.	Record keeping & Family Planning	Adolescence Clinic			

3.9 SANITATION

Solid waste disposal is done by public trucks which collect the waste on a Wednesday. Residents living in the interior or on the hills must take their garbage to the main road to be picked up by the truck. This sometimes posed a challenge for these individuals to move their waste to the designated pick-up locations. As a result, there is evidence that trash is burned and other less desirable solid waste disposal methods.

3.10 SOCIAL SERVICES

The main social service facilities in Colonaire are as follows: one (1) health clinic, a police station, two (2) churches and a post office. Additionally, there is a learning resource centre/community centre, a library, one playing field and a children playground.

The Colonaire Secondary School is the designated emergency shelter for the community.

3.11 PUBLIC INFRASTRUCTURE (CONDITION OF ROADS, BRIDGES, DRAINS; LIGHTING, ETC.)

Utilities such as electricity, water, telephone, cable television and internet were said to be easily accessible. The main means of transportation to Colonaire is by vehicles and boat for locals. Public transportation to and from the community is mainly via minivan. The fare from the capital Kingstown to Colonaire is XCD 5.00 one way. There is one main road that leads to the community with various subsidiary bypass roads to various villages within the district.

Table 7: Social Services contact information

Name	Contact
Colonaire Health Clinic	784-458-6251
Rema Deliverance Church	784-593-2959
Pray and Praise Tabernacle (Church of God of Prophecy)	
Colonaire Post Office	784-458-9968
Colonaire LRC	784-457-1504/492-5463
Colonaire Primary School	784-458-6505
George Stephens Secondary School	784-451-1529
Colonaire Pit stop	

4 Governance Profile



4.1 POLITICAL DIRECTORATE



Constituency:
North Central Windward
Parliamentary Representative:
Ralph E. Gonsalves
(from 1994 to present)

2. COLONAIRE TURTLE WATCH ORGANISATION



President:
Michelle Dabriel

4.2 SOCIAL/CIVIC ORGANISATIONS

This section provides an overview of the social and civic organisations that exist within the community.

1. COLONAIRE DISASTER GROUP



President:
Mr. Terry Williams

Vision:

A strong community group committed to the safety and security of life through effective participation and engagement of all stakeholders

Mission:

To foster a culture of disaster readiness through inclusive and participatory leadership which will protect lives and livelihoods.

Objectives:

- To create a stakeholder listing with at least 30 contacts that will be engaged by June 2020.
- To ensure at 30 least members of the Community of Colonaire through disaster preparedness outreach program by the end of 2020.

4.3 METHODS OF COMMUNITY ENGAGEMENT

From September 17th to 25th, 2018, a Community Engagement Survey (CES) was conducted in St. Vincent and the Grenadines by the Community Disaster Risk Reduction Fund (CDRRF) of the Caribbean Development Bank (CDB) in collaboration with the Seismic Research Centre of the University of the West Indies (UWI) and the Ministry of National Mobilisation (MoNM). The survey was conducted as part of the Volcano-Ready Communities Project in order to assist with the planning of community-based disaster risk reduction initiatives.

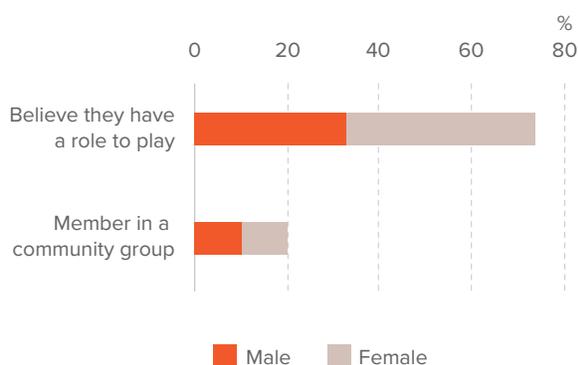
The purpose of the CES was to gather feedback on the community engagement needs and the preferences of select groups of residents in each community. During the implementation of the CDRRF sub-projects, limited inclusion and participation of community residents in project activities resulted from the consistent use of community meetings as a main engagement strategy. It was found, that women, youths, disabled and the elderly were often inadvertently excluded because meetings were scheduled at inconvenient times or days, or the location was not convenient or easily accessible. The survey therefore identified the most appropriate engagement strategies to secure the involvement of the different groups of residents in these interventions.

The survey was conducted in ten (10) communities and convenience sampling was employed. A total of 50 persons were interviewed in each community. Data was collected during the hours of 8:00 a.m. to 4:00 p.m.. Findings were presented to members of the North Leeward and North Windward communities and staff of the Ministry of National Mobilisation. The summary of the findings from the community engagement survey is highlighted below.

4.3.1. PARTICIPATION IN COMMUNITY GROUPS

Although only 25% of the Colonaire respondents stated that they were a member of a group involved in community development actions, 73% believed they had a role to play in in community development activities. These findings suggest that there is need to further analyse the contributing factors that limit participation, despite the high interest among those interviewed.

Figure 12: Participation and Inclusion (Source: CES, 2018)



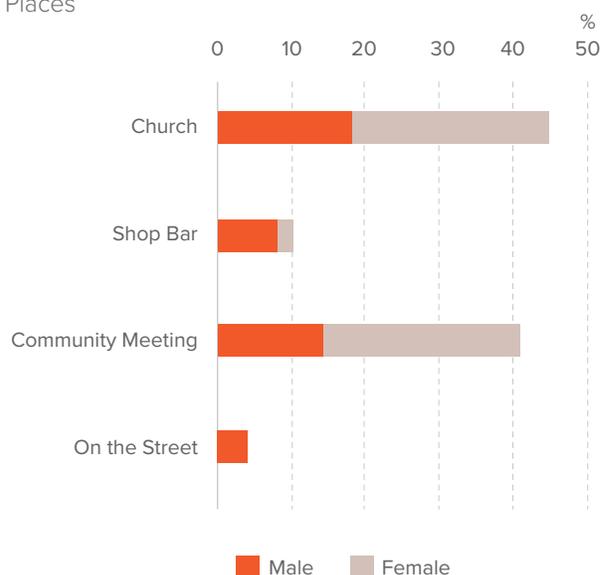
The activities most commonly attended by respondents were sport events (36%) and parties (30%). Such events include, Football, Basketball, Cricket, Netball, Christmas light up. Figure 10 shows this very clearly. It is interesting to note that while religious events are not attended by everyone, they are the only community activity that has a near equal participation rate of both men and women. The next event which has near parity of gender representation would be disaster preparedness activities.

The results of the Community Engagement Survey also revealed that sixty-four percent (64%) of persons surveyed held positive perceptions of community groups and noted that groups “are helpful” and “good for young people”.

4.3.2. PREFERRED METHODS FOR COMMUNITY ENGAGEMENT

Of those surveyed in Colonaire, the majority or 45% said they preferred to be engaged through their church, while 41% said they preferred being engaged through wider community meetings. Other preferred locations identified were shop/bar and on the street. This finding was also supported by the fact that majority of those interviews preferred to meet on a weekend as opposed to weekdays. In fact, 58% highlighted Saturdays and 20% Sundays as their most suitable days.

Figure 13: Engagement Preferences for Meeting Places



With respect to preferred places to meet, while not the most preferred option, “being engaged on the street” was the option that had almost completely parity between men and women as seen in Figure 13.

Figure 14: Preferred Days of the Week for Community Engagement

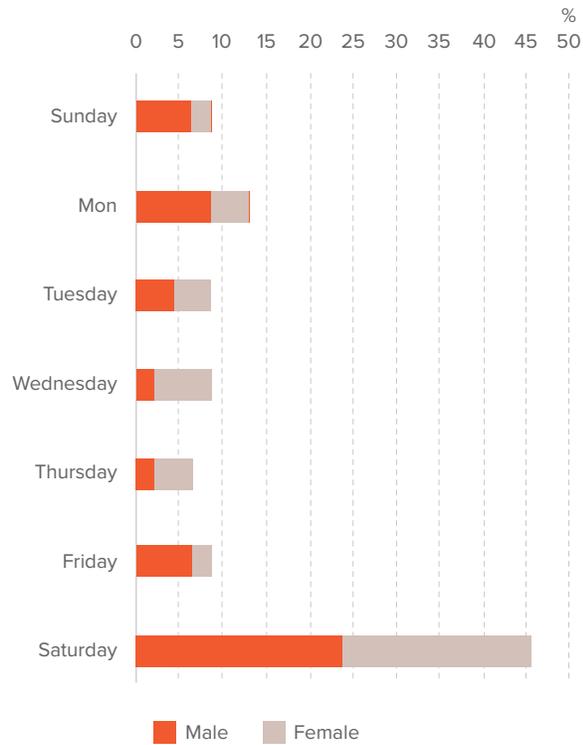
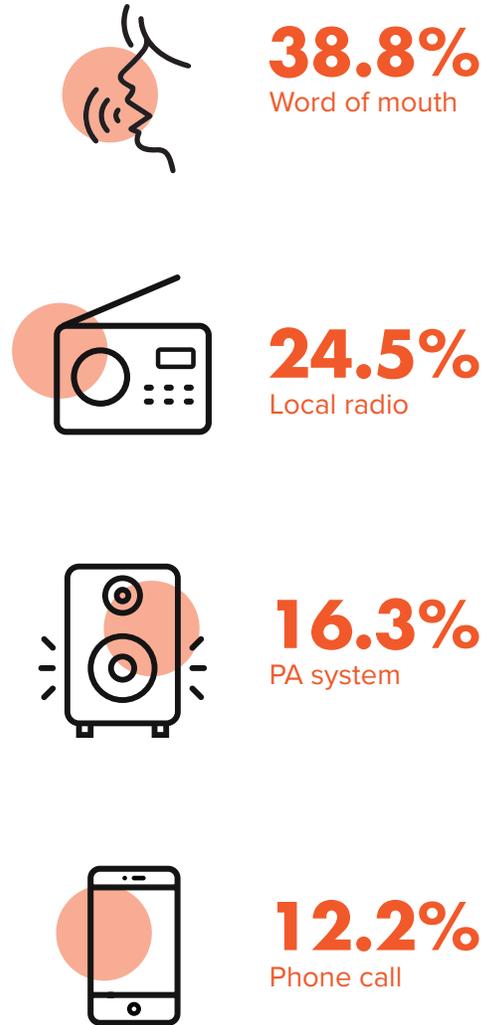


Figure 15: Preferred Community Channels



4.4 PREFERRED METHOD OF COMMUNICATION

In relation to preferred communication methods for engagement 39% of respondents selected word of mouth as the most suitable and convenient channel. Local radio stations and public address systems were 24.5% and 16.3% respectively. Telephone calls accounted for 12.2% of those who participated in the survey.

5 Economic Profile



In addition to the LBA assessment, data from the 2012 Population Census was used to provide an economic profile of the community. The 2012 Census indicated that there was an employment rate of 72.5% versus an unemployment rate of 26.6% at that time (Table 9). According to this data, the unemployment rate in the Colonaire district is higher than the national average.

The employment rate for men is 74.9% versus an unemployment rate of 25.1%; and for women the employment rate is 68.8% with unemployment rate being 31.2%. The employment rate for men and women in the Colonaire district can be seen in Table 8.

Table 8: Employment Rate by Gender for the Colonaire Census Division

Gender	Employed	Unemployed
Male	72.5	26.5
Female	68.8	31.2

According to the 2014 Regional Disaster Vulnerability and Reduction Project (RDVRP) Social Assessment Report, there were 5,099 persons within the Colonaire Census Division who were employed and 729 who were unemployed. Of those who were employed, most were employed in craft, trade and elementary jobs such as masons, watch men and domestic cleaners. Of the 729 persons unemployed, 527 were males and 202 were females.

5.1 OTHER TYPES OF LIVELIHOODS

Table 9: Colonaire community business types and names

BARS
Big Lion
Slice
Tonette
Atlantic Breeze
RESTAURANT
Slice fast food
Tittle's fast food
Big Lion
BEAUTY SALONS
Jey Nail Saloon
Basa Barba Shop
NIGHT CLUB
Beach View Mansion
Atlantic Breeze
GROCERY SHOPS
Big Lion
Tonette
Atlantic Breeze
Cindy's
Atlantic Breeze
Basa
AUTO SHOP/ACESSORIES
Quick Stop
FMC Enterprise
BLOCK MAKING SHOP
Jim Bobb
TIRE SHOP
FMC Enterprise

Community Business summary

- 4 Bars
- 3 Restaurant/Fast food
- 1 Beauty Salons
- 5 Small Grocery Shops
- 1 Tire Shop
- 1 Block Making Shop
- 2 Auto shop/Accessories
- 2 Night Clubs

5.2 OCCUPATION & SKILLS (BY GENDER)

Based on the findings of the Population and Housing Census Report 2012, the agricultural sector contributes approximately seven (7) percent to the GDP and employs about 11.8 percent of the employed workforce. This sector has experienced significant stresses over the past decade owing to recurrent exogenous shocks, storm damage, plant disease, and economic losses associated with the loss of preferential access to European markets. As of 2012, an estimated 8,000 ha⁴ of land were under cultivation with an additional 2,000 ha in pasture lands, representing approximately

25 percent of the land area available in SVG. Based on an estimated 2015 GDP of approximately US\$737.7 million, the agricultural sector is estimated to contribute US\$51.6 million.

Colonaire is a community made up of farmers who cultivate mainly bananas, tania, sweet potatoes, yams, eddoes and plantains. According to the Ministry of Agriculture (MoA) between 2014-2018 in Colonaire there were 60 males, 16 females and 4 youths involved in farming; totalling 80 persons whose main livelihood was farming. The ministry registered livestock rearing as an activity with which 25 persons within this community were actively engaged.

In 2019, a Vulnerability and Capacity Assessment (VCA) on Colonaire done as part of the Volcano Ready Communities Project (VRCP) looked at the major skills and occupations that were available within the community. Farmers topped the list, followed by Teachers then Shopkeepers, Caregivers and Janitors. Of the 21 persons who participated in the VCA, 12 were males and 9 females, with 16 over the age of 50.

⁴ Hectares

Table 10: Human Resource Data Base

Name	Address	Sex	Age	Contact Information	Occupation
			25-50 >50		
Kaylourn Lawrence	Top Village	F	*	432-8808	Waitress
Brammie John	Top Village	M	*	492-6364	Farmer
Rufus Dorset	Top Village	M	*	529-8500	Farmer
Cecila Payne	Top Village	F	*	529-7524	Janitor
Asley Denzil	Top Village	M	*	454-2897	Farmer
Amey Williams	Top Village	F	*	455-3821	Janitor
Patricia Toney	Top Village	F	*	433-1175	Caregiver
Kimmora Joseph	Top Village	F	*	433-0424	Hairdresser
Miss Gail	Stretch	F	*	494-1511	Teacher
Maxwell Butler	Stretch	M	*	433-8854	Shopkeeper
Renilza Adams	Top Village	M	*	451-1574	Contractor
Nadine Dabreo	Top Village	F	*	451-1834	Caregiver
Clarice Frank	Top Village	F	*	457-6553	Housekeeper
Franky Williams	Clinic	M	*		Mechanic
David Lawrence	Bottom Village	M	*	491-9620	Painter
Terrence Williams	Top Village	M	*		Teacher
Urvin Warrican	Top Village	M	*		Teacher
St.Clair Da Santos	Top Village	M	*		Principal
Helen Durrant	Top Village	F	*	458-9892	Shopkeeper
David	Clinic	M	*		Farmer
	Stretch	M	*		Barber

5.3 POVERTY LEVELS

Figure 16 from the Survey of Living Conditions/Country Poverty Assessment (KAIRI, 2007/2008) shows that Colonaire experiences the second highest level of poverty in the island.

5.4 FINANCIAL SERVICES

Residents of Colonaire have access to financial services offered by the major national institutions in neighbouring Georgetown. Services that are not available within the community are accessible in Kingstown which is located approximately 20 miles south the community.

Figure 16: Poverty Levels by Census District (Source: Kairi, 2007/2008)

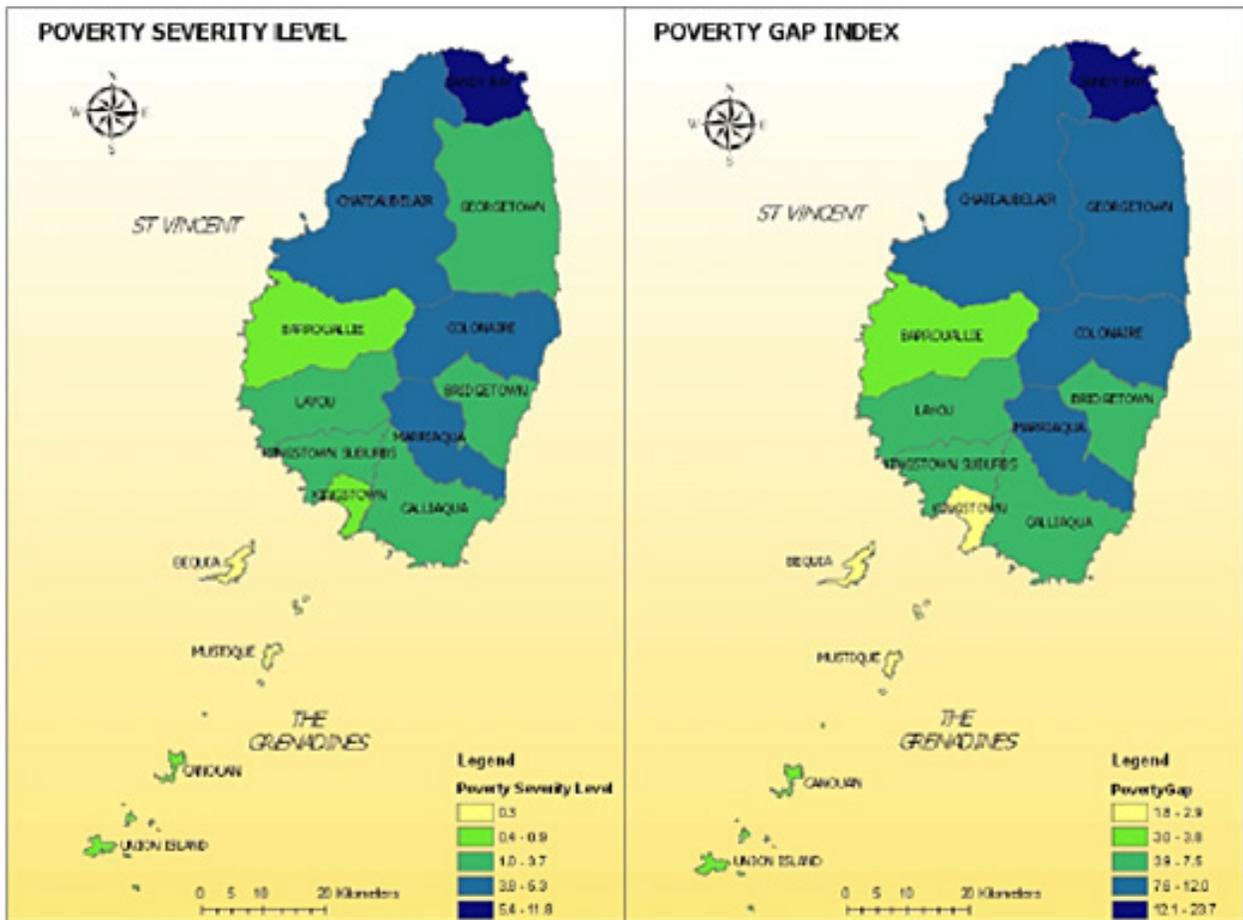


Table 11: Financial Services available within a 2 miles radius

Institution	Address	Services
General Employers Co Operative Credit Union (GCCU)	South Rivers Georgetown	Payment of Utility Bills Money receipt and transfer/change Loan Shares/saving Death benefit
Bank Of St. Vincent and the Grenadines (BOSVG)	Georgetown	Payment of utility bills Money transfer/change Loans Savings
Revenue/Post Office	Georgetown	Payment of utility bills Money receipt/transfer Payment of drivers/vehicle license
National Insurance Scheme (NIS)	Georgetown	Payment of contribution

5.5 DEVELOPMENTAL CHALLENGES IN COLONAIRE

Residents identified the following issues as the main challenges impacting the Colonaire community:

1. High Unemployment/Underemployment
2. Bad Roads and Drainage
3. Poor Infrastructure
4. Garbage Pollution
5. Littering on the beach
6. High number of School dropouts (25% of Boys; 10% of girls)
7. High incidence of Teenage Pregnancy
8. Flooding

6 Vulnerability and Hazard Profile



St. Vincent is exposed to high levels of risk to meteorological (high wind, extreme rainfall, hurricanes, and drought) and geophysical (earthquakes, volcanic eruptions, tsunamis) hazards, which have significant negative impacts on economic development, fiscal stability, and communities. Some of these natural hazards are being exacerbated by the adverse impacts of climate change, which increases stress on coastal investments, national infrastructure, water availability, and livelihoods, especially of the poor and vulnerable groups. Of the disasters regularly affecting SVG, hydro-meteorological (hydromet) events occur most frequently and represent a significant source of average annual losses, which from 1996 to 2015 were estimated to be around 1.2 percent of GDP (ranked 16th globally) (Kreft et al. 2015). The trough in December 2013 resulted in extensive physical damage and economic losses estimated at approximately US\$108.4 million (15 percent of GDP). The trough hit at a time when SVG was just showing signs of recovery from the global financial crisis, and the natural disasters exerted further strain on an already challenging fiscal context.

The island of St Vincent lies in the hurricane belt and is susceptible to both strong windstorms and heavy rains. Two-thirds of the island is forested (FAO, 2010). As noted in the 2013 Caribbean Catastrophe Risk Insurance Facility (CCRISF) report on the St Vincent and the Grenadines, the SVG islands are prone to moderate levels of a variety of hazards.

The islands lie towards the southern end of the main Atlantic hurricane belt although the complex topography can increase the risk for stronger winds, heavy rains and landslides.

The low-lying Grenadines are exposed to storm surge and wave hazards. Earthquake hazards are moderate, but there are significant volcanic hazards from both the Soufrière volcano on St Vincent and from Kick 'Em Jenny in the southern Grenadines, which is also a potential tsunami source. St Vincent and the Grenadines has limited economic diversity, with tourism important in the Grenadines where there is moderate exposure to wave and storm surge hazards.

Since bananas are the main export product from St Vincent, all farming is prone to the impact from high winds and heavy rain. Landslides commonly hamper communications on the island. Several volcanic

eruptions in the past 2 centuries have killed many people and devastated areas in the north of the island. While this report is being finalized, St. Vincent and the Grenadines is experiencing a series of explosive volcanic eruptions.



6.1 HURRICANES

Although St Vincent lies quite far south in the Lesser Antilles, hurricanes are still common, and the rugged topography of the island and low-lying nature of the Grenadines makes the impact of even moderate hurricanes potentially serious. Hurricanes Janet (1955), Allen (1980), Hurricane Lenny (1999), and Hurricane Tomas (2010) produced severe hurricane winds (greater than 110 mph) on St Vincent, although damage reports for these events are not available.



6.2 FLOODING

The islands are also vulnerable to flash flooding. The steep topography coupled with short (6 km) distances from the coast to the center mountain ridge creates a hydraulic system where stream concentration times are short (nominally 30 minutes). High rainfall, such as rain associated with a thunderstorm, quickly concentrates in stream channels, promoting rapid flooding. In this type of system, early warning of an actual flood event cannot be accomplished by monitoring stream levels because once they rise, it is too late. Any warning would need to be based on rainfall observations to trigger an alert.



6.3 LANDSLIDES, STORM SURGE AND DROUGHT

The Caribbean Handbook on Risk Information Management⁵ (CHARIM) also notes that Landslides, particularly on the larger islands, are a significant hazard and the risk is increased during the seasonal rains. Coastal flooding is a major concern particularly relating to storm surge and high wave action. The Grenadines are more susceptible to drought.

Given its geographic location, small land mass, and topography, the entire nation is highly vulnerable to natural disasters. Because of its volcanic origin, steep slopes dominate the islands' landscape and tilted volcanic layers define the geology and soils (De Graff 1988, cited in Westen, C.J. and Sijmons, Koert. 2016). It has more than 40 rivers and tributaries, which originate in the central mountains and discharge to the Caribbean Sea or the Atlantic Ocean (DLN Consultants 2006).

The combination of tropical temperatures and abundant rainfall leads to slope instabilities and the high potential for landslides. In 1988, De Graff produced an analysis of landslide susceptibility (Figure 18) and during the study identified about 475 landslides, covering about 1 percent of the country's surface. The most common type of landslides in SVG are debris avalanches, which are defined as rapid movements of an unconfined mass of soil and rock falls. Depending on the topography, another common type of landslide is debris flow, for which the movement of debris is confined to a channel. In SVG, debris flow is usually associated with river channels in the mountainous sections of the country. Debris flows can travel long distances, particularly when river flooding has occurred. They approach quickly and exhibit a considerable destructive force. Volcanic eruptions have affected the country in 1789, 1812, 1902, 1971, and 1979 and again in 2021. With the on-going eruption of La Soufriere, the combination of rainwater, debris and volcanic ash can form into lahar and can continue to pose as significant risks for months or even years to come.

⁵ <http://www.charim.net/stvincent/information>

Figure 17: Soil erosion map of St. Vincent. (Source; Government of SVG 2011.)

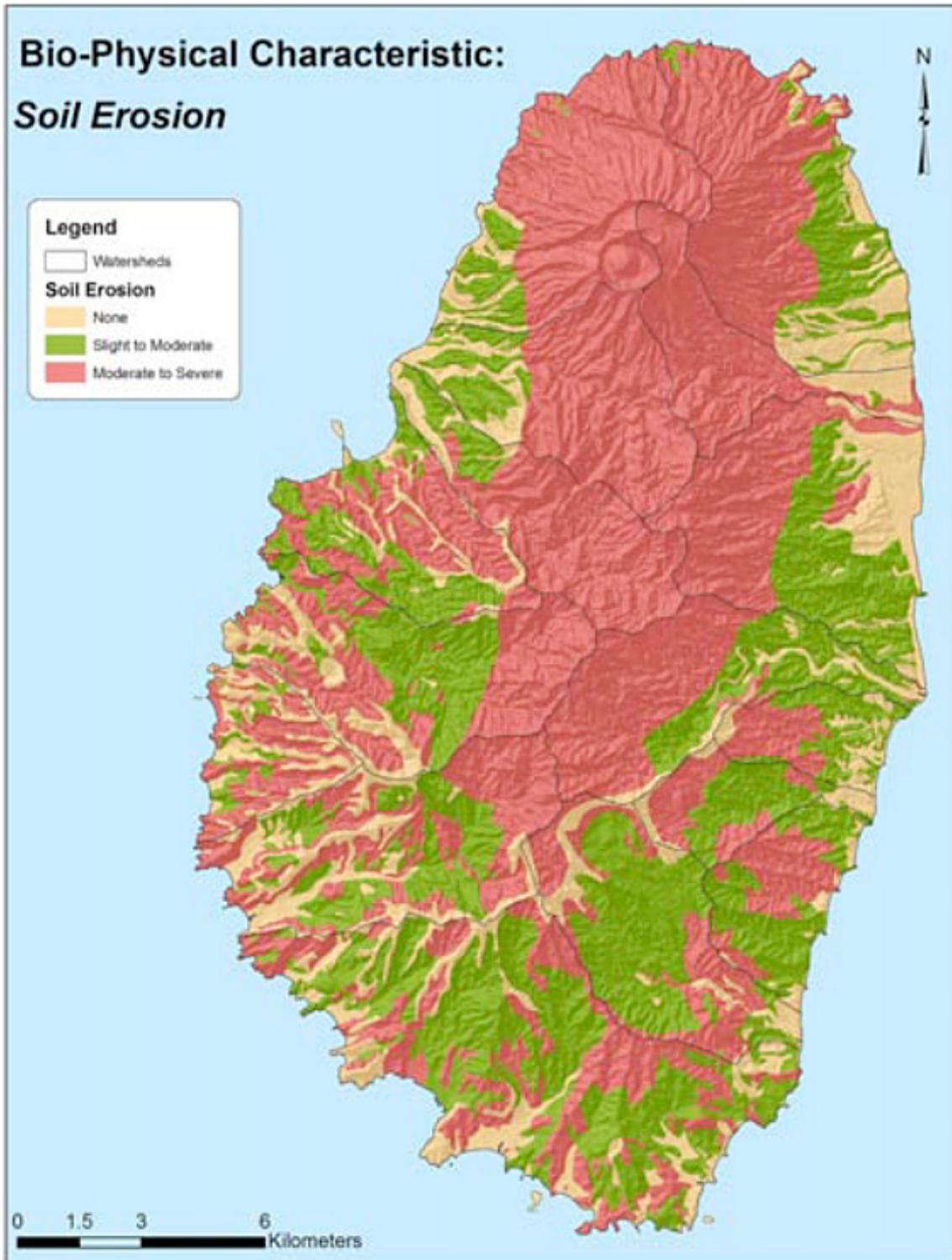
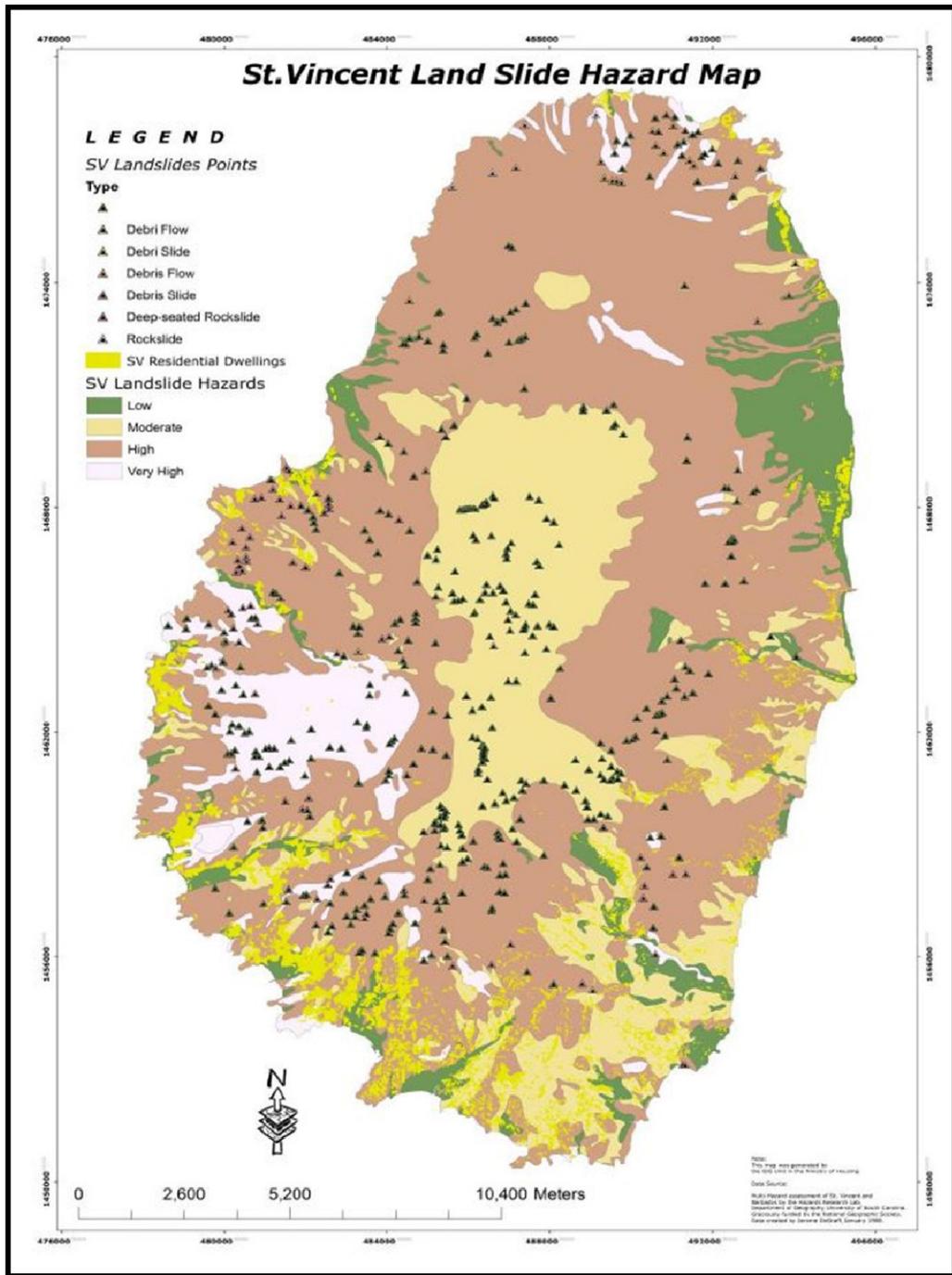


Figure 18: Landslide Hazard Map – St. Vincent (Source, cited in Joslyn, 2008)



Land Degradation Assessment of St. Vincent 2003 reports that the areas with greatest social vulnerability are generally located in densely urbanized and remote agricultural regions. Colonaire Census District ranked seventh in the SVG Socio-Economic Vulnerability rank.



6.4 EARTHQUAKES

An earthquake is the sudden release of stored energy in the earth crust. Most earthquakes occur along a fracture within the earth, called a fault. The shaking caused by this sudden shift is often very small, but occasionally large earthquakes produce very strong ground shaking. It is this strong shaking and its consequences – ground failure, landslides, liquefaction – that results in damaged buildings and structures and often results in negative impacts on the economy. Earthquake magnitude and intensity are measured on two different scales, the Richter Magnitude scale for source magnitude (the amount of energy released by the event) and the Modified Mercalli Intensity⁶ (MMI) scale for the amount of shaking felt at a specific place on the ground.

St Vincent and the Grenadines lie in a relatively quiet zone of the Lesser Antilles island arc. Earthquakes are more common to both the north and south. However, there are four instances of shaking intensity (MMI⁷) at category VII or VIII (potentially damaging) in the past 200 years, although actual damage reports for these events are not readily available (See Figure 19). Prior the current set of eruptions, the last major volcanic eruptions, in 1979 and 1902, produced felt earthquakes as well as more devastating explosions and pyroclastic flows in valleys around the north of the island.

⁶ Modified Mercalli Intensity scale

⁷ Modified Mercalli Intensity Scale developed from Giuseppe Mercalli's Mercalli intensity scale of 1902, is a seismic intensity scale used for measuring the intensity of shaking produced by an earthquake. It measures the effects of an earthquake at a given location, distinguished from the earthquake's inherent force or strength as measured by seismic magnitude scales (such as the "Mw" magnitude usually reported for an earthquake). While shaking is caused by the seismic energy released by an earthquake, earthquakes differ in how much of their energy is radiated as seismic waves. Deeper earthquakes also have less interaction with the surface, and their energy is spread out across a larger volume. Shaking intensity is localized, generally diminishing with distance from the earthquake's epicenter, but can be amplified in sedimentary basins and certain kinds of unconsolidated soils. https://en.wikipedia.org/wiki/Modified_Mercalli_intensity_scale

Figure 19: Mercalli Intensity Scale Categories (Source: <https://alltechinc.blogspot.com/2031/10/understanding-intensity-scale-and-sense.html>)

- I. Instrumental**
 Not felt by many people unless in favorable conditions
- II. Weak**
 Felt only by a few people at best, especially on the upper floors of buildings. Delicately suspended objects may swing.
- III. Slight**
 Felt quite noticeably by people indoors, especially on the upper floors of buildings. Many do not recognise it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
- IV. Moderate**
 Felt indoors by many people, outdoors by a few people during the day. At night, some awakened.
- V. Rather Strong**
 Felt outside by most, may not be felt by some people in non-favourable conditions. Dishes and windows may break and large bells will ring. Vibrations like train passing close to house.
- VI. Strong**
 Felt by all; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken; books fall off shelves; some heavy furniture moved or overturned; a few instances of fallen plaster. Damage slight.
- VII. Very Strong**
 Difficult to stand; furniture broken; damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by people driving motor cars.
- VIII. Destructive**
 Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture moved.
- IX. Violent**
 General panic; damage considerable in poorly designed structures, well designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
- X. Intense**
 Some well built wooden structures destroyed; most masonry and frame structures destroyed with foundation. Rails bent.
- XI. Extreme**
 Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly.
- XII. Cataclysmic**
 Total destruction - everything is destroyed. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock move position. Landscape altered, or leveled by several meters. In some cases, even the routes of rivers are changes.



6.5 VOLCANIC HAZARDS

According to the Seismic Research Center (SRC) of the University of the West Indies (UWI), there are 19 active volcanoes in the Eastern Caribbean with every island from Grenada to Saba directly exposed to volcanic eruption threats. The islands of Grenada, St. Vincent, St. Lucia, Martinique, Dominica, Guadeloupe, Montserrat, Nevis, St. Kitts, St. Eustatius and Saba have active volcanic centres. On the other hand, non-volcanic islands such as Anguilla, Antigua, Barbuda, Barbados, British Virgin Islands, most of the Grenadines and Trinidad & Tobago are close to volcanic islands and are also exposed to volcanic hazards such as severe ash fall and volcanically-generated tsunamis.

St. Vincent and the Grenadines is located in the southern section of a chain of volcanic islands which comprise the Lesser Antilles. It is an archipelagic State that forms part of the Windward Islands in the Southern part of the Caribbean and is surrounded by St Lucia to the North, Barbados to the East and Grenada to the South. The state covers a total land area of approximately 150.3 square miles (388 sq. km.) and a larger marine area including a shallow coastal shelf encompassing an area of approximately 690 square miles. The main island of Saint Vincent is 28 kilometers long and 15 kilometers wide. (source: SVG National Volcano Emergency Plan, 2021).

Topographically, St. Vincent is mainly defined by a backbone of volcanic mountains that stretch much of its length and rise northwards to an elevation of approximately 1,220 m above mean sea level where the La Soufriere volcano is located. The Soufriere is a strata-volcano, with an open summit crater of 1.6 km in diameter. Volcanologists have noted that volcanic activity can be quiet and effusive or violent and explosive, and the length of time that an eruptive episode persists can vary from a few minutes to weeks, months or even decades (source: SVG National Volcano Emergency Plan, 2021).

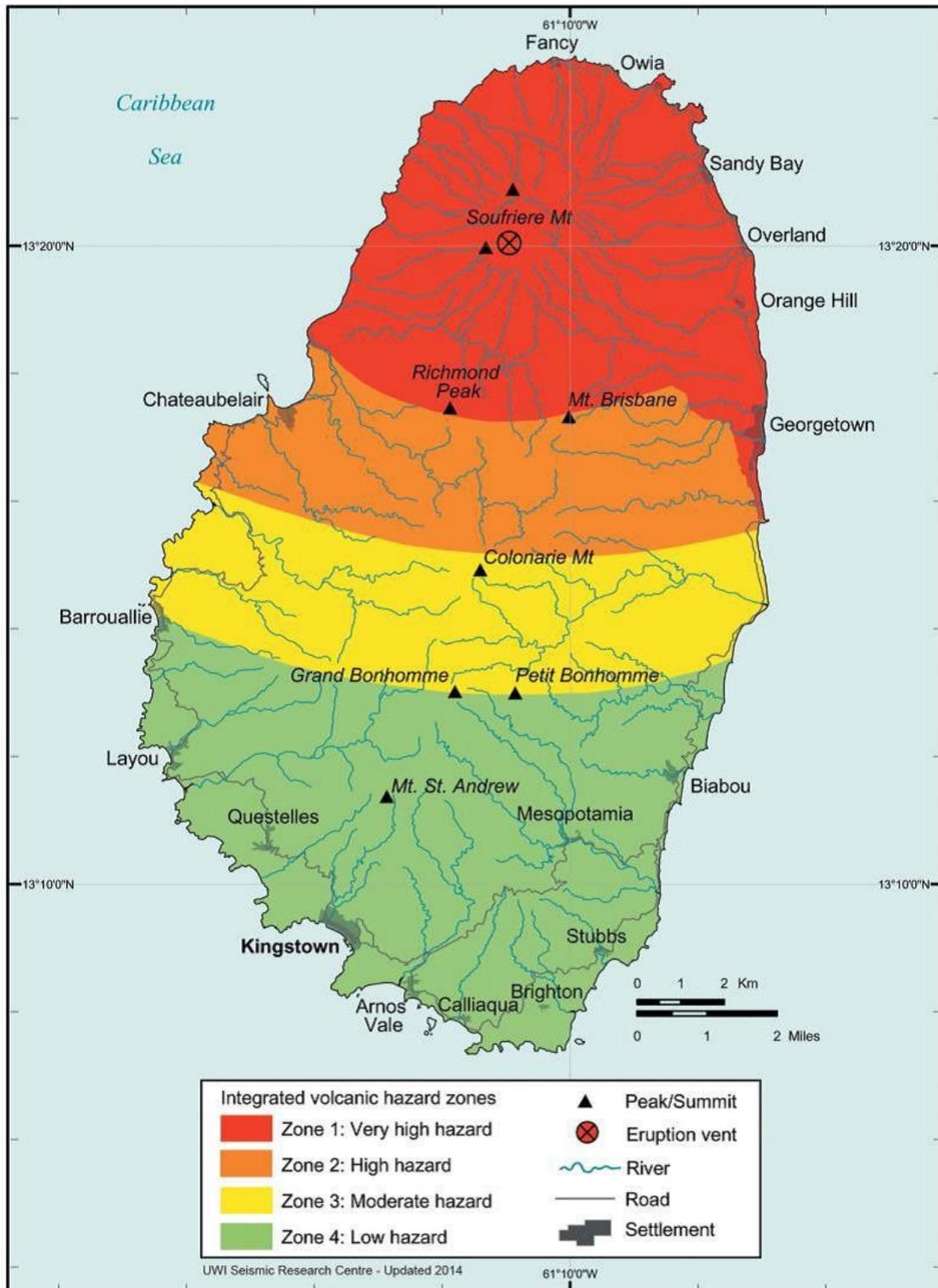
Figure 20 shows the various volcanic hazard zones for the whole island of St. Vincent and shows that the village of Colonaire which is in the Colonaire Division, is in the Yellow Zone.

In 1994, Robertson described volcanic vulnerability as a “measure of the susceptibility to loss expected due to a particular volcanic event. It is a measure of the possible magnitude of losses expected from a particular volcanic event (UNDRO, 1982)”. Alexander (1991, cited in Robertson 1994), presented a conceptual equation for vulnerability in which it is a function of four factors:

- risk amplification (results of bad construction practice);
- risk mitigation (due to good construction practice);
- risk perception and an indirect cultural factor.

The Soufrière volcano, whose steep sides, poorly-consolidated bedrock and incised ravines (or ‘gutters’, Nanton, 2017, cited in Pyle, et.al. 2018) present a suite of ongoing hazards during periods of both quiescence and unrest (e.g. from sediment-charged flash floods and landslides).

Figure 18: Volcanic Hazard Zones (Source: NEMO 2021)



As described by Pyle et.al., (2018), the summit of the Soufrière comprises a complex of intersecting craters of different ages, suggesting that it has experienced repeated eruptions during its history, most recently in 2021. In addition to 2021 activity, there have been at least five eruptions since 1718, which mean that St Vincent is – by this measure – the most active subaerial volcano in the Caribbean. Eruptions over the past 300 years have occurred against the backdrop of an evolving social, economic and political environment.

According to Robertson (1994), throughout its recorded history (post-1718), the Soufriere volcano has exhibited two contrasting styles of activity, a quiet, effusive versus a violent explosive style. Examination of the stratigraphy suggest that activity during the pre-historic period varied only slightly, with one major period of very cataclysmic Plinian type activity (Rowley, 1978a; Sigurdsson, 1981; Robertson, 1992 – cited in Roberston, 1994).

6.5.1. DIFFERENT TYPES OF VOLCANIC HAZARDS

The 2021 draft St. Vincent and the Grenadines: Volcano Emergency Plan and Standard Operating Procedures identifies the different types of primary volcanic hazards as follows:

- Pyroclastic flows and surges from dome collapses
- Pyroclastic flows and surges from the collapse of the crater walls
- Pyroclastic flows and surges from explosive column collapse
- Lateral Blasts Explosions with ash and rock fallout
- Mudflows or Lahars

Table 12: Effect of the 1979 volcanic eruption on some aspects of the human and natural resources of St. Vincent and the Grenadines. (Source: Robertson 1994)

Human and natural resource affected	Costs (USD)
Maintenance of evacuees housed in evacuation camps	39,507 per day
Maintenance of evacuees housed outside evacuation camps	5,269 per day
Operation of public transport involved in the evacuation exercise	3,160
Rehabilitation of schools, community centres and church buildings used as evacuation camps	79,013
Repairs to the national housing stock	2,130,069
Repairs to the national road network	4,213,994
Rehabilitation of agriculture	2,129,646
Damage to the main crop (bananas)	50-60% loss of entire crop

Table 13 presents these hazards and the types of impacts they can be expected to cause.

Table 13: La Soufriere Volcano Impact Matrix (Source: NEMO 2021)

Hazard	Area Affected (Radial distance from vent, km)	Immediate Risk	Ongoing Risk	Anticipated Loss	Mitigation	Recovery Period following Cessation of Activity
Earthquake*	5-8km	Low	Low	Small	Not applicable	Not applicable
Lava flows and domes*	1-3km	High	Low	High	Moderate	Several months to years
Pyroclastic flows and surges*	5-7km	High	High	Extreme	None	Several weeks to several months
Mudflows*	5-10km	High	High	High	None	Several weeks to several months
Ballistic projectiles*	1-5km	Moderate	Moderate	Moderate	Minor	1 week to several months
Airfall Tephra*	1 to >10km	Moderate	Moderate	Low to Moderate	Moderate	1 week to several months
Volcanic gases	1-3km	Moderate	Moderate	Low	Minor to Moderate	Not applicable
Phreatic explosions	<4km	Moderate	Low	Low	None	Several weeks to several months
Landslides*	5-8km	Moderate	High	Moderate		Several weeks to several months
Laterally directed blasts and structural collapse	5-8km	Low	Low	High		Several weeks to several months
Lightning*	<7km	Low	Low	Low	None	Days to weeks
Tsunami	5 to >10km	Low	Low	Low	Moderate	Up to 1 – 2 days

*Events which are likely to be repeated over a period of time (days, weeks to months) following the initial event

The secondary volcanic hazards are:

- Ruptured water lines which can lead to flooding.
- Fires
- Contamination of water supply
- Respiratory ailments due to dust
- Visibility issues due to dust
- Ash clouds can contribute to airport closures.

Volcanic threats to livelihoods include:

- Livestock farming
- Arable farming
- Traditional farming
- Nature tourism (Waterfalls, Ecology)
- Beekeeping
- Major impact to critical facilities such as healthcare
- Major impact to factories and small businesses
- Fishing industry (Restricted access to sea, damage to jetties and inability to access fish storage locations)

Prior to the 2021 eruption, Robertson (1994) suggested that the 1979 eruption already had huge impact on human and economic life and forced major adaptation in the patterns of human life and activity on the island of St. Vincent. But he also noted that population growth and increasingly limited options means that people would continue to live in and develop areas of high risk from eruptions at the Soufriere volcano. “Future volcanic eruptions should therefore be expected to have a greater effect socially, than has been the case in the past,” Robertson suggested.

The social impact of past eruptions, such as the 1979 eruption, have varied from disruption of family life due to evacuation and relocation, to migration of entire families to foreign countries. In addition, mental and emotional stress was placed upon the evacuated population who were accustomed to more expansive personal space. The social impacts have varied from disruption of family life due to evacuation and relocation, to migration of entire families to foreign countries. In addition, mental and emotional stress was placed upon the evacuated population who were accustomed to more expansive personal space.

Fortunately, even prior to the 2021 eruption, as Robertson noted in 1994, “the Soufriere volcano features prominently in the minds of most Vincentians” The degree to which this affects their actions varies largely with their economic status, recollection of past events, proximity to the volcano and knowledge of volcanic processes. The manner in which the volcanic threat is perceived is well illustrated by the fact that during all of the historic eruptions, people living within the areas of highest risk (north of the Rabacca and Wallibou rivers), begun moving away from the volcano prior to any formal evacuation exercise ordered by the governing authorities.

In 2021, the Soufriere volcano erupted once again. The impacts, damages and losses are discussed in the next section on vulnerability and risk.

6.6 EXACERBATION OF HAZARD IMPACTS DUE TO CLIMATE CHANGE

Climate vulnerabilities are further exacerbated by the country’s limited human and financial resources as well as highly exposed social and economic infrastructures—much of which are located in low-lying coastal areas. The considerable economic dependence on primary production and the service industry further contributes to such vulnerabilities as the success of both sectors is heavily influenced by climate.

6.7 HAZARD VULNERABILITY IN COLONAIRE

Colonaire has several environmental challenges that continue to be a daily threat to the natural assets of the community. If these are not urgently addressed, they will continue to negatively affect the environment within the community. Examples of such challenges are:

- a) the rivers and streams are being polluted by the negative actions of residents who illegally dump garbage into the rivers and streams;

Table 14: Colonaire: Hazard Matrix

Hazard	Year	Season	Location	Economic and Financial Losses (1-5)	Number of persons affected (1-5)	Overall Impact
Flooding	Yearly	April	<ul style="list-style-type: none"> • River Side • Lower Colonaire 	2	2	<ul style="list-style-type: none"> • Homes flooded • Land slippages
Hurricane Thomas	2003 2010	Dec.	<ul style="list-style-type: none"> • All village 	3	3	<ul style="list-style-type: none"> • Homes destroyed • Loss of crops
Storm Surge	2003	Dec. & Nov.	<ul style="list-style-type: none"> • Lower Colonaire 	5	5	<ul style="list-style-type: none"> • Homes destroyed
Droughts	2013 Yearly	April	<ul style="list-style-type: none"> • Entire community 	4	4	<ul style="list-style-type: none"> • Loss of crops

1 minor ----- 5 extreme

6.10 VOLCANO READY PROJECT AND REDUCING VULNERABILITY

The Volcano-ready Communities Project in St. Vincent, which is financed by the CDRRF and is being implemented by the Seismic Research Centre (SRC), University of the West Indies, St. Augustine, Trinidad and Tobago. This project seeks to reduce vulnerability to the multi-hazard environment of the Soufriere Volcano through a combination of activities designed to enhance community early warning procedures, increase adaptive capacities, strengthen awareness, and enhance response capacities. The Project comprises four components which seek to increase the resilience of the 12 communities in St. Vincent and the Grenadines to volcanic and other natural hazard events and climate change. The communities have been grouped into two and they are (a) Windward communities comprising Fancy, Owia, Sandy Bay, Overland and Big Level, South Rivers, Park Hill, Colonaire, and (b) Leeward communities comprising Fitz Hughes, Chateaubelair, Rose Hall, and Spring Village.

The project consists of three (3) main components:

Component 1

Increased Community Volcano and Other Natural Hazard Readiness;

Component 2

Increased Knowledge and Awareness of Volcano and Multi-Hazards Risk Reduction and Climate Change Impacts in the Beneficiary Communities; and

Component 3

Enhanced Adaptive Capacity. A fourth component covers project management and administration. CDRRF Volcano Ready Project

The proposed project is a solid example of effective partnership engagement and coordination. Strong partnerships with Red Cross and Community Development are particularly worth noting. Even though the initial consultation with the communities was over a year ago, all the communities visited during the Rapid Community Climate Vulnerability Assessment (RCCVA) mission were aware and in support of the proposed initiative.

At the time the RCCVA was conducted in 2016, it was evident that NEMO has a strong working relationship with the proposed communities and a detailed understanding of the social and environmental challenges. Relationships with a broad range of stakeholders in government, civil society, and the private sector ensure a holistic approach to the implementation of the project. This collaborative approach will also facilitate the sharing of knowledge and skills which could lead to greater impacts.

To also seek to effectively incorporate climate change in the proposed initiative, it will be important to broaden the focus from the volcanic hazards to the “volcanic environment” in general. In other words, to determine how the presence of the volcano creates other hazards that can interact with or be exacerbated by climate-related hazards. For example, due to the steep slopes, landslides and rates of flooding could increase under future changes in climate. The focus should be on building general resilience of the targeted communities rather than trying to build resilience to a specific hazard. The rationale is that increasing the resilience of particular parts of a community to specific disturbances may result in resilience lost in other ways.

6.10.1. FINDINGS FROM THE 2016 RAPID COMMUNITY CLIMATE VULNERABILITY ASSESSMENT (RCCVA)

During the focus group discussions (FGD) held in September 2016 across the Volcano Ready Communities, the participants identified agriculture as the most predominant livelihood activity in their communities. Problems were identified such as poor access to markets that limit income security at all times, and thereby undermine resilience in the face of hazards. Unemployment and constrained livelihood opportunities in the north of the island are therefore accentuating underlying vulnerability to disasters. Addressing the high level of uncertainty and problems related to agriculture will be key to resilience-building efforts at the community level. Other livelihoods are also under pressure as unemployment is widespread in these communities.



6.10.1.1. Finding 1

The consensus from the focus group discussions is that disaster impacts generally affect women more or in a worse way. In Fancy, the female farmers have organized themselves into a group (Fancy Ladies) to offset negative impacts on their livelihoods. Women are particularly involved with livestock production (sheep, goats, pigs). It will be important to consider these gender dynamics during the implementation of the project.



6.10.1.2. Finding 2

While La Soufriere Volcano is a hazard that can have a direct impact on the entire island as well as in the neighbouring islands, the proposed communities are also exposed to floods, hurricanes, droughts, landslides and coastal erosion. These are also major concerns. The most recurrent events are hurricanes and tropical storms. Given the island's topography, the types of construction and the places where these have been built, frequently in unstable hill areas, rain and wind often cause severe damages to buildings, infrastructure and agriculture. Landslide is also a major challenge facing the communities due to the steep topography, friable soils, and localized rainfall events. The situation is amplified in some areas by poor construction and land management practices which often lead to increased sedimentation and degradation of the marine environment. The proposed multi-hazard approach will ensure that a holistic approach is taken to reduce exposure to multiple stressors and shocks.



6.10.1.3. Finding 3

During the focus group discussions, the participants indicated the use of savings as the most typical coping strategy. Strong support from community members was also cited as a key coping strategy. The recovery process, or what people do after a hazardous event has impacted their household, seems to be based on a combination of factors: continuing with daily routines and activities, accessing assistance from the state, and using their savings or relying on their families and friends. The fact that the island is prone to the impact of multiple hazards means that recovering is made more difficult by the possibility that another hazard might impact soon after. For example, after the eruption in 1979, Hurricane Allan struck the island in 1980 and caused a lot of damage to crops that had been recently planted. Other problems, such as plant disease also impact farmers.



6.10.1.4. Finding 4

The main challenges facing the communities include:

- Marketing of agricultural produce (farmers are primarily dependent on Traffickers⁸)
- Land space and tenure - access to arable land are limited in most of the proposed communities

⁸ Traffickers” are not to be confused with illegal trafficking. This term is the popular term to define persons who are legally allowed to buy and sell produce. In other countries, they are sometimes referred to as “higglers”.

- Pest & Plant disease: Farmers indicated that they had experienced an increase in the frequency of pests and plant disease
- Drought and heavy rains: Drought was identified as ‘silent’ stressor while the increased frequency of heavy rain is a major concern
- Extension service: Farmers expressed the need for improvement in extension services to their communities
- Quality of seeds and planting material:
- Praedial Larceny
- Landslides
- Social cohesion: strong but formal groups are relatively weak



6.10.1.5. Finding 5

The success of the Community Early Warning Systems (CEWS) will be dependent on the strength of the community groups. While groups exist in most of the proposed communities, their capacities are limited and will need strengthening to effectively support the implementation. Of particular importance will be the building of awareness of local income-generating opportunities. In general, the communities are not sufficiently informed about national plans for coping with geologic hazards and do not have adequate resources, training and information with which to mitigate their impact. Building community adaptive capacity to volcanic eruptions can be challenging. The indicators and outcomes should be revised to focus on the volcanic environment in general and to capture and address the multi-hazard risks facing the targeted communities.

7 The 2021 Volcanic Eruption



In December, 2020, the La Soufriere Volcano became active once again and on April 9th 2021 it erupted explosively.

The explosive volcanic activity prompted mass evacuation of persons from communities in the red and orange zones (Figure 20) – the northeast and northwest of the island. Numerous farmers were been displaced from their communities and relocated to southern communities.

Late in April 2021, once the eruptions had subsided enough for Damage and Loss Assessments Teams (DaLAT) to form and assessments to be conducted of the infrastructure and crop damage, Detailed Agriculture Damage Assessment (DADA) reports were prepared. This LBA report includes the data and information that were collected from these preliminary reports.

The Eruption precipitated a mass evacuation from communities in the northeast and northwest of the country with over 13,000 persons moving from the hazard zones to public and private dwelling within the safer zones in the south of the country. Numerous farmers have been displaced from their communities and relocated to southern communities in the process. Extensive acreages of crops have been lost or damaged as a direct and or indirect consequence of the eruptions or from secondary reasons related to the abandonment of the crops and free roaming animals let loose by farmers before they evacuated.

The eruptions both directly and indirectly affected agriculture, forestry, fishing and agriculture infrastructure throughout the country resulting in damages and losses ranging from as low as 7% in the Green Zone to 100% in a substantial number of commodities in the Red and Orange Zones.

Table 16 summarizes the estimated damage and loss by sectors. However, the Damage and Loss Assessment Team have suggested that while their preliminary report estimated a loss of \$54,000,000 (USD \$20,000,000) in general agriculture infrastructure, “the full extent of the damage and loss will need to be comprehensively assessed and may result in much higher estimates.”

With respect to the livestock sector, the damage and loss was initially estimated to be low as farmers were advised to let their animals loose. However, “with the limited availability of feed and water in a highly ash contaminated environment, the prediction was that indirect losses in animals will increase ranging from 10 to 30 percent due to health and other complications.” Overall, the preliminary DADA report indicates the estimated value of total damage and loss sustained by the crops, livestock, apiculture, fisheries and forestry sectors is \$142,628,402.00.

A further cropland damage assessment done on April 26 2021 by Ghosh et.al., and employed Normalized Difference Vegetation Index (NDVI)⁹ analysis to assess the magnitude of ash damage to crop and vegetative cover and found that the changes in NDVI values are much higher in the surrounding areas of the volcano.

⁹ Normalised Difference Vegetation Index (NDVI) “quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs) <https://gisgeography.com/ndvi-normalized-difference-vegetation-index/>

Table 15: Crop Damage and Loss Assessment

Crop type	Acreage in production	Yield/a cre (lb.)	Expected Yield (Lb.)	Estimated Damage (acreage)	Cost of Production/acre	Estimated total Value of damage	Farm gate price/Lb	Total Value of Losses	Estimated total Damage and Loss E C\$	Estimated total Damage and Loss US\$
Arrowroot	98	9,000	882,000	98	\$5,700.00	\$558,600.00	\$1.00	\$558,600.00	1,440,600.00	533,555.56
Asparagus	5	8,000	40,000	0.2	\$3,705.00	\$741.00	\$10.00	\$16,000.00	16,741.00	6,200.37
Beet	1.5	4,000	6,000	0.5	\$4,268.00	\$2,134.00	\$1.00	\$2,000.00	4,134.00	1,531.11
Broccoli	1.5	7,000	10,500	1	\$7,245.00	\$7,245.00	\$4.00	\$28,000.00	35,245.00	13,053.70
Cabbage	20	12,000	240,000	12	\$7,065.00	\$84,780.00	\$2.00	\$28,000.00	372,780.00	138,066.67
Carrots	60	8,000	480,000	54	\$7,685.00	\$414,990.00	\$2.50	\$1,050,000.00	1,464,990.00	553,700.00
Cassava	80	25,000	2,000,000	88	\$7,537.00	\$512,176.00	\$0.90	\$1,530,000.00	2,042,176.00	756,361.48
Cauliflower	11	9,000	99,000	6	\$6,885.00	\$41,310.00	\$6.00	\$32,400.00	365,310.00	135,300.00
Celery	3	6,000	18,000	3	\$6,073.00	\$18,219.00	\$3.25	\$58,500.00	76,719.00	28,414.44
Chive	66	8,000	528,000	59	\$8,054.00	\$475,186.00	\$1.75	\$82,600.00	1,301,186.00	481,920.74
Corn	48	12,000	576,000	7	\$4,783.00	\$33,481.00	\$1.50	\$12,600.00	159,481.00	59,067.04
Cucumber	35	18,000	630,000	35	\$6,336.00	\$221,760.00	\$1.00	\$63,000.00	\$51,760.00	315,466.67
Dashew	400	14,000	5,600,000	100	\$4,166.00	\$416,600.00	\$0.80	\$1,120,000.00	1,536,600.00	569,111.11
Eddoes	550	11,000	6,050,000	138	\$4,100.00	\$565,800.00	\$1.00	\$1,518,000.00	2,083,800.00	771,777.78
Eggplant	6	15,000	90,000	6	\$6,853.00	\$41,118.00	\$2.00	\$18,000.00	221,118.00	81,895.56
Flavour pepper	8	15,000	120,000	1	\$9,347.00	\$9,347.00	\$2.50	\$37,500.00	46,847.00	17,348.89
Ginger	120	20,000	2,400,000	11	\$8,320.00	\$91,520.00	\$3.00	\$66,000.00	751,520.00	278,340.74
Hot Pepper	5	15,000	75,000	1.5	\$8,927.00	\$13,383.00	\$3.00	\$67,500.00	80,883.00	29,956.67
Lettuce	8	3,000	24,000	8	\$7,717.00	\$61,696.00	\$3.50	\$84,000.00	145,696.00	53,961.48
Melons	8	20,000	160,000	8	\$6,416.00	\$51,328.00	\$3.00	\$48,000.00	531,328.00	196,788.15
Ochra	12	6,000	72,000	1	\$5,206.00	\$5,206.00	\$2.00	\$12,000.00	17,206.00	6,371.59
Parsley	2	4,000	8,000	2	\$6,277.00	\$12,554.00	\$6.75	\$54,000.00	66,554.00	24,649.63
Pak-choi	3	12,000	36,000	3	\$5,955.00	\$17,865.00	\$2.00	\$72,000.00	89,865.00	33,283.33
Peanut	32	3,000	96,000	22	\$5,525.00	\$121,550.00	\$8.00	\$52,800.00	649,550.00	240,574.07
Pigeons Peas	20	10,000	200,000	14	\$4,914.00	\$68,796.00	\$7.00	\$98,000.00	1,048,796.00	388,447.96
Pumpkins	13	10,000	130,000	13	\$5,039.00	\$65,507.00	\$1.00	\$13,000.00	195,507.00	72,410.00
Radish	1	8,000	4,000	0.5	\$4,268.00	\$2,134.00	\$3.50	\$14,000.00	16,134.00	5,975.56
Sweet	8	5,000	40,000	6	\$5,195.00	\$31,180.00	\$3.00	\$90,000.00	121,180.00	44,884.44
Squash	5	15,000	75,000	5	\$5,303.00	\$26,515.00	\$3.16	\$237,000.00	263,515.00	97,598.15
String Beans	8	5,000	40,000	4	\$4,478.00	\$17,912.00	\$2.20	\$44,000.00	61,912.00	22,930.37
Sweet Pepper	55	7,000	385,000	33	\$5,683.00	\$187,539.00	\$4.00	\$92,400.00	1,111,539.00	411,681.11
S Potatoes	100	8,000	800,000	80	\$2,965.00	\$237,200.00	\$1.50	\$96,000.00	1,197,200.00	443,407.41
Tannia	150	9,000	1,350,000	45	\$5,983.00	\$269,235.00	\$2.50	\$1,012,500.00	1,281,735.00	474,716.67
Tomatoes	73	15,000	1,095,000	66	\$11,417.00	\$753,522.00	\$3.00	\$2,970,000.00	3,723,522.00	1,379,682.22
Turmeric	8	34,000	272,000	4	\$10,043.00	\$40,172.00	\$1.50	\$20,400.00	244,172.00	90,434.07
Water Melons	15	20,000	300,000	15	\$6,416.00	\$96,240.00	\$2.20	\$66,000.00	756,240.00	280,088.89
Other Yam	8	12,000	96,000	7	\$7,683.00	\$55,181.00	\$4.00	\$33,600.00	391,181.00	144,881.85
P Yam	40	8,000	320,000	36	\$9,879.00	\$355,644.00	\$4.00	\$1,152,000.00	1,507,644.00	558,386.67
White Yam	110	12,000	1,320,000	99	\$7,883.00	\$780,417.00	\$4.00	\$4,752,000.00	5,532,417.00	2,049,043.33
Yellow Yam	8	8,000	64,000	7	\$8,159.00	\$57,113.00	\$4.00	\$22,400.00	281,113.00	104,115.93
Avocado	123	9,000	1,104,000	49	\$2,209.00	\$108,241.00	\$0.80	\$70,560.00	\$13,841.00	301,422.59
Banana	593	20,000	11,864,800	534	\$11,340.00	\$6,055,580.00	\$0.92	\$9,825,600.00	15,881,160.00	5,881,911.11
Breadfruit	137	24,500	3,352,000	55	\$1,889.00	\$103,895.00	\$2.00	\$5,390,000.00	5,493,895.00	2,034,775.93
Breadnut	14	15,000	211,800	6	\$1,889.00	\$11,334.00	\$3.00	\$54,000.00	551,334.00	204,197.78
Carambola	15	9,000	135,000	6	\$2,268.00	\$13,608.00	\$2.00	\$21,600.00	229,608.00	85,040.00
Christophene	12	2,000	24,000	6	\$2,851.00	\$17,106.00	\$1.96	\$23,520.00	40,626.00	15,046.67
Chive	4	8,000	28,000	1	\$1,900.00	\$1,900.00	\$25.00	\$40,000.00	401,900.00	148,851.85
Cocoa	540	5,000	2,700,000	405	\$2,500.00	\$1,012,500.00	\$1.50	\$6,075,000.00	7,087,500.00	2,625,000.00
Coconut	1500	15,000	22,500,000	1350	\$1,689.00	\$2,280,150.00	\$0.50	\$20,250,000.00	22,530,150.00	8,344,500.00
Golden apple	116	21,000	2,437,000	17	\$2,209.00	\$37,553.00	\$1.00	\$71,400.00	751,553.00	278,352.96
Grapefruit	10	20,000	200,000	1	\$2,028.00	\$2,028.00	\$1.00	\$40,000.00	42,028.00	15,565.93
Guava	24	24,000	576,000	5	\$2,099.00	\$10,495.00	\$1.00	\$24,000.00	250,495.00	92,775.93
Jujube	5	24,000	121,800	3	\$2,268.00	\$6,804.00	\$3.00	\$432,000.00	438,804.00	162,520.00
Lemon	5	18,500	92,500	0.5	\$1,288.00	\$644.00	\$2.50	\$4,750.00	46,894.00	17,368.15
Limes	12	18,500	222,000	2	\$1,288.00	\$2,576.00	\$4.00	\$29,600.00	298,576.00	110,583.70
Mandarin	2	16,000	27,615	0.2	\$1,288.00	\$257.60	\$1.00	\$6,400.00	6,657.60	2,465.78
Mangoes	400	17,500	7,000,000	80	\$1,969.00	\$157,520.00	\$0.50	\$1,400,000.00	1,557,520.00	576,859.26
Nutmeg	40	800	32,000	4	\$1,900.00	\$7,600.00	\$3.50	\$22,400.00	30,000.00	11,111.11
Orange	15	27,000	405,000	1.5	\$2,367.00	\$3,550.50	\$1.00	\$81,000.00	84,550.50	31,315.00
Passion Fruit	10	8,000	80,000	10	\$2,841.00	\$28,410.00	\$2.50	\$20,000.00	228,410.00	84,596.30
Pawpaw	8	15,000	120,000	4	\$5,334.00	\$21,336.00	\$2.00	\$12,000.00	141,336.00	52,346.67
Pineapple	30	15,000	450,000	27	\$7,098.00	\$191,646.00	\$8.00	\$3,240,000.00	3,431,646.00	1,270,990.00
Plantain	700	30,000	21,000,000	595	\$8,092.00	\$4,814,740.00	\$1.00	\$17,850,000.00	22,664,740.00	8,394,348.15
Sapodilla	2	18,000	36,000	0.2	\$1,900.00	\$380.00	\$2.00	\$14,400.00	14,780.00	5,474.07
Soursop	14	20,000	280,000	2	\$1,914.00	\$3,828.00	\$1.20	\$96,000.00	99,828.00	36,973.33
Sugarapple	8	12,000	96,000	1	\$1,914.00	\$1,914.00	\$1.00	\$24,000.00	25,914.00	9,597.78
Tangerine	5	16,000	74,000	0.5	\$1,288.00	\$644.00	\$1.00	\$16,000.00	16,644.00	6,164.44
Waterapple	10	20,000	200,000	2	\$1,900.00	\$3,800.00	\$1.00	\$80,000.00	83,800.00	31,037.04
TOTAL CULTIVATED	6,556.4					\$21,722,919.10		\$93,637,170.00	115,360,089.10	42,725,958.93

Notes:
 163 acres of arrowroot planted, 65 acres (40%) of arrowroot was harvested before the eruption and is considered as the value of starch loss.
 15,000 coconuts/acre is estimated as 45,000 lbs.

Figure 19 shows that the entire region was affected after the eruption and clearly shows that the “changes in NDVI values are much higher in the surrounding areas of the volcano.”

Figure 19: Vegetation changes (NDVI) using Sentinel 2 after April 10th 2021 (left: Jan1-Apr9 and Right: Apr10-Apr26)

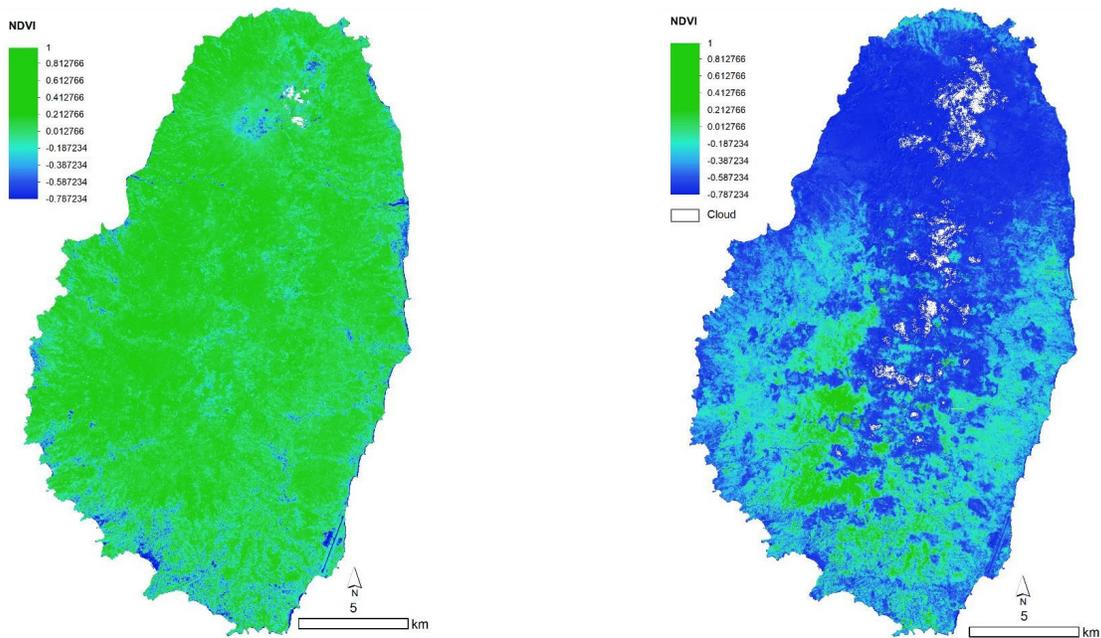
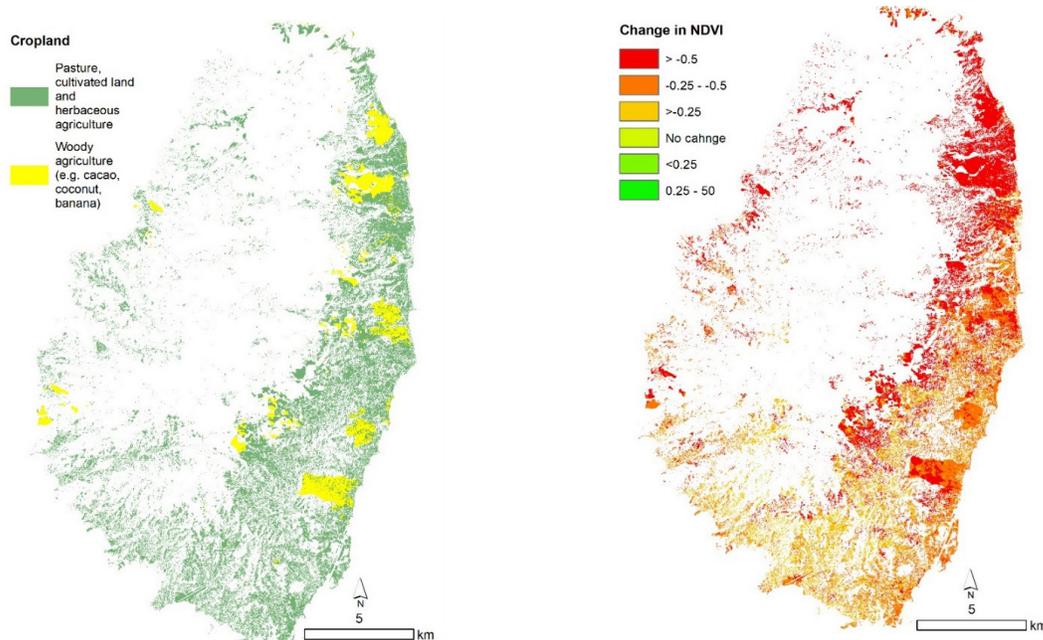


Figure 20 illustrates type of damage and changes in NDVI for specific types of land cover, including pasture, crops, and woody agriculture (tree crops).

Figure 20: NDVI Changes after 10th of April over the cropland area (left: Cropland, Right: NDVI change)



The NDVI analysis estimated that a total of 43% of all the cultivated lands in the island were severely impacted (roughly 3200 hectares), while 3000 hectares were partly affected and only 0.6% of lands were not affected.

Tables 16 and 17 provide further detailed estimated area of damage and the types of changes in vegetation and crop land in each of the hazard zones.

Table 16: Impacted cultivated land (ha) in Saint-Vincent Islands based on land cover, vegetation changes (NDVI), by hazard zones, land cover and administrative units

Hazard	Admin Units	Pasture, cultivated land and herbaceous agriculture	Woody agriculture (e.g. cacao, coconut, banana)	Impacted cultivated land (cropland)				
				Total	High	Medium	Low	No change
Red	Charlotte	1089.45	347.16	1436.61	1234.18	170.19	25.68	1.68
Red	Saint David	223.16	16.78	239.94	226.65	7.92	0.99	0.12
Orange	Charlotte	484.35	132.89	617.23	388.92	213.50	13.37	0.31
Orange	Saint David	196.55	6.28	202.83	138.05	56.54	6.52	0.06
Orange	Saint Patrick	5.21	0.00	5.21	2.77	1.87	0.33	-
Yellow	Charlotte	1017.34	127.19	1144.53	499.00	557.64	81.00	2.11
Yellow	Saint Andrew	1.19	0.00	1.19	0.30	0.27	0.45	0.01
Yellow	Saint David	7.58	0.00	7.58	2.81	4.03	0.43	0.04
Yellow	Saint Patrick	141.49	0.14	141.64	48.15	76.63	15.60	0.18
Green	Charlotte	1038.32	401.21	1439.53	448.07	795.65	184.73	6.12
Green	Saint Andrew	454.53	0.07	454.60	53.07	206.40	187.11	6.56
Green	Saint George	1680.96	4.06	1685.02	150.03	840.51	677.19	26.90
Green	Saint Patrick	83.37	56.65	140.02	48.39	73.63	15.53	0.67
Total		6424	1092	7516	3240	3005	1209	45

Table 17: Impact severity (%) on cultivated land based on vegetation (NDVI) changes, administrative units and hazard zones

Hazard zones	Admin Units	Negative changes (based on NDVI) in cultivated areas (cropland)			
		High <-0.5	Medium -0.5 to -0.25	Low <-0.25	No change
● Red	Charlotte	85.91	11.85	1.79	0.12
● Red	Saint David	94.46	3.30	0.41	0.05
● Orange	Charlotte	63.01	34.59	2.17	0.05
● Orange	Saint David	68.06	27.88	3.21	0.03
● Orange	Saint Patrick	53.26	35.89	6.42	-
● Yellow	Charlotte	43.60	48.72	7.08	0.18
● Yellow	Saint Andrew	25.62	22.31	38.01	0.83
● Yellow	Saint David	37.10	53.18	5.71	0.52
● Yellow	Saint Patrick	34.00	54.10	11.01	0.12
● Green	Charlotte	31.13	55.27	12.83	0.48
● Green	Saint Andrew	11.67	45.40	41.16	1.44
● Green	Saint George	8.90	49.88	40.19	1.6
● Green	Saint Patrick	34.56	52.58	11.09	0.48

Table 18: Total Effect of Volcanic Eruption to the Agriculture Sector

Category	Crops	Apiculture	Livestock	Forestry	Fisheries	Infrastructure	Grand Total EC\$	Grand Total US\$
Damage	21,722,919	116,500	447,662	20,832,500	423,947	54,000	43,597,528	16,147,232.59
Loss	93,637,170	110,250	522,243		4,815,211		99,084,874	36,698,101.48
Total	115,360,089	226,750	969,905	20,832,500	5,239,158	54,000	142,682,402	52,851,334.07

The Damage and Loss Assessment Team included officials from the Ministry Agriculture Planning Unit, Forestry, Fisheries, Extension and Advisory, Animal Health and Production Division, Banana Services Division, Inter American Institute for Cooperation Agriculture, Caribbean Agricultural Research and Development Institute (CARDI) and Food and Agriculture Organisation of the United Nations (FAO).

Figure 21: Map of St. Vincent Showing Agricultural Districts and Hazard Zones

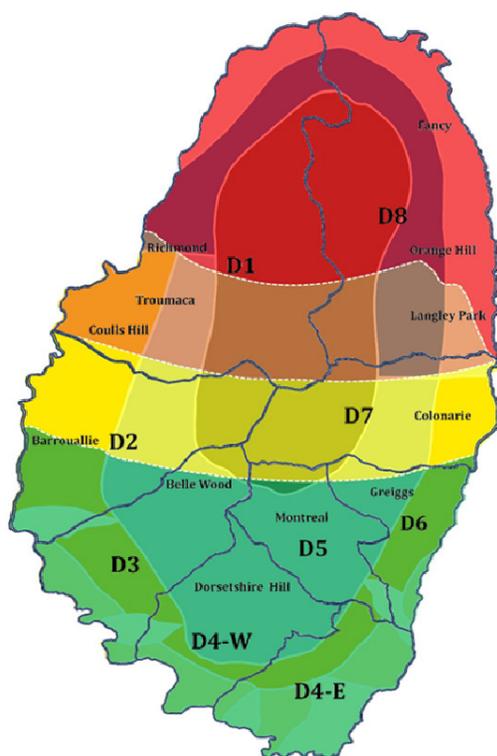


Figure 21 Composite map of St Vincent including Agro-ecological zones (CARDI), Agricultural Regions and Districts (MAFFRTIL) and Volcanic Hazard Zones (UWI SRC). Layers and overlays put together by Colville King, Diversification Officer MAFFRTIL, April 2021.

The National Emergency Management Organization (NEMO) reported that a total of 13,303 persons¹⁰ were evacuated. Of these persons, approximately 2875 were registered farmers and 278 were fisherfolk who

were dislocated from the red and orange zones (Table 19). Additionally, some farmers and fishers from the Yellow Zone, especially on the leeward side, were evacuated.

Table 19: Farmers Disaggregated by Hazard Zones

Zones	Total numbers of registered farmers	Total number registered fishers	Total by zone
Red	1850	125	1975
Orange	1023	153	1176
Yellow	2569	2	2571
Green	4996	1468	6464
	10,438	1,748	12,186

Figure 21 is a map of St Vincent showing the Hazard Zones and Agricultural Districts and a table showing the demographic distribution of registered farmers and fishers. Table 19 shows the distribution of farmers according to the different Hazard Zones.

A mixed methodology was employed to conduct the DADA and included “field visits, telephone and personal interviews, the use of data from the Ministry and other institutions, review of past damage assessment documents and statistics from MAFFRTIL and the Ministry of Finance and Economic Planning.”

Crop loss was calculated using the acreages affected multiplied by the expected yield foregone multiplied by the market price. Loss calculations for tree crops were done using the extended period of 24 months since recovery for this commodity group will take 2 to 3 years before full recovery.

¹⁰ National Emergency Management Organization update, dated April 19, 2021

Validation of these estimates was made using further resources and information from FAO, IICA and CARDI, as well as national statistics.

Livestock damage was calculated based on field visits and reports on deaths of animals and damage estimated using market values by type of animal. Losses were calculated based on production and farm gate prices.

Fisheries damage was calculated based on the estimated market value and repair costs to vessels, equipment and facilities affected. Fisheries losses were calculated based on two sets of variables (i) estimation based on vessels damaged (ii) an estimated 30% of the total fish landings for 2020.

Damage and loss in the forestry sector was not easily quantifiable due to the nature of the forestry ecosystem and services. Notwithstanding, observation and reports were used to estimate the damage done to plantation, primary and secondary forest. An estimate was made on the total number of acres of plantation and natural forest damaged and calculated using a multiplier.

The infrastructure estimation was done using visual observations from field visits and estimates of costs for damages.

7.1 CROP LOSS

The DADA provides detailed estimates for each of the main crops grown (primarily arrowroot, vegetables, root crops, bananas and plantains, and tree crops). Table 20 shows these DADA estimates in detail.

7.2 APICULTURE

The DADA report found that country's "thriving apiculture industry" (with 713 hives) was not severely impacted since less than 10 percent of the hives are located in the red and orange zones. The total damage was estimated at \$116,500.00 and loss amounted to \$110,250.00.

7.3 LIVESTOCK

However, the extensive loss of vegetation (pasture and other forage on which to graze animals) in the red and orange zones will further exacerbate preliminary estimated livestock losses which were determined to be at least \$447,662.00 in the red and orange zones with an overall estimated loss \$522,243.00. Even if farmers can get their livestock to safe zones, there are significant costs "associated with the protection, feeding and veterinary support of these livestock and their relocation to the areas."

The estimated livestock farmers affected in the red and orange zones is 1,233.

The affected animal population in the red zone for small ruminants is 4990, cattle 684 and approximately 400 pigs. More losses are expected as a result of respiratory and dietary issues and other complications.



Table 20: Livestock Damage and Loss

DAMAGES						LOSSES			
PRIVATE			PUBLIC			PRIVATE			PUBLIC
Commodity	No. of animals lost	Value of animals	Infrastructure damage value	No. of animals lost	Value of animals	Items	Infrastructure damage value	Farmgate loss	Production loss Apr-Dec
Poultry	2872	\$59,720.00	\$89,550.00	0	\$0.00	Pens	\$10,000.00	\$304,875.00	\$0.00
Sheep	45	\$26,000.00	\$32,000.00	9	\$3,250.00	Guttering	\$3,000.00	\$13,020.00	\$11,620.00
Goat	90	\$52,320.00	\$4,704.00	8	\$13,200.00	Fencing	\$2,950.00	\$28,040.00	\$20,600.00
Pig	59	\$45,725.00	\$22,308.00	10	\$850.00	Forage bank	\$12,585.00	\$57,520.00	\$37,708.00
Cattle	17	\$63,500.00	\$6,000.00	0	\$0.00			\$42,560.00	\$6,300.00
TOTAL	3083	\$247,265.00	\$154,562.00	27	\$17,300.00		\$28,535.00	\$446,015.00	\$76,228.00

Table 21: Livestock Infrastructure Damage and Loss

	PRIVATE	PUBLIC	TOTAL	XCD	USD
DAMAGE	No. of Animals	3083	27	3110	
	Value of Animals	\$247,265.00	\$17,300.00	\$264,565.00	\$447,662.00
LOSS	Infrastructure damage value	\$154,562.00	\$28,535.00	\$183,097.00	
	Farmgate Loss	\$446,015.00	0	\$446,015.00	\$522,243.00
	Production loss Apr- Dec	\$69,648.00	\$6,580.00	\$76,228.00	\$192,220.18
	TOTAL	\$917,490.00	\$52,415.00		\$969,905.00
					\$356,989.58

7.4 FISHERIES

The DADA reports that the fishery sector in the red, orange and yellow zones has been significantly impacted. Approximately 800 fishers have been affected among which 278 relocated.

The number of vessels damaged were reduced as the MAFFRIL provided prior advice to fishers to safeguard their vessels. It was reported that seven (7) vessels

with their engines and other equipment have been damaged.

As a result, the preliminary estimated damage and loss for fisheries is \$5,017,060.00 with \$361,850.00 representing damages and losses of \$4,655,210 (loss on fish landing, damaged vessels and aquaculture). International export of fisheries products also ceased due to the closure of the airport. The quantification of such loss is still to be determined.

Table 22: Summary of Fisheries Sector Damage

Number	Type/length	Boat	Engine HP	Beach Seine Net	Buoys / Fishing gears and auxiliaries	Oars	Damage	Loss	Total
1			27,000.00				27,000.00	-	27,000.00
1	Pirogue 26ft	40,000.00	38,000.00				78,000.00	147,000.00	225,000.00
1	Double Ender 28ft + Beach Seine Net	20,000.00		35,000.00		800	55,800.00	324,000.00	379,800.00
3	Double Ender 14 (support boat) ft (x3)	13,000.00	-			300	13,300.00	147,000.00	160,300.00
1	Double Ender 11ft	5,000.00	-				5,000.00	36,750.00	41,760.00
1	Bow and Stern 13ft	20,000.00	15,800.00				35,800.00	73,500.00	109,300.00
1	Deck Boat 30ft	100,000.00	38,000.00		8,950.00		146,950.00	122,500.00	269,450.00
	Total	198,000.00	91,800.00	35,000.00	8,950.00	1,100.00	361,850.00	850,860.00	1,212,600.00

Table 23: Fish Landing loss

Fish landing weight	Fish Price (\$)	Fish value
559,636	7.00	\$3,804,460

7.5 FORESTRY

The DADA estimated that “established plantations and the natural forest suffered in excess of 65% damage in the Red, Orange and Yellow zones. The estimated damage is \$56,247,750.”

Table 24: Forestry Damage

Forest area	Location	Cultivated area/ no. of trees/ stands (before disaster) Acres	Damaged/ Affected area/ no. of trees	Repair Cost (where applicable)	Replacement Cost (where applicable)	Ecosystem service value	Est. Value of Damage (USD\$)
Standing timber		569.47	No. Trees/ acre	Salvage/ Rehabilitation	Planting		
Plantation Forest			200				
Red & Orange zone		76.25	76.25/ 15,250	76,250.00	381,250.00		\$457,500.00
Yellow and Green		493.22	98,644	nil	nil		
Forest Access roads	Cumberland Perseverance Rabacca			10 miles	Tractor		
Natural Forest	Central	31,500	20,475			Wildlife, watershed	\$20,475,000.00
Upper Montane		10,500	Destroyed	Monitoring	Protection		
Montane							
Coastal							
Total		43,165.94					\$20,832,500.00 (XCD) \$56,247,750.00)

7.6 AGRICULTURE INFRASTRUCTURE

Substantial damage was done to agricultural infrastructure in the Red and Orange zones, since most of the agricultural investments were in this area (Agricultural Biotechnology Center, arrowroot and cassava factories, fisheries complex, CARDI Field Station, Ministry of Agriculture Livestock Centre, Langley Park Palletisation Centre, and Perseverance Agricultural Station).

At the time the preliminary DADA was completed, the information on the extent of damage and loss to private sector infrastructure (shade houses, farm sheds, animals housing and equipment) were not yet fully assessed. However, it was very clear that “roadways in agricultural areas in the red and orange zones as well as a number of bridges and feeder roads” were affected. The damage to the bridges and roads was an indirect result of erosion due to heavy rains, lahars and pyroclastic flows, clogged streams and rivers due to fallen trees and vegetation.

Table 25: List of General Agriculture Infrastructure

Location	Name Public	Name Private	Volcanic Zone	Impact	Proposed Relocation
Owia	Owia Fisheries Complex		● Red	Ash accumulation	Not Applicable (NA)
	Arrowroot Factory		● Red	Destroyed	No relocation recommended
Orange Hill	Orange Hill Agricultural Training Institute		● Red	Ash accumulation	NA
	Apiaries ATI		● Red	Total collapse	Botanical Gardens
	Irrigation Unit		● Red	Ash accumulation	Recommend to be moved to acquired lands in South Union
	Orange Hill Biotechnology Centre		● Red	Total green house collapse	Montreal Green House Park
Rabacca Farms	Rabacca Livestock Station		● Red	Partial damage	Montreal Green House Park
CARDI Field Station	Rabacca Farms		● Red	Partial damage	Montreal Green House Park
Langley Park	Langley Park Palletization Centre		● Red	Ash accumulation	No relocation recommended Assistance in rebuilding, no relocation
Langley Park		Little Nut	● Red	Total collapse of installation	No relocation recommended
Perserverance	Perserverance Agriculture Station		● Red	Total green house collapse	No relocation recommended
Perserverance		Hadley Cocoa Drying Facility	● Red	Ash accumulation	No relocation recommended
Congo Valley		Congo Valley Mountain Top	● Orange	Ash accumulation, disruption of water	No relocation recommended
Mt. Young		Mt. Young ALCO Hatchery	● Orange	Death of chicks	No relocation recommended
Byera		Mt. William Estate	● Orange	Ash accumulation	No relocation recommended
Three Rivers	Three Rivers Agriculture Station		● Yellow	Ash collection	No relocation recommended
New Grounds	New Grounds Nursery		● Yellow	Ash collection	No relocation recommended
Montreal Garden	Montreal Green House Park		● Green	In good condition	No relocation recommended
Dumbarton Garden	Dumbarton Agriculture station		● Green	In good condition	No relocation recommended
La Croix	La Croix Palletization Centre		● Green	In good condition	No relocation recommended
Rivulet	Rivulet Cannabis Authority		● Green	In good condition	No relocation recommended
Rivulet	Research and Development		● Green	In good condition	No relocation recommended
Kingstown	Kingstown: MAFFRIL head office		● Green	In good condition	No relocation recommended
Kingstown	Plant Quarantine Port		● Green	In good condition	No relocation recommended
Kingstown	Aviary Old Montrose		● Green	In good condition	No relocation recommended
Kingstown	Fisheries Division Headquarters		● Green	In good condition	No relocation recommended
Campden Park	Plant Protection Unit head office		● Green	In good condition	No relocation recommended
Campden Park	Bureau of Standards		● Green	In good condition	No relocation recommended
Campden Park		East Caribbean Feed Mills	● Green	In good condition	No relocation recommended
Campden Park		East Caribbean Flour Mill	● Green	In good condition	No relocation recommended
Rillian	Taiwan technical Mission Pembrook		● Green	In good condition	No relocation recommended
Peters Hope	Peters Hope Germ Plasm		● Green	In good condition	No relocation recommended
Barrouaillie	Barrouaillie Fisheries Complex		● Green	In good condition	No relocation recommended
Walliabou	Walliabou Agriculture Station		● Yellow	In good condition	No relocation recommended
Belle Isle	Research and Development Plot at Belle Isle		● Yellow	Ash accumulation	No relocation recommended
Belmont	Belmont Livestock Station		● Orange	Partial damage	No relocation recommended
Chateaubelair	Chateaubelair Fisheries Complex		● Orange	Ash accumulation	No relocation recommended
Richmond		Richmond Vale Academy	● Red	Ash accumulation	No relocation recommended

The DADA recommendations include: “urgent attention to avoid catastrophic outcomes” such as flowing down stream and river pathways as was experienced in December 2013. The figure of \$54,000,000 was quoted in the preliminary report however, from qualitative reports provided the extent of the damage maybe more. Given the extreme flooding that also

later occurred in late April 2021, further damage to agricultural infrastructure will need to be documented. Table 25 presents and inventory of both public and private agricultural infrastructure and shows which assets are located in Colonaire Division which includes Colonaire community and what damage was noted during the DaLA.

7.7 VULNERABLE GROUPS

According to the United Nations¹¹ appeal, most vulnerable groups in Saint Vincent and the Grenadines will be disproportionately affected by the eruption, with a long and difficult road to recovery ahead of them. High-risk groups include poor and vulnerable households, single female-headed households with children and dependents, pregnant women and girls, farmers and fisherfolk, people living with disabilities, as well as those living with HIV/AIDS, the LGBTQ¹² community, youth (aged 15-29) and children, especially those under five, and the elderly. Poverty is perhaps the broadest cross-cutting issue affecting vulnerable groups.

Prior to the eruption of La Soufrière, poverty was already expected to worsen significantly due to the impact of COVID-19 on livelihoods, projected to increase from 30.2 per cent to 38.5-43.8 per cent¹, while severe poverty was expected to jump from 2.9 per cent pre-pandemic to 11.9 per cent, significantly diminishing the resilience of affected people to recover from this crisis.

Tourism and agriculture are the backbone of the Vincentian economy, making workers in these sectors particularly vulnerable during the current emergency, especially women and youth. Unemployment disproportionately affects women (30.1%) and youth (ages 15-29), for whom joblessness is twice the national rate. Some of the poorest and most vulnerable populations, many of whom are dependent on agriculture and fisheries, reside in high-risk communities that have suffered losses and damages to housing, crops, livestock as well as the tools and equipment they depend on for their livelihoods. Those dependent on these sectors will be displaced from their source of livelihood, beyond the immediate short-term, as the sector's recovery could take months, if not years.

The current volcanic eruption appears to be far worse than what has happened in previous years. Several communities have had to be completely evacuated from the island entirely and are now on cruise ships waiting indefinitely to return once the volcanic activity has ceased.

But the eruption has also produced excessive amounts of ash across the entire island and as far a field as Barbados and other islands. More importantly, the ash has been so heavy that it has disrupted electricity supply, completely covered crops, stressed livestock, weighed down and snapped trees, and very importantly contaminated the island's water supply.

Farmers¹³ in St Vincent's breadbasket region are already counting thousands of dollars in losses after the decimation of their crops from the erupting La Soufriere volcano's ashfall.

Without water, livestock cannot be kept alive and crops cannot be salvaged.

7.8 LINKS/INTERACTION WITH COVID-19

The eruption of La Soufrière comes as Saint Vincent and the Grenadines is recovering from its largest COVID-19 surge amid the pandemic, and the region's worst Dengue outbreak in recent history. La Soufrière is likely continue to erupt in the coming weeks and maybe even months. The long-term effects of a protracted eruption on agriculture and tourism, which are the mainstays of the Vincentian economy and contribute about half of the Gross Domestic Product (GDP), will further exacerbate the already devastating socioeconomic impact of COVID-19. It will also reduce capacity for recovery and erode hard-earned development gains.

¹¹ United Nations. April 2021. UN Global Funding Appeal. Explosive Eruption of Soufriere Volcano: St. Vincent

¹² Lesbian, Gay, Bi-Sexual, Trans, Queer

¹³ Smith, Kareem. Farmers dig out from tonnes of ash, face uncertain future. Barbados Today. April 17, 2021. <https://barbadostoday.bb/2021/04/17/farmers-dig-out-from-tonnes-of-volcanic-ash-face-uncertain-future/>

8 Livelihood Assessment and Contingency Planning



Livelihood assessment data are collected ahead of the normal emergency appeal timetable and other elements of the Livelihood of the population in an area likely to be affected by a hazard.

Livelihoods consist of the capabilities, assets (both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, and provide net benefits to other livelihoods locally and more widely, both now and in the future, while not undermining the natural resource base (The Livelihood Assessment Tool-Kit).

To plan for and evaluate the possible impact hazards may have on the livelihoods within a community, an understanding of the types of livelihoods present, the sources needed, the susceptibility of these livelihoods to hazards (natural and man-made) and the existing and required response mechanisms is needed.

8.1 LIVELIHOOD ASSETS

Documentation of livelihood assets is very critical to any contingency planning. It is especially important to document the physical, natural and human resource assets that exist in case they are damaged or lost in any particular disaster. Matrix 1 outlines the key assets that are present in the Chateubelair community.

8.2 SEASONAL CALENDARS

Seasonal calendars indicate what type of livelihoods are taking place at any particular time of the year. This illustrates livelihood activities in a year without a hazard and the changes or coping strategies employed when there is a hazard event over the course of a year.

Seasonal Calendar shows livelihood activities in a year without a hazard and the changes or coping strategies employed when there is a hazard event over the course of a year.

Table 26: Colonaire: Livelihood Assessment Matrix

Activities	Skills Needed	Tools & Equipment Needed	Natural Resources
Farming <ul style="list-style-type: none"> Banana Eddoes Tannia Sweet Potatoes Yam Plantain 	<ul style="list-style-type: none"> Knowledge of planting Knowledge of seasons when to reap 	<ul style="list-style-type: none"> Spray Can Fertilizers Poison Cutlass, Rakes etc. 	<ul style="list-style-type: none"> Land Sunlight Rain
Laborers (construction)	<ul style="list-style-type: none"> Mixing cement Building and mechanical knowledge 	<ul style="list-style-type: none"> Shovels, Hammers, Saws etc. 	<ul style="list-style-type: none"> Sunlight
Services <ul style="list-style-type: none"> Barbers Hair Stylist Hand craft Security Guards 	<ul style="list-style-type: none"> Hair cutting Weaving Cosmetology Self defense Emergency contact numbers 	<ul style="list-style-type: none"> Shavers, Hair combs, Hair Dryers Needles and threads Batons, flashlight, heavy duty shoes, rain coats 	<ul style="list-style-type: none"> Good weather

Farmers who depend on root and cash crop, service providers such as teachers, carpenters, fishermen, and hunters are most affected by the flooding and landslides. Farmers suffer significant losses to crops already planted therefore harvest or reaping is drastically reduced leading to significant financial losses.

year. Evidently, farmers who depend on banana and those persons who fall in the service provider livelihood category are most affected by the hurricanes. Banana farmers suffer significant losses to crops already planted. Harvesting or reaping is therefore drastically reduced leading to significant financial losses. In the case of the service providers, households seemingly cut back on their usage as more urgent recovery strategies, such as rebuilding and money for food take precedence.

Table 27 livelihood activities in a year without a hazard and the changes or coping strategies employed when there is a hazard event over the course of a

Table 27: Colonaire: Seasonal Calendar – Normal and Hazard Year (Hurricane)

Description of Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Comments
Farming:													
• Banana	P	P	P R-HY	P	P	P	P	P	P	P	P	P RX	Reaping is significantly reduced in the hazard year due to loss of crops. Banana is planted year-round.
• Eddoes			R ₁	P ₂					R ₂	P ₁			Eddoes and Tannias are more resilient to Hurricane as they are root crops, therefore Harvesting and Planting are not affected
• Tannia			R ₁	P ₂					R ₂ P ₂	P ₁ P ₁			
• Plantain													
• Sweet Potatoes													
• Yams													
Labourers: (construction)													Laborers do not experience significant impact to their livelihood in a hazard year as rebuilding efforts increase demand for their skills
Services:													Service providers experience reduction in earnings during and immediately after a hazard year. To counter this, they; • depend on government assistance • borrow from friends and family members locally, • depend on remittances • borrow from credit services • use savings • do odd jobs
• Barbers													
• Hair Stylist													
• Hand craft													
• Security Guards													

└──────────────────┬──────────────────┘
HURRICANE SEASON

Key: R = Reap; P = Plant; W = work; R-HY=Reap hazard year, P-HY=Plant hazard year; **RX = reduction in Reaping; W = reduction in work in Hazard year**

9 Coping Strategies



Understanding how people cope with various hazards and disasters is critical to knowing how to plan and support them. People may have both positive and negative coping strategies. For contingency planning, it is important to find measures to support the positive coping strategies, while finding alternative measures of support to mitigate against the negative coping strategies.

Negative coping strategies for example might include selling all livelihood assets, selling livestock, using all of one's savings, taking children out of school, and so on. According to the residents of Colonaire town, the main strategies used to cope with fallout from the hazards are government assistance in the form of equipment and housing material, borrowing, remittances and doing odd jobs. Whilst these strategies help them to cope they also threaten negative longer term effects such as conflicts due to the borrowing leading to frustration and ultimately depression.

Table 28: Colonaire Coping Strategies

Coping Strategies	Positive Impact	Negative Impact
Depend on government help <ul style="list-style-type: none"> • farming equipment • housing assistance 	Families are able to recover quickly	Political favoritism
Borrow from friends and family members locally,	Families will not starve	Can create tension and damage relationships
Depend on remittances	Families are able to survive on monies provided	<ul style="list-style-type: none"> • Long wait for remittances • can become target of thieves
Borrow from credit services	Quick access to needed fund to help with recovery and purchase of equipment	Increasing debt
Use savings	Families will not starve	Depletion of savings can lead to more hardships
Do odd jobs	Occasional earnings helps to provide for families	Uncertainty, frustration and depression

10 Response and Recovery Typologies



With respect to the 2021 Volcanic Eruption, the DADA reports that have been completed identify both a number of short-term and long-term types of responses that should be implemented. These are presented here:

10.1 IMMEDIATE RESPONSE NEEDS (NEXT 3 TO 6 MONTHS)

- Protection of the public and private livelihoods assets in the red and orange zones (livestock, planting materials, tools/equipment, in-vitro facilities, etc.)
- Income support to farmers, fishers and farm workers.
- Initiative to make food readily available and accessible (to reduce food and nutrition insecurity).
- Policy on loan moratorium for farmers with financial institutions to reduce foreclosure.
- Infrastructure to support relocation of farm and farm assets.
- Identification of lands to relocate farmers (a land bank approach).
- Program to engage farmers, youth and women in initiatives at the evacuation centres.
- Procurement of planting materials, genetic stock for crop and livestock
- Clearing of rivers and streams especially in the upper watersheds in red and orange zones.
- Establishment of crop and livestock support systems.

10.2 MEDIUM TO LONG TERM RECOVERY AND REHABILITATION NEEDS (NEXT 6 TO 12 MONTHS)

- A comprehensive plan for recovery and rebuilding of a modern, competitive agricultural sector
- Farm relocation
- Introduction of technology and innovation
- Incentive program to encourage young people into farming.
- Policy support for incentives, infrastructure, information and intelligence to build a modern agriculture sector.

10.3 RESPONSE TYPOLOGIES IDENTIFIED FOR COLONAIRE

While individuals employ their own responsive mechanisms/coping strategies, external interventions are usually required for the effective and efficient restoration of livelihoods. In the event of a hurricane and/or storm surge, possible responses post-disaster could include the replacement of farming equipment for economic purposes and dwellings for Shelter. The clearing of the main drains in the district post-flood would alleviate excess flood waters.

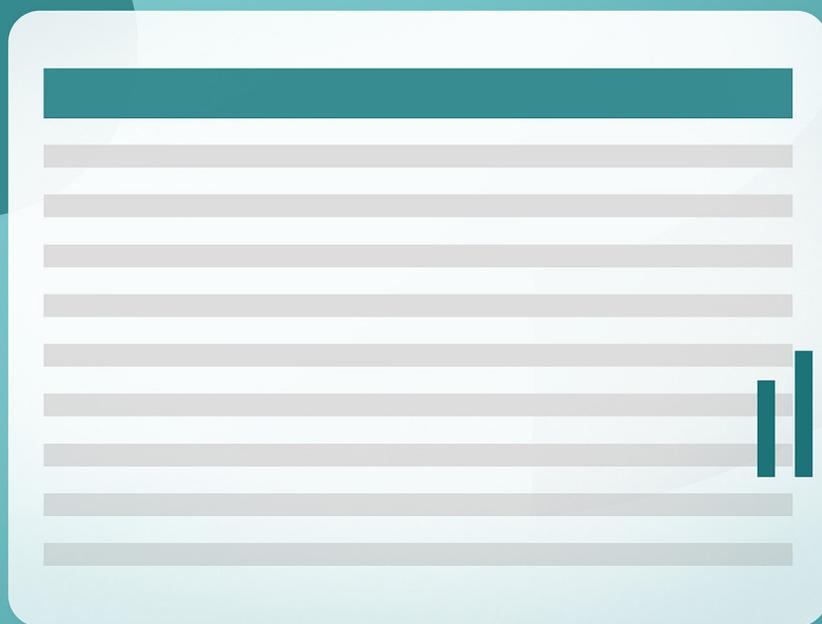
In addition to earning a living from the sale of roots, tubers and livestock, farmers across SVG also earn a livelihood from the sale of fruits. There is an abundance of fruit trees across mainland SVG. Along with selling their produce locally, many farmers export their produce to regional markets such as Trinidad and Tobago, Barbados, Grenada and the BVI.

Table 29: Colonaire Response Typology

Type of Response Needed	Geographical Area	# of Households likely to be affected	Required quantity (US\$)	Duration	Cost (US\$)	Responsibility
Replacement cost of plant material:	Upper Colonaire farmlands					
Banana		18	680 plants @\$3.70x50 ac	One-off	125,800	Min. of Agriculture
Sweet Potato		23	14,520 plants @\$0.37x7 ac		37,606	
Plantain		12	1,210 plants @\$4.44x4 ac		21,490	
Yam		7	4,840 plants @\$1.85x4 ac		35,816	
Cost of production per acre*:						
Banana		18	4 acres (ac)@\$2,839		11,356	
Sweet Potato		23	7 acres (ac)@\$1,098		7,686	
Plantain		12	4 acres (ac)@\$2,839		11,356	
Yam		7	50 acres (ac)@\$3,659		182,950	
2. Emergency Loans	All Colonaire	60		3 months	20,000	
3. Rental Assistance	Colonaire coastline	10	222.22 per month	6 months	13,333	Min. of National Mobilisation
4. Interim assistance benefit	Colonaire coastline	10	184.19 per month	9 months	16,577	Min. of National Mobilisation
5. Uniform assistance	Colonaire coastline	30	\$55.56 per student	One-off	1,667	Min. of National Mobilisation
Meals & transport subsidy		30	\$66.67 per student	9 months	18,001	
6. Cleaning	Colonaire coastline	10		1 week	9,260	BRAGSA

*Cost of production per acre includes: labour operations (clearing, digging, planting, weeding, fertilizer application, moulding and harvesting); materials (herbicide, fungicide, insecticide, fertilizer, tools, other); other costs (transportation)

11 Annexes



ANNEX 1 – PHOTOS OF COLONAIRE

Traditional home



Modern home



Abandoned homes after sea surge. Hurricane Thomas 2010



Colonaire River depositing into the Atlantic Ocean



Colonaire Bridge. Fist constructed 1960, rehabilitated 2012.



ANNEX 2 - MINISTRY OF AGRICULTURE, INDUSTRY AND LABOUR COMPENSATION LIST FOR AGRICULTURAL CROPS AND LIVESTOCK (2019)

Agriculture Region and District	No. of crops	Name of cash crop	Acres	Average number of farmers per crop	Plants per acre	Expected Yield (XCD\$)	Growing Duration (months)	Value at stage in mid of hurricane season (XCD\$)	Value (XCD\$)	75% dependent on crop grown above ground (XCD\$)	55% dependent on crop grown underground	Justification
CHATEAUBELAIR*												
REGION ONE District 1	1	Ginger	2	16	21,780	20,000	9	\$2.00 per plant	87,120		47,916	Roots and tubers are more like to be affected by flash floods as a result of run-off water from heavy rains
	2	Eddoes	1	28	11,616	11,000	6	\$2.00 per plant	23,232		12,778	
Leeward	3	Dasheen	1	6	7,260	14,000	7	\$2.00 per plant	14,520		7,986	
FITZ HUGHES												
District 1	1	Eddoes	2	15	11,616	11,000	6	\$2.00 per plant	46,464		25,555	
	2	Ginger	1	11	21,780	20,000	10	\$0.10per sq. ft.	4,356		2,396	
	3	Sweet Potatoes	1	14	14,520	7,000	4	\$1.00 per plant	14,520		7,986	
ROSE HALL												
District 1	1	Carrots	7	60	264,000	8,000	3/4	\$0.10per sq. ft.	30,492		16,771	Flash floods
	2	Tomatoes	6	90	21,780	15,000	3	\$2.00 per plant	174,240	130,680		Plant like to be damaged/ destroyed by heavy rains and high winds
	3	Cabbages	3-4	90	14,520	12,000	3	\$0.30 per plant	14,810		8,146	Flash flood, heavy rains and drought
SPRING VILLAGE												
District 1	1	Eddoes	30	134	11,616	11,000	6	\$2.00 per plant	696,960		383,328	
	2	Sweet potatoes	14	103	14,520	8,000	4	\$1.00 per plant	406,560		223,608	
	3	Corn	7	93	9,680	25,000	3/4	\$2.00 per plant	67,760	50,820		Plants are likely to be damaged by high winds

*Hurricane intensifies in the latter half of the season and costs were based on this trend and period estimate for growth

Agriculture Region and District	No. of crops	Name of cash crop	Acres	Average number of farmers per crop	Plants per acre	Expected Yield (XCD\$)	Growing Duration (months)	Value at stage in mid of hurricane season (XCD\$)	Value (XCD\$)	75% dependent on crop grown above ground (XCD\$)	55% dependent on crop grown underground	Justification
COLONARIE												
REGION THREE District 7	1	Plantain	4	12	1,210	30,000	11	\$12.00 per plant	58,080	43,560		Plants are likely to be damaged/ destroyed by high winds
	2	Sweet Potatoes	7	23	14,520	8,000	4	\$1.00 per plant	101,640		55,902	
Windward	3	Yams	4	7	4,840	12,000	9	\$5.00 per plant	96,800		53,240	
	4	Bananas	50	18	680	20,000	9	\$10.00 per plant	340,000	255,000		
FANCY												
District 7	1	Sweet Potatoes	5	20	14,520	8,000	4	\$1.00 per plant	72,600		39,930	
	2	Groundnuts	3	16	87,120	3,000	4	\$0.10 per sq. ft.	13,068		7,187	
	3	Eddoes	3	15	11,616	11,000	6	\$2.00 per plant	69,696		38,333	
PARK HILL												
District 7	1	Yams (Portuguese)	7	18	2,723	20,000	7	\$5.00 per hole	95,305		52,418	Extensive dry periods can result in produce smaller in size or loss of plantlets due to the heat. The method of calculation can apply for loss during a drought.
	2	Sweet Potatoes	5	17	14,520	8,000	4	\$1.00 per plant	72,600		39,930	
	3	Dasheen	2	7	7,260	14,000	7	\$2.00 per plant	29,040		15,972	
OWIA												
District 8	1	Sweet Potatoes	12	33	14,520	8,000	4	\$1.00 per plant	174,240		95,832	
	2	Tannia	9	32	4,840	9,000	9	\$2.00 per plant	87,120		47,916	
	3	Eddoes	7	25	11,616	11,000	6	\$2.00 per plant	162,624		89,443	

Agriculture Region and District	No. of crops	Name of cash crop	Acres	Average number of farmers per crop	Plants per acre	Expected Yield (XCD\$)	Growing Duration (months)	Value at stage in mid of hurricane season (XCD\$)	Value (XCD\$)	75% dependent on crop grown above ground (XCD\$)	55% dependent on crop grown underground	Justification
OVERLAND AND MAGNUM												
District 8	1	Sweet Potatoes	12	47	14,520	8,000	4	\$1.00 per plant	174,240		95,832	
	2	Tannia	9.5	43	4,840	9,000	9	\$2.00 per plant	91,960		50,578	
	3	Eddoes	5	29	11,616	11,000	6	\$2.00 per plant	116,160		63,888	
SANDY BAY												
District 8	1	Tannia	23	73	4,840	9,000	9	\$2.00 per plant	222,640		122,452	
	2	Sweet Potatoes	22	77	14,520	8,000	4	\$1.00 per plant	319,440		175,692	
	3	Eddoes	9.3	39	11,616	11,000	6	\$2.00 per plant	216,058		118,832	
SOUTH RIVERS												
District 7	1	Dasheen	8	24	7,260	14,000	7	\$2.00 per plant	116,160		63,888	
	2	Sweet Potatoes	14	37	14,520	8,000	4	\$1.00 per plant	203,280		111,804	
	3	Eddoes	5	18	11,616	11,000	6	\$2.00 per plant	116,160		63,888	

Please note that agriculture regions 1 and 3 tend to be severely affected by hurricanes and other natural disasters. Both regions are in the north of the country and experience a greater intensity of wind and heavy rainfall.

Livestock	Cost per animal	Infrastructure cost		
Sheep	300	\$35/sq. ft.	roof \$8/sq	8800/sq. ft. fencing
Goat	300	\$35/sq.ft.	roof \$8/sq	8800/sq. ft. fencing
Pigs	450	\$35/sq.ft.	roof \$8/sq	
Cattle Female	3000			
Cattle Male	4000			
Poultry Boiler	1.25			
Poultry Layer	4.25			
Peak layers	20			
Pre Peak	10			

A 20 ft. x 10 ft pig pen (10 years plus and dilapidated was valued at \$2,500)

ANNEX 3 – MINISTRY OF NATIONAL MOBILISATION - SERVICES OFFERED UNDER THE SOCIAL ASSISTANCE PROGRAMME (XCD\$)

BACKGROUND

The Ministry of National Mobilisation etc. is charged with the national portfolio of providing social protection to vulnerable households through the Public Assistance Programme guided by the Public Assistance Act. Due to societal changes during the past two (2) decades, additional types of monthly and emergency assistance were added to compliment the traditional services. The following are some of the services currently being offered under this programme:

1. Uniform Assistance (\$100&150/student once per year).
2. Rental Assistance (\$400-\$600/person per month for six months).
3. School fees & Exam Fees (\$200/student).
4. Meals & Transport Subsidy (\$180/student per month).
5. Basic Amenities & Disaster Relief (\$250&\$1200/person (one-off assistance).
6. Interim Assistance Benefit (\$500/family for nine (9) months).
7. Medical & Funeral (\$2000/person (one-off assistance).

ANNEX 4 MINISTRY OF AGRICULTURE, INDUSTRY AND LABOUR – COMPENSATION LIST FOR AGRICULTURAL AND FORESTRY CROPS

FIELD CROPS	COSTS (XCD\$)	FIELD CROPS	COSTS (XCD\$)
Arrowroot	10 cents per sq. ft.	Grasses (cultivated)	5 cents per sq. ft.
Bananas	\$3.00 per plant up to 3 months \$6.00 per plant at medium stage \$10.00 per plant if bearing	Ground Nuts	10 cents per sq. ft.
Plantain	\$4.00 per plant up to 3 months \$7.00 per plant at medium stage \$12.00 per plant if bearing	Yams (Portuguese)	\$3.00 per hole when young \$5.00 per hole if matured
MaughFaugh Baugh	\$1.00 per plant up to 3 months \$3.00 per plant at medium stage \$6.00 per plant if bearing	Dominic	\$2.00 per hole when young \$4.00 per hole if matured
Grindy	\$3.00 per plant up to 3 months \$6.00 per plant at medium stage \$9.00 per plant if bearing	Water	\$1.00 per hole when young
Sugar Cane	\$1.00 per hole	White	\$3.00 per hole if matured
Cassava	30 cents per hole up to 3 months \$2.00 per plant when matured	Bascombe	75 cents per hole when young
Corn	15 cents per hole up to 3 months \$2.00 per plant when matured	Others	\$2.00 per hole if matured
Pigeon Peas	\$1.00 per hole in pure stand \$6.00 per isolated tree	Sweet Potatoes	25 cents per hole when young \$1.00 per hole if matured
Cotton	60 cents per hole up to 2 months \$2.00 per plant if bearing	Ochro	25 cents per hole when young \$1.00 per hole if matured
Eddoes	50 cents per hole up to 3 months \$2.00 per plant if matured	Ginger	10 cents per sq. ft.
Tannia	50 cents per hole up to 3 months \$2.00 per plant if matured	Sorrel	15 cents per hole when young 25 cents per hole if matured
		Tobacco	50 cents per hole up to 3 months
		Pineapple	\$1.75 per hole up to 3 months \$3.50 per hole up to 3 months \$7.50 per hole up to 3
		Dasheen	50 cents per hole up to 3 months \$2.00 per plant if matured

GREEN VEGETABLES	COSTS (XCD\$)	GREEN VEGETABLES	COSTS (XCD\$)
Beans	10 cents per hole non flowering 25 cents per hole if bearing	Lettuce	20 cents per hole for young plants \$1.00 per plant if bearing
Beets	10 cents per hole	Pepper (Hot or Sweet)	25 cents - 50 cents for young plants \$1.00 per plant if bearing
Cabbage	25 cents per hole when immature \$2.00 per plant when matured	Tomato	10 cents – 50 cents per young plant non flowering \$1.50 - \$2.50 per plant if bearing
Carrots	10 cents per sq. ft.	Pumpkin	10 cents -50 cents per hole when immature \$5.00 per hole if bearing
Cauliflower	25 cents per plant when immature \$1.00 - \$2.00 per plant when matured	Passionfruit	\$1.00 per non bearing vine \$5.00 per vine if bearing
Christophene	\$1.00 per hole when immature \$5.00 per hole if bearing	Black Pepper	\$1.00 per plant not bearing \$5.00 per plant if bearing
Cucumber	10 cents per plant when immature \$2.00 per plant if bearing	Pineapples	\$1.75 up to 3 months \$3.50 up to 6 months \$7.50 up to and over 12 months
Egg Plant	10 cents - 50 cents per plant when immature \$2.00 per plant if bearing		

FOREST CROPS (XCD\$)

SPECIES	BEARING TREES	DAMAGED OVER 10 YRS	DAMAGED OVER 5-10 YRS	DAMAGED 0-5 YRS
Mahogany	\$140.00	\$80.00	\$45.00	\$35.00
Teak	\$140.00	\$80.00	\$45.00	\$35.00
Red Cedar	\$140.00	\$80.00	\$45.00	\$35.00
White Cedar	\$140.00	\$80.00	\$45.00	\$35.00
Cype	\$140.00	\$80.00	\$45.00	\$35.00
Honduras Mahogany	\$100.00	\$60.00	\$30.00	\$20.00
W.I Mahogany	\$100.00	\$60.00	\$30.00	\$20.00
Blue Maho	\$100.00	\$60.00	\$30.00	\$20.00
Galba	\$100.00	\$60.00	\$30.00	\$20.00
Pinus Caribbean	\$100.00	\$60.00	\$30.00	\$20.00
Angeline	\$100.00	\$60.00	\$30.00	\$20.00
Bamboo	\$100.00	\$60.00	\$30.00	\$20.00

ORCHARD TREES AND PERMANENT CROPS (XCD\$)

SPECIES	BEARING TREES	DAMAGED OVER 10 YRS	DAMAGED OVER 5-10 YRS	DAMAGED 0-5 YRS
Breadfruit	\$120.00	\$60.00	\$45.00	\$45.00
Breadnut	\$90.00	\$50.00	\$30.00	\$25.00
Cocoa	\$80.00	\$60.00	\$45.00	\$35.00
Coconut	\$100.00	\$70.00	\$60.00	\$45.00
Coffee	\$45.00	\$35.00	\$30.00	\$15.00
Cashew	\$50.00	\$45.00	\$30.00	\$15.00
Custard Apple	\$15.00	\$10.00	\$8.00	\$6.00
Golden Apple	\$75.00	\$50.00	\$30.00	\$20.00
Sugar Apple	-	\$15.00	\$8.00	\$6.00
Guava	\$40.00	\$30.00	\$20.00	\$10.00
Mango (other)	\$70.00	\$45.00	\$30.00	\$15.00
Mango (grafted)	\$120.00	\$60.00	\$45.00	\$35.00
Mammie Apple	\$56.00	\$40.00	\$30.00	\$15.00
Nutmeg	\$120.00	\$90.00	\$60.00	\$35.00
Pawpaw	\$30.00	\$20.00	\$10.00	\$5.00
Plum	\$70.00	\$50.00	\$30.00	\$15.00
Plumrose	\$50.00	\$35.00	\$25.00	\$15.00
Sapodilla	\$70.00	\$50.00	\$30.00	\$15.00
Pear (Avocado)	\$90.00	\$60.00	\$45.00	\$30.00
Grapefruit	\$90.00	\$60.00	\$45.00	\$30.00
Orange	\$90.00	\$60.00	\$45.00	\$30.00
Tangerine	\$90.00	\$60.00	\$45.00	\$30.00
Ortanique	\$90.00	\$60.00	\$45.00	\$30.00
Lime	\$90.00	\$60.00	\$45.00	\$30.00
Soursop	\$50.00	\$40.00	\$30.00	\$15.00
Clove	\$70.00	\$50.00	\$40.00	\$30.00
Cinnamon	\$70.00	\$50.00	\$40.00	\$30.00
Mauby	\$50.00	\$40.00	\$30.00	\$15.00

ANNEX 5 – COST OF PRODUCTION

Source: Ministry of Agriculture, Industry and Labour, SVG.

CROP: Ginger **VARIETY:** Jamaican **ACREAGE:** One (1) Acre **DATE:** 7/10/2018

ITEMS	UNITS	RATE(\$)	NO.	COST(\$)
LABOUR OPERATIONS				
Land clearing (Cutlass & Clean) / spraying	M/day	40.00	12	480.00
Ranging	M/day	40.00	15	600.00
Gathering / preparation of planting material	M/day	40.00	5	200.00
Chopping holes and planting	M/day	40.00	6	240.00
Weeding manually (X 2) & Moulding(X 1)	M/day	40.00	28	1120.00
Fertilising - Band application (X 3)	M/day	40.00	4	160.00
Harvesting (pull, cut, wash, dry, bag)	M/day	40.00	30	1200.00
Heading out of field	M/day	40.00	20	800.00
Subtotal				\$ 4,800.00
MATERIALS				
Planting Materials ()	Lbs	1.50	3000	4500.00
Grammoxone & pre-emergent	Gal			205.00
Fertiliser (NPK)	Sack	65.00	12	780.00
Tools(e.g.) Spray can Fork, Hoe, Cutlass, File		665.00	1	665.00
Other(Bags)		1.00	200	200.00
Subtotal				\$ 6,350.00
OTHER COSTS				
Land charges (Lease)	Acre	500.00	1	500.00
Transportation		300.00		300.00
Supervision				
Interest on loans (9 - 11%)				
Depreciation on tools & equipment				
Other				
Subtotal				\$ 800.00
Total cost of production				\$ 11,950.00
Total cost per unit of output(\$/Lb)				\$ 0.60
ASSUMPTIONS				
a) Plant spacing	1 X 3 Within Row X Between Row (Ft)			
b) Plant density	14,520 plants per acre			
c) Marketable yields	20,000 Lbs			
d) Losses & main cause	Negligible.(Due nematode)			
e) Maturation Period	10 Months			
f) Price per unit yield - Farmgate :				

CROP: Eddoe **VARIETY:** Black **ACREAGE:** One (1) Acre **DATE:** 31/12/2014

ITEMS	UNITS	RATE(\$)	NO.	COST(\$)
LABOUR OPERATIONS				
Land clearing --Spraying/Cleaning	M/day	40.00	2	80.00
Digging Holes	M/day	40.00	15	600.00
Gathering and preparing plant material	M/day	40.00	4	160.00
Planting (Including heading and dropping)	M/day	40.00	8	320.00
Weed control (herbicide)(X2)	M/day	40.00	3	120.00
Fertiliser application (X 2)	M/day	40.00	4	160.00
Moulding (x1)	M/day	40.00	12	480.00
Harvesting (incl. Sort & heading)	M/day	40.00	12	480.00
Heading out of field	M/day	40.00	8	320.00
Subtotal				\$ 2,720.00
MATERIALS				
Planting materials (Slips)				
Herbicide -(Grammaxone)	Gal.	136.00	2	180.00
Fertiliser (types) N.P.K.	sack	100.00	9	900.00
Tools(e.g.) Fork, Hoe, Cutlass, File, Spray can				
Other (e.g.) Boxes, bags				
Subtotal				\$ 1,080.00
OTHER COSTS				
Land charges (Lease/ Rent/ Share)	Acre			
Transportation				300.00
Supervision				
Subtotal				\$ 300.00
Total cost of production				\$ 4,100.00
Total cost per unit of output(\$/Lb)				\$ 0.37
ASSUMPTIONS				
a) Plant spacing	2 X 3 Within Row X Between Row (ft)			
b) Plant density	7,260 plants per acre (plants/acre)			
c) Marketable yields(lbs)	11,000			
d) Losses (Rejects & Spoils)	Negligible			
e) Maturation Period	6 Months			
f) Price per unit yield - Farmgate :	\$0.75/Lb			

CROP: Dasheen **VARIETY:** Upland **ACREAGE:** One (1) Acre **DATE:** 31/12/2014

ITEMS	UNITS	RATE(\$)	NO.	COST(\$)
LABOUR OPERATIONS				
Land clearing --Spraying/Cleaning	M/day	40.00	2	80.00
Digging Holes	M/day	40.00	15	600.00
Gathering and preparing plant material	M/day	40.00	3	120.00
Planting (Including heading and dropping)	M/day	40.00	5	200.00
Weed control (herbicide)(X2)	M/day	40.00	3	120.00
Fertiliser application (X 2)	M/day	40.00	4	160.00
Moulding (x1)	M/day	40.00	12	480.00
Harvesting (incl. Sort & heading)	M/day	40.00	12	480.00
Heading out of field	M/day	40.00	8	320.00
Subtotal				\$ 2,560.00
MATERIALS				
Planting materials (Slips)				0.00
Herbicide -(Grammaxone /Touchdown)	Gal.	170. /136	2	306.00
Fertiliser (types) N.P.K.	sack	100.00	10	1,000.00
Tools(e.g.) Fork, Hoe, Cutlass, File, Spray can				
Other (e.g.) Boxes, bags				
Subtotal				\$ 1,306.00
OTHER COSTS				
Land charges (Lease/ Rent/ Share)	Acre			
Transportation				300.00
Supervision				
Subtotal				\$ 300.00
Total cost of production				\$ 4,166.00
Total cost per unit of output(\$/Lb)				\$ 0.30
ASSUMPTIONS				
a) Plant spacing	2.5 X 3 Within Row X Between Row (ft)			
b) Plant density	5,800 plants per acre (plants/acre)			
c) Marketable yields(lbs)	14,000			
d) Losses (Rejects & Spoils)	Negligible			
e) Maturation Period	8Months			
f) Price per unit yield - Farmgate :	\$.60/Lb			

ANNEX 6 – REFERENCES

Adams, Lennie D. 2013. Land Degradation in Georgetown (Final Report). Ministry of Wellness and the Environment St. Vincent and the Grenadines. Under the GEF Integrating Water, Land and Eco-Systems Management in the Caribbean Small Island Development States (IWECO) Project.

Boruff, Bryan & Cutter, Susan. (2007). The Environmental Vulnerability of Caribbean Island Nations. Geographical Review. <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1931-0846.2007.tb00278.x>

Campbell, Donovan. 2016. Preliminary Rapid Community Climate Vulnerability Assessment (RCCVA) for the “Volcano Ready Communities in St. Vincent and the Grenadines (VRCinSVG)” Project. Community Disaster Risk Reduction Fund (CDRRF), Caribbean Development Bank (CDB). Barbados.

Caribbean Handbook on Risk Information Management (CHARIM). <http://www.charim.net/stvincent/information>

Community Engagement Survey (CES). September 17th – 25th, 2018. Community Disaster Risk Reduction Fund (CDRRF), Caribbean Development Bank (CDB).

Dalton, Michael, et.al. April 2021. Detailed Agriculture Damage Assessment Report. Prepared by the Damage and Loss Assessment Team (DaLAT). National Emergency Management Organisation (NEMO), Kingstown.

DeGraff, J.V., 1988. Landslide hazard on St. Vincent, West Indies Final Report. Washington, D.C., Organization of American States. 2, Cited in Westen, C.J. and Sijmons, Koert. 2016. Saint Vincent and the Grenadines: Topographic map, Caribbean Handbook on Disaster Information Management project (CHARMIN). https://www.researchgate.net/publication/311311875_Saint_Vincent_and_the_Grenadines_Topographic_map/citation/download

DNL Consultants. 2005. Inception Report for the Island Wide Flood Risk Assessment Study Project No. SVGDMP-CON-ICB-F-B12/03.

Economic Commission for Latin America and the Caribbean (ECLAC). 2011. St. Vincent and the Grenadines: Macro Socio-Economic Assessment of the Damage and Losses Caused by Hurricane Tomas. https://info.undp.org/docs/pdc/Documents/BRB/76749_LC-CAR-L%20294%20-%20SVG%20DaLA%20REPORT.pdf

Geographical Information Systems (GIS) Division. Ministry of Housing, Informal Human Settlement, Land and Surveys and Physical Planning. http://www.housing.gov.vc/housing/index.php?option=com_content&view=article&id=37:geographical-information-systems-division&catid=31&Itemid=50

Geographical Information Systems (GIS) Division. Ministry of Housing, Informal Human Settlement, Land and Surveys and Physical Planning. http://www.housing.gov.vc/housing/index.php?option=com_content&view=article&id=37:geographical-information-systems-division&catid=31&Itemid=50

Ghosh, Amit, et.al. April 26, 2021. Cropland damage assessment after the volcanic eruption of La Soufrière in Saint-Vincent Island. FAO, contact: Matieu.henry@fao.org and Roberto.Sandoval@fao.org

GIS Unit. Physical Planning Division, Ministry of Transport, Works, Lands, and Physical Planning, Kingstown. St. Vincent and the Grenadines.

Global Environmental Facility (GEF) – Integrated Watershed and Coastal Area Management Project (IWCAM) - Land and Water National Awareness Raising Proposal. No Date.

Government of SVG. 2011. Strategic Programme for Climate Resilience SAINT VINCENT AND THE GRENADINES PHASE TWO PROPOSAL Narrative. Kingstown.

Government of St. Vincent and the Grenadines. 2014. Regional Disaster Vulnerability Reduction Project (RDVRP). Social Assessment Report. Central Planning Division. Ministry of Finance, Planning and Economic Development. Kingstown. https://www.gov.vc/images/pdf_documents/rdvrp_social_assessment_april_2014.pdf

John, Lyndon. 2006. From growing ganja to planting trees: Stimulating legal livelihoods and watershed management in Saint Vincent through payments from public utilities A report on the Integrated Forest Management and Development Programme (IFMDP) and Forest User Groups of St. Vincent and the Grenadines. https://www.researchgate.net/publication/321010618_From_growing_ganja_to_planting_trees_Stimulating_legal_livelihoods_and_watershed_management_in_Saint_Vincent_through_payments_from_public_utilities_A_report_on_the_Integrated_Forest_Management_and_Dev

Joslyn, Ottis. 2008. Pilot Vulnerability and Capacity Assessment Study Final Report St. Vincent and the Grenadines. St. Vincent and the Grenadines National Trust And The Environmental Services Unit Ministry of Health and the Environment. Kingstown.

Joyette, Antonio. 2006. SVGNETS Annual Report to CMC46 Directors of Meteorology, Antigua and Barbuda.

Joyette, Antonio. (2007). An Assessment of the climate of St. Vincent and the Grenadines: Reviewing Trends in identified variables, Identifying Risks and Providing Guidance. https://www.researchgate.net/publication/271837547_An_Assessment_of_the_climate_of_St_Vincent_and_the_Grenadines_Reviewing_Trends_in_identified_variables_Identifying_Risks_and_Providing_Guidance

Joyette, Antonio. (2015). The Management of Drought In St. Vincent and the Grenadines. https://www.academia.edu/31196414/The_Management_of_Drought_In_St_Vincent_and_the_Grenadines

Kairi Consulting. St. Vincent and the Grenadines. Country Poverty Assessment (CPA) 2007/2008. Living Conditions in a Caribbean Small Island Developing State (SIDS). Final Report. Kingstown. <http://stats.gov.vc/stats/wp-content/uploads/2019/03/Country-Poverty-Assessment-Report-Volume-1-2007-to-2008.pdf>

Kreft, Sonke, David Eckstein, Lukas Dorsch & Livia Fischer. November 2015. Briefing Paper: Global Climate Risk Index 2016. Who Suffers the Most from Extreme Weather Events. Weather-related Loss Events in 2014 and 1995 to 2014. Germanwatch. <https://germanwatch.org/sites/germanwatch.org/files/publication/13503.pdf>

Lyndon, J. and D. Firth (2005) 'Water, watersheds, forests and poverty reduction: a Caribbean perspective'. Paper originally presented at the Seventeenth Commonwealth Forestry Conference, Kuala Lumpur, 28th February – 5th March, 2005. The Caribbean Natural Resources Institute (CANARI), Laventille, Trinidad and Tobago and International Institute for Environment and Development, London, UK. <https://pubs.iied.org/sites/default/files/pdfs/migrate/G00403.pdf>

McIntosh, Sarah and Nicole Leotaud. 2007. Fair deals for watershed services in the Caribbean. Natural Resource Issues No. 8. International Institute for Environment and Development. London, UK. <https://canari.org/wp-content/uploads/2015/04/Fair-deals-for-watershed-services-in-the-Caribbean.pdf>

Murray, Reynold. Updated 2016. Environmental Management Framework for Regional Disaster Vulnerability Reduction Project (RDVRP). Ministry of Finance, Planning and Economic Development. Kingstown. https://www.gov.vc/images/pdf_documents/emf_feb_2016_redisclosure4_final3.pdf

National Emergency Management Office (NEMO). 2005. St. Vincent and the Grenadines National Disaster Plan. Kingstown. <http://nemo.gov.vc/nemo/images/PoliciesActsAndBills/NationalDisasterPlan.pdf>

Primary/Secondary School Listing. 2018. Ministry of Education. Government of St. Vincent and the Grenadines. Kingstown. <https://www.svgcdu.org/primary-and-secondary>

Protz, Maria. 2020. Detailed Rapid Community Climate Vulnerability Assessment (RCCVA) for the “Volcano Ready Communities in St. Vincent and the Grenadines (VRCinSVG)” Project. Community Disaster Risk Reduction Fund (CDRRF), Caribbean Development Bank (CDB). Barbados.

Pyle, D.M., Jenni Barclay, Maria Teresa Armijos. 2018. The 1902–3 eruptions of the Soufrière, St Vincent: Impacts, relief and response. *Journal of Volcanology and Geothermal Research* 356 (2018) 183–199. <https://www.sciencedirect.com/science/article/pii/S0377027317306613>

Robertson, Richard E.A. November 1994. An Assessment of the Risk from Future Eruptions of the Soufriere Volcano of St. Vincent. *Natural Hazards* 11: 163-191, 1995. Seismic Research Unit, University of the West Indies, St. Augustine, Trinidad. https://www.researchgate.net/publication/226148597_An_assessment_of_the_risk_from_future_eruptions_of_the_Soufriere_volcano_of_St_Vincent_West_Indies/link/5761e34d08ae5c6f86da81d4/download

Robertson, Richard. (2012). Land Degradation Assessment of St. Vincent, W.I.. 10.13140/RG.2.2.33175.27044. https://www.researchgate.net/publication/318693005_Land_Degradation_Assessment_of_St_Vincent_WI

Robertson, Richard. Proposal Document (ProDoc). Volcano Ready Communities in St. Vincent and the Grenadines. Seismic Research Centre, University of the West Indies, St. Augustine, Trinidad and Tobago.

Robertson, R.E.A. (2003). The Volcanic Geology of the Pre Soufrière rocks of St Vincent, West Indies. PhD, Department of Geography and Geology, University of the West Indies, Mona. Sam’s Taxi Tours. <https://samtaxitours.com/>

St. Vincent and the Grenadines. April 2021. Encyclopaedia Britannica. <https://www.britannica.com/place/Saint-Vincent-and-the-Grenadines/Government-and-society>

St. Vincent and the Grenadines Educational Statistical Digest: 2018-2019. Prepared by the Planning and Research Units within the Ministry of Education, National Reconciliation and Information with assistance from the Examinations and Assessment Unit, Reprographic Unit, Human Resources Department the Education Media Unit and educational institutions. Kingstown. <http://education.gov.vc/education/images/Stories/pdf/Education-Statistical-Digest-of-SVG-2018-19.pdf>

Statistical Office. 2015. National Health and Nutrition Survey. Non-Communicable Disease Risk Factor Surveillance Report for St. Vincent and the Grenadines. Economic Planning and Sustainable Development Division Ministry of Finance, Economic Planning, Sustainable Development & Information Technology, Kingstown. <http://stats.gov.vc/stats/wp-content/uploads/2018/10/2015-National-Health-and-Nutrition-Survey.pdf>

Statistical Office. 2015. Overview of the Labour Market of St. Vincent and the Grenadines: A Gender Perspective. Economic Planning and Sustainable Development Division Ministry of Finance, Economic Planning, Sustainable Development & Information Technology, Kingstown. <http://stats.gov.vc/stats/wp-content/uploads/2018/09/Overview-of-the-labour-Market-of-SVG.pdf>

Statistical Office. Central Planning Division. Ministry of Finance, Planning and Economic Development. 2012. Population and Housing Census Report: 2012. Kingstown, St. Vincent and the Grenadine. <http://stats.gov.vc/stats/wp-content/uploads/2018/11/Population-and-Housing-Census-Report-2012.pdf>

Sword-Daniels, Victoria. STREVA Project – Strengthening Resilience in Volcanic Areas. University College, London. http://nemo.gov.vc/nemo/images/pdf/article_pdf/AshimpactsDRR.pdf

United Nations. April 2021. UN Global Funding Appeal. Explosive Eruption of Soufriere Volcano: St. Vincent and the Grenadines. United Nations – Barbados and the Eastern Caribbean. Bridgetown, Barbados.

Westen, C.J. and Sijmons, Koert. 2016. Saint Vincent and the Grenadines: Topographic map, Caribbean Handbook on Disaster Information Management project (CHARMIN). https://www.researchgate.net/publication/311311875_Saint_Vincent_and_the_Grenadines_Topographic_map/citation/download