



La Soufrière Volcanic Eruption Sector Reports

SAINT VINCENT AND THE GRENADINES



August 2021



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August 2021



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Social Sectors



Education Sector

The education sector in Saint Vincent and the Grenadines is comprised of 223 schools ranging from early, primary and secondary education. Presently, there are one hundred and twenty-eight (128) early childhood centres. Of these institutions, 117 are privately operated while the remaining eleven are (11) operated by government institutions. Pupils within the primary school system are accommodated in sixty-eight (68) primary institutions. Of these institutions, 57 are public and the remaining 11 are government assisted or private institutions. Secondary Education in St. Vincent and the Grenadines is provided by 27 institutions, 19 of which are public. The remaining eight schools are owned by churches but operate with substantial financial assistance from the Government.

In terms of exposure to the volcano, 22 percent of the education buildings are in the red, orange, and yellow zones as defined by the volcanic hazard map. In terms of physical vulnerability, of the school buildings, the weakest constructive

typology is the one that has metal sheet roofing, due to its inability to withstand additional vertical load added by the weight of ash, especially if wet.

While one can say that the Education Sector in Saint Vincent and the Grenadines was not the most severely sector impacted by the volcanic eruption, the costs to repair and rebuilt the affected infrastructure turns out to be important. The total assets value of the building schools in the country was estimated at XCD 135.2 million.¹ The damage in terms of the costs to repair and replace the affected infrastructure represents 10.8% of that total value of the school buildings assets. Due to the importance of maintaining the education system running this should be one of the priority sectors in the reconstruction process.

During the volcanic eruption, educational facilities on the main island of Saint Vincent were affected and the effects were directly correlated to the radial proximity to the volcano. A classification was established ranking areas from the greatest

¹ Ministry of Education 2021.

to the least affected using four colours: a) red identifying the most affected, b) orange identifying the moderately affected, c) yellow identifying the mildly affected, and d) green identifying the minimally affected.

A total of 177 schools were impacted, comprised of early childhood centres (106), primary schools (52) and secondary schools (19). Of the total number of

affected schools, 139 were mildly affected, and 19 each were moderately and severely affected. Total damage is estimated at XCD 14.6 million with XCD 7.8 million corresponding to private property, and XCD 6.8 million public property; while other losses and additional costs amount to XCD 0.73 million, including XCD 0.34 million in the public sector and XCD 0.39 million in the private sector. See Table 1 for details.

Table 1: Damage and loss summary

| | PRIVATE | PUBLIC | Total |
|------------|-----------|-----------|------------|
| Damage XCD | 7,829,723 | 6,763,156 | 14,592,879 |
| Loss XCD | 391,486 | 338,158 | 729,644 |
| TOTAL XCD | 8,221,209 | 7,101,314 | 15,322,523 |

Source: Education sector evaluation team.

For this assessment, loss has been estimated at XCD 0.73 million and this reflects the additional costs incurred to collect, remove, and dispose debris mostly associated with the partial or total destruction of roofs. Other costs related to the cleaning of ash are significant but are not included in these costs, those costs have been captured globally in the Transport Sector. Impact to the environment has been significant due to the fall of ashes, this has been compounded by the large amount of debris linked to the partial or total destruction of mostly roofs in this and other sectors such as housing and health for example.

In terms of human impact, students that were studying from home due to the ongoing pandemic were displaced substantially. This displacement forced them to change their daily activities, since they had to adapt to new conditions in government led and private shelters. During the emergency a total of 20,915 students were displaced: 12,025

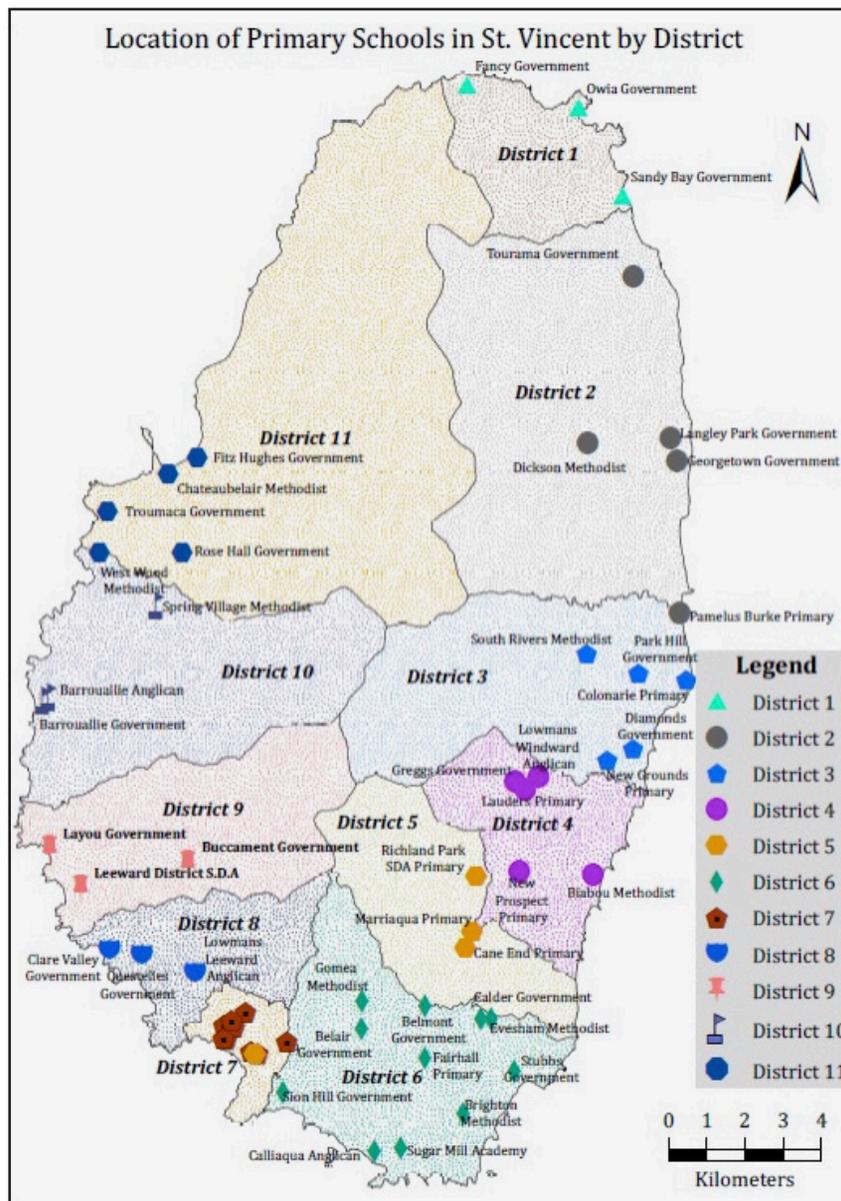
from primary schools and 8,890 from secondary schools.

The recorded damage and loss figures were used as a basis to estimate the recovery needs. Concepts of building back better and disaster risk reduction were applied to counteract effects caused by the volcanic ashfall in a potential new eruption, but also any future catastrophic event including hurricanes and storms. To this end, an additional 20 percent in the replacement values was applied. Total needs amount to XCD 18.2 million, which corresponds to XCD 17.5 million for building improvement and XCD 0.7 million for incurred expenses.

In the short term, the recovery needs amounts to XCD 11.8 million, while in the medium term, which includes improvements on educational facilities located in the green zone of the hazard map, amounts to XCD 6.4 million.

2. Context or Sector Background

According to the Saint Vincent and the Grenadines Ministry of education, the total recorded student population reaches a total of 26,623 students; 3,919 in early childhood level, 13,194 in the primary level and 9,510 in the secondary level.



Source: Ministry of Education

St. Vincent and the Grenadines is comprised of 11 educational districts on the mainland.

Presently, there are one hundred and twenty-eight (128) early childhood centres. Of these institutions, 117 are privately operated while the remaining eleven are (11) operated by government institutions. Together, all 128 institutions cater for children between ages three to five years of age. The overall enrolment for the 2018-2019 Academic year stood at 3,919.²

The primary enrolment for 2018-2019 stood at 12,962 and indicates a decrease of 232 students over the 2017-2018 figure which stood at 13,194. This decrease may be partially attributable to pupils from the leeward islands returning home following the passage of tropical storms which displaced them from their respective homelands. Pupils within the primary cycle are accommodated in sixty-eight (68) primary institutions. Of these institutions, 57 are public and the remaining 11 are government assisted or private.³

Secondary Education in St. Vincent and the Grenadines is provided by 27 institutions, 19 of

which are public. The remaining eight schools are owned by churches but operate with substantial financial assistance from the Government. These eight schools are referred to as Assisted Secondary (AS) schools. In 2018-2019, the overall secondary enrolment stood at 9,510 with the Gross Enrolment Rate (GER) being 99.10 while the Net Enrolment Rate (NER) being 88.89.⁴

Baseline

According to information provided by the Ministry of Education, the country's assets in educational buildings amount to a total of 111 buildings for pre-school education, 58 for primary education and 22 for secondary education. Overall the value of the education system runs at an estimated XCD 135.2 million, of which XCD 56.9 million corresponds to assets in the public sector and XCD 78.2 million corresponds to the private sector. Table 2.

2 Education statistical digest 2018-2019, St. Vincent and the Grenadines

3 Ibidem.

4 Ibidem.

Table 2: Total assets (schools)

| Description | Quantity | Average area (Sm) | Unit cost (XCD) | Estimate value per unit | Total assets (XCD) | Property (XCD) | |
|----------------------|----------|-------------------|-----------------|-------------------------|--------------------|-------------------|-------------------|
| | | | | | | Public | Private |
| Urban schools | | | | | 33,052,860 | 11,017,620 | 22,035,240 |
| Saint George | | | | | | | |
| Early Childhood | 48 | 210 | 1,377 | 289,170 | 13,880,160 | 4,626,720 | 9,253,440 |
| Primary | 11 | 540 | 1,755 | 947,700 | 10,424,700 | 3,474,900 | 6,949,800 |
| Secondary | 4 | 1,080 | 2,025 | 2,187,000 | 8,748,000 | 2,916,000 | 5,832,000 |
| Rural schools | | | - | | 102,125,610 | 45,905,940 | 56,219,670 |
| Charlotte | | | | - | | | |
| Early Childhood | 32 | 210 | 1,377 | 289,170 | 9,253,440 | 4,626,720 | 4,626,720 |
| Primary | 24 | 540 | 1,755 | 947,700 | 22,744,800 | 11,372,400 | 11,372,400 |
| Secondary | 5 | 1,080 | 2,025 | 2,187,000 | 10,935,000 | 5,467,500 | 5,467,500 |
| Saint David | | | | - | | | |
| Early Childhood | 9 | 210 | 1,377 | 289,170 | 2,602,530 | 1,301,265 | 1,301,265 |
| Primary | 8 | 540 | 1,755 | 947,700 | 7,581,600 | 3,790,800 | 3,790,800 |
| Secondary | 2 | 1,080 | 2,025 | 2,187,000 | 4,374,000 | 2,187,000 | 2,187,000 |
| Saint Patrick | | | | - | | | |
| Early Childhood | 5 | 210 | 1,377 | 289,170 | 1,445,850 | 722,925 | 722,925 |
| Primary | 6 | 540 | 1,755 | 947,700 | 5,686,200 | 2,843,100 | 2,843,100 |
| Secondary | 3 | 1,080 | 2,025 | 2,187,000 | 6,561,000 | 3,280,500 | 3,280,500 |
| Saint Andrew | | | | - | | | |
| Early Childhood | 17 | 210 | 1,377 | 289,170 | 4,915,890 | 1,638,630 | 3,277,260 |
| Primary | 9 | 540 | 1,755 | 947,700 | 8,529,300 | 2,843,100 | 5,686,200 |
| Secondary | 8 | 1,080 | 2,025 | 2,187,000 | 17,496,000 | 5,832,000 | 11,664,000 |
| Totals | | | | | 135,178,470 | 56,923,560 | 78,254,910 |

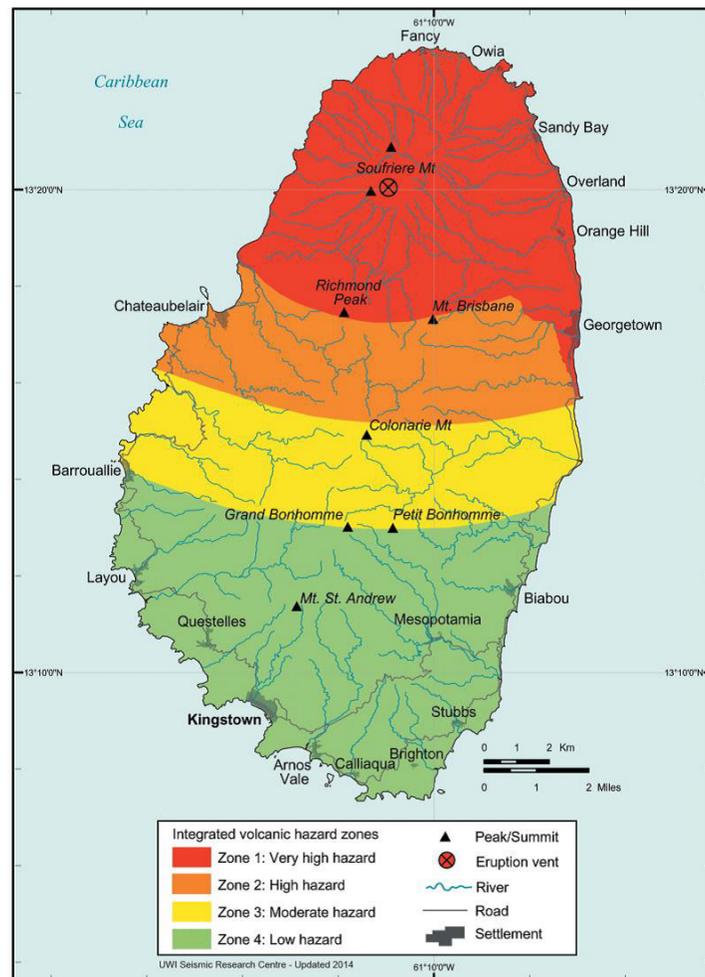
Source: Ministry of Education 2021.

Table 3: Total students in affected areas

| Description | Quantity | | | Property | | Number of students | |
|----------------------|-----------------|-----------|-----------|-----------|------------|--------------------|-------------|
| | Early Childhood | Primary | Secondary | Public | Private | Primary | Secondary |
| Urban schools | | | | | | | |
| Saint George | 48 | 11 | 4 | 12 | 51 | 3907 | 3745 |
| Rural schools | | | | | | | |
| Charlotte | 32 | 24 | 5 | 49 | 12 | 5383 | 3382 |
| Saint David | 9 | 8 | 2 | 8 | 11 | 741 | 469 |
| Saint Patrick | 5 | 6 | 3 | 5 | 9 | 615 | 736 |
| Saint Andrew | 17 | 9 | 8 | 6 | 28 | 1379 | 558 |
| Totals | 111 | 58 | 22 | 80 | 111 | 12025 | 8890 |

Source: Ministry of Education 2021.

3. Sector effects and cost of the effects 3. Assessment of Disaster effects



During the April 2021 volcanic eruption, the educational facilities on the main island were affected and these effects were directly correlated to the radial proximity to the volcano. A classification was established ranking areas from the greatest to the least affected using four colours: a) red identifying the most affected, b) orange identifying the moderately affected, c) yellow identifying the mildly affected, and d) green identifying the minimally affected.

Damage is estimated at XCD 14.6 million out of

which, XCD 7.8 million represents private property, and XCD 6.8 million correspond to public property. Loss and additional costs amount to XCD 0.73 million, including XCD 0.34 million in the public sector and XCD 0.39 million in the private sector.

The need to relocate educational buildings or change the construction technology of the roof in the red zone should be evaluated, however this requires a detailed study to avoid transferring students to a new site.

Table 4: Damage and loss summary

| Item | Damage (XCD) | | Loss (XCD) | |
|--|------------------|------------------|----------------|----------------|
| | Public | Private | Public | Private |
| Estimation of Damage to Infrastructure and Physical Assets | | | | |
| a) Schools with severe damage | 2,911,626 | 2,911,626 | | |
| b) Schools partially destroyed (moderate damage) | 1,711,631 | 1,711,631 | | |
| b) Schools partially destroyed (mild damage) | 2,139,899 | 3,206,466 | | |
| Estimation of Change in Economic Flows (CEF)/Losses | | | | |
| Debris removal | | | 338,158 | 391,486 |
| Total | 6,763,156 | 7,829,723 | 338,158 | 391,486 |

Source: Education sector evaluation team.

To estimate the damage and loss caused by the volcanic eruption, data was classified by division and subsequently the category based on level of affectation was used according to the geolocation, assigning a percentage of affectation according to their location in the volcanic hazard map, either red, orange or yellow zones.

To estimate the value of the educational facilities, the information from the baseline and the local reference was used according to the type of construction.

Subsequently, the damage percentages were applied as follows:

- Mild – No significant damage: the structure is usable and can be occupied. Required repairs

are minimal. Examples: some shingles have blown off the roof or the roof covering has loosened. Windows are broken. 5%.

- Moderate – Minor damage: the structure is usable and can be occupied after taking urgent temporary measures. The owner will probably need assistance with repairs. Examples: parts of the roof covering are missing. Windows and doors are blown out. The structure has shifted in its foundation. 25%
- Severe– Major damage: the structure is not usable and cannot be occupied until repairs are made. Example: Roof covering has blown off or destroyed, exposing the interior of the structure. Windows and doors are missing, and walls are damaged. 40%

Table 5: Damage by division

| Description | Quantity | Damage level | | | Total damages (XCD) | Property | |
|----------------------|----------|--------------|----------|--------|---------------------|------------------|------------------|
| | | Mild | Moderate | Severe | | Public | Private |
| Urban schools | | | | | | | |
| Saint George | | | | | | | |
| Early Childhood | 48 | 48 | | | 694,008 | 231,336 | 462,672 |
| Primary | 11 | 11 | | | 521,235 | 173,745 | 347,490 |
| Secondary | 4 | 4 | | | 437,400 | 145,800 | 291,600 |
| Rural schools | | | | | | | |
| Charlotte | | | | | | | |
| Early Childhood | 32 | 32 | | | 462,672 | 231,336 | 231,336 |
| Primary | 24 | 24 | | | 1,137,240 | 568,620 | 568,620 |
| Secondary | 5 | 5 | | | 546,750 | 273,375 | 273,375 |
| Saint David | | | | | | | |
| Early Childhood | 9 | | | 9 | 1,041,012 | 520,506 | 520,506 |
| Primary | 8 | | | 8 | 3,032,640 | 1,516,320 | 1,516,320 |
| Secondary | 2 | | | 2 | 1,749,600 | 874,800 | 874,800 |
| Saint Patrick | | | | | | | |
| Early Childhood | 5 | | 5 | | 361,463 | 180,731 | 180,731 |
| Primary | 6 | | 6 | | 1,421,550 | 710,775 | 710,775 |
| Secondary | 3 | | 3 | | 1,640,250 | 820,125 | 820,125 |
| Saint Andrew | | | | | | | |
| Early Childhood | 17 | 17 | | | 245,795 | 81,932 | 163,863 |
| Primary | 9 | 9 | | | 426,465 | 142,155 | 284,310 |
| Secondary | 8 | 8 | | | 874,800 | 291,600 | 583,200 |
| Totals | | | | | 14,592,879 | 6,763,156 | 7,829,723 |

Source: education sector evaluation team.

For this assessment, loss has been estimated at XCD 0.73 million and this reflects the additional costs incurred to collect, remove, and dispose of debris mostly associated with the partial or total destruction of roofs. Other costs related to the cleaning of ash are also significant, have not been captured in this sector assessment but are reflected globally under the transport sector. Of the total loss, XCD 0.33 million corresponds to the

public sector and XCD 0.39 million to the private sector.

Other additional costs such as those related to the cleaning, maintenance and refurbishing of those school facilities used as shelters or temporary housing have not been included either in this evaluation, meaning that actual loss could be higher than what is reported here.

Table 6: Total loss

| Description | Quantity | Damage level | | | Total loss (XCD) | Property (XCD) | |
|-----------------------|----------|--------------|----------|--------|------------------|----------------|----------------|
| | | Mild | Moderate | Severe | | Public | Private |
| Debris removal | | | | | | | |
| Charlotte | 61 | 61 | | | 107,333 | 53,667 | 53,667 |
| Saint David | 19 | | | 19 | 291,163 | 145,581 | 145,581 |
| Saint Patrick | 14 | | 14 | | 171,163 | 85,582 | 85,582 |
| Saint Andrew | 34 | 34 | | | 77,353 | 25,784 | 51,569 |
| Saint George | 63 | 63 | | | 82,632 | 27,544 | 55,088 |
| Totals | | | | | 729,644 | 338,158 | 391,486 |

Source: education sector evaluation team with information of the DDSA report.

4. Linking the effects to the human impact

In terms of human impact, students that were studying from home due to the ongoing pandemic were displaced substantially. This displacement forced them to change their daily activities, since they had to adapt to new conditions in government led and private shelters. During the emergency a total of 20,915 students were displaced: 12,025 from primary schools and 8,890 from secondary schools.

Like in many other countries, school buildings

are used as shelters to provide immediate but temporary housing to the most affected and displaced populations. On April 8th, 2021, a total of 87 shelters were immediately activated after the eruption noting that nearly 70% of them are school buildings, the rest are churches, community centers and others. By the 24th of July 2021, 47 shelters have been closed, leaving 40 shelters still open. This will pose additional challenges to have school facilities ready to welcome students as regular activities are progressively resumed.

5. Recovery Needs and Strategy

To estimate recovery needs in the Education Sector, cost of the damage and loss was used as the basis for the analysis. The concept of building back better is applied to estimate the additional cost that would be needed to provide the school infrastructure with improved capacities to withstand a potential new eruption in the coming weeks or months, but also provides for improved resistant capacities to mitigate other climate related events such as strong winds produced by hurricanes and storms. To this end, an additional 20 percent was applied to the cost to repair or rebuild as per the PDNA methodology. Total needs amount to XCD 18.2 million, which corresponds to XCD 17.5 million for educational facilities improvement, and XCD 0.7 million for additional expenses incurred.

To determine a priority order for intervention in

the different divisions, the colour zone defined on the volcanic hazard map was used and thus, the highest priority was given to the divisions marked within the red and yellow zones, leaving the green zone with a lower priority. The expenses already incurred such as the removal of rubble are included within the recovery needs, since these expenses will need to be covered by the government.

In terms of recovery strategy and considering that most of the shelters are using school premises, it would be important to identify medium- and long-term sheltering solutions for the displaced population in view of the level of uncertainty of the duration of the volcanic event, especially if face-to-face sessions are resumed should the spread of the COVID-19 virus is reduced overtime with the vaccination campaigns.

Table 7: Recovery needs

| Item | DaDamage | Loss | Justification. Needs coming from the analysis of effects and impacts. | Needs (XCD) |
|--------------------------------|-------------------|----------------|---|-------------------|
| 1. Building improvement | | | | |
| Urban schools | | | | |
| Saint George | | | | |
| Early Childhood | 694,008 | | Green zone | 832,810 |
| Primary | 521,235 | | Green zone | 625,482 |
| Secondary | 437,400 | | Green zone | 524,880 |
| Rural schools | | | | |
| Charlotte | | | | |
| Early Childhood | 462,672 | | Green zone | 555,206 |
| Primary | 1,137,240 | | Green zone | 1,364,688 |
| Secondary | 546,750 | | Green zone | 656,100 |
| Saint David | | | | |
| Early Childhood | 1,041,012 | | Red zone | 1,249,214 |
| Primary | 3,032,640 | | Red zone | 3,639,168 |
| Secondary | 1,749,600 | | Red zone | 2,099,520 |
| Saint Patrick | | | | |
| Early Childhood | 361,463 | | Yellow zone | 433,755 |
| Primary | 1,421,550 | | Yellow zone | 1,705,860 |
| Secondary | 1,640,250 | | Yellow zone | 1,968,300 |
| Saint Andrew | | | | |
| Early Childhood | 245,795 | | Green zone | 294,953 |
| Primary | 426,465 | | Green zone | 511,758 |
| Secondary | 874,800 | | Green zone | 1,049,760 |
| 3. Debris removal | | | | |
| | | 729,644 | Executed | 729,644 |
| Total | 14,592,879 | 729,644 | | 18,241,099 |

Source: education sector evaluation team.

Based on the priorities described above, needs in the short and medium term were estimated. The renovations and improvement of the educational buildings should be carried out as a priority in the areas defined with the colours red and yellow. The recovery needs in short term amount to XCD 11.8 million.

In the medium term, improvements to the education facilities located in the green zone

of the map of damages caused by the volcanic eruption have been included, with a total of XCD 6.4 million.

In the red zone, the need to relocate educational buildings or change the construction technology of the roof should be evaluated, however this requires a detailed study to avoid affecting the transfer of students to a new site.

Table 8: Recovery needs prioritization

| Intervention/Activity | Short Run* | Intermedi-ate* | Long Run * | Priority | Comment | Cost |
|--------------------------------|-------------------|------------------|------------|----------|-------------|-------------------|
| | | | | (1 a 5) | | (XCD) |
| 1. Building improvement | | | | | | |
| Urban schools | | | | | | |
| Saint George | | | | | | |
| Early Childhood | | 832,810 | | 4 | Green zone | 832,810 |
| Primary | | 625,482 | | 4 | Green zone | 625,482 |
| Secondary | | 524,880 | | 4 | Green zone | 524,880 |
| Rural schools | | | | | | |
| Charlotte | | | | | | |
| Early Childhood | | 555,206 | | 5 | | 555,206 |
| Primary | | 1,364,688 | | 5 | | 1,364,688 |
| Secondary | | 656,100 | | 5 | | 656,100 |
| Saint David | | | | | | |
| Early Childhood | 1,249,214 | | | 1 | Red zone | 1,249,214 |
| Primary | 3,639,168 | | | 1 | Red zone | 3,639,168 |
| Secondary | 2,099,520 | | | 1 | Red zone | 2,099,520 |
| Saint Patrick | | | | | | |
| Early Childhood | 433,755 | | | 2 | Yellow zone | 433,755 |
| Primary | 1,705,860 | | | 2 | Yellow zone | 1,705,860 |
| Secondary | 1,968,300 | | | 2 | Yellow zone | 1,968,300 |
| Saint Andrew | | | | | | |
| Early Childhood | | | | 3 | Green zone | |
| Primary | | | | 3 | Green zone | |
| Secondary | | | | 3 | Green zone | |
| 3. Debris removal | 729,644 | | | 1 | Executed | 729,644 |
| Totals | 11,825,461 | 6,415,637 | | | | 18,241,099 |

* To be agreed with the Government.
Source: education sector evaluation team.

6. Sources of information, references

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- Global Rapid Post Disaster Damage Estimation (Grade) Report, World Bank Gpurl D-Ras Team, April 2021.
- River Crossing and Housing Infrastructure Detailed Damage Assessment, Ministry of Transport, Works, Lands & Physical Planning, Government of Saint Vincent, July 2021.
- Education statistical digest 2018-2019, St. Vincent and the Grenadines.
- Situation reports La Soufrière Volcano, St. Vincent, from CDEMA, April 2021.

7. Annex

Annex 1

Distribution of Shelters that remain open by 24 July 2021

| No. | Name of Centre | Location | Total |
|-----|--------------------------------------|------------------|-------------|
| 1 | Argyle Primary School | Argyle | 76 |
| 2 | Baptist Bible College_Caribbean | Prospect | 27 |
| 3 | Belair Government School | Belair | 44 |
| 4 | Belmont Government School | Belmont | 28 |
| 5 | Biabou Learning Resource Centre | Biabou | 37 |
| 6 | Biabou Methodist School | Biabou | 46 |
| 7 | Brighton Methodist School | Brighton | 72 |
| 8 | Buccament Gov't School | Dubois | 26 |
| 9 | C.W. Prescod Primary School | Kingstown | 45 |
| 10 | Calliaqua Anglican School | Calliaqua | 85 |
| 11 | Cane End Government School | Cane End | 12 |
| 12 | Diamond Deliverance Assembly | Diamond | 21 |
| 13 | Diamond Gov't School | Diamond | 29 |
| 14 | Doresetshire Hill Evangelical Church | Dorsetshire Hill | 16 |
| 15 | Doris McKie Learning Centre | Cane Hall | 21 |
| 16 | Dr. J. P. Eustace Secondary School | Edinboro | 43 |
| 17 | Emmanuel High School Mespo | Mespo | 92 |
| 18 | Evesham Methodist School | Evesham | 38 |
| 19 | Fair Hall Primary | Fair Hall | 79 |
| 20 | Golden Years Centre Buccament | Buccament | 22 |
| 21 | Gomea Methodist School | Gomea | 32 |
| 22 | Kingstown Government School | Kingstown | 31 |
| 23 | Kingstown Prep. School | Kingsdown | 66 |
| 24 | Lauders Primary | Lauders | 31 |
| 25 | Lodge Village New Testament | Lodge Village | 14 |
| 26 | Lodge Village Primary School | Lodge Village | 31 |
| 27 | Lowmans Leeward Anglican | Lowmans | 56 |
| 28 | Lowmans Windward Anglican School | Lowmans | 22 |
| 29 | Marriaqua Government | Mespo | 91 |
| 30 | Marriaqua Learning Resource Centre | Evesham | 22 |
| 31 | Mt. Coke Methodist Centre | Stubbs | 17 |
| 32 | New Grounds Primary | New Grounds | 39 |
| 33 | North Union Secondary School | North Union | 84 |
| 34 | Questelles Learning Resources Centre | Questelles | 12 |
| 35 | Richland Park Government | Richland Park | 53 |
| 36 | Rillian Hill Community Centre | Rillian Hill | 30 |
| 37 | Sion Hill Government | Sion Hill | 25 |
| 38 | St. Clair Dacon Secondary School | Carapan | 96 |
| 39 | Stubbs Government School | Stubbs | 52 |
| 40 | West St. George Secondary School | Belair | 77 |
| | Total | | 1740 |

Shelters closed by 24 July 2021

| No. | Name of Centre | Location |
|-----|--------------------------------------|------------------|
| 1 | Adelphi Secondary | Adelphi |
| 2 | Apostolic Faith Mission Church | Campden Park |
| 3 | Barrouallie Government School | Barrouallie |
| 4 | Barrouallie Learning Resource Centre | Barrouallie |
| 5 | Barrouallie Technical Institute | Barrouallie |
| 6 | Bequia Anglican Primary and ECDC | Bequia |
| 7 | Bethel High School | Campden Park |
| 8 | Biabou Church of Christ | Biabou |
| 9 | Biabou Methodist Church | Biabou |
| 10 | Bishop's College Kingstown | Kingstown |
| 11 | Buccament Bay Secondary School | Buccament |
| 12 | Calder Primary School | Calder |
| 13 | Central Leeward Secondary School | Barrouallie |
| 14 | Church of the Ascension | Sion Hill |
| 15 | Church of the Latter Day Saints | Kingstown |
| 16 | Clare Valley Community Centre | Clare Valley |
| 17 | Clare Valley Government School | Clare Valley |
| 18 | Clare Valley SDA | Clare Valley |
| 19 | Doresetshire Hill Government | Dorsetshire Hill |
| 20 | Evesham SDA Church | Evesham |
| 21 | Girl's High School | Kingstown |
| 22 | Glen SDA Church | Glen |
| 23 | Grace and Truth Campsite | Layou |
| 24 | Grammar School | Kingstown |
| 25 | Greiggs Primary | Greiggs |
| 26 | Intermediate High School | Kingstown |
| 27 | International Pentecostal Assembly | Richland Park |
| 28 | Kingdom Life Ministries | Barrouallie |
| 29 | Kingdom Life Tabernacle | Mespo |
| 30 | Layou Government School | Layou |
| 31 | Mountain View Adventist Academy | Richland Park |
| 32 | Mt. Moriah SDA Youth Dev. Centre | Brighton |
| 33 | New Creation Baptist Church | Peruvian Vale |
| 34 | New Testament Wilson Hill | Kingstown |
| 35 | Paradise SDA Church | Vermont |
| 36 | Questelles Government School | Questelles |
| 37 | St. Joseph's Convent Kingstown | Kingstown |
| 38 | St. Mary's RC | Kingstown |
| 39 | St. Mary's Spiritual Baptist | Brighton |
| 40 | Streams of Power, Carriere | Carriere |
| 41 | Temple Emmanuel SB Church | Kingstown |
| 42 | Thomas Saunders Secondary | Kingstown |
| 43 | Union Methodist Church | New Grounds |
| 44 | Wesleyan Holiness | Campden Park |
| 45 | World Wide Mission Church | R. Sharpes |
| 46 | Church of God of Prophecy | Greens, K'town |
| 47 | Glad Tidings Camp Site | Queen's Drive |
| | TOTAL CLOSED SHELTERS | |

Evaluation team

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- Osmar Velasco, World Bank – Facilitator

Health Sector

Fig. 1 Health Facilities in the red and orange zones



The April 9, 2021, volcanic eruption of La Soufriere, found the Health Sector in Saint Vincent and the Grenadines (SVG) in an already difficult situation. Pressure for an effective response to COVID-19 had already demanded additional human and

financial resources to contain the spread of the virus, but also to manage the increased rate of infections specially at the beginning of the year. In April 2021, infection rates had fallen, and the authorities had started a vaccination campaign which required good planning, management, and delivery.

An IFRC report on the dengue outbreak in the country showed the Dengue Fever was present in all the health districts in the country, with 58% of cases reported occurring in persons who live in the Pembroke, Kingstown, and Calliaqua Health Districts of the Green Zone. As of 20 January 2021, there were 1,790 confirmed cases with 8 deaths, an 11% increase in the number of cases since the last published Surveillance Report of October 2020.

In this context, the volcanic eruption further compounded the health situation in the country by adding to the demand for health services as reported by PAHO⁵. In the afternoon of 8 April 2021, the Prime Minister issued an order to evacuate over 20,000 individuals from the volcano red zone due to an imminent explosive eruption, the next day, evacuations of the orange zone also started. The National Emergency Management Organization (NEMO) activated a network of 76

5 [Volcano La Soufriere eruption in Saint Vincent and the Grenadines - PAHO/WHO | Pan American Health Organization](#)

emergency shelters. Due to community spread and asymptomatic spread of COVID-19 in the island, public health risk involved in gathering in a shelter was significant.

The health sub-sector did not record any major collapse of health facilities, due to the additional weight of ash on the building roofs. However, one facility, the temporary Clinic in Sandy Bay, a building that was refurbished to carry out clinic functions was severely damaged, and all content was lost. In addition, medical stock, furniture and IT equipment were affected. Eighteen health care centers, located in hazard zones red and orange, were closed and their services were moved to safer districts. This included two district hospitals – Chateaublair and Georgetown, the medical center and the attached dialysis unit. Health services were redirected towards the Milton Cato Memorial hospital in Kingstown while the Barbados Defense Force was on standby to provide a field hospital. The surge in demand for health services following the eruption overwhelmed the capacity of the health services to provide emergency and essential care to the affected populations by both this natural event and the COVID-19 pandemic. The Ministry of Health also reported a shortage of sexual and reproductive health commodities and supplies to manage the health consequences of sexual violence, and to prevent unintended pregnancies, as well as HIV and other STIs. The amount of ash covering main roads especially in Owia, Sandy Bay and Overland, exceeded in many

places the 30 cm expected in the red zones from the hazard map released by NEMO. See Figure 1 depicting the location of critical facilities in the highest hazard zones, red and orange, and Annex 1 for details.

Damage to the health sector, which includes the cost to repair and rebuilt infrastructure and physical assets, amounted to **XCD 3,151,203**. This amount includes the cost to replace medical stock, furniture and IT equipment that were affected. In terms of change in economic flows, estimates of income loss due to the closure of the hospitals were not able to be captured, neither the additional costs due to services provided in shelters. A total loss of **XCD 358,150.00** as per this report which takes into account forgone income to the Government for services it would have provided, due to the closure of health facilities in the red and orange zones, salaries of non-medical personnel and replacement of medical records only. This loss figure could be increased as additional information is provided. Total **recovery needs** are estimated at XCD 10,329,105 that includes additional costs to reduce existing vulnerability of the health facilities specially at the roofing, to ensure safety of water provision, monitoring of the quality of air, provision of psychological support to families and other basic improvements in the provision to health services and access to health services, including for sexual and reproductive health.

Recovery Needs of Health

| | Public |
|----------------|------------|
| Damage XCD | 3,151,203 |
| Loss XCD | 358,150 |
| Recovery Needs | 10,329,105 |

2. Context or Sector Background

General Administration

The Ministry of Health and the Environment, MOHWE, is the executive arm of the Government of Saint Vincent and the Grenadines responsible for pursuing all official national health policies. With the Minister providing political direction and as the political directorate, a Permanent Secretary leading the administration and a Chief Medical Officer as the technical lead.

Health Financing

The Government of SVG contributes 73 percent to annual expenditures to meet the health needs of the population. Other sources include household direct out-of-pocket payments, 14 percent, grants and other donor funds from external sources up to 10 percent, and funds from purchase of private insurance plans, 3 percent. In 2012, the government cost-recovery mechanism accounted for a mere 2.4 percent of total public health expenditure.

Leadership and Governance

The MOHWE is committed to the effective, efficient and transparent use of resources for health through the processes of good leadership and governance. In one aspect, the concentration of leadership is on streamlining the process elements of the health service delivery system such as planning, information management, monitoring and evaluation, integration and community engagement; while, at the same time, managing the human resources, finances, and hardware components. It also ensures that appropriate policy frameworks are developed and implemented. Measures are also in train to develop a robust legislative and regulatory framework that

will support the operations of the health delivery system.

Medical & Health Care

Medical and Health Care facilities are distributed in nine Health Districts. Primary care is delivered at the 39 health care facilities, 3 polyclinic and 5 district hospitals. These services include antenatal care, child health and chronic diseases screening.

Secondary care is offered at the Milton Cato Memorial Hospital, and includes general surgery, internal medicine, radiology, pediatrics, orthopedics and nephrology. Ophthalmology and physiotherapy are two services that are provided at both levels of health care.

The Modern Medical and Diagnostic Centre (MMDC), which was opened in 2018 and located in Georgetown, is in the red zone. It provides services in Oncology, Nephrology, Dialysis, Radiology, Laboratory, Surgery and Accident and Emergency. Also located near the MMDC is the Georgetown Hospital which also provides service to the red zone.

Performance of the Health Sector

Basic health indicators for Saint Vincent and the Grenadines are generally positive as shown in table 1. Some of the more pressing challenges facing the health sector are fiscal constraints; changing family structures; an ageing population; an upsurge in chronic non-communicable diseases; relatively high levels of communicable diseases; and limited/lack of access to sexual and reproductive health services for most vulnerable and marginalized populations, including persons with disabilities.

Chronic Non-Communicable Diseases (NCDs) is one of the causes of mortality in both males and females. The shift away from traditional diets to more varied energy-dense diets has resulted in a steady rise in persons overweight. Together with HIV/AIDS, NCDs are the main health threats to the people of SVG and the main focus of the health sector. Although the social and economic impact has not been fully assessed, the financial burden alone is tremendous, with most human and technical resources being used in the treatment of these diseases.

Key achievements

Free primary health care services⁶ and mental health services are offered at all health centers while oral health services are delivered at selected health centers.

Emphasis also is being placed on investments in health infrastructure throughout the country – including refurbishing existing facilities and constructing new and modern clinics. Recent achievements in this area include the opening of the Modern Medical Complex in Georgetown in 2018, state-of-the-art polyclinics in Buccament and Mesopotamia, and a Smart Hospital in Chateaubelair in 2019. The Government continues to strengthen administrative capacity in the health sector, re-orient the primary health care system to create a more positive impact on the health status of the nation and expand secondary and tertiary health care services to include new treatment modalities.

SVG has made huge strides in terms of disease reduction and improved sanitation. Over 93 percent of the population has access to clean

Table 1. Health Indicators 2016 in SVG

| Indicators | Estimate |
|---|----------|
| Life Expectancy at Birth (in completed years) | 73 |
| Male | 71 |
| Female | 75 |
| Peri-natal Mortality Rate per 1,000 Live Births | 24.9 |
| Infant Mortality Rate per 1,000 Live Births | 16.6 |
| Child Mortality Rate per 1,000 Live Births | 16.9 |
| Still Births (count) | 23 |
| Total Fertility Rate | 2.1 |
| Registered Nurses per 1,000 population | 4.5 |
| Immunization Coverage in infants less than 1 year (%) | 100 |
| Births Attended by Skilled Personnel (%) | 98.6 |

Source: Statistical Office of Saint Vincent and the Grenadines

⁶ These services include emergency care, medical care, prenatal and postnatal care, midwifery and child health services including immunization, school health and family planning services, communicable and non-communicable diseases control

potable water. Overall, the country has a low disease spread, this also is true of COVID-19, in which the country has recorded 27 cases.

In 2019, the Government published its first Charter of Patient Rights and Responsibilities. The Charter focuses on the right to health as a fundamental human right.

Focus also continues to be placed on lifting the general health status of the population through the implementation of a wide range of programmes and the enhancement of existing ones such as the “Wellness Revolution”. In 2017, Saint Vincent and the Grenadines ratified the World Trade Organization’s Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, which will make it easier for the country to have a secure legal pathway to access affordable medicines.

The country continues to increase the human resource capacity of the health sector, employing additional doctors and nurses – for example a 71 percent increase in the number of doctors between 2018 and 2019 and a 29 percent increase in the number of nurses over the same period; and an increase of 123 percent in the purchase of medicines over 2018 – 2019 as a mechanism to ensure access to essential medicines.

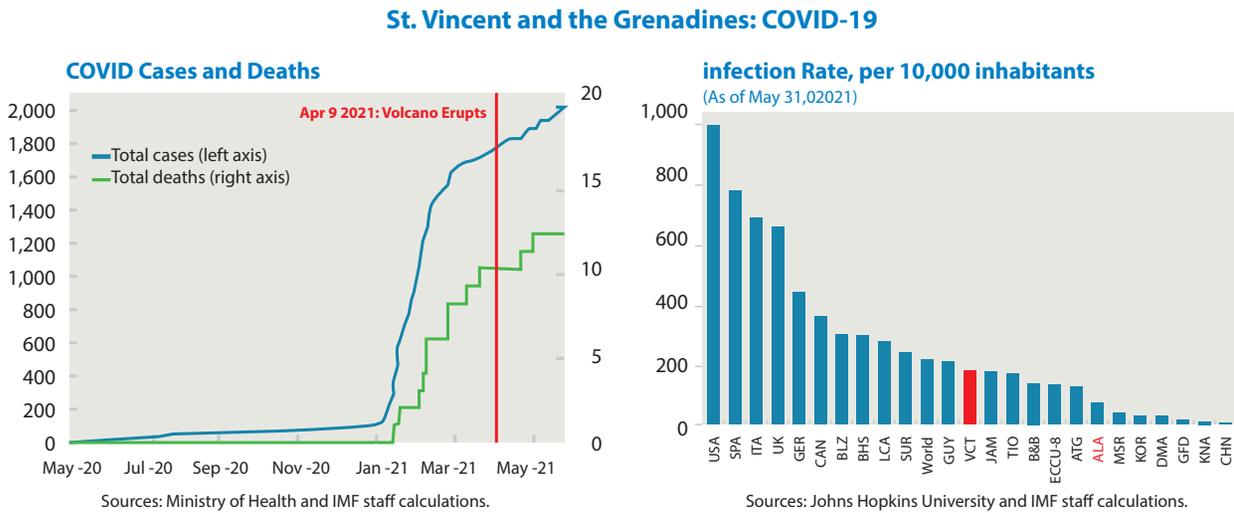
COVID-19 in SVG

Saint Vincent and the Grenadines was the only country in the ECCU that did not declare a state of emergency to manage the potential impact of COVID-19 but preferred to introduce other mitigation measures such as 14-day quarantines for passengers arriving from countries with COVID-19 outbreaks, allowing all businesses to continue with their regular activities⁷. Once the first domestic case was detected, tight social distancing and health measures to contain the spread of the virus were introduced.

As shown in Fig. 2 taken from the IMF Country Report of July 2021, infection rates started to increase at the end of 2020 and the beginning of 2021, as tourists and nationals of SVG living abroad, started to return for the Christmas holidays. Number of deaths also increased at the beginning of 2021. By the end of May 2021, infection rate per 10,000 inhabitants was around 200 in SVG, comparable to other countries in the ECCU.

Prior to the first volcanic explosion, infection rates had fallen, and the authorities had started a vaccination campaign following the arrival of around 40,000 doses from India. An additional 46,000 doses were committed through the COVAX Facility, 24,000 of which were delivered on April 6.

Figure 2: COVID-19 Cases and Deaths and infection Rate per 10,000 inhabitants



Source: IMF Country Report No. 21/157, July 2021

Dengue outbreak⁸

In an official bulletin dated 22 October 2020, the Surveillance Committee of the Ministry of Health, Wellness, and the Environment, MOHWE, had confirmed an increase in reported cases of Dengue infection in the country with 1,617 confirmed cases and eight fatalities⁹. Persons within the 0-15 years age group accounted for most cases, with an attack rate of 2.6% in the 5-14 years age group. As outlined in Table 1 below, persons within the 0-14 years age groups continue to account for most cases, with the highest attack rate of 3.54% in the 5-14 years age group. Of the eight (8) deaths reported 62.5% are within the 0-15 age ranges. As of 20 January 2021, there were 1,790 confirmed cases with 8 deaths, an 11% increase

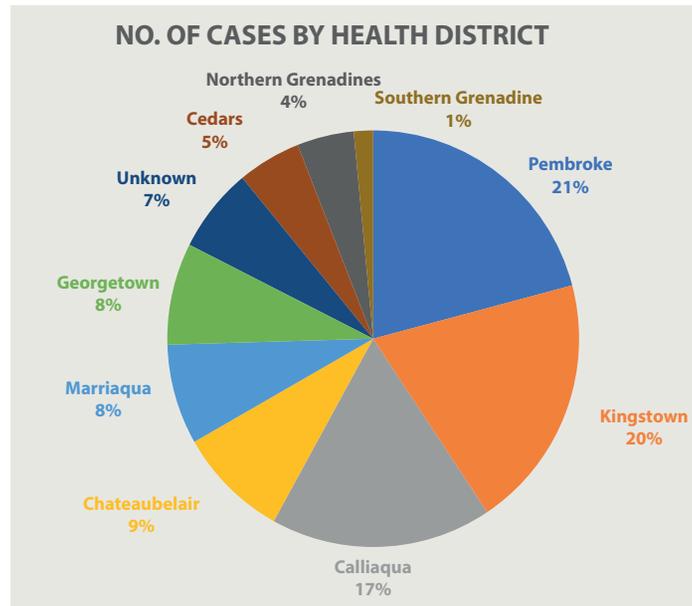
in the number of cases since the last published Surveillance Report in October 2020.

In terms of the most affected communities, the mosquito-borne disease continues to affect all health districts with 58% of cases reported occurring in persons who live in the Pembroke, Kingstown, and Calliaqua Health Districts. The Chateaubelair, Marriaqua and Georgetown Health Districts are now ranked as 4th, 5th, and 6th respectively with the next 25% of confirmed cases. This current number of Dengue cases highly surpasses previous years. Figure 3 provides a breakdown of the distribution of the number of cases per health district. This is based on data presented on Epi Week 46.

8 IFRC, SVG Dengue Outbreak, February 2021

9 MOHWE-SVG Syndromic Surveillance Report for the epidemiological week 46, October 2020

Figure 3: Impact of Dengue in the Health Districts is SVG



Source: Ministry of Health

Tropical Storm Elsa

According to information received from the Scientists at the Belmont Volcano Observatory, lahar flows were observed on July 2nd within the river system in the Red and Orange Volcano Hazard Zones. This dense mixture of ash and water occurs during heavy rain which creates mudflow that rushes down the volcano’s slopes faster than

a river. The forecast received from the St. Vincent and the Grenadines Meteorological Services indicate that occasional showers are expected to continue until the end of the rainy season in November. Additional affectation to the health system has not been confirmed yet due to either rain and/or lahars.

3. Assessment of Disaster effects

Assumptions to estimate the **DAMAGE** defined as the economic cost to repair or rebuild infrastructure and physical assets to their condition prior to the disaster.

Despite the heavy ashfall, out of the seven facilities located in the red zone, only one, the old Sandy Bay Clinic, suffered severe damage, the rest of them showed moderate damage only. Similarly, one facility located in the orange zone,

the Georgetown Health Center showed moderate damage while the remaining 8 showed light damage only.

Facilities are considered to have suffered severe damage when up to 40% of the infrastructure has been affected, moderate damage up to 25% and light damage, up to 15%. To estimate the cost to repair, same percentage is applied to initial cost of the building.

There are two main typologies of health facilities: Clinics and Hospitals, unit costs for hospitals are higher due to the best quality of materials and construction. Because of the lack of data, Google Maps was used to estimate the size of the buildings. Some health facilities are not shown in the Google maps, in that case, an average area of 2500 sq. ft. was used.

The cost per sq. ft. of the facilities was assumed based on the typology and quality of construction.

Estimates from the Ministry of Transport for general buildings, US guides on the cost of hospitals/clinics in rural/urban areas and a construction guides for the Caribbean and PAHO recent costs to retrofitting were used to estimate a unit cost for each typology: XCD 160/sq. ft. for all the clinics and XCD 350/sq. ft for hospitals.

Cost to repair basic furniture, IT equipment and to replace medical stock was also included and only public sector infrastructure was assessed.

Table 2. Estimates of Damage for the Health Sector¹⁰

| Components | Quantity | Cost of the Facility prior to eruption (ECD) | Level of destruction | | | Cost to repair or Rebuild Damage (ECD) | Property |
|--|----------|--|----------------------|----------|--------|--|---------------------|
| | | | Light | Moderate | Severe | | Public (ECD) |
| Health Facilities red&orange | | | | | | | |
| Fancy (1 floor) | 1 | 400,484.13 | | 1 | | 100,121.03 | 100,121.03 |
| Owia (clinic and Nurses quarters) | 1 | 534,290.94 | | 1 | | 133,572.74 | 133,572.74 |
| Sandy Bay 1 (existing clinic) | 1 | 228,184.35 | | | 1 | 91,273.74 | 91,273.74 |
| Sandy Bay 2 (newly renovated clinic) | 1 | 403,200.00 | | 1 | | 17,299.66 | 17,299.66 |
| Sandy Bay (doctors quarters) | 1 | 153,600.00 | | 1 | | 155,996.03 | 155,996.03 |
| Sandy Bay (nurses quarters) | 1 | 153,600.00 | | 1 | | 788,383.57 | 788,383.57 |
| Overland | 1 | 69,198.62 | | 1 | | 100,800.00 | 100,800.00 |
| Georgetown Hospital | 1 | 623,984.13 | 1 | | | 93,597.62 | 93,597.62 |
| Georgetown Health Center (Modern Medical Diagnostic) | 1 | 3,153,534.27 | | 1 | | 788,383.57 | 788,383.57 |
| Georgetown Clinic | 1 | 137,579.47 | 1 | | | 20,636.92 | 20,636.92 |
| Troumaca | 1 | 400,000.00 | 1 | | | 60,000.00 | 60,000.00 |
| Coulls Hill | 1 | 400,000.00 | 1 | | | 60,000.00 | 60,000.00 |
| Rose Hall | 2 | 800,000.00 | 1 | | | 120,000.00 | 120,000.00 |
| Chateaubelair Hospital SMART | 2 | 2,816,043.72 | 1 | | | 422,406.56 | 422,406.56 |
| Byera | 1 | 400,000.00 | 1 | | | 60,000.00 | 60,000.00 |
| South Rivers | 1 | 208,210.91 | 1 | | | 31,231.64 | 31,231.64 |
| Medical Stock in premises red-zone | 4 | 10,000.00 | | | | 40,000.00 | 40,000.00 |
| Furniture and equipment red-zone | 1 | 67,500.00 | | | | 67,500.00 | 67,500.00 |
| Total | | | | | | 3,151,203.07 | 3,151,203.07 |

Source: Health Assessment Team

¹⁰ Cost for the Modern Diagnostic Centre were derived by the team based on estimates provided at the time of generating this report in August 202. Further consideration/analysis can be given when defining a prioritized recovery action plan

According to the PDNA methodology, **LOSS** in the Health Sector should refer to the forgone income plus the additional costs to continue to provide the service, additional costs related to governance and increased risks. Income loss due to closure of some services were approximately XCD 8,100 monthly, this would be at the revenue collection points such as Georgetown modern medical center. Based on this information and assuming a closure of at least 6 months, forgone

income was estimated at XCD 48,600. Additional costs to clean the ash has been captured globally in the transport sector. Other cost such as those for salaries paid to non-medical personnel that is not providing the service were considered, it amounts to XCD 120,000 and the additional costs to replace medical records for XCD 10,000. Also costs incurred for emergency monitoring the quality of air amounts to XCD 179,550

Table 3. Loss Estimates for the Health Sector

| Components | Loss (XCD) |
|--|-------------------|
| Forgone income due to closure of Health Facilities | 48,600.00 |
| Recover of medical records in Sandy Bay (additional cost) | 10,000.00 |
| Salaries of non medical personnel in closed facilities for 3 months - red zone | 120,000.00 |
| Emergency monitoring quality of air | 179,550.00 |
| Total | 358,150.00 |

Source: Health Evaluation

4. Linking the effects to the human impact

Population density and displacement in shelters will increase the risk of communicable diseases. The National Emergency Management Organization, NEMO, reported that 22,400 persons have been displaced from the orange and red zones, out of them, 4,456 persons are in shelters and 17,932 are staying in private homes. To date, 200 healthcare workers have been displaced and are in shelters. The migration of people from affected areas has created new challenges for disease surveillance (especially COVID-19) and health programming. As cleanup efforts continue, the incidence of respiratory injuries and diseases could increase.

Of the registered displaced families, a large sample of 60.7% were reviewed for their reported medical conditions and 10.6% of the reviewed population were identified as either elderly, chronically ill,

disabled or currently pregnant. Disruption in the timely medical care and intervention of displaced patients could further complicate their health situation.

The existing public health sector professionals are now being deployed as an extension of the primary health care service network locally, but strictly to ensure the frequent physiological and psychological needs of the displaced families are addressed. Anxiety, neuroses, and depression are acute public health problems following a disaster, families and communities need to continue receiving support.

Lack of access to Family Planning (FP) services can increase unplanned pregnancies, unsafe abortions, and the transmission of STIs

including HIV. Likewise, lack of access to basic and comprehensive emergency obstetric and neonatal care (EmONC) can increase the risk of maternal and neonatal death. Increased risk of sexual violence during emergencies is associated with an increase in HIV and other STIs, and untreated trauma from gender-based violence (GBV) can lead to poor mental health outcomes, including depression and suicide.

Despite the complex situation, there was no national surge for health care demanded, so the system was not overwhelmed. There were surges in attendance at some health districts due to

persons sheltering in schools in that area. But the demand for health care services remained just about the same according to national census.⁹

These impacts will continue to reduce the air and water quality, over time therefore quality, quantity, and coverage of potable water is critical along with proper sanitation systems. On the other hand, food shortages, damage to food production or consumption of unhealthy foods may result, especially in the displaced populations adding to the chronic situation of patients with non-communicable diseases.

5. Recovery Needs and Strategy

Recovery Needs

Estimates of recovery needs include the cost of Damage in each one of the facilities plus improvements to reduce risk to a new eruption, this could include retrofitting of walls and roofing to make it more resistant to additional vertical weights, but also a full upgrade with multi hazard criteria for example floods, hurricanes, earthquakes, landslides. Suggested increase of 20% to account for all those improvements, basically roofs.

The Sandy Bay old clinic is an exception to this rule because the poor quality of the structure suggests at least 70% of additional costs for a substantive upgrading. For those hospitals where costs to upgrade was already used, the assumption is that cost to upgrading has already been included so additional increase is used.

Costs to include upgrading in technology and basic improvements in the data collection and management for the health sector were also included as well as communication and

information campaigns to prevent new outbreak of Dengue as people are allowed to progressively go back to the orange and red areas while the rainy season continues to hit the country.

Table 6 shows in detail recovery needs for the post volcanic eruption phase. Total cost of **recovery needs is of XCD 10,329,105**

In terms of prioritization and sequencing, restoration of services in healthcare facilities, repair of damage with a vision of reducing vulnerabilities and increasing resilience is the immediate action to be taken. Support to the affected population in terms of emotional support, provision of safe water and monitoring air quality, investments to reduce the probability of a new dengue outbreak as people move back to their homes in the red and orange areas and improving capacities in the Health Sector to prepare for future emergencies, are considered in the first and second years (2021-2023). Funding required in the **short run amounts to XCD 7,235,065.37**.

11 Personal communication Ms. Donna Bascombe, Director of Health Security, Ministry of Health, 29 July 2021

Table 4. Cost for recovery interventions in the short run (2021-2023)

| Components | Recovery Needs (XCD) |
|--|--------------------------|
| Short Term | |
| Repair infrastructure in improved conditions | 3,544,703.00 |
| Recover of medical records in Sandy Bay (additional cost) | 10,000.00 |
| Salaries of non-medical personnel in closed facilities for 3 months - red zone | 120,000.00 |
| Psychosocial services for the affected population (to include training SME's) | 200,000.00 |
| Measures to reduce Dengue outbreak and actions to mitigate against outbreaks of food, water and vector borne diseases, when families return to their homes in red and orange zones | 680,000.00 |
| Contingency Planning and Training | 320,000.00 |
| Safe Water Supply | 1,066,500.00 |
| Dialysis machines Modern Medical Centre, Georgetown | 483,862.37 ¹² |
| Monitoring quality of air during recovery activities | 810,000.00 |
| Total | 7,235,065.37 |

Interventions that can be initiated in the short term can be executed in phases and be completed in the intermediate and long run. Among key interventions that could be extended to the 3rd and 4th year include, among others, the betterment of the data collection and management of health indicators, improved logistics, monitoring the quality of water and air in addition to those interventions needed to strengthen the health services. The amount needed until completion in the **long run is XCD 3,094,040**

Table 5. Cost for recovery interventions with short to long term perspective

| Components | Recovery Needs (XCD) |
|--|----------------------|
| Improving data collection and management systems (Surveillance) | 200,000.00 |
| Logistics | 1,355,000.00 |
| data management and IT systems | 298,100.00 |
| Increased MHPSS support and health campaigns to address the mental well-being of the community at risk | 325,200.00 |
| Comprehensive sexual and reproductive health services and supplies | 390,000.00 |
| Implement comprehensive evidence-based health promotion interventions. | 135,500.00 |
| Project management support for planning department MoH | 390,240.00 |
| Total | 3,094,040.00 |

¹² Cost doesn't include XCD 550,000 as a replacement costs for the cooling system as this total was provided after report generation in August 2021

Table 6. Estimated Recovery Needs in the Health Sector

| Components | Cost to repair or Rebuild Damage (ECD) | Loss | Needs | Comments |
|---|--|-------------------|----------------------|---|
| | | (ECD) | (ECD) | |
| Health Facilities red&orange | | | | |
| Fancy (1 floor) | 100,121.03 | | 120,145.24 | Roofing retrofitting to withstand ashfall and hurricanes additional 20% is considered |
| Owia (clinic and Nurses quarters) | 133,572.74 | | 160,287.28 | Due to severe damage 70% increase is considered |
| Sandy Bay 1 (existing clinic) | 91,273.74 | | 155,165.36 | Roofing retrofitting to withstand ashfall and hurricanes additional 20% is considered |
| Sandy Bay 2 (newly renovated clinic)) | 17,299.66 | | 20,759.59 | Due to severe damage 70% increase is considered |
| Sandy Bay (doctors quarters) | 155,996.03 | | 187,195.24 | Roofing retrofitting to withstand ashfall and hurricanes additional 20% is considered |
| Sandy Bay (nurses quarters) | 788,383.57 | | 946,060.28 | |
| Overland | 100,800.00 | | 120,960.00 | |
| Georgetown Hospital | 93,597.62 | | 93,597.62 | already retrofitted SMART |
| Georgetown Health Center (Modern Medical Diagnostic) | 788,383.57 | | 788,383.57 | |
| Georgetown Clinic | 20,636.92 | | 24,764.30 | Roofing needs to be retrofitted to withstand possible ashfall and hurricanes additional 20% is considered |
| Troumaca | 60,000.00 | | 72,000.00 | |
| Coulls Hill | 60,000.00 | | 72,000.00 | |
| Rose Hall | 120,000.00 | | 144,000.00 | |
| Chateaubelair Hospital SMART | 422,406.56 | | 422,406.56 | already retrofitted SMART |
| Byera | 60,000.00 | | 72,000.00 | Roofing needs to be retrofitted to withstand possible ashfall and hurricanes additional 20% is considered |
| South Rivers | 31,231.64 | | 37,477.96 | replacement of stock |
| Medical Stock in premises red-zone | 40,000.00 | | 40,000.00 | replacement basic medical and IT equipment |
| Furniture and equipment red-zone | 67,500.00 | | 67,500.00 | |
| Total | 3,151,203.07 | | 3,544,703.00 | |
| Forgone income due to closure of Health Facilities | | 48,600.00 | | This loss is not compensated |
| Recover of medical records in Sandy Bay (additional cost) | | 10,000.00 | 10,000.00 | 2 medical staff for 3 months (yearly ECD20k) |
| Salaries of non medical personnel in closed facilities for 3 months - red zone | | 120,000.00 | 120,000.00 | Salaries being paid to admin personnel, cleaning, maintenance even if premises are closed 3 persons for 6 months in 4 clinics |
| Psychosocial services for the affected population (to include training SME's) | | | 200,000.00 | DDSA suggests 0.2 mn page 78 |
| Measures to reduce Dengue outbreak and actions to mitigate against outbreaks of food, water and vectore borne diseases, when families return to their homes in red and orange zones | | | 680,000.00 | This program requires ECD 1.7 million, 60% of it is financed already |
| data magamanent and IT systems | | | 298,100.00 | Software developer in SVG, software updates to include new software licenses and subscriptions. |
| Improving data collection and management systems (Surveillance) | | | 200,000.00 | Hiring data collectors, data collection equipment and additional training (after EWARS), hiring consultant to help MoH to develop the national strategy, creating and fund surveillance officer positions to support surveillance in the regions. |
| Contingency Planning and Training | | | 320,000.00 | 2 trainings in 5 locations, twice a year, for 4 years @ ECD 8k/training |
| Logistics | | | 1,355,000.00 | Construction of new Logistics warehouse for storage |
| Emergency monitoring quality of air | | 179,550.00 | | Baseline air quality monitoring to gather air pollution data. Inform public health and build capacities towards a robust air quality monitoring strategy. |
| Monitoring quality of air during recovery activities | | | 810,000.00 | Monitoring of PM2.5; PM10; SO2, H2S and met data to assess air pollution levels and inform public health decisions. 24 months monitoring |
| Safe Water Supply | | | 1,066,500.00 | Quotation received from MoH in the amount of USD 178,547.00 |
| Dialysis machines Modern Medical Centre, Georgetown | | | 483,862.37 | |
| Increased MHPSS support and health campaigns to address the mental wellbeing of the community at risk | | | 325,200.00 | Capacity building for health professionals and non-specialized personnel. Increased availability of mental health services. Psychosocial campaigns and promotion |
| Comprehensive sexual and reproductive health services and supplies | | | 390,000.00 | Syndromic management of HIV, STIs, clinical management of rape, SRH supplies, capacity building of service providers |
| Implement comprehensive evidence-based health promotion interventions. | | | 135,500.00 | |
| Project management support for planning departmet MoH | | | 390,240.00 | For minimal of 24 months. |
| Total | 3,151,203 | 358,150.00 | 10,329,105.37 | |

Source: Health Evaluation Team

Recovery Strategy

Short term recovery strategies in the health sector will target the restoration of services and health supplies in healthcare facilities, repair of damage, replacement of equipment and identifying temporary facilities for use during reconstruction. Work should focus on the main health facilities, including the Evesham Health Centre and the Modern Medical Centre in Georgetown, which both provide dialysis and other essential medical services, and the 4 health care facilities which are hard to access in the red zone. Mitigation measures are to be implemented in existing and repaired healthcare facilities during this hurricane season, considering that permanent structures will not be completed during this season.

In the medium to long-term, the strategy will include building resilience in physical structures and in health systems, making use of affordable technology. Health policies, strategies and legislation will be reviewed with the lens of climate resilience. Communication and health information systems must be made resilient using affordable technology and equipment.

In the reconstruction to healthcare facilities, it is recommended that PAHO Smart Hospitals standards for resilience and greening, and low energy and water consumption are incorporated. Healthcare facilities roofs should be designed to withstand its self-weight, and other loads which may act on the roof such as live loads, wind and seismic in accordance with OECS Building Code 7th Edition 2016 (accessed via <https://www.oecs.org/>). The current building codes do not account for volcanic ash loading, however this risk should be treated as an additional live load on the roof. Data on the ash loading and densities from the 2021 La Soufriere eruption will be available on the PAHO website (www.paho.org) later this year. Additionally, windows that are hurricane

resistant are completely sealed when closed, this doubles to prevent ash from penetrating the building which reduces the risk of damage to medical equipment and interior furnishings. Remote facilities that may become inaccessible should be self-sustainable with back-up power supply, water storage, telecommunication, and adequate stocks to continue services.

Facilities in the orange and red zones need to be continuously cleaned and sanitized internally and externally to provide a safe environment for patients and staff. The cleaning protocols can be used from the International Volcanic Health Hazard Network <https://www.ivhhn.org/information> should be used as important guidance. Assessment of air pollution health risks due to volcanic ash should be conducted to inform public health decisions and relocations to these zones as well as to monitor impacts for outdoor cleaning procedures.

The human resource strategy for nurses and public health staff must be reviewed to make use of persons trained and unemployed. An OECS regional approach to health worker training and exchange should be developed along with regional risk sharing strategies to reduce evacuation and overseas healthcare costs. Use of telemedicine and mechanisms for sharing of key specialists between islands should be explored.

Faced with many health priorities e.g. COVID-19 pandemic, etc, the MoH is already overstretched to deliver the immediate repair and required retrofitting works in healthcare facilities. It needs additional technical management support to ensure that the works are completed efficiently and effectively to aid the return of the displaced populations and provide critical health services to the affected population, including comprehensive sexual and reproductive health services and supplies.

Mental Health is essential to the overall well-being, functioning, and resilience of individuals and communities recovering from the direct and indirect impact of the volcanic eruption. Emphasis is placed on developing sustainable coordination mechanisms; scaling up training in health professionals and non-specialized personnel; ensuring the availability of mental health and psychosocial support services; whilst ensuring social communication and availability of basic services and security. Increased psychosocial support and health campaigns are needed to address the mental wellbeing of the community at risk.

An increase in supply of health workers is needed, because health care workers need time off as well as support for recovery.

Additionally, there is an urgent need to enhance the surveillance system, a more diligent management of chronic diseases and increased visits in shelter and homes. With the support from PAHO and CARPHA, The Early Warning and Response System (EWARS) is currently being implemented and tested, and this system should be expanded in the intermediate and long term to boost the existing surveillance mechanism, especially due to the response to the ongoing displaced persons in shelters and the challenge to differentiate between COVID-19 and respiratory diseases symptoms. A 3-5-year strategy should be implemented to strengthen the capacity of surveillance officers at central and regional levels on basic concepts of field epidemiology including surveillance, data management and analysis (e.g. epidemiological bulletins, annual reports) and outbreak investigation.

There are several logistics supply chain information systems in place in country, including a pharmaceutical and medical supplies management system. Because of the potential

for disparities between these systems in use, it is advised that a technical assessment of these systems by an expert Software Developer to determine the most practical options will be conducted including for reproductive health commodity security.

The MoH requires immediate financial support for the development of a comprehensive long-term storage or warehousing solution to accommodate both routine and emergency supplies. This is a long-standing problem however the situation has been severely compounded over the last eighteen months by the impact of the COVID-19, the La Soufriere volcanic eruption and the passage of Hurricane Elsa. These events have exacerbated the congested storage situation experienced in Kingstown by CMS and HEOC. It is impractical to consider the long-term lease of a storage facility at the current rates of between \$1.2 to \$1.5 US per sq ft. as the final solution to the MoH storage challenges. It would be a more prudent investment to support the MoH with the planning and construction of a new warehouse facility that will fully meet their current and projected requirements, including the fluctuating rapid increase/decrease of storage requirements required to accommodate emergency and disaster response supplies.

Increased environmental monitoring and vector control are also required to address the increased risks. The activities of the vector control program in controlling the dengue outbreak which began in the early part of 2021, were halted as the response to the volcanic eruptions took priority. Dengue continues to circulate and, to prevent further outbreaks, the environmental health department needs to strengthen its capacity for monitoring environmental conditions and undertaking actions to mitigate against outbreaks of food-water-and vector-borne diseases. The need exists for additional environmental health and vector

control officers, vehicles, insecticide application equipment, insecticides, rodenticides, PPEs and communications materials for dissemination of information to the public. In support of both the Ministries of Health in SVG and Barbados, PAHO is currently implementing the short-term Air Quality Monitoring (AQM) proposal which should provide a baseline to facilitate the intermediate and long term AQM plan to assess air pollution health risks over population living in conditions of vulnerability.

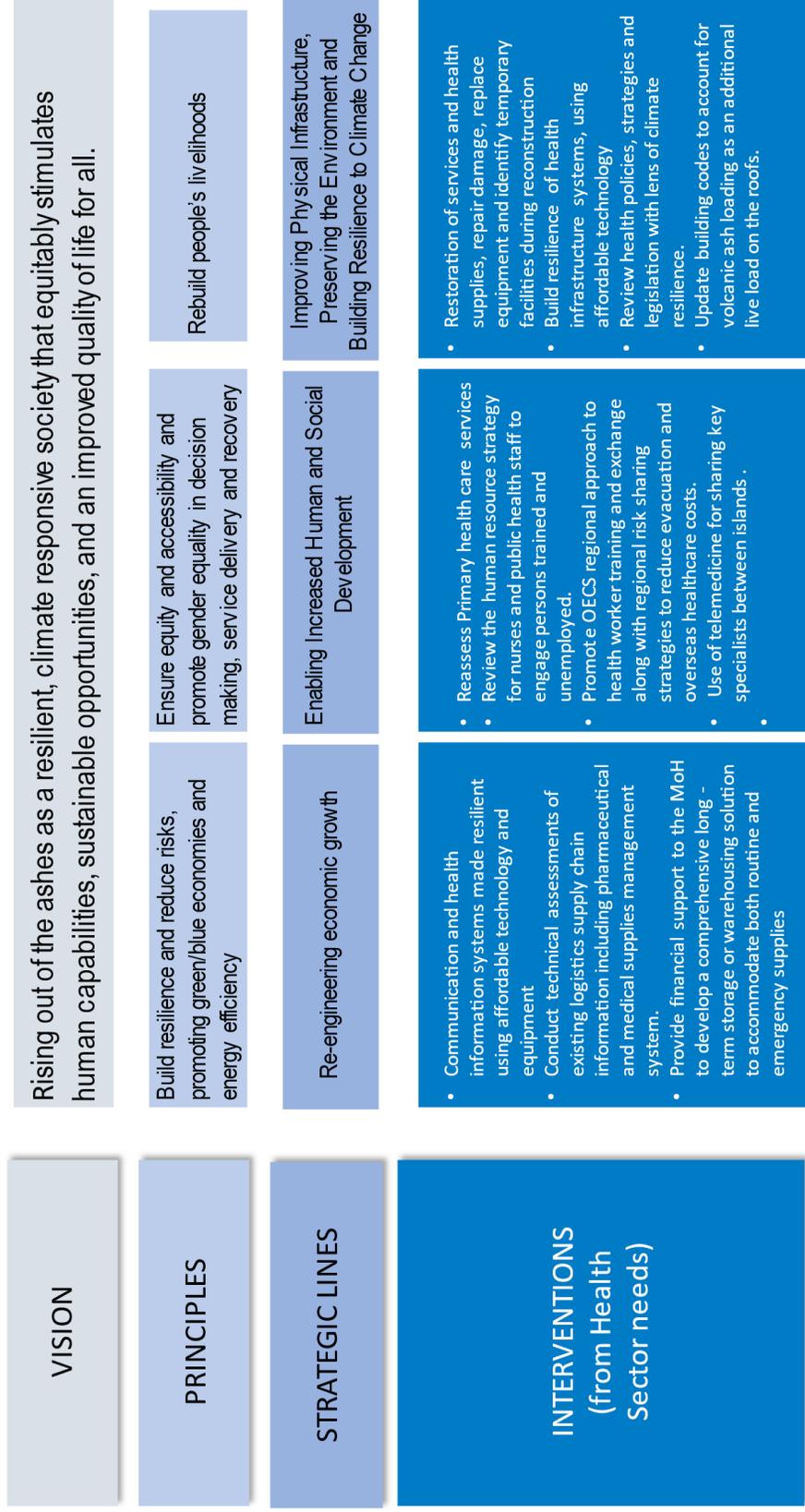
Contingency plans at both the healthcare facilities and the national levels need to be updated, including the draft National Health Sector Strategic Plan and the National Health Disaster Management Plan. The further implementation of the incident command system to run the Health Emergency Operations Centre and the

use of computerized system to improve data collection and analysis should be a high priority to strengthen preparedness and response capacity. See also PAHO/WHO Multi-Country Cooperation Strategy for Barbados and Eastern Caribbean Countries 2018-2024, strategic priority 5 and the National Health Sector Strategic Plan (2019-2025), strategic objective 2.2. (to improve quality of primary, secondary and emergency management services).

Contingency plans at the health care facility level should include lessons from the La Soufriere volcano eruption on Montserrat. See: Consequences of long-term volcanic activity for essential services in Montserrat: challenges, adaptations, and resilience: <https://mem.lyellcollection.org/content/39/1/471>



Figure 4: Summary of Health Recovery Interventions Aligned to National Strategic Lines for

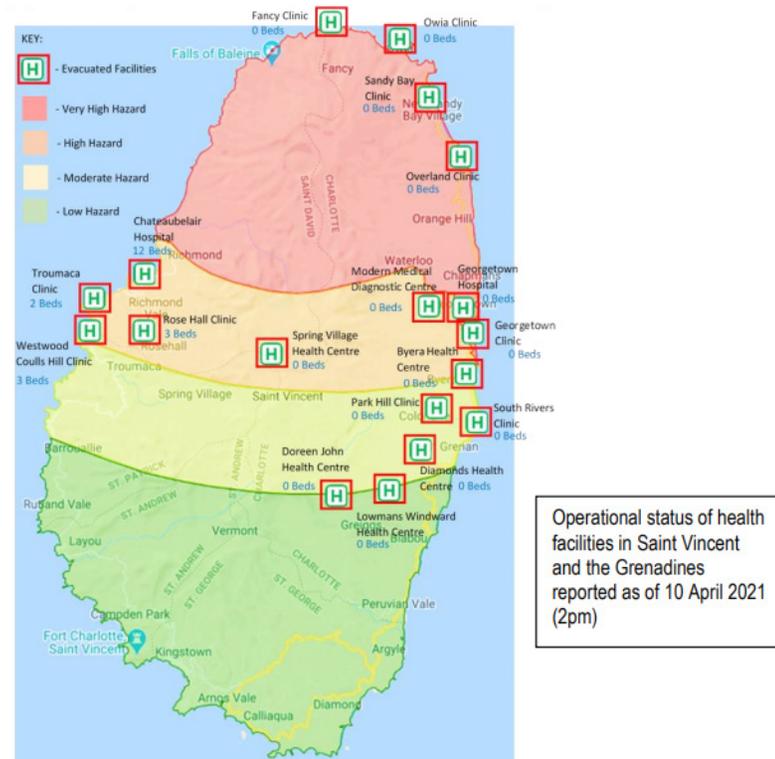


Recovery6. Sources of information, references

1. International Volcanic Health Hazard Network Volcanic ash information: <https://www.ivhnn.org/information>
2. PAHO/WHO Multi-Country Cooperation Strategy for Barbados and Eastern Caribbean Countries 2018-2024
3. National Health Sector Strategic Plan St. Vincent and The Grenadines 2019-2025 (Draft May 2019)
4. PAHO Smart Toolkit: <https://www.paho.org/en/health-emergencies/smart-hospitals/smart-hospitals-toolkit>
5. Consequences of long-term volcanic activity for essential services in Montserrat: challenges, adaptations and resilience: <https://mem.lyellcollection.org/content/39/1/471>
6. PAHO Air Quality Monitoring Proposal SVG and Barbados (July 2021)
7. Detailed Damage Sector Analysis, DDSA, Report of the Explosive Eruption of La Soufriere in Saint Vincent and the Grenadines, May 4, 2021
8. Sustainable Development Goals Voluntary National Review, Saint Vincent and the Grenadines, July 2020

Annex 1

Operational Status of Health facilities as of 10 April 2021 by PAHO



Annex 2

Service Delivery by Levels of Care

| Level of Care | Designation of Service | Type of Services |
|-------------------------------|--|--|
| Primary Care | <ul style="list-style-type: none"> Health Centres (37) Polyclinics (3) <p>Environmental Health</p> | <ul style="list-style-type: none"> Maternal and child health Management of communicable and chronic diseases, Community mental health Oral health Pharmaceutical services Health promotion Food and nutrition information and education Food safety, vector control, water quality control, solid waste management |
| Primary/Secondary Care | <ul style="list-style-type: none"> Rural Hospitals Modern Medical Complex | <ul style="list-style-type: none"> Primary care Outpatient care Laboratory and radiology services Nephrology, oncology, internal medicine, ambulatory services |
| Secondary Care | Milton Cato Memorial Hospital (211 beds) | <ul style="list-style-type: none"> Specialty care in internal medicine, general surgery, paediatrics, obstetrics/gynaecology, ENT, orthopaedics, oncology, ophthalmology, pathology, radiology, pharmacology, and physical rehabilitation |
| Rehabilitative Care | <p>Mental Health Rehabilitation Centre (182 beds)</p> <p>Lewis Punnett Home (102 beds)</p> | <ul style="list-style-type: none"> Acute and rehabilitative mental health care services Health and social care of the elderly |

Source: Health Evaluation Team

Annex 3

Health Sector Team Composition

| | |
|---|--|
| David Latchman | SVG Ministry of Health Planning |
| Charmaine Bailey-Rodgers | SVG Ministry of Health Medical registrar |
| Neri James | SVG Ministry of Health, Environmental |
| Donna Joyette Bascombe | SVG Ministry of Health Director Health Security |
| Clemens Buter | PAHO |
| Melvin Tebbutt (WASH; Damage Assessments) | PAHO |
| Patrice Lawrence-Williams (MHPSS) | PAHO |
| Denise Blackstock | UNFPA |
| Karen Poslon (Environmental Health) | PAHO |
| Benjamin Puertas (HSS) | PAHO |
| Juan J. Castillo (Air quality) | PAHO |
| Dorji Tshewang (Surveillance) | PAHO |
| Derek Hardy (Logistics) | PAHO |
| Jeannette Fernandez | UNDP - Facilitator |

Housing Sector

1. Summary

The Housing Sector is one of the most affected by the eruption of La Soufrière with 18% of all the dwellings in the country being in the red, orange, and yellow zones. Several houses will have to be relocated given the imminent risk to continued ash fall and other hazards such as strong winds and heavy rain.

With regards to the typology of the houses, those with metal sheet roof (90.8% of the stock) are the most vulnerable to ash fall given the additional loads that they will need to withstand due to the ash.

According to the 2012 Housing and Population Census, Saint Vincent has a total population of 109,991 persons including 56,419 males and 53,572 females. According to their living conditions, the population in the islands comprise 109,188 people living in private dwellings, 85 people living in a state of homelessness and 718 living across various institutions.

The construction materials of the houses is an important factor to consider due to its vulnerability to different natural hazards that may impact the country. Figures taken from the census indicate that 90.8% of the houses in the island are built with metal sheet roofs, while 7.3% are built with concrete and 1.8% are built with other types of materials. Metal sheet roofs which are the most prominent in the islands, are also the type of structure susceptible to suffer the greatest

impacts when facing the ashfall from the volcanic eruption, given the additional loads that they will need to withstand.

Reports available show that during the volcanic eruption, houses on the main island of St. Vincent were affected and the degree of impact was clearly correlated to their radial proximity to the volcano. A classification was established ranking areas from the greatest to the least affected using four colours: a) red identifying the most affected, b) orange identifying the moderately affected, c) yellow identifying the mildly affected, and d) green identifying the minimally affected.

The damage from this event is estimated at XCD 263.5 million in private property, while loss and additional costs amount to XCD 32.3 million, including USD 30.5 million in the public sector and XCD 1.9 million in the private sector.

It is important to mention that the most affected area (identified in red) is also the area with the fewest dwellings, while the least affected area (identified in green), which also has the highest concentration of houses, shows also that dwellings were only slightly affected (less than 5% of the house with some level of damage). Therefore, the percentage of housing damage with relation to the total number of houses in the country, is not concentrated in the area closest to the volcano but rather spread out. Notwithstanding, all the houses that were moderately or severely damaged are

in the Red Zone (Georgetown and Sandy Bay), Orange (Chateaubelair) and Yellow Zone (Colonaire). In addition, 91.5% of the houses in the Red Zone are constructed with metal-sheet roofs, 92.3% in the Orange Zone and 92.2% in the Yellow Zone, compared with the national average of 90.8%.

Table 1: Damage and loss summary

| | PRIVATE | PUBLIC | Total |
|--------|-------------|------------|-------------|
| Damage | 263,542,495 | | 263,542,495 |
| Loss | 1,859,095 | 30,474,269 | 32,333,364 |
| TOTAL | 265,401,589 | 30,474,269 | 295,875,858 |

Source: Housing sector evaluation team.

The additional weight of ash on the already weak roofing was the cause of the level of affectation observed in the housing sector. This produced rubble comprised of metal sheets and wood that had to be collected and disposed adding to the costs that this sector had to bear to also clean the volcanic ash accumulated on the roofs and surrounding areas. Important to consider the potential impact in the environment that needs to be captured when analysing this cross-cutting issues as per the PDNA methodology.

Loss estimates in the housing sector are grouped under three main categories: a) costs for removal of debris, b) costs associated to the provision of temporary housing therefore operation and maintenance of shelters, and c) foregone income from rental housing. Total loss amounts to XCD 32.3 million, of which XCD 12.3 corresponds to debris removal, XCD 18.1 million to the operation and maintenance of shelters and XCD 1.9 million to rental housing.

In terms of ownership, of the total loss, XCD 30.4 million was within the public sector while only XCD 1.9 million occurred within the private sector.

In terms of human impact, the displaced population as a result of the impact on the housing sub-sector is another important factor to consider.,

During the emergency a total of 5,535 households were displaced which represents about 19,914 individuals (18% of the population). This displaced population had to adapt to new living conditions in government led or private shelters which resulted in their need to substantially change their daily routine of activities. From the beginning of the emergency to the date of this report, 1,981 individuals from 1,227 households were accommodated in government shelters, including 647 children and 1,137 individuals from vulnerable groups.

Recovery needs in the sector were estimated based on the analysis of damage and loss. The concept of building back better was applied to counteract not only the damage caused by the volcanic ash fall, but also to mitigate the impacts of any future catastrophic events including hurricanes and storms. In this context, an additional 20% was applied to replacement values to cover the cost of inflation of construction materials and technical improvements in building constructions to ensure the adherence to national building codes and standards. The total recovery needs amount to XCD 355.9 million, out of which XCD 296.4 million corresponds to home improvement, XCD 30.4 million for incurred expenses and XCD 29.1 million for the construction of new houses that must be relocated.

In the short term, recovery needs are estimated to be valued at XCD 190.1 million. In the medium term, recovery needs are estimated at XCD 165.8 million, which includes improvements required to those homes located in the green zone that were affected by the volcanic eruption.

In an effort to lower the risks of susceptibility of some house's future disaster risks, it is necessary to relocate 375 homes that are located in highly disaster-prone areas, non-suitable for housing construction, that already suffered severe damage during the last volcanic eruption, this represents a cost of XCD 29.1 million.

2. Context or Sector Background

According to the 2012 Housing and Population Census, Saint Vincent has a total population of 109,991 people, including 56,419 males and 53,572 females. According to their living conditions, the population in the islands is grouped into three categories including 109,188 people living in private dwellings, 85 people living in a state of homelessness and 718 living across various institutions¹³.

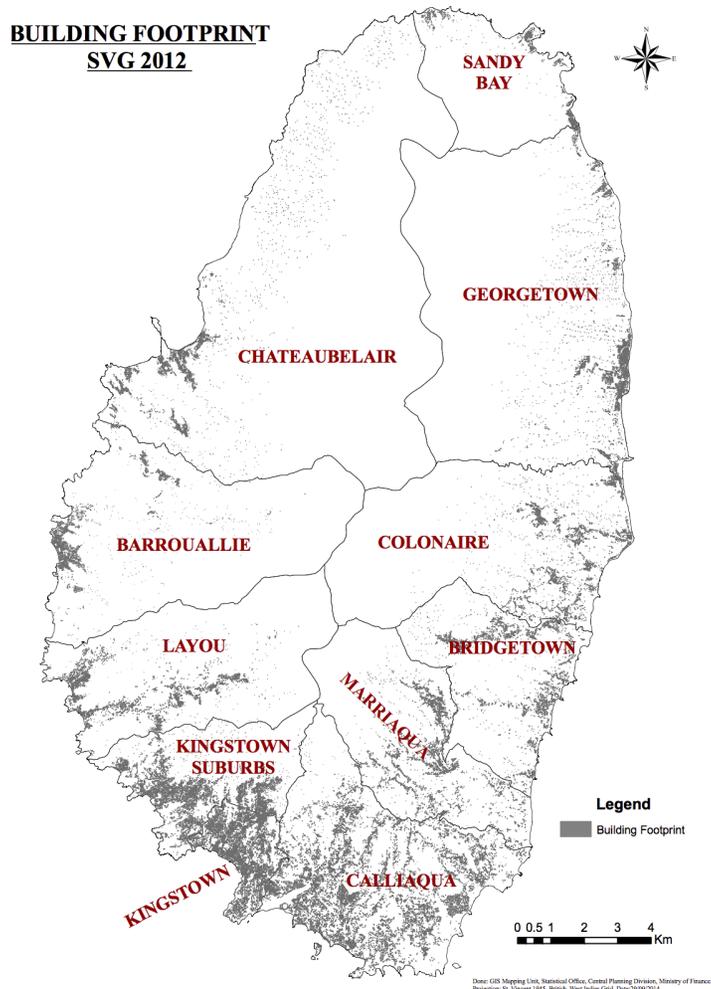
St. Vincent and the Grenadines is comprised of 13 census divisions, 11 of which are located on the mainland. Those on the mainland accounted for 90.6% of the household population in 2012. The census divisions of Kingstown, Suburbs of Kingstown, Calliaqua and Marriaqua, account for most of the country's household population. Sandy Bay remains the least populated census division, accounting for only 2.4% of the household population. Kingstown, Suburbs of Kingstown, Calliaqua and Marriaqua therefore continue to account for the largest proportion of the country's population (see Building Footprint 2012). Over time, the proportion of the population living in the Kingstown and Marriaqua census divisions decreased, while those of Suburbs of Kingstown and Calliaqua increased. Kingstown and Marriaqua, specifically, recorded declines of

6.0% and 5.5%, respectively, while Calliaqua and Suburbs of Kingstown registered increases of 7.0% and 5.8%, respectively.

During the intercensal period, several low-income housing projects were implemented, allowing more people from vulnerable groups to own their own homes. Additionally, commercial banking institutions introduced credit financing programmes, which gave public servants access to loans for housing constructions, with concessional levels of security/collateral. Consequently, the proportion of Owner-occupied dwelling units increased from 75.7% (23,130) in 2001, to 78.7% (28,987) in 2012. The Sandy Bay census division had the highest concentration of Owner-occupied dwellings (95.9%). The Southern Grenadines had the largest concentration of rented dwelling units (28.1%), based on its concentration of migrant workers from other divisions, while the Sandy Bay census division had the lowest concentration (1.1%), as it is the furthest away from urban centres. An additional 0.2% of households were rented from the Government during 2012, an increase from the 0.1% of 2001. Furthermore, 8.4% of the households lived in rent-free dwellings, 0.1% in leased dwellings and 0.6% in informal human settlements (Squatted)¹⁴.

¹³ Housing and population census Saint Vincent, 2012.

¹⁴ Ibidem.



Source: Housing and population census, Saint Vincent, 2012.

For residential constructions, concrete and blocks were the most common type of material used on walls (69.8%). The Chateaubelair and Barrouallie census divisions had the largest concentration of Concrete and block houses, with 84.2% and 82.0% of dwellings, respectively. In other census divisions, the proportion of the housing stock constructed from this material ranged from 65.1% to 74.0%,

except for Sandy Bay, with a concentration of 50.4%. Wood was the next most common type of construction material, accounting for 9.8% of dwellings. The Southern Grenadines had the largest concentration of wooden houses (13.5%), while the Chateaubelair division had the lowest concentration (4.5%).

Baseline

Table 2: total assets

| Description | Quantity | Average area (Sm) | Unit cost | Unit cost per house | Total assets (XCD) | Percentage of rental houses | Household size (persons) |
|---|---------------|-------------------|-----------|---------------------|----------------------|-----------------------------|--------------------------|
| Division | 45,377 | | | | 4,224,841,176 | | |
| Kingstown | 5,271 | 81 | 1,377 | 111,806 | 589,322,996 | 29.56 | 2.7 |
| Suburbs of Kingstown | 5,403 | 76 | 1,103 | 84,371 | 455,838,539 | 15.05 | 2.8 |
| Calliaqua | 10,664 | 79 | 1,263 | 99,930 | 1,065,632,095 | 17.99 | 2.5 |
| Marriaqua | 3,001 | 74 | 1,026 | 76,095 | 228,390,583 | 15.63 | 2.9 |
| Bridgetown | 2,569 | 79 | 1,216 | 96,637 | 248,252,905 | 7.47 | 2.9 |
| Colonaire | 2,679 | 75 | 1,077 | 80,681 | 216,111,862 | 11.17 | 2.9 |
| Georgetown | 2,696 | 72 | 880 | 63,270 | 170,565,703 | 12.01 | 2.9 |
| Sandy Bay | 816 | 72 | 896 | 64,757 | 52,819,033 | 1.82 | 3.6 |
| Layou | 2,684 | 77 | 1,167 | 89,628 | 240,518,702 | 18.57 | 2.7 |
| Barrouallie | 2,225 | 80 | 1,288 | 103,486 | 230,274,136 | 8.62 | 2.9 |
| Chateaubelair | 2,056 | 75 | 1,004 | 75,448 | 155,150,338 | 10.56 | 3.2 |
| Northern Grenadines | 3,293 | 83 | 1,436 | 119,628 | 393,983,351 | 17.42 | 2.1 |
| Southern Grenadines | 2,021 | 77 | 1,144 | 88,081 | 177,980,931 | 28.35 | 2.3 |
| Household goods in urban houses | | | 0 | | | | |
| average estimated cost of household goods | 45,377 | Global | 3240 | | 147,021,515 | | |
| Totals | | | | | 4,371,862,691 | | |

Source: Housing and population census St. Vincent 2012, plus updating percentage of 11.1% according to OpenStreetMap imagery 2021.

The materials that comprise these building is an important factor to consider as they can cause a dwelling to become more susceptible to natural disasters. 90.8% of the houses in the island are built with metal sheet roofs according to census information, while 7.3% are built with concrete and

only 1.8% are built with other types of materials. Metal sheet roofs which are the most prominent on the island, are also the types of structures that suffer the greatest impacts when facing different hazards such as heavy rain, strong winds or ash fall, like in the case of the recent eruption.

Table 3: roof type per division

| Census Division | Roof Type | | | |
|----------------------|---------------|--------------|------------|---------------|
| | Sheet metal | Concrete | Other | Total |
| Kingstown | 4,863 | 335 | 73 | 5,271 |
| Suburbs of Kingstown | 4,825 | 505 | 72 | 5,402 |
| Calliaqua | 9,303 | 1,107 | 255 | 10,665 |
| Marriaqua | 2,754 | 229 | 19 | 3,001 |
| Bridgetown | 2,320 | 160 | 90 | 2,570 |
| Colonaire | 2,469 | 159 | 51 | 2,678 |
| Georgetown | 2,475 | 121 | 100 | 2,696 |
| Sandy Bay | 738 | 63 | 14 | 816 |
| Layou | 2,545 | 115 | 22 | 2,683 |
| Barrouallie | 2,147 | 63 | 16 | 2,226 |
| Chateaubelair | 1,898 | 143 | 16 | 2,057 |
| Northern Grenadines | 3,071 | 154 | 69 | 3,294 |
| Southern Grenadines | 1,809 | 159 | 53 | 2,021 |
| | 41,216 | 3,313 | 850 | 45,377 |

Source: Housing and population census St. Vincent 2012, plus updating percentage of 11.1% according to OpenStreetMap imagery 2021.

3. Assessment of Disaster effects

Reports on the ground show that during the volcanic eruption, houses on the main island were affected and the degree of impact was clearly correlated to their radial proximity to the volcano. A classification was established ranking areas from the greatest to the least affected using four colours: a) red identifying the most affected, b) orange identifying the moderately affected, c) yellow identifying the mildly affected, and d) green identifying the minimally affected.

The damage from this event is estimated at XCD 263.5 million to private property, while loss and

additional costs amounts to XCD 32.3 million, including USD 30.5 million in the public sector and USD 1.9 million in the private sector.

It is important to note that the most affected area (identified in red) is also the area with the fewest dwellings, while the lightly affected area (identified in green) has the highest concentration of dwellings (includes 5 % of the value of the assets only). Therefore, the percentage of housing damage with relation to the total number of houses in the country, is not concentrated only in the area closest to the volcano, but rather widely spread.

Table 4: Damage and loss summary

| Item | Damage | | Loss | |
|---|----------|--------------------|-------------------|------------------|
| | Public | Private | Public | Private |
| Estimation of Damage to Infrastructure and Physical Assets | | | | |
| a) Houses with severe damage | | 58,968,555 | | |
| b) Houses partially destroyed (moderate damage) | | 49,796,206 | | |
| b) Houses partially destroyed (mild damage) | | 138,218,543 | | |
| c) Household goods | | 16,559,190 | | |
| Estimation of Change in Economic Flows (CEF)/ Losses | | | | |
| Losses by affected rental houses | | | | 1,859,095 |
| Removal debris | | | 12,349,165 | |
| Improvement and maintenance of shelters | | | 6,713,001 | |
| Total | 0 | 263,542,495 | 30,474,269 | 1,859,095 |

Source: housing sector evaluation team.

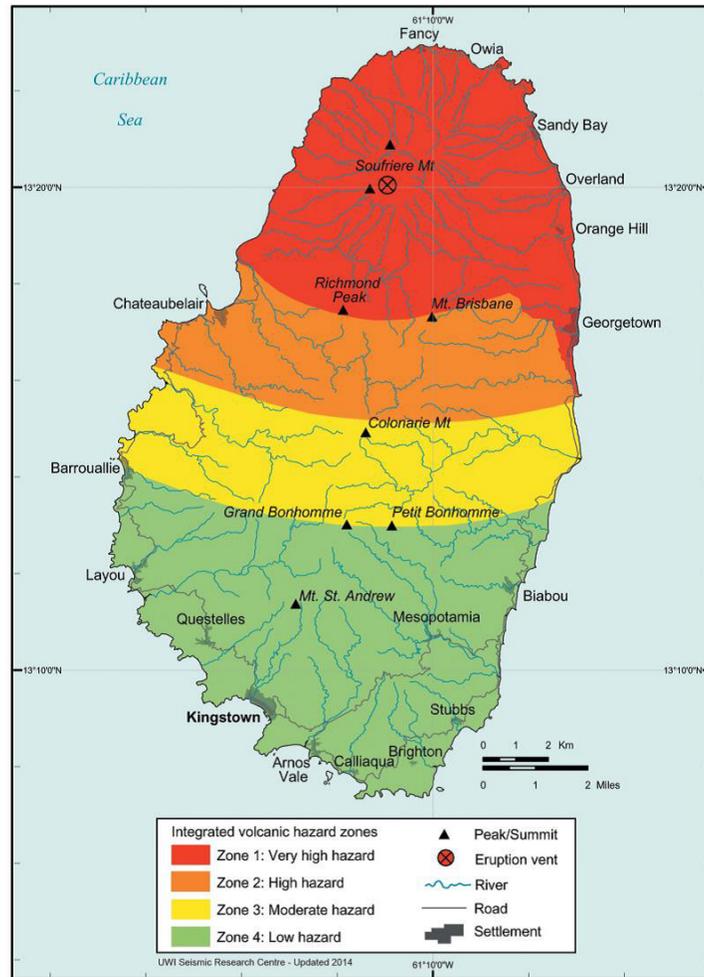
To estimate the damage and loss caused by the volcanic eruption, housing data was classified by division and subsequently a specific category, based on level of affectation was assigned according to the geolocation, assigning a percentage of low affectation to all the dwellings that are in the green strips. On the other hand, information from the DDSA¹⁵ report was used to identify the other four divisions that include the red to yellow strips.

To estimate the value of the houses, the information from the baseline and the local reference was used according to the type of construction and the average housing area by division.

Subsequently, the damage percentages were applied as follows:

- Mild – No significant damage: the structure is usable and can be occupied. Required repairs are minimal. Examples: some shingles have blown off the roof or the roof covering has loosened. Windows are broken. 5%.
- Moderate – Minor damage: the structure is usable and can be occupied after taking urgent temporary measures. The owner will probably need assistance with repairs. Examples: parts of the roof covering are missing. Windows and doors are blown out. The structure has shifted in its foundation. 25%

15 Detailed Damage Sector Assessment prepared by the GoSVG with support from CDEMA, June 2021



- Severe– Major damage: the structure is not usable and cannot be occupied until repairs are made. Example: Roof covering has blown

off exposing the interior of the structure. Windows and doors are missing, and walls are damaged. 40%

Table 5: Damage by division

| Description | Quantity | Damage level | | | Total damages (XCD) | % |
|-----------------------------------|---------------|---------------|--------------|------------|---------------------|--------|
| | | Mild | Moderate | Severe | | |
| Division | 41,216 | 32,992 | 3,240 | 104 | 246,983,304 | 100.0% |
| Kingstown | 4,863 | 4,863 | | | 27,183,114 | 11.0% |
| Suburbs of Kingstown | 4,824 | 4,824 | | | 20,350,646 | 8.2% |
| Calliaqua | 9,303 | 9,303 | | | 46,480,492 | 18.8% |
| Marriaqua | 2,754 | 2,754 | | | 10,479,535 | 4.2% |
| Bridgetown | 2,320 | 2,320 | | | 11,209,033 | 4.5% |
| Colonaire | 2,469 | | 2,469 | | 49,796,206 | 20.2% |
| Georgetown | 2,475 | 1,950 | 515 | 10 | 26,905,355 | 10.9% |
| Sandy Bay | 738 | 558 | 120 | 60 | 8,917,952 | 3.6% |
| Layou | 2,545 | 2,545 | | | 11,407,406 | 4.6% |
| Barrouallie | 2,147 | 2,147 | | | 11,108,318 | 4.5% |
| Chateaubelair | 1,898 | 1,728 | 136 | 34 | 23,145,248 | 9.4% |
| Northern Grenadines | 3,071 | | | | - | 0.0% |
| Southern Grenadines | 1,809 | | | | - | 0.0% |
| Household goods in houses | | | | | | |
| Estimated cost of household goods | 5,111 | | | | 16,559,190 | |
| Totals | | | | | 263,542,495 | |

Source: housing sector evaluation team with information of the DDSA report and the Department of Housing.

The additional weight of ash on the already weak roofing was the cause of the impact observed in the housing sector. This produced rubble comprised of metal sheets and wood that had to be collected and disposed adding to the costs that this sector had to bear to also clean the volcanic ash accumulated in the roofs and surrounding areas. Important to consider the potential impact in the environment that needs to be captured when analysing this cross-cutting issues as per the PDNA methodology.

Loss estimates in the housing sector correspond

to three main categories: a) costs for removal of rubble, b) costs associated to the provision of temporary housing therefore operation and maintenance of shelters, and c) foregone income from rental housing. Total loss amounts to XCD 32.3 million, of which XCD 12.3 corresponds to debris removal, XCD 18.1 million to the operation and maintenance of shelters and XCD 1.9 million to rental housing.

Of the total losses, XCD 30.4 million correspond to the public sector while only XCD 1.9 million correspond to the private sector.

Table 6: Total Losses

| Description | Quantity of houses | Damage level (houses) | | | Total losses (XCD) |
|--|--------------------|-----------------------|----------|--------|--------------------|
| | | Mild | Moderate | Severe | |
| Debris removal due to houses affected | 41,216 | | | | 12,349,165 |
| Kingstown | 4,863 | 4,863 | | - | 1,359,156 |
| Suburbs of Kingstown | 4,824 | 4,824 | | - | 1,017,532 |
| Calliaqua | 9,303 | 9,303 | | - | 2,324,025 |
| Marriaqua | 2,754 | 2,754 | | - | 523,977 |
| Bridgetown | 2,320 | 2,320 | | - | 560,452 |
| Colonaire | 2,469 | - | 2,469 | | 2,489,810 |
| Georgetown | 2,475 | 1,950 | 515 | 10 | 1,345,268 |
| Sandy Bay | 738 | 558 | 120 | 60 | 445,898 |
| Layou | 2,545 | 2,545 | - | - | 570,370 |
| Barrouallie | 2,147 | 2,147 | - | - | 555,416 |
| Chateaubelair | 1,898 | 1,728 | 136 | 34 | 1,157,262 |
| Northern Grenadines | | | - | - | - |
| Southern Grenadines | | | - | - | - |
| Shelter's maintenance | | | | | 18,125,104 |
| Operation of shelters (person/day) | | | | | 7,375,104 |
| Pay for those staying in hotels & guest houses incl. their meals | | | | | 2,500,000 |
| Purchase prepackaged food boxes to distribute (MinSocDev) | | | | | 2,250,000 |
| Food vouchers for vulnerable people | | | | | 2,000,000 |
| Reinvigorate and restart the popular love box program | | | | | 2,000,000 |
| Enhance the work done by the Ministry of Social Development | | | | | 2,000,000 |
| Losses by affected rental houses | | | | | 1,859,095 |
| Colonaire | 299 | | | | 724,190.8 |
| Georgetown | 324 | | | | 614,548.2 |
| Sandy Bay | 15 | | | | 28,839.2 |
| Chateaubelair | 217 | | | | 491,516.3 |
| Totals | | | | | 32,333,364 |

Source: housing sector evaluation team with information of the DDSA report and the Department of Housing.

4. Linking the effects to the human impact

In terms of human impact, the displaced population is another important factor to consider. 82 shelters were activated on April 8th 2021, during the emergency, a total of 5,535 households were displaced which represents about 19,914 individuals (18% of the population). This displaced population had to adapt to new living conditions in government led or private shelters which resulted in their need to substantially change their daily activities. 1,227 households and 1,981 individuals were recorded in government shelters

including 647 children and 1,137 people from vulnerable groups.

Similarly, as the COVID 19 pandemic escalated, many daily activities changed and were carried out in the homes. Therefore, households that were affected by the volcanic eruption and that had to relocate to shelters with limited access to digital tools also found their economic and productive activities affected. This includes activities such as remote work, virtual education, and family life.

5. Recovery Needs and Strategy

The registered damages and losses were used as a basis to estimate the recovery needs, and in the concept of building back better was applied to counteract not only the damages caused by the volcanic ash fall but also any future catastrophic events including hurricanes and storms, applying an additional 20% to replacement values. The needs amount to XCD 355.9 million, which corresponds to XCD 296.4 million for home improvement, XCD 30.4 million for incurred expenses and XCD 29.1 million for the construction of houses that must be relocated. To reduce future disaster risks, it is necessary to relocate 375 homes that are in non-suitable housing areas and that suffered severe

damage during the last volcanic eruption, this represents a cost of XCD 29.1 million.

The expenses already incurred such as the removal of rubble and the operation and maintenance of shelters are included within the recovery needs, since these expenses were covered by the government.

Damages from household goods and private losses from rental housing have not been included within the needs, as there are no government programs to address this type of costs.

Table 7: Recovery needs

| Item | DaDamage (XCD) | Loss (XCD) | Justification. Needs coming from the analysis of effects and impacts. | Recovery Needs (XCD) |
|--|----------------|------------|---|----------------------|
| 1. Housing improvement | | | | |
| 1.1 Kingstown | 27,183,114 | | Green zone | 32,619,737 |
| 1.2 Suburbs of Kingstown | 20,350,646 | | Green zone | 24,420,775 |
| 1.3 Calliaqua | 46,480,492 | | Green zone | 55,776,590 |
| 1.4 Marriaqua | 10,479,535 | | Green zone | 12,575,442 |
| 1.5 Bridgetown | 11,209,033 | | Green zone | 13,450,839 |
| 1.6 Colonaire | 49,796,206 | | Yellow zone | 59,755,448 |
| 1.7 Georgetown | 6,905,355 | | Red zone | 32,286,426 |
| 1.8 Sandy Bay | 8,917,952 | | Red zone | 10,701,542 |
| 1.9 Layou | 11,407,406 | | Green zone | 13,688,887 |
| 1.10 Barrouallie | 11,108,318 | | Green zone | 13,329,981 |
| 1.11 Chateaubelair | 23,145,248 | | Orange zone | 27,774,298 |
| 1.12 Household goods | 16,559,190 | | Private damage | |
| 3. Debris removal | | 12,349,165 | Executed | 12,349,165 |
| 4. Shelter maintenance | | 18,125,104 | Executed | 18,125,104 |
| 5. Risk reduction | | | | |
| 5.1 houses to be relocated (375) | | | Risk area | 29,140,635 |
| 6. Losses by affected rental houses | | 1,859,095 | Private loss | |
| Total | 263,542,495 | 32,333,364 | | 355,994,870 |

Source: housing sector evaluation team.

Based on the priorities described above, recovery needs are grouped in the short and medium term. The renovations and improvement of the dwellings should be carried out as a priority in the areas defined with colours red, orange, and yellow.

Recovery needs in short term amount to XCD 190.1 million. In the medium term, improvements to the houses located in the green zone have been included, with a total of XCD 165.8 million.

Table 8: Recovery needs prioritization

| Intervention/Activity | Short Run* (XCD) | Intermedi-ate* (XCD) | Long Run * (XCD) | Priority (1 a 5) | Comment | Cost (XCD) |
|----------------------------------|--------------------|----------------------|------------------|------------------|-------------|--------------------|
| 1. Housing improvement | | | | | | |
| 1.1 Kingstown | | 32,619,737 | | 5 | Green zone | 32,619,737 |
| 1.2 Suburbs of Kingstown | | 24,420,775 | | 5 | Green zone | 24,420,775 |
| 1.3 Calliaqua | | 55,776,590 | | 4 | Green zone | 55,776,590 |
| 1.4 Marriaqua | | 12,575,442 | | 4 | Green zone | 12,575,442 |
| 1.5 Bridgetown | | 13,450,839 | | 4 | Green zone | 13,450,839 |
| 1.6 Colonaire | 59,755,448 | | | 3 | Yellow zone | 59,755,448 |
| 1.7 Georgetown | 32,286,426 | | | 1 | Red zone | 32,286,426 |
| 1.8 Sandy Bay | 10,701,542 | | | 1 | Red zone | 10,701,542 |
| 1.9 Layou | | 13,688,887 | | 4 | Green zone | 13,688,887 |
| 1.10 Barrouallie | | 13,329,981 | | 4 | Green zone | 13,329,981 |
| 1.11 Chateaubelair | 27,774,298 | | | 2 | Orange zone | 27,774,298 |
| 3. Debris removal | 12,349,165 | | | 1 | Executed | 12,349,165 |
| 4. Shelter maintenance | 18,125,104 | | | 1 | Executed | 18,125,104 |
| 5. Risk reduction | | | | | | |
| 5.1 houses to be relocated (375) | 29,140,635 | | | 1 | Risk area | 29,140,635 |
| Totals | 190,132,618 | 165,862,252 | | | | 355,994,870 |

* To be agreed with the Government.
Source: housing sector evaluation team.

6. Sources of information, references

1. Global Rapid Post Disaster Damage Estimation (Grade) Report, World Bank Gpurl D-Ras Team, April 2021.
2. Housing and population census 2012, Saint Vincent.
3. River Crossing and Housing Infrastructure Detailed Damage Assessment, Ministry of Transport, Works, Lands & Physical Planning, Government of Saint Vincent, July 2021
4. Situation reports La Soufrière Volcano, St. Vincent, from CDEMA, April 2021.

Evaluation team

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Productive Sectors

The Productive Sector, within the context of the PDNA, is comprised of four (4) sub-sectors: Agriculture, Tourism, Commerce and Industry. Agriculture includes Crops, Livestock, Fisheries, Forestry and Apiculture. In the conduct of this PDNA, the focus is on the Agriculture and Tourism Sub-sectors.



Agriculture, Forestry and Fisheries

Executive Summary

The La Soufrière Volcano in St. Vincent and the Grenadines became active on 27th December 2020. The activity involved a series of effusive eruptions resulting in the formation of a new lava dome. On April 9th 2021, the volcano transitioned to explosive eruptions which created numerous ashfall, pyroclastic flows and lahars or mudflows. The heightened volcanic activity prompted the immediate evacuation of persons from communities located in the red and orange zones.

Information from the National Emergency Management Organization (NEMO) indicates that thirteen thousand three hundred and three (13,303) persons have been evacuated and registered. There are approximately 2,875 registered farmers and 308 fisher-folks who have been dislocated from the red and orange zones and who are among the evacuees. Additionally, some farmers and fishers from the Yellow Zone, especially on the leeward side, have been evacuated.

The volcanic eruptions have directly and indirectly affected agriculture, forestry, fishing, apiculture and agricultural infrastructure throughout the country resulting in damage and loss 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 1.1 summarizes the estimated damage and loss by sectors.

Table 1.1: Total Effect of La Soufrière Volcanic Eruption on the Agricultural, Forestry and Fisheries Sector

| Description Sub-sector | Total Damage (XCD '000') | Total Loss (XCD '000') | Total Damage and Loss (XCD'000') |
|------------------------|--------------------------|------------------------|----------------------------------|
| Crops | 17,350.96 | 98,685.58 | 116,036.54 |
| Livestock | 1,509.01 | 1,653.62 | 3,162.63 |
| Fisheries | 718.10 | 5,013.76 | 5,732.86 |
| Apiculture | 217.30 | 377.30 | 594.60 |
| Forestry | 84,053.01 | 20,566.65 | 104,619.66 |
| Total | 103,848.38 | 126,296.91 | 230,145.29 |

Source: Agriculture Evaluation Team

The assessment report indicates the estimated value of total damage and loss sustained by the crops, livestock, apiculture, fisheries and forestry sectors is approximately XCD 230.145 million. The

breakout of detailed estimates for each sub-sector is presented in **Annex 3** and summarized in the body of the document.

2. Context and Background of the Agricultural and Related Sectors

2.1 Performance of the Agricultural Sector

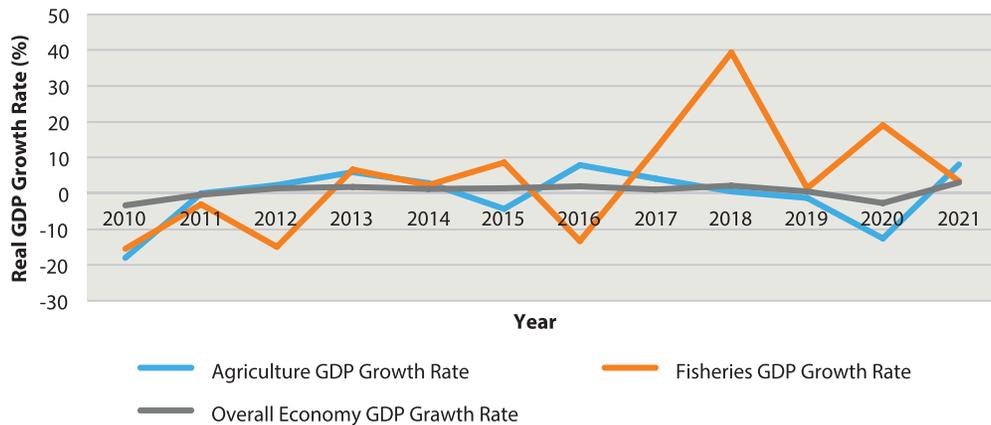
The agricultural sector's¹⁶ real growth has fluctuated over the last decade (2010 – 2020), with a downward tendency, especially after 2016 as can be observed from **Figure 2.1**. However, although the fisheries sub-sector has demonstrated some level of fluctuations over the same period, real growth of this sub-sector has shown a significant

upward tendency. Notwithstanding the negative trend in the growth of the overall sector,¹⁷ it continues to play an important part in the economic life of the country through its contribution to GDP, employment, foreign exchange earnings and more recently and importantly, through its linkages and impacts on the health and tourism sectors and the achievement of food and nutrition security for the population.

¹⁶ Crops, Livestock, Apiculture and Forestry

¹⁷ Crops, Livestock, Apiculture, Forestry and Fisheries

Figure 2.1: Real GDP Growth Rate in Agriculture(Crops, Livestock Forestry) , Fisheries and Overall Economy (2010 - 2021)

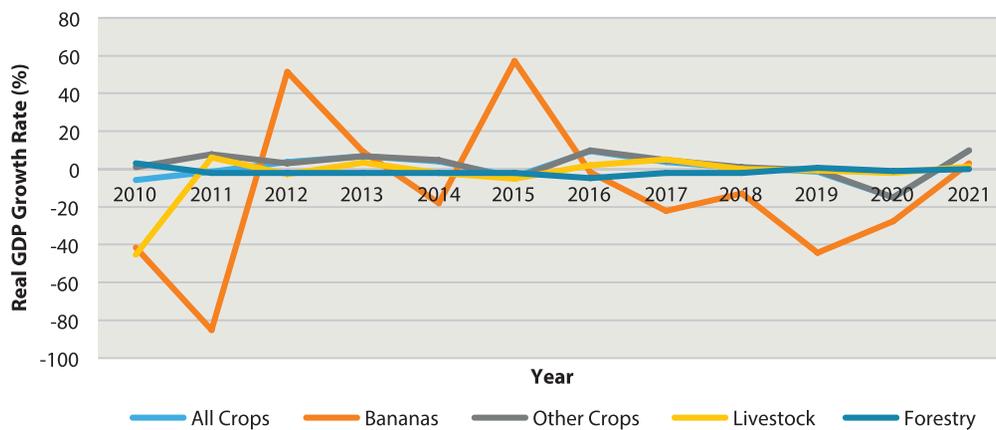


Source: ECCB Database

The real growth rate of the various sub-sectors is presented in **Figure 2.2**. Projections were for

positive growth rates in the various sub-sectors in 2021.

Figure 2.2: Real GDP Growth Rate of Agriculture Sub-sectors (2010-2021)



Source: ECCB Database

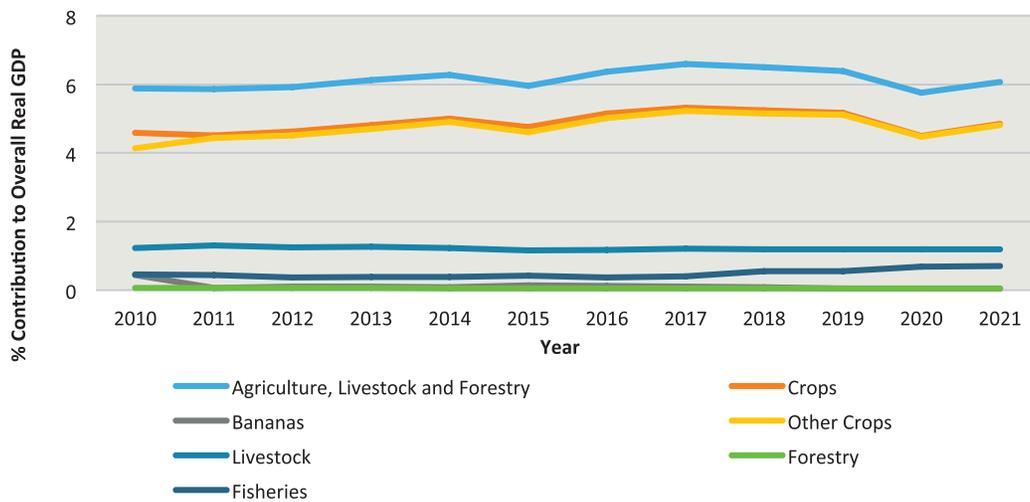
The contributions of the various sub-sectors to overall GDP as well as to total agricultural GDP are presented in **Figures 2.3 and 2.4**, respectively. The **Figures** demonstrate the importance of the ‘Other Crops’ sub-sector to the agricultural sector and the declining role of the **banana industry** in the socio-economic development of the country.

Historically, banana was the single most important agricultural commodity produced in SVG. However, the sub-sector has experienced a significant decline in its contribution to GDP, foreign exchange earnings and employment. The significant change in the fortune of the banana industry over the past years was strongly influenced by external and

domestic factors. The main external factor relates to the loss of preferential access to the traditional UK market. The major domestic factors include severe droughts and outbreaks of the Moko disease and

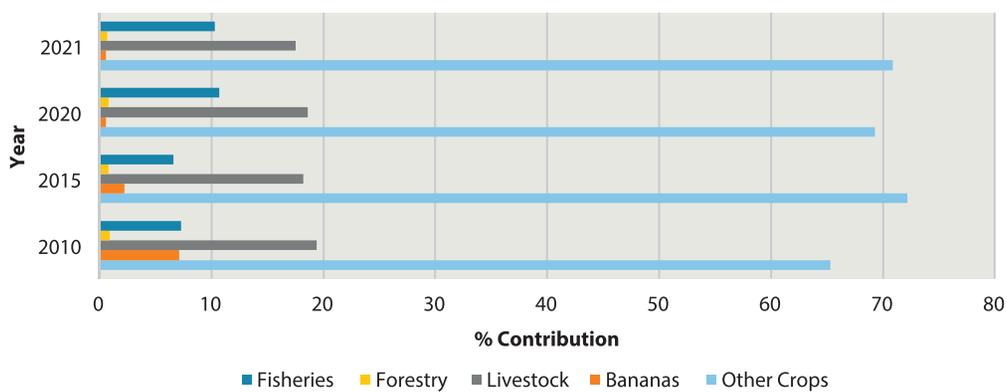
the Black Sigatoka Disease, resulting in not only a reduction in the area under banana cultivation but also reduced output per acre.

Figure 2.3: % Contribution of Sub-sectors to Overall Real GDP (2010-2021)



Source: ECCB Database

Figure 2.4: % Contribution of Agriculture Sub-sectors to Overall Real Agriculture GDP (2010, 2015, 2020 and 2021)



Source: ECCB Database

The **'Other Crops' sub-sector** includes plantains, root crops (dasheen, eddoes, yams, sweet potatoes, ginger, arrowroot, cassava, tannia, carrots and peanuts), fruits and vegetables and fruit trees. This sub-sector has partially filled the void created by the decline of the banana industry and has been the major contributor to agricultural GDP (accounting for an estimated 69.5% of overall agricultural GDP in 2020).

The **livestock sub-sector** is small but growing, relative to crops, with the production of poultry, pigs, cattle and small ruminants (mainly for meat) being the main activities. Its contribution to GDP, foreign exchange earnings and employment are minimal. The industry contribution to Agricultural GDP was 18.6% in 2020 and the projected contribution for 2021 was 17.5%. The sub-sector experienced real growth of 1.2% in 2020 and was projected to grow by 1.19% in 2021. The country is self-sufficient in table eggs and there is a fairly high level of self-sufficiency in pork and the meat of small ruminants. However, overall there is a high level of importation of meat and meat parts as well as dairy products, as value addition has not progressed to significant levels in the sub-sector. The sub-sector has presented prospects for growth and development of the industry and created opportunities for import substitution of livestock products, as well as for increasing employment, reducing poverty and enhancing food and nutrition security in rural areas.

The **fisheries sub-sector** and related marine environment are important to socioeconomic development in SVG, through their contribution to sustainable livelihoods in rural areas, foreign exchange earnings and GDP. The marine and coastal environments lie at the core of the country's tourism appeal and thus have strong, though underestimated, linkages to the growing and important tourism sector.

Fishing is an extremely important industry in the Grenadines and some rural communities of the mainland of St. Vincent. The fishing industry is primarily small-scale and artisanal with most fishermen operating from small boats close to the shore. The fleet consists of 839 registered vessels operating from thirty-six (36) landing sites, of which twenty (20) are located on the mainland and sixteen (16) in the Grenadines). Most of these landing sites lack modern infrastructure and are just designated points where fishermen pull up their boats to serve the villages.

It is estimated that there are 2,500 persons directly or indirectly employed in the industry, with approximately 85% (2,124 persons) being solely dependent on fishing or related activity for economic survival (**Table 2.1**). The industry, in 2020 contributed approximately 0.69% of total GDP and approximately 10.7% of Agricultural GDP.

Table 2.1: Number of Fishers in Volcanic Hazard Zones

| Zone | Description of Fishers/ Operators | Number of Fishers and Operators | | | % |
|--------------------|--------------------------------------|---------------------------------|-------------|--------------|--------------|
| | | Male | Female | Total | |
| Red Zone | Fisher-folks | 72 | 2 | 74 | |
| | Vendors | 9 | 2 | 11 | |
| | Workers | 17 | 20 | 37 | |
| | Total | 98 | 24 | 122 | 7.9 |
| Orange Zone | Fisher-folks | 126 | 22 | 148 | |
| | TRI Operators | 7 | 8 | 15 | |
| | Total | 133 | 30 | 163 | 10.5 |
| Yellow Zone | Fisher-folks ¹⁸ | 1 | 0 | 1 | |
| | Total | 1 | 0 | 1 | 0.0 |
| Green Zone | Fisher-folks | 892 | 19 | 911 | |
| | Vendors | 195 | 64 | 259 | |
| | Workers | 48 | 52 | 100 | |
| | Total | 1135 | 135 | 1,270 | 81.6 |
| All Zones | | | | 1,556 | 100.0 |
| | Fisher-folks | 1,091 | 43 | 1,134 | 72.8 |
| | Vendors | 204 | 66 | 270 | 17.4 |
| | Workers | 65 | 72 | 137 | 8.8 |
| | TRI Operators | 7 | 8 | 15 | 1.0 |
| Grand Total | | 1,367 | 189 | 1,556 | |
| % | | 87.9 | 12.1 | | 100.0 |

Source: MAFFRIL/Fisheries Division

The latest available data has put fish landings at an estimated 32,988 tonnes in 2018, compared to 81,413 tonnes in 2014. The bulk of the landed catches are sold locally to retailers/vendors, directly to consumers and to middlemen or fish traders for export to the United States of America,

Martinique and other regional markets. The value of fish imported into SVG in 2018 was USD 2.35 million compared to the export value of USD 2.49 million. The main fish and fish products imported included dried salted fish (cod), Salmon (smoked and fillet), and shrimp. The main import

¹⁸ Figures to be updated

markets are the United States and Canada while the main export markets are Martinique and the United States primarily for fresh and frozen kingfish, dolphin and tuna. It is important to mention that the “tri-tri” or West Indian whitebait (*Sicydium plumieri*), although of small size, is one of the important fishes of SVG. It is the young of a freshwater fish commonly known as the Macock and inhabits mountain streams and live in the quiet pools and eddies. These Macocks, after mating, lay their eggs in huge bundles in the river and the eggs are then washed down into the sea by water currents. Hatching of the eggs takes place in the sea but the tiny fish or fries would then make their way to the river mouths and eventually move upstream in the freshwater. Marketing of Tri-Tri is a very profitable exercise (XCD 10.00 per pound) and there is great demand locally for the commodity. Currently, there are approximately one hundred and fifty (150) registered Tri Tri fishers, although Table 2.1 above indicates only 15 operators in the orange zone, which represents a gross underestimation of the number of Tri Tri fishers.

SVG is covered by 25-30% **forests**, which include several forest types such as the Montane Rainforest, Coastal Dry-woodlands, Littoral Forest and the Elfin Woodlands. Some of these forests are important to timber production, including high-value species such as the Blue Mahoe and Mahogany. The forests provide several services and benefits to SVG, including:

- Providing livelihoods or supplement to income for several persons in the communities (such as charcoal makers, building contractors, craft makers and agro/eco-tourism operators).
- Conservation of water which benefits the population with water for drinking, irrigation and hydro-electricity.
- Significant contribution to the tourism sector through eco-tourism and the several areas designated as national parks.

The conservation of the forests and wildlife resources is a major area of operation. In this context, the forests are important from a conservation and environmental standpoint for bio-diversity, water production and conservation, positive effects to clean air and the climate, and soil fertility and conservation. There are several Forest Reserves including those located at Cumberland and Kings Hill. The major threats to forests and biodiversity are deforestation due to crop production, encroachment, poaching, and overexploitation. The industry contribution to real agricultural GDP was 0.8% in 2020 and the projected contribution for 2021 is 0.7%. The sub-sector experienced negative real growth of -1.0% in 2020, and zero growth is projected in 2021.

2.2 Resource Base

Table 2.2 below presents information from the **St. Vincent and the Grenadines Agricultural Census for 2000** on the number of holding and area of holdings. The table shows that there are 876 “landless” farmers and a heavy concentration of land in just a few holdings, with 87.7% of all holdings occupying only 39.0% of the total land area. The land distribution system in the country suggests the urgent need for land reform to ensure that small farmers in the country have better access to land for agricultural production.

Table 2.2: Number and Area of Holdings

| Description Size of Holdings (hectares) | No. of Holdings | | Land Area (hectares) | | Cumulative (%) | |
|--|-----------------|--------------|----------------------|--------------|-----------------|----------------------|
| | No. | % | Area | % | No. of Holdings | Land Area (hectares) |
| Landless | 876 | 11.9 | - | 0.0 | 11.9 | 0.0 |
| < .2 hectare | 2,032 | 27.5 | 148 | 2.1 | 39.4 | 2.1 |
| .2 – .4 hectare | 732 | 9.9 | 169 | 2.3 | 49.3 | 4.4 |
| .4 – 1 hectare | 1,735 | 23.5 | 1,018 | 14.1 | 72.8 | 18.5 |
| 1- 2 hectares | 1,102 | 14.9 | 1,477 | 20.5 | 87.7 | 39.0 |
| 2 - 4 hectares | 647 | 8.8 | 1,569 | 21.8 | 96.5 | 60.8 |
| 4 – 10 hectares | 187 | 2.5 | 968 | 13.5 | 99.0 | 74.3 |
| 10.1 – 20.2 hectares | 41 | 0.6 | 527 | 7.3 | 99.6 | 81.6 |
| 20.2 – 40.5 hectares | 19 | 0.3 | 535 | 7.4 | 99.9 | 89.0 |
| > 40.5 hectares | 9 | 0.1 | 789 | 11.0 | 100.0 | 100 |
| Total | 7,380 | 100.0 | 7,200 | 100.0 | | |

Source: SVG 2000 Agricultural Census

Data gleaned from the 2000 Agricultural Census shows that of total land holdings, 75.3% are operated under an owner-like land tenure system, while another 19.2% are operated under rental agreements. The remaining landholdings (5.5%) are squatted lands or land operated under other forms of land tenure.

Approximately 7,920 hectares of the total land area of the country of 42,630 hectares are

used for agricultural purposes. This represents approximately 18.6% of the total land area of SVG. The farmers use about 42% of the agricultural land for permanent crops and about 15% for temporary crops.

Available data shows that there are approximately 10,438 registered farmers operating in the country (**Table 2.3**). However, this data is being updated.¹⁹

¹⁹ This update is being conducted by the MAFFRTIL.

Table 2.3: Farmers Disaggregated by Hazard Zones

| Zone | Number of Registered Farmers | |
|---------------|------------------------------|--------------|
| | No. | % |
| Red | 1,850 | 17.7 |
| Orange | 1,023 | 9.8 |
| Yellow | 2,569 | 24.6 |
| Green | 4,996 | 47.9 |
| Total | 10,438 | 100.0 |

Source: MAFFRIL

3 Total Effect of the La Soufriere Volcanic Eruption on the Agricultural, Forestry and Fisheries Sector

3.1 Overview

The total effect of the La Soufrière Volcanic Eruption on the agricultural sector of SVG was assessed by utilizing the PDNA Guidelines for the Productive Sector. Within this context, the effect on the sector was categorized under two broad headings of damage and loss. The effect of the volcanic eruption on the physical assets and infrastructure of the agricultural sector at the time of the disaster was categorized as 'Damage'. The 'Loss' was determined based on changes in economic flows arising from the disaster linked to the disruption of service delivery and production

of and access to goods, disruption of governance and decision-making processes, and emerging risks and vulnerabilities.

The total effect of the volcanic eruption on the agricultural sector, including crops, livestock, fisheries, apiculture and forestry is estimated at approximately XCD 230.145 million, with damage accounting for XCD 103.848 (45.1%) and loss put at XCD 126.297 million (54.9%). The effect by sector is presented in **Figure 3.1** below. The Figure shows the crops and forestry sub-sectors accounted for the highest levels of total effects within the agricultural sector, reporting 50.4% and 45.4%, respectively.

Figure 3.1: Total Effect (Damage and Loss) of the Volcanic Eruption on Agriculture

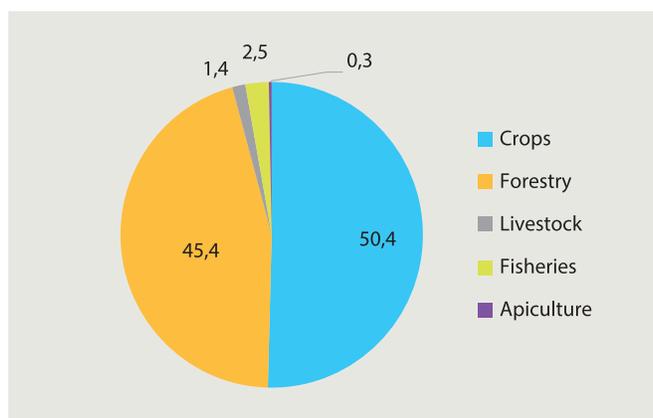


Table 3.1 provides a summary of the *total effects* and *damage and loss* of the volcanic eruption on the various sub-sectors, with the effects on the agricultural infrastructure integrated into the sub-sectoral estimations. Notwithstanding, the main agricultural infrastructure impacted are identified and the damage estimated. Annex 3 presents details of the damage and loss incurred by the various sub-sectors as a result of the event. Damages to farm roads are not included in the

estimates as this is addressed under the Transport and Works sector.

Geographically, the impact of the Volcanic Eruption on the agricultural sector, although widespread throughout the country, was concentrated in the Northern part of the country, inflicting substantial damage to the sector. The damage was most severe in Agricultural District 8 of Agricultural Region 3 and District 1 of Agricultural Region 1.

Table 3.1: Summary of Total Effect of La Soufrière Volcanic Eruption on the Agricultural, Forestry and Fisheries Sector

| Description | Private | Public | Total | % |
|------------------------------|-------------------|-------------------|-------------------|--------------|
| | (XCD '000') | (XCD '000') | (XCD '000') | |
| Total Damage | 17,148.15 | 86,700.23 | 103,848.38 | 45.1 |
| Crops Sub-sector | 15,465.24 | 1,885.72 | 17,350.96 | 16.7 |
| • Plantains | 3,585.82 | 340.25 | 3,926.07 | |
| • Banana | 5,589.88 | 561.96 | 6,151.84 | |
| • Other Fruit Tree Crops | 3,611.90 | 350.25 | 3,962.15 | |
| • Roots and Tubers | 1,490.63 | 511.86 | 2,002.49 | |
| • Fruits and Vegetables | 1,187.01 | 121.40 | 1,308.41 | |
| Livestock | 835.51 | 673.50 | 1,509.01 | 1.5 |
| Fisheries | 630.10 | 88.00 | 718.10 | 0.7 |
| Apiculture | 217.30 | | 217.30 | 0.2 |
| Forestry | | 84,053.01 | 84,053.01 | 80.9 |
| Total Loss | 105,385.91 | 20,911.00 | 126,296.91 | 54.9 |
| Crops Sub-sector | 98,685.58 | | 98,685.58 | 78.1 |
| • Plantains | 16,096.89 | | 16,096.89 | |
| • Banana | 10,458.13 | | 10,458.13 | |
| • Other Fruit Tree Crops | 40,969.05 | | 40,969.05 | |
| • Roots and Tubers | 17,746.31 | | 17,746.31 | |
| • Fruits and Vegetables | 13,415.20 | | 13,415.20 | |
| Livestock | 1,399.27 | 254.35 | 1,653.62 | 1.3 |
| Fisheries | 4,923.76 | 90.00 | 5,013.76 | 4.0 |
| Apiculture | 377.30 | | 377.30 | 0.3 |
| Forestry | | 20,566.65 | 20,566.65 | 16.3 |
| Total Damage and Loss | 122,534.06 | 107,611.23 | 230,145.29 | 100.0 |

Source: Agriculture Evaluation Team

Details on the estimation of damage, loss and total effects of the volcanic eruption on the agriculture sector are presented in Annex 3.

3.2 Crops Sub-sector

The overall effects of the volcanic eruption on the Crops Sub-sector were significant, representing 50.4% of the total effects in Agriculture, representing 16.7% of the overall damage in Agriculture and 78.1% of overall loss. A total of 4,151 acres of crops were totally destroyed or damaged, comprised of tree crops (3,045 acres), roots and tubers (693 acres) and fruits and vegetables (413 acres).

3.2.1 Bananas and Plantain

It is estimated that 1,028 acres (543 bananas and 485 plantains) were damaged in the entire country, of which 764 acres (433 bananas and 332 plantains) were in the red, orange and yellow zones. Apart from the physical damage to the plants, the fruits are unmarketable. Total damage to both crops is estimated at XCD 10.08 million, while the loss is assessed at XCD 26.56 million.

3.2.2 Tree Crops

Tree crops across the country have been impacted with ash resulting in the breaking of branches and stripping of some trees; in some cases the snapping of trees is evident. The entire fruit tree crop industry has been impacted ranging from 7% damage in the green zone to up to 100% damage in the red zone. Cocoa, coconuts, avocado, breadfruit and mangoes have all been severely affected. The total acreage of damaged tree crops. It is estimated that approximately 2,017.9 acres of tree crops were damaged, with total effects estimated at XCD 44.92 million (damage at XCD 3.96 million and the loss at XCD 40.96 million). Of the tree crops, the coconut industry suffered severe damage and loss, where 1,350 acres were impacted at a total damage and loss value of XCD 23.04 million.

3.2.3 Root Crops

Over 693 acres of root crops were estimated as damaged (sweet potatoes, eddoes, yams, cassava, arrowroot, turmeric and ginger). The damage was valued at XCD 2.00 million and the loss of XCD 17.75 million. There was 80% damage to these crops in the red and orange zones and whatever survived the impact of the ash also suffered indirect damage from the livestock that are let loose and currently ravaging any remaining plants in the area.

The Arrowroot crop is grown predominantly in the north windward area located in the red zone. Total production for 2020 was estimated at 440 metric tonnes. An estimated 98 acres that were unharvested was totally damaged due to ash fall ranging from 4 to 6 inches in some cases. Apart from the damage to the arrowroot crop the roof at the factory in Owia also collapsed resulting in the loss of starch estimated at XCD 511,875.00. The total arrowroot damage and loss (including the crop in the field plus tubers and starch in storage) is estimated at XCD 2.00 million.

3.2.4 Fruits and Vegetables

There was a 100% damage to fruits and vegetables in the red and orange zones as this was primarily the peak season for tomatoes, sweet peppers and cabbages in the north windward and north leeward areas (red and orange zones). These areas produce up to 73% of the over 568 acres of vegetables produced in the country. The crops are produced primarily for the domestic market and the loss have resulted in some levels of food shortage and increased prices of some commodities. The total damage and loss for fruits and vegetables is estimated at XCD 14.73 million (damage being XCD 1.31 million while losses accounted for XCD 13.42 million). While there is total damage to all vegetables in the red

and orange zones, there have been reports by farmers and Extension Officers of total damage to leafy vegetables across the country. Considerable damage was done to a portion of greenhouses across the country, especially in the red and orange zones.

3.3 Livestock Sub-sector

There was extensive loss of vegetation (pasture and other forage on which to graze animals) in the red and orange zones. All classes of livestock from the two zones are currently let loose based on prior advice from the MAFFRIL given the nature of the emergency. The damage to the livestock sub-sector is estimated at XCD 1.51 million in all zones and the loss is assessed at XCD 1.65 million. There are significant costs associated with the protection, feeding and veterinary support of these animals and their relocation to the safe zones. The estimated number of livestock affected in country is 3,110, comprised of poultry (2,872), sheep (54), goats (98), pigs (69) and cattle (17). The number of livestock by category affected in the the red and orange zones is estimated at 1,233, animals, the composition of which were not available at the time of the report.

3.4 Fisheries

3.4.1 Overview

The fishery sector in the red, orange and yellow zones has been significantly impacted. Approximately 800 fishers island-wide have been affected, with 278 relocated. Due to prior advice provided by MAFFRIL to fishers to safeguard their vessels, many fishers took the advice and protected their vessels from the effects of the volcanic eruption. In this context, this mitigating effort ensure that most of the protected vessels were able to escape the damaging effects of the volcanic eruption. It has been reported that

eleven (11) vessels with their engines and other equipment have been damaged. The estimated damage and loss for fisheries is XCD 5.73 million, with XCD 0.72 million representing damage and XCD 5.013 million loss. International export of fisheries products was temporarily interrupted due to the closure of the airport and the fisheries centre in the red zone.

3.4.2 Environmental Impact

The Volcanic hazards catastrophically destroyed fishing villages and turtle nesting beaches at Sandy Bay and Owia on the Windward side of the island and Rose bank, Chateaubelair, Fitz Hughes and Richmond on the Leeward side. These are prominent fishing villages located within proximity to the La Soufriere volcano. Wallibou beach, a known turtle nesting area, was destroyed and is now inundated by the sea. Several rivers on the Windward side of the island which are known for the harvesting of "Tri-Tri" were also destroyed and can no longer function in that capacity.

The Fisheries Division does not have a comprehensive outlook of the extent of damages and coastal erosions from the pyroclastic density currents and Lahar flows because of a lack of specialized resources to carry out detailed damage assessments. However, the Division is cognizant that these pyroclastic density currents and Lahar flows pose a significant threat to lives and livelihoods in and around the coast and inevitably ends up in the sea during severe weather. This may lead to cataclysmic devastation to nearshore nurseries and habitats and in extreme cases fish kill. The Government and people of SVG were advised by the University of the West Indies (UWI) Seismic Unit that Lahar flows are the second most destructive volcanic hazard and they may occur for months up to years with devastating life-threatening impacts.

Moreover, the Fisheries Division received reports of instances of discolouration of the ocean during La Soufriere's eruptive fervour. Fishers reported sightings of large swaths of seawater having dark green appearance nearshore. Fishing grounds are also covered with logs and other debris, floating and on the substrate, due to the Lahar flows.

3.5 Apiculture

The thriving apiculture industry with 713 hives across the country was not severely impacted since less than 10 percent (10%) of the hives are located in the red and orange zones. The total damage was estimated at XCD 0.217 million and loss XCD 0.377 million.

3.6 Forestry

3.6.1 Overview

The established plantations and the natural forest suffered an excess of 65% damage in the Red, Orange and Yellow zones. The estimated damage to the forestry industry is XCD 84.053 million and loss is XCD 20.567 million. The ecosystem services value has been calculated based on an estimate of 65% damage to the 13,000 hectares of natural forest in SVG. The calculated value of USD 1,000 per acre was determined by the use of the 'Economics of Ecosystem biodiversity Manual' for evaluating the economic value of ecosystems.

3.6.2 Impact

This section provides a preliminary synopsis of the impact and needs in relation to the forest, biological diversity and functions.

Assessment of Ash-fall by Volcano Hazard Zone

- Red Zone - Pyroclastic Density Clouds and very heavy ash fall flows

- Orange zone - Heavy ash deposits
- Yellow Zone - Heavy to moderate ash-fall
- Green - Moderate to light ash-fall

Pyroclastic flows resulted in the complete destruction of the landscape destroying both flora and fauna around the crater's rim and on the western slopes of the volcano. The vegetation on the top 1/3 of the mountain was also destroyed from the edge of the crater. Mudflows destroyed vegetation in some valleys in the east to southern slopes extending to the coast. These pyroclastic currents and mudflows changed waterways and built-up coastal delta-like formations.

In the orange and yellow hazard zones, heavy ash-fall caused breakage of branches and some falling of trees. Damage also included the middle and ground stories of the forest while plantation forests also had damage to trees similar to the natural forest.

Effect on ecosystem function:

- Impacts on evapotranspiration and photosynthesis in severely damaged trees may die however other trees produce new foliage
- Sever impact on the habitat of the faunal species
- Some animals may have been killed during the eruptions
- Heavy ash cover on the forest floor disrupts the functions of the forest floor in the nutrient and water cycles

Impact on Ecosystem Services (Biodiversity, Soil and Water Conservation)

Approximately 70% of the terrain in St. Vincent is made up of slopes over a 30% gradient which makes exposed young soils vulnerable to soil

erosion in heavy rainfall. The forest ecosystem that covers the interior mountainous areas covers and protects the soil from the erosive power of rain and allows for percolation of the water and storage and gradual release thus maintaining sustainable sources of surface water for human use and maintenance of aquatic ecosystems in the many streams and rivers that originate in the 16 watersheds found in St. Vincent. With the loss of this protective cover, due to the impact of the volcano with ash covering the forest floor, there are concerns of erosion and downstream impacts from debris-laden floodwaters.

The loss of biological diversity due to the explosive eruptions is also a concern with a number of endemic species being destroyed. With natural regeneration, these ecosystems and habitats will return once protected from negative human impacts. The endemics will recolonize from neighbouring ecosystems, however, this relies on minimizing the negative impact such as the introduction of invasive species. An effective forest management programme will assist with protection, monitoring and enhancement being the main outputs to protect the regeneration and succession process.

The forestry recovery needs include the implementation of the Forest and Wildlife Recovery Programme, which will be achieved through reforestation, soil conservation, clearing of water ways and stabilisation of river and stream banks. Affected plantation forests in the lower slopes will be replanted, especially in areas such as Orange Hill. The forestry recovery needs also include the protection and conservation of gullies in areas where housing once existed, the planting of agro-forest trees in these areas for the generation of livelihoods for displaced residents, and the provision of support for the cleaning of rivers and streams, especially in the upper watersheds in red and orange zone.

3.7 Agricultural Infrastructure

Substantial damage was done to agricultural infrastructure in the Red and Orange zones since most of the agricultural investments are 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). The damage to the public agricultural infrastructure is identified and presented in Annex 3. Information on the extent of damage and loss to private sector infrastructure (shade houses, farm sheds, animals housing and equipment) have been integrated into the sub-sectoral damage assessments. Concerning roadways in agricultural areas in the red and orange zones, reports indicate that a number of bridges and feeder roads have been affected. The damage to the bridges and roads is an indirect result of erosion due to heavy rains, lahars and pyroclastic flows. It is anticipated that the assessment of the total effects of the volcanic eruption on agricultural roads will be conducted by the Ministry of Transport and Works.²⁰

3.8 Socio-economic Impact of Damage and Loss in the Sector

A large proportion of stakeholders in the agriculture, fisheries and forestry sectors are self-employed. According to the Housing and Population Census Report (2012), approximately 11.8% of Vincentians are employed in the agriculture, forestry and fisheries sector.

The majority of persons activity involved in the sectors reside in rural areas which were impacted by the heavy deposits of ashfall during the volcanic eruptions. This resulted in significant losses of various commodities which were

²⁰ That information is not currently available

unmarketable and non-consumable. The primary income of these stakeholders in the sector have been disrupted and the resultant indirect spill off extends to other sectors that rely on primary commodities through various value chains.

The economic activities within the sectors can be described as leaden footed by the effects of the volcanic eruptions of La Soufrière. Farmers and fishers in the red and orange zones have

borne significant damage and loss. The gender and age groupings of those affected by their displacement, disruption of source of income and livelihood varies due to geographic location and socio-economic circumstances. Moreover, is the heightened risk of food vulnerability and reduced quality of nutritional intake among those affected and practice subsistence farming and artisanal fishing.

4. Recovery Needs and Strategy

The recovery needs of the agricultural sector are based on six (6) main factors:

- The need to restore service delivery and production capacity and to ensure access to services and goods
- The priority needs to build back better (BBB) service delivery and production capacity and to ensure access to services and goods.
- The restoration and strengthening of governance capacity, including DRM.
- The priority needs for BBB governance and DRM.
- The need to address pre-existing risks and new risks related to the volcano.
- The need for BBB to reduce risks and vulnerabilities to future events.

In the context of the above, the total recovery needs for sector are estimated at XCD258.85 million, with XCD103.85 million (40.1%) to cover damage, XCD126.30 million (48.8%) to cover loss and XCD28.71 million (11.1%) for building back better (BBB). These needs have been disaggregated and presented in **Table 4.1**. The Recovery Strategy will be formulated following the Results-based model to include priority needs, interventions required in the short, medium and long-term, expected outputs recovery costs and intended outcomes.

Table 4.1: Recovery Needs for the Agriculture Sector ²¹

| Description of Intervention/Activity | Priority (1 to 5) | Sub-sector | Effects | | Short Term | Medium Term | Long Term | Total Needs XCD '000' |
|---|-------------------|-----------------|------------|------------|------------|-------------|-----------|-----------------------|
| | | | Damage | Loss | | | | |
| 1. Replacement/Rehabilitation of Assets and Infrastructure | | | 103,848.38 | | 70,227.18 | 26,899.01 | 6,722.19 | 103,848.38 |
| 1.1 Rehabilitation/Relocation of Agricultural Stations/ Germplasm Plots (Assets and Operations) | 1 | Crops/Livestock | 2,647.22 | | 2,647.22 | | | 2,647.22 |
| | | | 17,148.15 | | 17,148.15 | | | 17,148.15 |
| | | | 15,465.24 | | 15,465.24 | | | 15,465.24 |
| 1.2 Replacement/Rehabilitation of private Assets and Infrastructure | 1 | Crops | 835.51 | | 835.51 | | | 835.51 |
| | 1 | Livestock | 630.10 | | 630.10 | | | 630.10 |
| | 1 | Fisheries | 217.30 | | 217.30 | | | 217.30 |
| | 1 | Apiculture | | | | | | |
| 1.3 Implement the Forest and Wildlife Recovery Programme through reforestation, soil conservation, clearing of water ways and stabilisation of stream banks. Replanting of plantation forests in the lower slopes, such as in Orange Hill. Protection and conservation of gullies where housing existed, to include agro-forestry for the generation of livelihoods for displace residents. | 1 | Forestry | 84,053.01 | | 50,431.81 | 26,899.01 | 6,722.19 | 84,053.01 |
| 2. Restore Farmers, Fisher-folks and related workers Livelihoods through the provision of income, institutional and relocation support | | | | 126,296.91 | 124,240.24 | 2,056.67 | | 126,296.91 |
| | | | | 26,021.64 | 26,021.64 | | | 26,021.64 |
| | 1 | Tree Crops | | 16,870.00 | 16,870.00 | | | 16,870.00 |
| | 1 | Annual Crops | | 8,619.00 | 8,619.00 | | | 8,619.00 |
| | 1 | Livestock | | 419.78 | 419.78 | | | 419.78 |
| | 1 | Apiculture | | 112.86 | 112.86 | | | 112.86 |
| 2.1 Provision of Income Support for 2,873 farmers in the Red and Orange Zones | | | | | | | | |

21 Source - Agriculture evaluation team

| | | | | | | |
|--|---|--|-----------|-----------|-----------|-----------|
| 2.2 Provision of Income Support for 7,565 farmers in the Yellow and Green Zones | 1 | Tree Crops | 68,738.93 | 68,738.93 | 68,738.93 | 68,738.93 |
| | 1 | Annual Crops | 44,800.00 | 44,800.00 | 44,800.00 | 44,800.00 |
| | 1 | Livestock | 22,695.00 | 22,695.00 | 22,695.00 | 22,695.00 |
| | 1 | | 979.49 | 979.49 | 979.49 | 979.49 |
| | | | 264.44 | 264.44 | 264.44 | 264.44 |
| 2.3 Provision of Income Support for 469 fishers, vendors and workers in the Red and Orange Zones | 1 | Fisheries | 1,923.75 | 1,923.75 | 1,923.75 | 1,923.75 |
| 2.4 Provision of Income Support for 1,655 fishers, vendors and workers in the Yellow and Green Zones | 1 | Fisheries | 2,928.00 | 2,928.00 | 2,928.00 | 2,928.00 |
| 2.5 Provision of Support for Production input (Planting materials, fertilizers, chemicals, feeds, veterinary drugs and supplements, etc) | 1 | Crops/ Livestock/ Fisheries/ Apiculture | 6,117.94 | 6,117.94 | 6,117.94 | 6,117.94 |
| 2.6 Provision of support for the cleaning of rivers and streams especially in the upper watersheds in red and orange zones. | 1 | Forestry | 20,566.65 | 18,509.98 | 2,056.67 | 20,566.65 |
| 3. Development of a comprehensive plan for recovery and rebuilding of a modern, competitive agricultural sector | 1 | All Sub-sectors | 270.00 | 270.00 | 270.00 | 270.00 |
| 4. Conduct research and development of agro-ecological models for sustainable commercial agriculture in the red and orange zones. | 2 | | 1,500.00 | 1,250.00 | 250.00 | 1,500.00 |
| 5. Introduction of new and appropriate resilient technology and innovation | 1 | | 11,075.00 | 6,537.50 | 3,522.50 | 1,015.00 |
| | | | | | | 11,075.00 |
| 6. Provision of policy framework and related fiscal incentives, and necessary infrastructure and market intelligence to build a modern agricultural sector | 2 | | 8,000.00 | 6,000.00 | 2,000.00 | 8,000.00 |

| | | | | | | | | | |
|--|---|--|--|--|-------------------|-------------------|------------------|-----------------|-------------------|
| 7. Strengthening of the database system for better data capture and analysis in support of decision making and planning. | 2 | | | | 540.00 | 540.00 | | | 540.00 |
| 8. Implement alternative livelihoods initiatives for displaced farm and fisher families and illegal uses of the forest. | 1 | | | | 3,275.00 | 2,500.00 | 775.00 | | 1,275.00 |
| 9. Scale up community-level water harvesting, storage and irrigation. | 2 | | | | 2,700.00 | 900.00 | 1,800.00 | | 2,700.00 |
| 10. Incentive programme to encourage young people into farming. | 2 | | | | 1,350.00 | 1,080.00 | 270.00 | | 1,350.00 |
| Sub-Total – Build Back Better | | | | | 28,710.00 | 17,827.50 | 9,617.50 | 1,265.0 | 28,710.00 |
| Grand Total Recovery Needs | | | | | 103,848.38 | 126,296.91 | 38,573.18 | 7,987.19 | 258,855.29 |

Table 3A.1a: Fruit Tree Crops Damage and Loss Assessment²²

| Zone | Baseline Data | | | | | Effects of the Volcano on the Crop Subsector by Type | | | | | | Total Estimates of Damage and Loss | | |
|--------------------------------|----------------|-----------------------|---------------------------|---------------------------|-------------------------------|--|-----------------------|------------------------------------|---------------------------------------|-------------------------------------|------------------------------------|------------------------------------|--|--|
| | No. of Farmers | Area Under Production | % of Area by Zone (Acres) | Expected Yield/Acre (lbs) | Cost of Production (XCD/Acre) | Estimated Acres Damaged | No. of Farms Affected | Farm Gate Price of Output (XCD/lb) | Estimated Value of Damage (XCD '000') | Estimated Value of Loss (XCD '000') | Total Estimates of Damage and Loss | | | |
| | | | | | | | | | | | XCD '000' | USD '000' | | |
| PLANTAINS | | | | | | | | | | | | | | |
| RED | 126 | 235 | 39 | 30,000 | 8,100 | 235.00 | 126 | 1.00 | 1,903.50 | 7,804.35 | 9,707.85 | 3,595.50 | | |
| ORANGE | 25 | 46 | 8 | 30,000 | 8,100 | 46.00 | 25 | 1.00 | 372.60 | 1,527.66 | 1,900.26 | 703.80 | | |
| YELLOW | 131 | 216 | 36 | 30,000 | 8,100 | 151.20 | 131 | 1.00 | 1,224.72 | 5,021.35 | 6,246.07 | 2,313.36 | | |
| GREEN | 138 | 105 | 17 | 30,000 | 8,100 | 52.50 | 138 | 1.00 | 425.25 | 1,743.53 | 2,168.78 | 803.25 | | |
| Total | 420 | 602 | 100.0 | 30,000 | 8,100 | 484.70 | 420 | 0.92 | 3,926.07 | 16,096.89 | 20,022.96 | 7,415.91 | | |
| BANANAS | | | | | | | | | | | | | | |
| RED | 17 | 47.34 | 8 | 20,000 | 11,340 | 47.34 | 17 | 0.92 | 536.84 | 912.63 | 1,449.47 | 536.84 | | |
| ORANGE | 89 | 177.40 | 30 | 20,000 | 11,340 | 177.40 | 89 | 0.92 | 2,011.72 | 3,419.92 | 5,431.64 | 2,011.72 | | |
| YELLOW | 64 | 116.75 | 20 | 20,000 | 11,340 | 116.75 | 64 | 0.92 | 1,323.94 | 2,250.70 | 3,574.64 | 1,323.94 | | |
| GREEN | 117 | 251.25 | 42 | 20,000 | 11,340 | 201.00 | 117 | 0.92 | 2,279.34 | 3,874.88 | 6,154.22 | 2,279.34 | | |
| Total | 287 | 592.74 | 100.0 | 20,000 | 11,340 | 542.49 | 287 | 0.92 | 6,151.84 | 10,458.13 | 16,609.97 | 6,151.84 | | |
| COCONUTS | | | | | | | | | | | | | | |
| Total | | 1,500.00 | | 15,000 | 1,690 | 1,350.00 | | 0.50 each | 2,281.50 | 20,761.65 | 23,043.15 | 8,534.50 | | |
| COCOA | | | | | | | | | | | | | | |
| Total | | 540 | | 5,000 | 2,500 | 405 | | 1.50 | 1,012.50 | 6,378.75 | 7,391.25 | 2,737.50 | | |
| BREADFRUIT AND BREADNUT | | | | | | | | | | | | | | |
| Bread-fruit | | 137 | | 24,500 | 1,890 | 55 | | 2.00 | 103.95 | 5,390.00 | 5,493.95 | 2,034.80 | | |
| Breadnut | | 14 | | 15,000 | 1,890 | 6 | | 3.00 | 11.340 | 540.00 | 551.34 | 204.20 | | |
| Total | | 151 | | 1,890 | 1,890 | 61 | | | 115.29 | 5,930.00 | 6,045.29 | 2,239.00 | | |
| MANGOES | | | | | | | | | | | | | | |
| Total | | 400 | | 17,500 | 1,970 | 80 | | 0.50 | 157.60 | 1,490.00 | 1,647.60 | 610.22 | | |
| PINEAPPLE | | | | | | | | | | | | | | |
| Total | | 30 | | 15,000 | 7,100 | 27 | | 8.00 | 191.70 | 3,320.00 | 3,511.70 | 1,300.63 | | |
| OTHER FRUIT TREES | | | | | | | | | | | | | | |
| Total | | 406 | | | 2,145 | 94.9 | | | 203.56 | 3,088.65 | 3,292.21 | 1,219.34 | | |
| Grand Total | | 4,221.74 | | | | 3,045.09 | | | 14,040.06 | 67,524.07 | 81,564.13 | 30,208.94 | | |

22 Tables 3A.1a to 3A.6 are sourced through the Agriculture Evaluation Team

Table 3A.1b: Root and Tuber Crops Damage and Loss Assessment

| Description | Baseline Data | | | | Effects of the Volcano on the Crop Subsector by Type | | | | | | | |
|-----------------------------|----------------|-----------------------|---------------------------|---------------------------|--|-------------------------|-----------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|-----------------|
| | No. of Farmers | Area Under Production | % of Area by Zone (Acres) | Expected Yield/Acre (lbs) | Cost of Production (XCD\$/Acre) | Estimated Acres Damaged | No. of Farms Affected | Farm Gate Price of Output (XCD/lb) | Estimated Value of Damage (XCD'000') | Estimated Value of Loss (XCD'000') | Total Estimates of Damage and Loss | |
| | | | | | | | | | | | XCD'000' | USD'000' |
| YAMS | | | | | | | | | | | | |
| White Yam | 110 | | | 12,000 | 7,885 | 99 | | 4.00 | 280.62 | 5,417.91 | 5,698.53 | 2,110.57 |
| P Yam | 40 | | | 8,000 | 9,880 | 36 | | 4.00 | 95.68 | 1,753.86 | 1,849.54 | 685.01 |
| Yellow Yam | 8 | | | 8,000 | 8,160 | 7 | | 4.00 | 27.12 | 269.90 | 297.02 | 110.01 |
| Other Yam | 8 | | | 12,000 | 7,885 | 7 | | 4.00 | 55.20 | 226.30 | 281.50 | 141.30 |
| Total Yam | 166 | | | | | 149 | | 4.00 | 458.62 | 7,667.97 | 8,126.59 | 3,009.85 |
| Total Dasheen | 400 | | | 14,000 | 4,170 | 100 | | 0.80 | 117.00 | 1,434.24 | 1,551.24 | 574.53 |
| Total Eddoes | 550 | | | 11,000 | 4,100 | 138 | | 1.00 | 165.80 | 1,938.98 | 2,104.78 | 779.55 |
| Total Cassava | 80 | | | 25,000 | 7,535 | 68 | | 0.90 | 212.38 | 1,939.62 | 2,152.00 | 797.04 |
| Total Sweet Potatoes | 100 | | | 8,000 | 2,965 | 80 | | 1.50 | 137.20 | 1,345.30 | 1,482.50 | 549.07 |
| Total Arrowroot | 98 | | | 9,000 | 5,700 | 98 | | 1.00 | 770.46 ²³ | 1,232.86 | 2,003.32 | 741.97 |
| Total Turmeric | 8 | | | 34,000 | 10,045 | 4 | | 1.50 | 10.18 | 246.97 | 257.15 | 95.24 |
| Total Ginger | 120 | | | 20,000 | 8,320 | 11 | | 3.00 | 61.52 | 690.00 | 751.52 | 278.34 |
| Total Tannia | 150 | | | 9,000 | 5,985 | 45 | | 2.50 | 69.33 | 1,250.37 | 1,319.70 | 488.78 |
| Grand Total | 1,672 | | | | | 693 | | | 2,002.49 | 17,746.31 | 19,748.80 | 7,314.37 |

23 Includes infrastructural damage to the Owia Arrowroot Factory Roof valued at XCD\$511.86

Table 3A.1c: Fruits and Vegetables Damage and Loss Assessment

| Description | Baseline Data | | | | Effects of the Volcano on the Crop Subsector by Type | | | | | | | |
|--|----------------|-----------------------|---------------------------|---------------------------|--|-------------------------|-----------------------|------------------------------------|---------------------------------------|-------------------------------------|------------------------------------|-----------------|
| | No. of Farmers | Area Under Production | % of Area by Zone (Acres) | Expected Yield/Acre (lbs) | Cost of Production (XCD\$/Acre) | Estimated Acres Damaged | No. of Farms Affected | Farm Gate Price of Output (XCD/lb) | Estimated Value of Damage (XCD '000') | Estimated Value of Loss (XCD '000') | Total Estimates of Damage and Loss | |
| | | | | | | | | | | | XCD '000' | USD '000' |
| ROOTY VEGETABLES | | | | | | | | | | | | |
| Beet | 1.50 | | | 4,000 | 4,270 | 0.50 | | 1.00 | 0.40 | 3.84 | 4.24 | 1.57 |
| Carrot | 60 | | | 8,000 | 7,685 | 54 | | 2.50 | 83.00 | 1,493.96 | 1,576.96 | 584.06 |
| Radish | 1.00 | | | 8,000 | 4,270 | 0.50 | | 3.50 | 1.14 | 15.34 | 16.48 | 6.10 |
| Total | 62.50 | | | | | 55 | | | 84.54 | 1,513.14 | 1,597.68 | 591.73 |
| Total Tomatoes | 73 | | | 15,000 | 11,420 | 66 | | 3.00 | 253.72 | 3,514.88 | 3,768.60 | 1,395.78 |
| Total Cucumber | 35 | | | 18,000 | 6,340 | 35 | | 1.00 | 88.76 | 798.84 | 887.60 | 328.74 |
| Total Lettuce | 8 | | | 3,000 | 7,715 | 8 | | 3.50 | 31.72 | 116.41 | 148.13 | 54.86 |
| Total Cauliflower | 11 | | | 9,000 | 6,885 | 6 | | 6.00 | 21.31 | 350.48 | 371.79 | 137.70 |
| Total Sweet Pepper | 55 | | | 7,000 | 5,685 | 33 | | 4.00 | 137.61 | 988.05 | 1,125.66 | 416.91 |
| Total Chives | 66 | | | 8,000 | 8,055 | 59 | | 1.75 | 175.25 | 1,155.45 | 1,330.70 | 492.85 |
| Total Cabbage | 20 | | | 12,000 | 7,065 | 12 | | 2.00 | 34.78 | 355.21 | 389.99 | 144.44 |
| Total Watermelon | 15 | | | 20,000 | 6,420 | 15 | | 2.20 | 46.30 | 724.10 | 770.40 | 285.33 |
| Total Melons | 8 | | | 20,000 | 6,420 | 8 | | 3.00 | 31.36 | 379.52 | 410.88 | 152.18 |
| PULSES | | | | | | | | | | | | |
| Pigeon Peas | 29 | | | 10,000 | 4,915 | 14 | | 7.00 | 68.81 | 980.00 | 1,048.81 | 388.45 |
| String Beans | 8 | | | 5,000 | 4,480 | 4 | | 2.20 | 7.92 | 54.80 | 62.72 | 23.23 |
| Peanuts | 32 | | | 3,000 | 5,525 | 22 | | 8.00 | 91.55 | 564.82 | 656.37 | 243.10 |
| Total Pulses | 69 | | | | | 40 | | | 168.28 | 1,599.62 | 1,767.90 | 654.78 |
| Total Other Fruits and Vegetables | 145.5 | | | | | 75.7 | | | 234.78 | 1,919.50 | 2,154.28 | 797.88 |
| Grand Total | 568.0 | | | | | 412.7 | | | 1,308.41 | 13,415.20 | 14,723.61 | 5,453.18 |

Table 3A.2: Summary of Livestock Damage and Loss

| Description of Effects on Assets and Infrastructure | Estimates of Damage to Assets and Infrastructure Loss (EC\$'000') | | | | Estimates of Loss (EC\$'000') | | | | | | Total Damage and Loss (\$'000') | | |
|---|---|-----------------|-----------|-----------------|-------------------------------|-----------------|---------------|-----------------|--------------|-----------------|---------------------------------|-----------------|--|
| | Private | | Public | | Private | | Public | | Total | | XCD | USD | |
| | No. | Value of Damage | No. | Value of Damage | Income Flows | Additional Cost | Income Flows | Additional Cost | Income Flows | Additional Cost | | | |
| Animals | | | | | | | | | | | | | |
| • Poultry | 2,872 | 57.44 | 0 | 0.00 | 57.44 | 60.91 | 10.00 | 0.00 | 0.00 | 70.91 | 128.35 | 47.54 | |
| • Sheep | 45 | 27.00 | 9 | 5.40 | 32.40 | 47.25 | 5.50 | 10.50 | 0.89 | 64.14 | 96.54 | 37.76 | |
| • Goats | 90 | 54.00 | 8 | 13.20 | 67.20 | 94.50 | 9.95 | 11.95 | 2.36 | 118.76 | 185.96 | 68.87 | |
| • Pigs | 59 | 45.73 | 10 | 7.75 | 53.48 | 80.03 | 6.60 | 18.00 | 0.23 | 104.86 | 158.34 | 58.64 | |
| • Cattle | 17 | 63.75 | 0 | 0.00 | 63.75 | 127.50 | 8.10 | 0.00 | 0.00 | 135.60 | 199.35 | 73.83 | |
| Sub-Total Animals | 3,083 | 247.92 | 27 | 26.35 | 274.27 | 410.19 | 40.15 | 40.45 | 3.48 | 494.27 | 768.54 | 284.64 | |
| Housing/Guttering/Fencing | | | | | | | | | | | | | |
| • Poultry | | 89.55 | | 0.00 | 89.55 | 243.97 | 10.75 | 0.00 | 0.00 | 254.72 | 344.27 | 127.50 | |
| • Sheep | | 32.00 | | 6.40 | 38.40 | 19.95 | 3.84 | 14.39 | 0.77 | 38.95 | 77.35 | 28.65 | |
| • Goats | | 4.70 | | 0.42 | 5.12 | 20.00 | 0.56 | 5.00 | 0.05 | 25.61 | 30.73 | 11.38 | |
| • Pigs | | 22.31 | | 3.78 | 26.09 | 48.52 | 2.68 | 8.22 | 0.45 | 59.87 | 85.96 | 31.84 | |
| • Cattle | | 6.00 | | 0.00 | 6.00 | 19.70 | 0.72 | 0.00 | 0.00 | 20.42 | 26.42 | 9.79 | |
| • Belmont Livestock Farm | | 0.00 | | 250.00 | 250.00 | 0.00 | 0.00 | 25.00 | 5.00 | 30.00 | 280.00 | 103.70 | |
| • Rabbaca Livestock Farm | | 0.00 | | 300.00 | 300.00 | 0.00 | 0.00 | 30.00 | 6.00 | 36.00 | 336.00 | 124.44 | |
| Sub-Total Infrastructure | | 154.56 | | 560.60 | 715.16 | 352.14 | 18.55 | 82.61 | 12.27 | 465.57 | 1,180.73 | 473.30 | |
| Forage banks/Pasture | | 382.72 | | 42.53 | 425.25 | | 512.84 | | 56.99 | 569.83 | 995.08 | 368.55 | |
| Others (Equipment, Machinery, Stored Feed, etc.) | | 50.31 | | 44.02 | 94.33 | 65.40 | | 58.55 | | 123.95 | 218.28 | 80.84 | |
| Total | 3,083 | 835.51 | 27 | 673.50 | 1,509.01 | 827.73 | 571.54 | 181.61 | 72.74 | 1,653.62 | 3,162.63 | 1,171.34 | |

Table 3A.3: Summary of Fisheries Damage and Loss

| No. | Description (Type/Length) | Damage (EC\$/000') | | | | | | Loss (EC\$/000') | | | Total Damage and Loss(\$'000) | | |
|-----|---|-----------------------|---------------|-----------------------|--|-------------|---------------|---------------------|-----------------|--------------------------|----------------------------------|-----------------|-----------------|
| | | Boat | Engine | Beach Seine Net | Buoys/Fishing gears /Auxil- iaries | Oars | Others | Total Damage | Income Flows | Addi- tion-al Cost | Total Loss | XCD | USD |
| 1 | Engine 75 HP | | 27.00 | | | | | 27.00 | 10.30 | | 10.30 | 37.30 | 13.80 |
| 1 | Pirogue 26ft | 40.00 | 38.00 | | | | | 78.00 | 147.00 | | 147.00 | 225.00 | 83.33 |
| 1 | Double Ender 28ft plus Beach Seine Net | 20.00 | | 35.00 | | 0.80 | | 55.80 | 324.00 | | 324.00 | 379.80 | 140.67 |
| 3 | Double Ender 14ft (Support Boat) | 13.00 | | | | 0.30 | | 13.30 | 147.00 | | 147.00 | 160.30 | 59.37 |
| 1 | Double Ender 14ft Boat | 5.00 | | | | | | 5.00 | 36.75 | | 36.75 | 41.75 | 15.46 |
| 1 | Double Ender 11ft | 5.00 | | | | | | 5.00 | 36.75 | | 36.75 | 41.75 | 15.46 |
| 1 | Bow and Stern 13ft | 20.00 | 15.80 | | | | | 35.80 | 73.50 | | 73.50 | 109.30 | 40.48 |
| 1 | Deck Boat 30ft | 100.00 | 38.00 | | 8.95 | | | 146.95 | 122.50 | | 122.50 | 269.45 | 99.80 |
| 1 | Boat 30ft plus 2 Engines 100 HP each | 150.00 | 64.00 | | 6.45 | | 32.50 | 252.95 | 210.90 | | 210.90 | 463.85 | 171.80 |
| 2 | Boat Navigation equipment | 8.00 | | | | 0.20 | | 8.20 | 10.60 | | 10.60 | 18.80 | 6.96 |
| | Barrouaille Fish Market Re- pairs (Gutters, Equipment) | | | | | | 2.10 | 2.10 | | | | 2.10 | 0.78 |
| | Calliaqua Fisheries Centre (Replacement Cost for Regu- lator and Compressor | | | | | | 38.00 | 38.00 | | | | 38.00 | 14.07 |
| | Chateaubelair Fisheries Centre (ASH Clean-up) | | | | | | | | | 15.00 | | 15.00 | 5.56 |
| | Owia Fisheries Centre (Over- hauling of Equipment and Ash Clean-up) | | | | | | | | | 75.00 | | 75.00 | 46.30 |
| | Fish landing Loss | | | | | | | | | | | 3,804.46 | 1,409.06 |
| | TOTAL | 361.00 | 182.80 | 35.00 | 15.40 | 1.30 | 122.60 | 718.10 | 1,119.30 | 90.00 | 5,013.76 | 5,731.86 | 2,122.90 |

Table 3A.4: Summary of Apiculture Damage and Loss

| Description | Damage | | | Total Loss (XCD'000') | Total Damage and Loss | |
|---|------------|-----------|-------------------------------|--------------------------|-----------------------|---------------|
| | No. | Unit Cost | Value of Damage (XCD'000') | | (XCD'000') | (US'000') |
| Domesticated Hives Destroyed (With Bees) | 129 | 1.20 | 154.80 | 316.05 | 470.85 | 174.39 |
| Hive Bodies Without Bees | 50 | 0.85 | 42.50 | 61.25 | 103.75 | 38.43 |
| Sub-total Hives(With/Without Bees) | 179 | | 197.30 | 377.30 | 574.60 | 212.82 |
| Infrastructure | | | | | | |
| • Shed (Apiary Housing) 30ft X 20ft | 1 | 12.00 | 12.00 | 0.00 | 12.00 | 4.44 |
| • Shed (Apiary Housing) 15ft X 20ft | 1 | 8.00 | 8.00 | 0.00 | 8.00 | 2.96 |
| Sub-total Apiary Housing | 2 | | 20.00 | 0.00 | 20.00 | 7.40 |
| Total | | | 217.30 | 377.30 | 594.60 | 220.22 |

Table 3A.5: Summary of Forestry Damage and Loss

| Forest Area | Location | Cultivated Area/ No. of Trees/ Stand (Before disaster) | Affected Area/ No. of Trees | Damage | | | | Total Loss (XCD'000') | Total Damage and Loss | |
|---|--------------------------------------|--|--------------------------------|---|--|-------------------------------------|----------------------------------|-----------------------|-----------------------|-----------|
| | | | | Description of Damage | Rehabilitation Cost (Where applicable) | Replacement Cost (Where applicable) | Total Value of Damage (XCD'000') | | (XCD'000') | (US'000') |
| Standing Timber Plantation Forest | | Acre – 569.47 | Acre – 200 | Trees completely destroyed or damaged. Ash coverage of trees and ground | | | | | | |
| | Red and Orange Zone | Acre – 76.25 | Acre – 76.25 Trees – 15,250 | Forest either completely destroyed or damaged in some areas | 76.25 | 381.25 | 457.50 | 173.85 | 631.35 | 233.83 |
| | Yellow and Green Zone | Acre – 493.22 | Trees – 98,644 | Minimal damage observed, mainly some ash on the trees and the ground. | 65.12 | 15.15 | 80.27 | 28.25 | 108.52 | 40.19 |
| Sub-total | | | | | 141.37 | 396.40 | 537.77 | 202.10 | 739.87 | 274.02 |
| Forest Red and Orange zone | Volcano Richmond to Falls of Belaine | Acre – 9,654.19 Hectares – 3,906.91 | Trees and ground vegetation | Total Destruction with trees and vegetation destroyed | | | 12,067.74 | 4,440.93 | 16,508.67 | 6,114.32 |
| | Volcano south to Colonaire mountains | Acre – 12,932 Hectares – 5,233.41 | Trees broken | Total destruction in northern areas with branches broken and ground cover with thick ash layer defoliation, blocked waterways by ash, debris and boulders, destruction of nesting sites and the loss of food trees. | | | 16,165.00 | 5,948.72 | 22,113.72 | 8,190.27 |
| Sub-total | | | | | | | 28,232.74 | 10,389.65 | 38,622.39 | 14,304.59 |
| Natural Forest -Wildlife and Watershed/ Ecosystem Services | Central | Acre – 31,500 | Acre – 20,475 | Damage to Natural Forest estimated at 65% of the 31,500 acres, and included ash cover, defoliation, blocked waterways by ash, debris and boulders, destruction of nesting sites and the loss of food trees. | | | 55,282.50 | 9,974.90 | 65,257.40 | 24,169.41 |
| Total Forestry | | | | | 141.37 | 396.40 | 84,053.01 | 20,566.65 | 104,619.66 | 38,748.02 |

Table 3A.6: Summary of Agricultural Infrastructure Damage and Loss

| Location | Name of Infrastructure | Description of Impact | Total Damage (XCD'000') |
|----------------------|---|---|-------------------------|
| Owia | Owia fisheries complex | Ash accumulation, damage to cooling/ice system | 50.00 |
| | Owia Arrowroot Factory | Extensive damage to roof | 511.86 |
| Orange Hill | Orange Hill Agricultural Training Institute | Ash accumulation, spouting | 15.0 |
| | Orange Hill Biotechnology Centre | Ash accumulation, greenhouses completely destroyed (10 30*60 houses) | 765.00 |
| Rabbaca | Rabbaca Livestock Farm | Ash accumulation, damage to goat and sheep pen roof, damage to pigpen roof and spouting | 300.00 |
| | CARDI field Station | Greenhouse damage (plastic damaged, structure intact, storage shed damaged) | 7.00 |
| Perseverance | Perseverance Agricultural Station | Ash accumulation, greenhouses destroyed (3 Greenhouses) | 65.00 |
| Peters Hope | Peters Hope Germplasm | Damage to fencing and greenhouse covering | 10.00 |
| Belmont | Belmont Livestock Station | Damage to pens | 250.0 |
| Chateaubelair | Chateaubelair Fisheries Complex | | |
| Total | | | 1,973.86 |

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Tourism Sector

Tourism - National Parks

Acronyms

| | |
|-------|--|
| NEMO | National Emergency Management Organization |
| NPRBA | National Parks, Rivers and Beaches Authority |
| PVC | Polyvinyl Chloride |

1. Summary

The La Soufrière Volcano began erupting effusively in December 2020 and moved to an explosive eruptive phase on Friday April 9th. This series of explosive events included deposition of ash across the island of St. Vincent and pyroclastic flows along the slopes of the volcano.

A rapid assessment was done under the aegis of the Damage and Needs Assessment Subcommittee of the National Emergency Management Organization (NEMO). It was conducted by a team from National Parks, Rivers and Beaches Authority between April 17th and July 22nd, 2021.

The assessment covered seventeen (17) tourism and recreation sites managed by NPRBA across mainland St. Vincent. Eleven (11) of the seventeen (17) sites were actually visited, while the other six (6) were deemed inaccessible or high-risk due to high ash fall on access road to such sites and to the ongoing volcanic activity. These latter sites are Dark View Falls, La Soufriere Bamboo Range

Trail Head and Trail, Owia Salt Pond Recreational Park, Falls of Baleine, Trinity Falls and Cumberland Nature Trail.

This report provides information on the effects of the La Soufrière eruption on sites up to July 22nd, 2021, and projected revenue loss over an initial three-month period due to the closure of sites. Information also includes cost estimates for the recovery, restoration, and post-disaster rebuilding at sites over the immediate, short, medium and long term inclusive of specific resilience-building interventions.

The La Soufrière Volcano eruption caused an estimated effect of XCD 965,127.00 (table 1). The damages represent around 55% of the effects while the losses and additional costs amounted to 45%. Furthermore, the financial needs for recovery - which include different time frames, are estimated at XCD 1.498 million (table 2).

Table 1: Summary of Damage and Losses

| | PRIVATE | PUBLIC (XCD) |
|--------------|---------|-------------------|
| Damage | | 530,500.00 |
| Losses | | 434,627.47 |
| TOTAL | | 965,127.47 |

Source: Evaluation team based on sector information.

Table 2: Summary of Recovery Needs

| | COSTS (XCD) |
|--------------|---------------------|
| Short-run | 336,750.00 |
| Intermediate | 306,800.00 |
| Long-run | 854,700.00 |
| TOTAL | 1,498,250.00 |

Source: Evaluation team based on sector information.

2. Sector Background

Saint Vincent and the Grenadines (SVG) is an archipelago with 32 islands, and islets, located in the Southern end of the Lesser Antilles. The country is strategically located in the Eastern Caribbean. As a result, it offers warm Caribbean weather year-round which allows foreign tourists and locals to visit and enjoy its beautiful natural sites year-round. To illustrate, besides the white sand beaches typical of the Caribbean, the country has approximately 12,700 hectares of tropical forests. These forests not only provide a natural habitat for wildlife, but they also offer different

options for tourism experiences like waterfalls, volcano, petroglyphs, black sand beaches, and other attractions.²⁴

Although the main productive activity in the country is agriculture, the government has made a huge effort to promote what is unique “Vincy” natural attractions to increase tourists²⁵ while preserving, protecting, and managing natural and ecological resources. The National Parks, Rivers and Beaches Authority has the mandate to oversee and address sustainable tourism and to

²⁴ National Parks, Rivers and Beaches Authority (nd). SVG National Parks and Protected Areas System Plan 2010-2014 <http://nationalparks.gov.vc/nationalparks/images/documents/Final%20System%20Plan.pdf>

²⁵ In fact, before the COVID-19 pandemic hit, the number of international tourists' arrivals had an upward trend, increasing from 207,000 in 2015 to 392,000 in 2019. Source World Bank Indicators: <https://data.worldbank.org/indicator/ST.INT.ARVL?locations=VC>

ensure that the attendant environmental issues are integrated into a holistic management regime.

SVG also promotes its culture as a part of its unique attractions. Among the cultural activities that have become an annual tradition for locals and capture the foreign interest, mention can be made of: Blues Fest (March); Vincy Mas carnival (at the end of June - beginning of July); the Bequia Regatta and the Eastervel Regatta (Easter weekend); and the Maroon festival on Union Island (a day-long festival takes place on a full moon in May).

Since the La Soufrière Volcano's explosive eruption on April 9th, 2021, the island of St. Vincent has been covered by the deposition of ash and pyroclastic flows, affecting seventeen (17) tourism and recreation sites. Consequently, this section focuses on the descriptions of visitor's patterns of the following sites before the eruption namely: Black Point Recreational Park; Cumberland Beach Facility; Joseph Chatoyer National Park; Rawacou Recreational Park and Wallilabou Recreational Park; Belmont Look-Out; Botanical Garden; Layou Petroglyph; Mt.Wynne Beach; Vermont Nature Trail; Indian Bay Beach Facility; Dark View Falls; La Soufriere Bamboo Range and Owia Salt Pond; Falls of Baleine, Trinity Falls and Cumberland Nature Trail.

During 2019, the data collected shows that twelve sites received 191,208 visitors, of which 55% of them were foreign visitors. The Indian

Bay Beach Facility and the Botanical Garden are the most popular sites concentrating about 40% of the visits during the year. However, there is a difference if we break down the number of visits by locals and foreigners. For instance, the most visited places for foreigners (besides the Botanical Garden) were the Wallilabou Heritage Park (18,547 visitors), the Dark View Falls (17,956 visitors), and the Belmont Lookout (11,901 visitors). By contrast, the site that concentrated most local visitors (besides Indian Bay Beach) was Mt. Wynne beach (17,958 persons). Another relevant fact is that the number of foreigners that visit the affected places is equivalent to 27% of the international tourists' arrivals reported in 2019.²⁶

Due to the COVID-19 pandemic, during 2020, the number of visitors to these twelve sites decreased to 100,154. Even though we can say that the number of total visitors was evenly divided among locals and foreigners, the number of foreign visitors decreased by 56% compared to the previous year. The first trimester of the year, which usually corresponds to high season, saw 95% of the foreign visitors in 2020. In fact, January 2020 was the only month that surpassed foreign visitors compared with 2019, while March showed a sharp decline (from 15,614 to 6,852). Conversely, the sharpest decline in local visitors was in July and August (from over 11,000 to 6,000). As we can see in chart 1, the COVID-19 pandemic represented a profound setback to the number of visitors exploring and enjoying the touristic sites.

26 We acknowledge that it is not a straight comparison because one tourist can visit multiple places during one or more visits. Still, it offers an idea about the number of visitors that eventually look for those kinds of attractions.

Chart 1: SVG NPRBA' Sites visitors 2014-2020



Source: National Parks, Rivers and Beaches Authority²²

3. Assessment of Disaster Effects

An assessment was done under the aegis of the Damage and Needs Assessment Subcommittee of the National Emergency Management Organization (NEMO). It was conducted by a team from National Parks, Rivers and Beaches Authority between April 17th and July 22nd, 2021.

The assessment covered seventeen (17) tourism and recreation sites managed by NPRBA across mainland St. Vincent. Fourteen (14) of the seventeen (17) sites were actually visited, while the other three (3) were deemed inaccessible or high-risk due to high ash fall on access road to such sites and to the ongoing volcanic activity. These latter sites are Falls of Baleine, Trinity Falls and Cumberland Nature Trail. Besides the prevailing volcanic hazards, these same three sites have been closed to visitors for approximately 5 years.

This site closure is due to environmental hazards such as landslides and rock falls.

Significant ash fall was recorded at eight (8) sites namely: La Soufrière Bamboo Range Trail Head Facility, Owia Salt Pond and Dark View Falls, Black Point Recreational Park, Cumberland Beach Facility, Joseph Chatoyer National Park, Rawacou Recreational Park and Wallilabou Recreational Park. Lower levels of ash fall were observed at Belmont Look-Out, Botanical Garden, Layou Petroglyph, Mt. Wynne Beach, Vermont Nature Trail. Ash fall was comparatively less at Brighton Salt Pond and Indian Bay Beach Facility. Three (3) sites namely Falls of Baliene, Trinity Falls and Cumberland Nature Trail were deemed inaccessible at the time of the assessment. As indicated above, these sites have been closed to visitors for an extended period of

27 See <http://nationalparks.gov.vc/nationalparks/index.php/visitor-sites/sites-visitor-data>

time for reasons not related to the recent volcanic eruptions. Hence, they were not included in the Damage and Needs Assessment Report.

The deposition of ashes is the less damaging element after a volcanic eruption. However, the ashes can cause damage to the roofs of building and other depending on the magnitude, frequency, and duration of the eruptions as well as weather

conditions such as rain and wind direction. These factors together with the volume of ash generated and the elements contained therein can cause different levels of damage to the structures.²⁸ Due to the La Soufrière Volcano eruption, the NPRBA will need to repaint some facilities and restore damaged signs and interpretive material from the affected sites. These costs have been classified as minor damage to assets in table 3.

Table 3: Summary of Damage^{30 31}

| DAMAGE | PRIVATE | PUBLIC (XCD) |
|---|---------|-------------------|
| 1. Damage to assets | | 126,800.00 |
| 3. Restorative work on trails (Vermont and La Soufrière Cross Country) | | 75,000.00 |
| 4. Replanting of trees and turf | | 25,000.00 |
| 5. Rehabilitation and construction at severely affected sites: La Soufriere Trail and Bamboo Range Trail head facilities, ²⁹ Dark View Falls Recreation Park and Owia Salt Pond Recreation Park: | | 303,700.00 |
| · Repair to roofs and other damaged fixtures | | |
| · Repair to plumbing and replacement of water storage tanks | | |
| Replacement of Viewing platform, bamboo bridge and abutments at Dark View Falls | | |
| TOTAL DAMAGE | | 530,500.00 |

Source: Evaluation team based on sector information.

The assessment team estimated the losses as the difference between income earned from each affected site during April and May 2021 with the income earned during 2020, plus the remuneration to their staff from April to June 2021. The same logic was applied for sites that will be closed for

more than three months. However, the losses assumes that the number of visitors will be the same as in 2020. It may not be precisely the case if SVG authority gradually establishes more flexible rules for visitors' entrance.

²⁸ See Torres-Corredor, R.A., Ponce-Villarreal, P., y Gómez-Martínez, D.M. 2017. Vulnerabilidad física de cubiertas de edificaciones de uso de ocupación normal ante caídas de ceniza en la zona de influencia del volcán Galeras. Boletín de Geología, 39(2): 67-82.

²⁹ See in the Annex Image 1.

³⁰ Source: sector evaluation team

³¹ Trinity Falls was not assessed given the limited access to the zone. No estimates for damage were made and no provision for recovery needs were made at the report generation. Any further consideration should be given when defining a prioritized action plan for recovery.

Table 4: Summary of Losses and Additional Costs³²

| | PRIVATE | PUBLIC (XCD) |
|--|---------|-------------------|
| LOSSES | | 295,877.47 |
| 1. Sites closed up to 3 months | | 211,560.00 |
| 2. Sites closed more than 3 months | | 84,317.47 |
| ADDITIONAL COSTS | | 138,750.00 |
| 1. Cleaning, removal of ash and washing of buildings | | 30,800.00 |
| 2. Pruning of damaged trees, bucking-up and discarding of biomass | | 26,600.00 |
| 3. Replacing of aggregates and compacting of walkways | | 7,500.00 |
| 4. Procurement of supplies and equipment | | 58,350.00 |
| 5. Increase coastal monitoring and assessment of beaches, rivers/ waterfalls use for recreational purposes | | 5,500.00 |
| 6. Clearing of access road to Dark View Falls and La Soufriere Bamboo Range Trail Head | | 10,000.00 |
| TOTAL LOSSES AND ADDITIONAL COSTS | | 434,627.47 |

Source: Evaluation team based on sector information.

4. Human Impact

Significant among the human impacts, which will be felt as a result of the temporary closure of sites is that of loss or reduced income among the workers engaged both formally and informally. The informal sector represents approximately 38.1% of the entire economy of St Vincent and many young persons and women who may have been engaged in livelihoods such as food preparation and sale or tour guides may have been engaged in the informal economy. Loss of income even for short periods could push vulnerable persons, of which nearly half of the population of SVG (48.2%) who were so classified, into poverty.

The volcanic eruption curtailed temporary projects or activities geared towards the preservation of

local cultural and business prospects that could boost the local economy. As a result, it exacerbated the financial and emotional hardships that people were facing since the pandemic.

In addition, sites are the places for social gatherings and places to enjoy picnics or cultural events. The effect of recreation on the people's psyche is relevant more than ever after a year of lockdowns and social distancing. Indeed, experimental evidence suggests that "physical activity in a natural environment might

produce greater mental health benefits than physical activity elsewhere." The loss of such sites would be deeply felt.

³² Costs included based on that available at time of generation of the report. Further consideration can be given when defining a prioritized recovery plan for the sector

5. Recovery Needs and Strategy

Climate Change adaptation was highlighted as one of the strategic priorities enshrined within the National Parks, Rivers and Beaches Authority Advanced Budget Proposal 2021-2023. One of the objectives in this regard, is the procurement and installation of water storage tanks at the various Tourism and Recreation Sites. Several of the NPRBA sites are relatively expansive and located in drought-prone areas. Some of these same sites such as the Black Point Heritage and Recreation Park, Cumberland Beach Recreation Park, Owia Salt Pond Recreation Park and Rawacou Beach Recreation Park were all impacted by heavy ash fall from the explosive eruption at La Soufrière Volcano. Impacts include disruption to potable water supply to the sites as well as ruptured guttering from roofs of buildings that compromised rainwater harvesting and the ability of the NPRBA to respond effectively to rehabilitation needs and restoration of services at such sites. This proposal is aimed at building resilience against disruption to the potable water supply at the sites; disruption that may be linked not only to climate change, but also other natural disasters such as hurricanes, storms, droughts and future volcanic eruptions.

Two (2) sub-component costs must be highlighted in association with the cost for the installation of water tanks at the various recreational and tourism sites. These are costs for (1), the construction of reinforced concrete bases and elevated platforms on which to mount the installed water tanks and (2), the procurement of materials and supplies for and the actual construction of screens for the installed water tanks.

The volume of the water tanks to be installed range from 600 to 2000 gallons. Said tanks need to be mounted in locations or at elevations that would provide the best gravitational feed to

the intended on-site facility, be it a washroom, gazebo or an office, etc. Given their importance to the proper functioning of sites during periods of potable water shortage, their sheer weight when filled and their initial price tag, it is imperative that the water tanks be anchored securely to their bases so as to prevent damage or minimize the chance of toppling especially during periods of storms and hurricanes.

Whether mounted, these water tanks, especially those with the larger volumes, can and occasionally do compromise the visual quality of an area. This has implications for our recreation and tourism sites. The proposal caters to the construction and placement of PVC lattice screens around the installed water tanks. This particular material is considered more durable than and preferable to wood, especially at sites prone to the effects of high precipitation. The lattice would be painted green and embellished with floral climbers to soften the environmental footprint of the newly installed infrastructure. In locations where aesthetics is not a major concern, vegetative or 'green' screens would be used instead of the PVC lattice.

Tables from 5 to 7 list and rank the recovery needs in different time frames. In this case, the priority is represented on a scale from 1 to 5, where 5 is the top priority. The items listed with priority 5 represent immediate needs, in other words, activities that would allow for continued or resumption of operations. Moreover, the assessment team also prioritized interventions that allow the facilities to be more resilient if they impacted by other natural disasters. To illustrate, to install water tanks and installing shutters would enable them to be more prepared and withstand natural disasters and with a guaranteed water supply needed to operate.

Table 5: Recovery Needs - Short Run

| INTERVENTION/ACTIVITY | PRIORITY | COSTS (XCD) |
|---|----------|-------------------|
| 1. Cleaning, removal of ash and washing | 5 | 30,800.00 |
| 2. Pruning of damaged trees, bucking-up and discarding of biomass | 5 | 26,600.00 |
| 3. Replacing of aggregates and compacting of parking lots and other areas prone to water logging and erosion from pedestrian traffic. | 3 | 7,500.00 |
| 4. Repairs and repainting | 5 | 90,000.00 |
| 5. Rental of heavy equipment for the grading and removal of ash and aggregates at La Soufrière Bamboo Range Trail Head Facility and at Owia Salt Pond | 5 | 28,000.00 |
| 6. Procurement of supplies and equipment | 5 | 38,400.00 |
| 7. PPE | 5 | 19,950.00 |
| 8. Coastal monitoring and assessment of beaches, rivers/ waterfalls | 3 | 5,500.00 |
| 9. Clearing of access road to Dark View Falls and La Soufriere Bamboo Range Trail Head | 5 | 10,000.00 |
| 10. Demolish and rebuild damaged Gazebo at Owia Salt Pond and La Soufriere Bamboo Range Trail Head Facility | 5 | 80,000.00 |
| TOTAL | | 336,750.00 |

Source: Evaluation team based on sector information.

Table 6: Recovery Needs – Intermediary

| INTERVENTION/ACTIVITY | PRIORITY | COSTS (XCD) |
|--|----------|-------------------|
| 1. Repainting | 4 | 31,800.00 |
| 2. Damaged signs and interpretive materials | 5 | 45,000.00 |
| 3. Restorative work on trails | 5 | 75,000.00 |
| 4. Replanting of trees and turf | 4 | 25,000.00 |
| 5. Research on impact of ash on marine, coastal and terrestrial biodiversity | 3 | 70,000.00 |
| 6. Redefining communication, education, public awareness and marketing of Tourism and Recreation Sites with emphasis on La Soufriere and Geo-Tourism | 3 | 60,000.00 |
| TOTAL | | 306,800.00 |

Source: Evaluation team based on sector information.

Table 7: Recovery Needs – Long Run

| INTERVENTION/ACTIVITY | PRIORITY | COSTS (XCD) |
|---|----------|-------------------|
| 1. Rehabilitation of severely affected sites: La Soufrière Trail and Bamboo Range Trail head facilities, Dark View Falls Recreation Park and Owia Salt Pond Recreation Park | 5 | 303,700.00 |
| 2. Shutters | 4 | 75,600.00 |
| 3. Development of sustainable tourism products | 2 | 20,000.00 |
| 4. Procurement and installation of water tanks | 4 | 235,000.00 |
| 5. New Bridge at Dark View Falls | 3 | 100,000.00 |
| 6. Dry wall at La Soufrière Bamboo Range Trail Head Facility Parking Lot | 3 | 3,000.00 |
| 7. Upgrade to storage facility at La Soufrière Bamboo Range Trail Head Facility | 2 | 5,000.00 |
| 8. Construction of two (2) Gazebos at Owia Salt Pond | 3 | 80,000.00 |
| 9. Construction of Twelve (12) picnic benches at Owia Salt Pond and six (6) at Dark View Falls | 3 | 32,400.00 |
| TOTAL | | 854,700.00 |

Source: Evaluation team based on sector information.

6. References

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7. Annex

Image 1: Gazebo and Vegetation: Bamboo Range (before and after the eruption)



Source: National Parks, Rivers and Beaches Authority

National Parks, Rivers and Beaches Authority - Team Composition

- Mrs. Rodica Tannis - Superintendant of Rivers, Beaches and Recreation Sites
- Mr. Andrew Lockhart - Superintendant of Marine and Terrestrial Parks
- Ms. Shanell Murray - Administrative Assistant/ Projects
- Dr. Omar D. Bello - Facilitator
- Ms. María Eugenia Rodríguez - Facilitator

Tourism Sector – Accommodation

1. Summary

The La Soufrière Volcano eruption caused an estimated effect of XCD 11.81 million (table 1) on the tourism sector specific to accommodation.

The effects are concentrated in foregone revenues estimated as XCD 9.2 million and additional costs estimated as XCD 2.61 million.

Table 1: Summary of Effects (millions of XCD)

| | PRIVATE | PUBLIC |
|-------------------|------------|-------------|
| Losses | | |
| Foregone revenues | 9.2 | |
| Additional costs | | 2.61 |
| TOTAL | 9.2 | 2.61 |

Source: Assessment team

2. Background information

The Tourism sector in St. Vincent and the Grenadines (SVG) was very dynamic between 2015 and 2019. According to figures from the Eastern Caribbean Central Bank (ECCB), the average annual growth rate was 18.2%. During this period, the group where the greatest dynamic was shown was that of cruise ship passengers, which had been experiencing an increasing flow of international visitors in line with the expansion of the number of cruise passengers received. Official figures show that since the beginning of the decade of the 2010s, the number of cruise ship vessels received by SVG more than doubled from 124 in 2011 to 260 in 2019 (see Figure 1). In

the same period, the number of passengers that arrived to SVG via cruise ship increased by 187%, to reach more than 255,000 in 2019.

Another tourism sub-sector that has been expanding in recent years is the yacht chartering industry, that has been attracting increasing number of international passengers. Between 2011 and 2019 the number of yacht passengers increased by 50%.

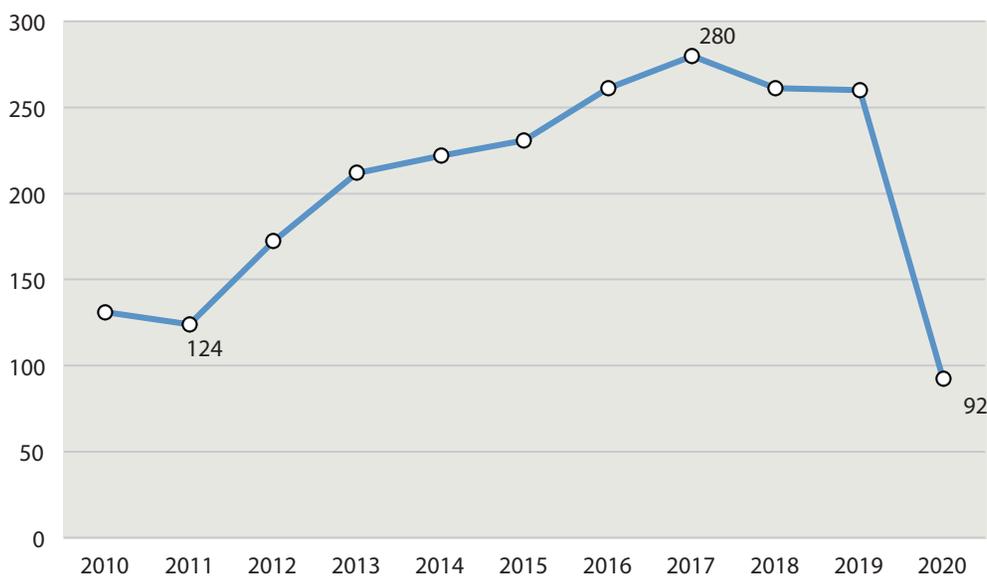
More of 60% of the total nation's annual visitors come from the United States, the United Kingdom and Canada, while other countries in the

Caribbean account for another 20% of visitors. In 2019, this country received more than 404,100 (in thousands) overseas visitors.

Before the COVID-19 pandemic, tourism in the SVG archipelago was at all-time highs. According to the ECCB estimates, during 2019, of the all SVG reported international visitors (404,100 in thousands), approximately 63% were cruise passengers, while 21% were stay-over visitors that use touristic services like hotels, resorts, restaurants and the like, and the balance of 16% were visitors on private yachts. (See Figure 2). The total expenditure from this tourist was estimated at USD 117.8 million

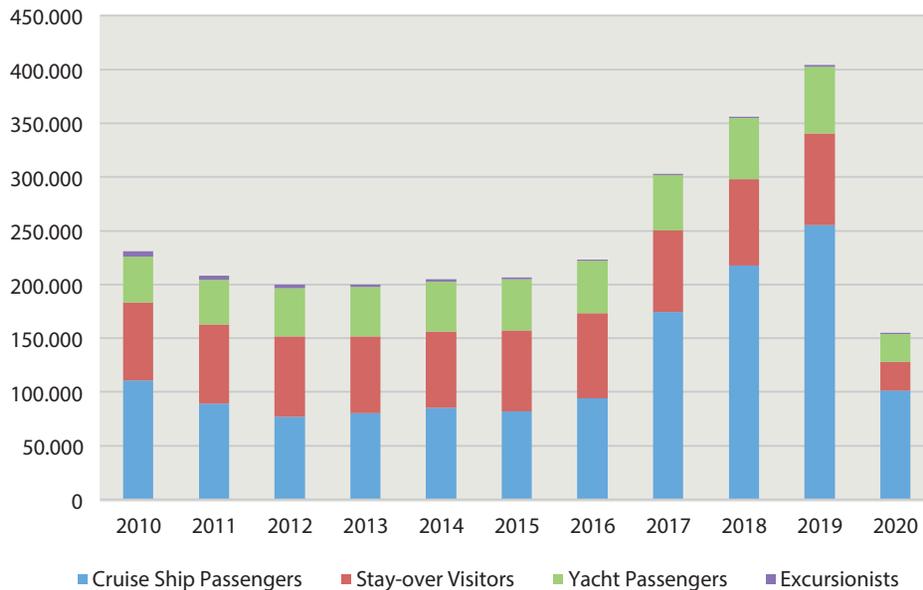
In terms of nationality of passengers, the number of tourists from the United States has consolidated in recent years as the main source of passengers for the SVG touristic sector, somehow displacing passengers from the United Kingdom. In 2019, SVG received approximately 30,000 stay-over visitors from the United States, compared to 13,000 visitors received from the United Kingdom. Canadian visitors increased 56% between 2011 and 2019, reaching more than 10,000 stay-over passengers and becoming the fastest growing nationality among the source countries of SVG tourism sector.

Figure 1. Saint Vincent and the Grenadines: Total cruise ship calls per year



Source: ECCB

Figure 2. Saint Vincent and the Grenadines: Total visitors by type and year (in thousands)

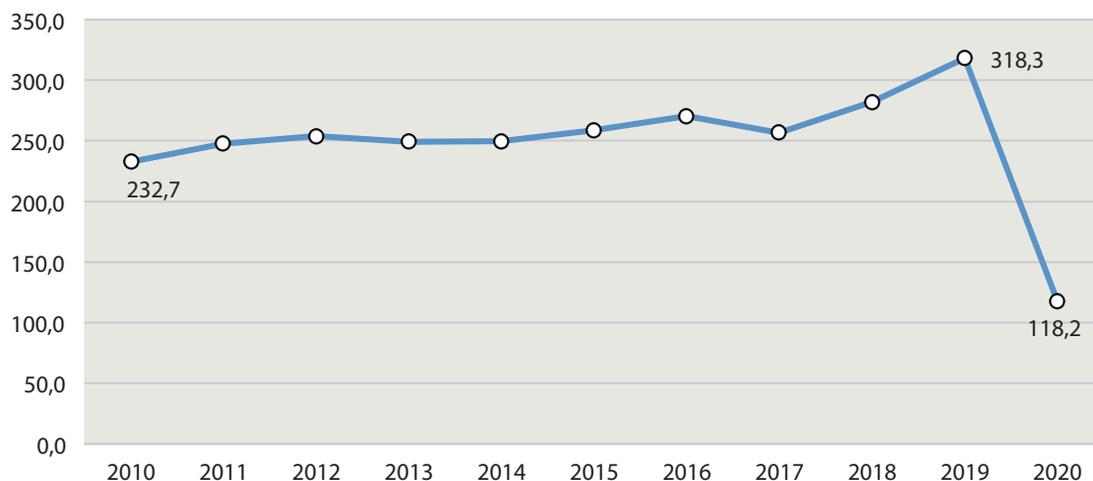


Source: ECCB

As is already well known, since the pandemic designation for the COVID-19 disease in March 11th 2020, containment measures were imposed by governments all around the world, including draconian mobility and confinement restrictions for citizens. Those measures had an immediate

toll on flows of international travelers, severely affecting the tourism sector all over the world. SVG was not an exception, and during 2020 international visitors declined 63% with respect of 2019, and total income from international visitors dropped by 86% (see Figure 3).

Figure 3. Saint Vincent and the Grenadines: Total expenditure from international visitors (millions of XCD\$)



Source: ECCB

It is important to note that the negative impact of the COVID-19 pandemic on the tourism sector was attenuated by a better than expected first quarter of 2020, when SVG showed strong numbers of arrivals and expenditures by international passengers despite the initial impacts of the global

health crises. According to ECLAC, comparatively speaking, SVG was expected to be one of the Caribbean countries least affected in terms of losses, in part due to the relatively resilient yachting chartering sector.

3. Damage

According to information provided by the Ministry of Tourism, Sports and Culture of Saint Vincent and the Grenadines, there are 167 registered and licensed³³ accommodation establishments of which 32% are in the island of Saint Vincent (Table 2)³⁴. Those establishments include hotels,

apartments, guest houses, inn, and resorts. Additionally, there are 37 rental properties that have 125 rooms. Most accommodation establishments in Saint Vincent are located in the south of the island.

Table 2. Registered and Licensed Accommodation Establishments (2020)

| Location | Accommodation Establishments | Rooms |
|------------------|------------------------------|-------------|
| St Vincent | 53 | 696 |
| Bequia | 94 | 255 |
| Mustique | 2 | 24 |
| Union Island | 11 | 90 |
| Petit St Vincent | 1 | 22 |
| Palm Island | 1 | 43 |
| Mayreau | 1 | 9 |
| Canouan | 4 | 60 |
| | 167 | 1199 |

Source: Ministry of Tourism, Sports and Culture

³³ Additionally, there are 32 accommodation establishments that are registered but not licensed. They have 241 rooms.

³⁴ These establishments have 1,199 rooms of which 57% were on the island of St Vincent.

4. Losses

This report will center its analysis on the effects of the eruption of La Soufrière volcano over the tourism sector of Saint Vincent and the Grenadines but work under the assumption of simultaneous disasters, which is that any estimated impact associated with the eruption of the volcano will be added to the baseline scenario of the ongoing disaster of the COVID 19 pandemic.

The baseline scenario for this report is based on the estimated losses for SVG due the COVID-19 pandemic, which is included in CEPAL, 2020. The estimation of losses caused by the pandemic of COVID-19 in the tourism sector of Saint Vincent and the Grenadines is done comparing the baseline that reflects what would have happened without the volcanic eruption (ECLAC, 2014); and the modeled trajectory of the future flows of tourism with the simultaneous events (COVID-19 and the Volcanic Eruption). Damage and Loss are estimated as the difference between the two scenarios. The post-pandemic scenarios were constructed taking into consideration the time for development of an effective vaccine; the time for lifting the generalized closure of borders; the drop-in economic activity in the countries of origin of tourists who come to SVG; the reluctance of tourists to travel under current conditions, and d) the potential drop in income due to greater competition in the aftermath of the pandemic. Scenarios were estimated for the period between March 2020 and February 2023.

Figure 3 shows the combined fall of international expenditure for tourism due to the simultaneous disasters in SVG. The estimate adds the losses due to COVID-19 for the period 2021-2022 to the

marginal effects of the April 2021 La Soufrière volcano eruption. In the baseline scenario (blue line), the counterfactual international arrivals were modeled as a function of seasonal patterns in the monthly official historical data since 2010³⁵. The scenario of losses then takes into consideration actual arrivals of international visitors and average expenditures per tourist as per the ECCB official figures until March 2021. In the resulting scenario, a drop in international arrivals after first travel restrictions were imposed in March 2020, is followed by a slow recovery during 2020 and 2021. The volcano eruption reinforces that trend and postpones the start recovery until January 2022. Finally, international arrivals are projected to converge to baseline levels at the end of 2022 (see Figure 4).

In terms of the losses in the tourism sector due to forgone income of missing international visitors, Figure 4 shows the total annual expenditures estimated for both, the baseline scenario and the estimated trajectory of arrivals. Total losses for the direct effects of the simultaneous disasters are estimated to be XCD 54.8 million for 2020 (March-December), XCD 182.0 million for 2021 and XCD 30.5 million for 2022, for a total of XCD 266.2 million for the complete period 2020-2022 (see figure 5).

The relatively small impact found in this report is a consequence of two factors: first, the volcano eruption occurred in April 2021, which is the beginning of the low season of tourism for SVG, which implies relatively low counterfactual income to begin with. Secondly, the simultaneous disasters approach means that the effects of the volcano are modeled in addition to the baseline

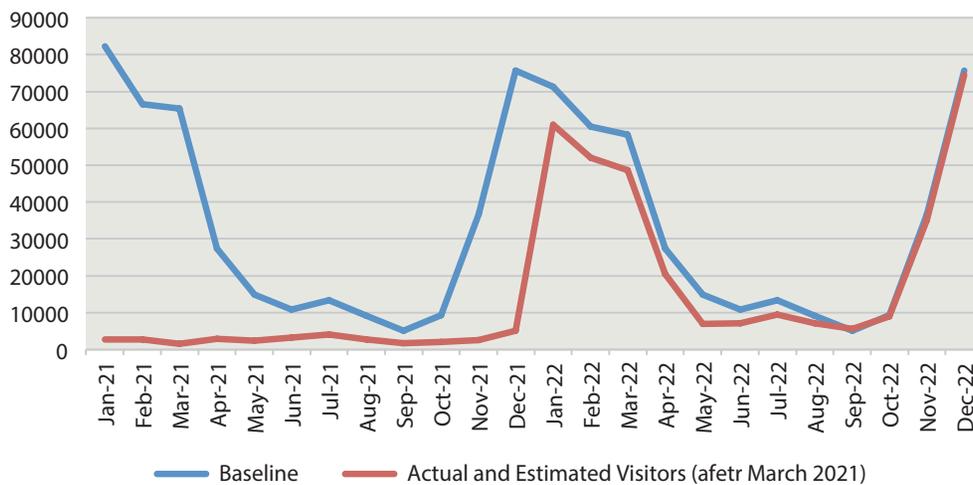
³⁵ Given the strong seasonality in monthly tourism arrivals in Caribbean countries, baseline (counterfactual) projections of international tourist flows based on historical data for each country, as well as estimates of spending by different types of travelers for the period March 2020 - December 2022 were generated using ARIMA time series analysis models (see Hyndman et al, 2020; Hyndman and Khandakar, 2008).

scenario under COVID-19 scenario noting projected incomes near zero for the most part of 2021, even before La Soufrière eruption.

As mentioned, this report is assessing the impacts of the La Soufrière volcanic eruption as a simultaneous disaster that builds upon the deep and long-lasting COVID-19 disaster as a baseline. As we write this report, the direct impacts of the volcanic eruption are mostly concentrated in the red and orange zones with no significant

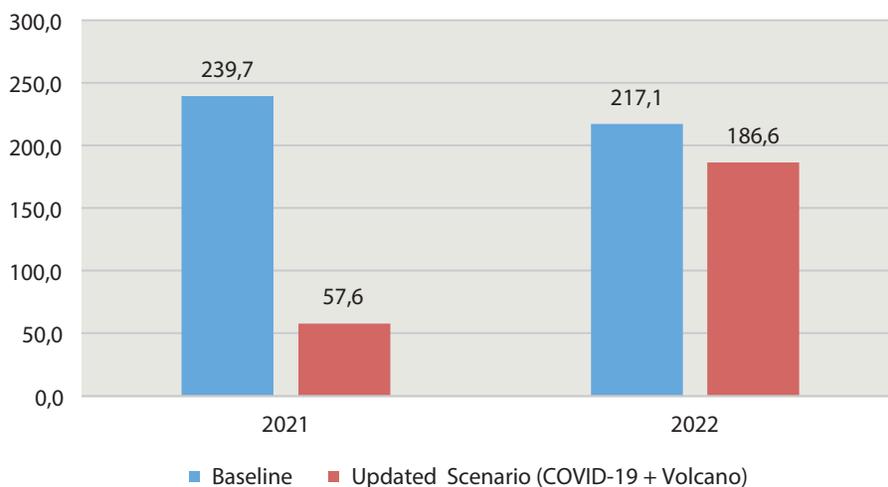
destruction of private or public infrastructure or services. Effects are assumed to be concentrated only in the second and third quarter of 2021 and will translate mostly in a delay in the recovery pattern of the already depressed international arrivals due to COVID-19. In table 3, a breakdown of estimated losses due to both disasters is presented. Total foregone revenue attributed to the eruption of La Soufrière volcano are estimated to be XCD 9.2 million.

Figure 4. Total international visitors arrivals. Baseline Vs. Estimated Arrivals



Source: Assessment team

Figure 5. Estimated expenditure by international visitors. Baseline Vs. Estimated Scenarios (millions of XCD)



Source: Assessment team

Table 3. Breakdown of estimated losses due to simultaneous disasters. Baseline Vs. Estimated Scenarios (millions of XCD)

| Year | COVID19 Updated | COVID19 + Volcano |
|----------------|-----------------|-------------------|
| 2020 | 54,8 | 54,8 |
| 2021 | 172,8 | 182,0 |
| 2022 | 30,5 | 30,5 |
| 2023 (Jan-feb) | 0,0 | 0,0 |
| Total | 258,1 | 266,2 |

Source: Assessment team

Approximately, 20,000 persons were evacuated from the red and orange zones as a prompt precaution against the effects of the eruption, a fraction of whom were temporarily located in a group of 22 hotels and lodging properties in the southern zone of St Vincent. According to official figures, between April and June a total of XCD 1.091 million were expended for accommodation and meals for the persons using those 22 hotels as shelter. Note that the information provided was for the months of April and June 2021. As

usual in disasters, this situation will last for a few more months until all the people return home. We estimate that through December this may involve an additional XCD 1.6 million. These are additional costs. Notice that in terms of the tourism sector it partially compensates the forgone revenues. There are other additional costs related to the eruption of the volcano, such as cleaning costs for buildings and swimming pools. The SVG hotel association informed us that these costs were small and therefore they had not collected this information.

5. Recovery Needs and Strategy

It is imperative that the Government of SVG continues to aggressively implement its COVID-19 Recovery and Stimulus Package, especially those related to the tourism sector. Given that the lodging infrastructure were mostly untouched by the simultaneous disasters, a swift recovery is expected after the international travel resume to pre-pandemic levels.

The SVG tourism sector should build upon its strengths, for instance, promoting the arrival of people of countries with high evacuation rates (USA, Canada and UK), and promoting the resilience of yachting industry and resorts of The Grenadines, both as an opportunity to construct health bubbles offering reassurances to visitors.

St Vincent and the Grenadines has natural health bubbles as it is an archipelago comprised of 32 different islands, islets, and cays. This must be promoted.

In the context of the medium term, although it may be paradoxical, this eruption should be used as a point to further promote the tourist attraction of the La Soufrière volcano. All the hiking circuits of the volcano must be reinforced. To generate added value, tours could be promoted to explain the recent eruption, boat trips where visitors can appreciate the view of the volcano from the sea and promote viewpoints from nearby that have various amenities, as is done in other countries that have volcanoes.

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Tourism–Team Composition

1. Ministry of Tourism, Sports and Culture Team
2. Mr. Omar Zambrano – Facilitator
3. Dr. Omar D. Bello – Facilitator



Infrastructure Sectors

Transport Sector

1. Summary

Transport has been the most affected sector within the whole infrastructure sector. The total cost of damage and loss as a consequence of the la Soufrière volcanic eruption to this sector is estimated as XCD 74.4 million. The physical damage was estimated as XCD 30 million, corresponding mainly to partial repair and rebuild (intermediate damage level) of roads and river crossing infrastructure as bridges and fords; while the cost associated to the loss including changes in economic flows, ash removal and cleaning activities, amounts to XCD 44.4 million.

One of the most relevant losses in the transport sector caused by the disaster is associated to cleaning and ash/debris removal from the road network of the mainland Saint Vincent. The Buildings, Roads and General Services Authority (BRAGSA) estimated a total clean-up cost of the road network of XCD 12.514 million in the red zone, and of XCD 1.1 million; XCD 1.14 million; and XCD 0.811 million in the green, yellow and orange zones respectively. Cleaning interventions were also required in the airports, especially in the Argyle International Airport at a cost of XCD 0.35 million. The ashfall partially closed the road network of St. Vincent triggering interruption of traffic, delays and a lack of inputs to other economic sectors, among other. It is estimated that a loss of profit in land transport of passengers and cargo by traffic interruption is around XCD 1.3 million. Other cost associated with business interruption issues are

integrated in the corresponding sectors.

Total recovery needs were estimated in XCD 89.3 million, being XCD 36 million to cover the needs generated by the damage of physical infrastructure and XCD 53.3 million to account for the losses especially those for cleaning and ash removal needs. The recovery cost related to damage includes a suggested increase of 20% to account for all those improvements and modernizations to increase the resilience not only to volcanic hazard but also to other future catastrophic events. Note that approximately XCD 79.6 million of the recovery needs coming from the red zone. The volcanic eruption triggered a need for a cleaning program with a focus on addressing roads (XCD 15.6 million), river mouths (XCD 15.0 million), drains (XCD 7.7 million), river crossing infrastructure (XCD 14.2 million), footpaths and fallen trees (XCD 0.258 million) and airports (XCD 0.350 million) that have ash deposits that may even become more problematic with rains. The programme also predicted that periodic cleaning would be necessary with the onset of future rainstorms.

Based on the recovery needs identified in the analysis, as expected, the recovery strategy suggested the prioritization of the cleaning and removal of ash and debris from the roads, bridges, fords and airports, starting for the region more effected, Georgetown and Sandy Bay. A short-

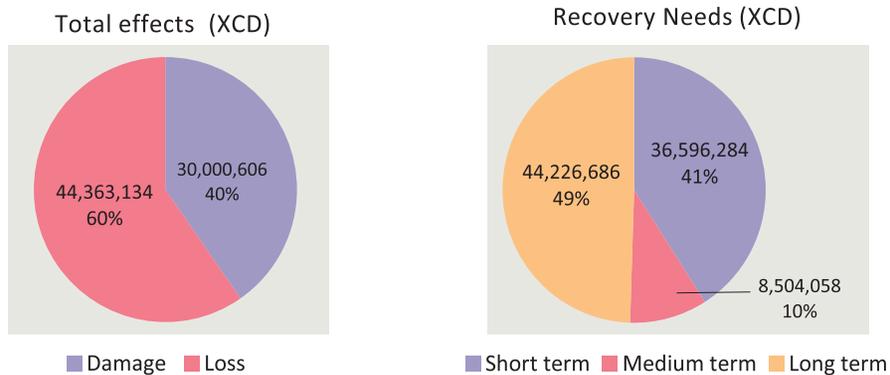
term and medium-term budget of XCD 36.6 million and XCD 8.5 million to cover the mentioned cleaning interventions is being proposed. The long-term budget of XCD 44.2 million, considers repair/reconstructions of transport infrastructure and the continuity of cleaning along Georgetown, Sandy Bay and Chateaubelair Districts; 81 percent is designated to repair/recovery and 19 percent for cleaning.

The development and adequate maintenance of road networks is critical for achieving regionally balanced economic growth as well as promoting inclusive growth by enabling people to access public services and opportunities for advancement. Moreover, roads are vital for rapidly responding with support services in the event of a disaster.

In terms of the potential funding sources, it is important to mention that an allocation amounting to EUR 490,000, dedicated to road maintenance and training, is still available on the program “Road Maintenance and Management System in St Vincent and Grenadines (EUR 5.83M)” implemented by CDB. It has been proposed by EU Delegation to use that budget to support post eruption cleaning of roads using Labour Intensive Method.

The information contained in this report is based on and/or was provided by the Ministry of Transport, Works, Lands and Physical Planning (MTW) of SVG, the Roads, Buildings and General Services Authority (BRAGSA) and the Argyle International Airport.

Figure 1. Summary of effects and recovery needs



Source: Transport Evaluation Team

2. Context or Sector Background

Roads, the deep-water port in Kingstown and the new Argyle International Airport which in 2017 replaced the old E.T Joshua Airport constitute the main transportation network of Saint Vincent and the Grenadines. Therein, compared to the port and airports, the road network is relatively more complex but is a most predominant transport component in the country.

Road Network

The Ministry of Transport, Works, Lands and Physical Planning (MTW) and the Roads, Buildings and General Services Authority (BRAGSA), are the institutions involved in road network development and operations in St. Vincent and the Grenadines. The Office of the Chief Engineer in the MTW is in charge of developing the road network while BRAGSA is in charge of maintenance of the road network. The government regulatory authority in charge of the vehicular traffic in the country is the Traffic Branch of the Royal St. Vincent and the Grenadines Police Force (RSVGPF).

St. Vincent and the Grenadines' road network consists of 829 kilometers according to the Transport Infrastructure Manual Inventory Database 2013. The road network on mainland St. Vincent comprises 11.2% of major roads, 25.4% percent of secondary roads and 63.3% of minor roads (rural and agricultural access). Major roads are the arterial routes which carry large volumes of traffic and permit traffic flow through and between cities & towns, while also facilitating travel between major elements of the urban areas. They are found throughout the length and breadth of the country. Secondary roads are those that don't carry a large volume of traffic and are those that provide access within residential neighborhoods to the major roads. Minor roads are those in rural and agricultural areas. In the 2

Road network SVG



Source: BRAGSA 2021 report

major affected zones (red and orange), major roads extend across 61.9 km while secondary and minor roads, which is crucial for rural communities, covers approximately 112.61 km.

Major Roads.

There are 5 major and main important roads in the St. Vincent's road network namely the Windward Highway, the Ivy Joshua Highway, the Vigie Highway, the Nelson Mandela Highway and the Leeward Highway. The Windward Highway stretches along the eastern coast and commences in Kingstown and traverses through Arnos Vale, Calliaqua, Peruvian Vale, Biabou and Georgetown, terminating at Rabacca, after which the Ivy Joshua Highway commencing at Rabacca, continues along the eastern coast toward the north of the island, traversing through communities in Orange

Hill, Magum, Overland, London, Sandy Bay, Point, Owia and terminates in the village of Fancy.

The combined length of the Windward Highway and the Ivy Joshua Highway is approximately 55 km. The road has a flexible pavement structure between the capital Kingstown and the village of Sandy Bay, then between Sandy Bay and Fancy it becomes a rigid concrete pavement. The carriageway has a typical width of 5.5m to 6.5m. The Nelson Mandela Highway, renamed on July 19, 2018 is an 11km section of the Leeward Highway, commencing in Kingstown and terminating in Layou. The rest of the Leeward Highway stretches along the western coast; continuing from Layou, through Barrouallie and Chateaubelair, to terminate in Richmond. 19.5km of the Leeward Highway is a flexible pavement structure and 22.9km is a rigid pavement structure with a carriageway typical 5.3m in width. The Vigie Highway runs through the interior of the island and commences at the Arnos Vale Round about and traverses through Mesopotamia and Yambou, terminating at Peruvian Vale on the Windward Highway. The length of this road is approximately 10 km. The road is a flexible pavement structure for

which the carriageway has a typical width of 5.3 m.

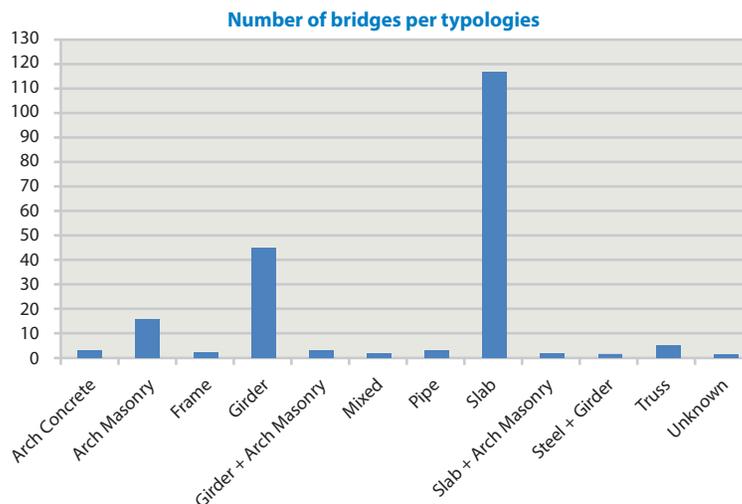
For the eruption event of the La Soufrière Volcano which occurred on 9th April, mainland St Vincent was divided into four hazard risk zones from red to green representing a very high risk to low risk. The affected major roads extend across 50-60km due to the ash plume. While affected secondary and minor roads, which are crucial for rural communities, cover about 40%.

Bridges

There are 200 bridges of different typologies and materials. When the bridge is composed by two or more different typologies, especially when it has been widened, it is classified as a mixed bridge. The graph below gives an overview of the different typologies and materials that relate to bridge construction in SVG.

One of the most important bridges affected by the volcanic eruption and lahar flows was the Rabacca Bridge which is a slab concrete bridge of 3 spans. Details of this damage will be presented in the disaster effects section.

Figure 2. Bridges per district (Source: INES; October 2011)



Road Network in the Grenadines’ islands

The Grenadines road networks comprises of 123.2 km of roadway which are flexible, rigid pavement structures and unpaved roads and has a typical carriageway width of 3m to 4 m. The total length of the five larger Grenadine islands are: Bequia - 46.441 Km, Mustique – 28.187 Km, Canouan – 13.256 Km, Union Island – 28.320 and Mayreau – 7.027 Km.

Airports

There are five airports in SVG: The Argyle International Airport, Canouan Jetport, James F. Mitchell (Bequia) Airport, Mustique Airport and the Union Island Airport. Argyle International Airport is the most important in the country

located about 8.3 km from Kingstown and serves as a major gateway to the Grenadines, with several airlines operating an extensive network of direct domestic flights from AIA to all destinations in the Grenadines.

Table 1. Summary of the Transport infrastructure in St. Vincent

| Type of facilities | Number/Length |
|----------------------|---------------|
| Mayor roads (Km) | 128.002 |
| Secondary roads (Km) | 118.102 |
| Minor roads (Km) | 442.986 |
| Bridges | 200 |
| Airports | 5 |
| Ports | 4 |

3.Sector effects and cost of the effects Assessment of Disaster effects

The total cost of the damage caused by the volcanic eruption, based on the available information, has been estimated at XCD 30.0 million while the cost associated with the ash removal and cleaning of roads, drain, removal of fallen trees from roads, cleaning of airports and traffic disruption on roads, was estimated as XCD 44.363 million. Thus, the total cost of the effects as consequence of the la Soufriere eruption is estimated in XCD 74.363 million

Damage in river crossing infrastructure

Ministry of Transport, Works, Land & Physical Planning of SVG has categorized the damage of transport infrastructure into 3 levels ranging from 1) superficial damage which require cleaning and disposing of ash (low damage); 2) a second damage level requiring partial repairs and; 3) a high level of damage for those structures impacted catastrophically, structurally compromised and unsafe for use requiring complete replacement

of the entire structure. The evaluation was carried out by the MTW-SVG using mainly visual inspections in the 3 most critical census districts impacted namely Chateaubelair, Georgetown and Sandy Bay.

According to the most recent report relating to “River Crossing and Housing Infrastructure Detailed Damage Assessment” delivered by the Ministry of Transport of SVG, Georgetown has been the most affected district of the country, with 31 river crossings infrastructure elements damaged by the volcanic eruption, of which, 71 percent present low damage and the remaining 29 percent level two of damage, requiring partial repairs. In Sandy Bay 15 river crossing structures were damaged. This is represented as 10 structures with minor damage and another 5 structures requiring partial repairs caused by the destruction/loss of bridge rails and/or impact damage caused by river debris and boulders colliding with the structure. In the case of Chateaubelair District, the 100 percent of

the 15 affected structures were classified with low damage level requiring minor interventions.

As shown in Table 2, the damage in the Georgetown district amounts to XCD 16.430 million while the cost of the damage in Sandy Bay district has been estimated as XCD 11.965 million. The cost of river crossing damage was mainly derived by analyzing the damage of the wing walls, river training, scour protection, under pinning, bridge works, drainage works, road works and miscellaneous works.

The Georgetown district, Perseverance Bridge No. 2, Rabacca Dry River Bridge and Agrika River Bridge represent more needs of intervention and actions. Individually, the cost attributed to damage observed in those bridges was estimated as XCD 3 million; XCD 3.57 million and XCD 3.195 million respectively. Perseverance Bridge No. 2 upstream inlet was blocked causing an overtopping of the bridge during flood conditions/lahar flows and boulders have been deposited throughout the channel. The Agrika bridge inlet has been blocked with debris, boulders and other material which caused the channel to be completely filled. The river overtopped the bridge and caused damage to homes along the riverbanks. The Rabacca Dry River bridge upstream inlet pier "from Fancy" of the bridge suffered major damage to the protective steel sheet covering, exposing the concrete and steel rebar pier support to abrasion by the heavy flow of the Rabacca Dry River during flood conditions and lahars. The bridge also endured damage to the bridge rails on the deck.

Miss/Lady Jane and Perseverance No. 3 Bridges present a joint damage approximately of XCD 3.4 million. The Miss/Lady Jane bridge inlet was block with debris, as such, the bridge was overtopped and functioned as a ford in high flow events. Perseverance Bridge No. 3 comprises of four (4) 0.9m concrete culverts supporting a concrete deck collapsed following the continued

scouring of the foundation support. Three of the four culvert pipes had damaged or displaced segments. Beyond the culverts toward the CWSA catchment, the approach fill and foundation support for the retaining wall scoured, causing the caving of the concrete carriageway section. The river flowed below the invert of the culverts, enabling the cavity to be formed and eventually cave in to make the road impassable for motor vehicles and a safety hazard for pedestrians. In the case of Waribishy River Bridge, cost attributed to the damage reaches XCD 1.122 million. This bridge inlet was blocked which allowed for the filling of the upstream channel, which caused the river to flow over the bridge deck as a ford. The bridge endured additional damage to the bridge rails appears and damage to concrete surfaces.

Bridges such as Perseverance No. 1, No. 4, and No. 5, Dickson Village, Chapmans, Dickson, Langley Park, God Save the Queen, between others represent low level of damages which costs ranging from XCD 12,500.00 to XCD 120,000.00. Karo Point Ford, Owia Little River Ford and Fancy River Ford experienced a damage categorized as level 2, which an associated cost of XCD 1.7 million; XCD 1.5 million and XCD 1.3 million respectively, with river training damage being the most important concern.

In the case of Sandy Bay District, Karo River Bridge, Cayo River Bridge and Owia Big River Bridge damage is categorized as level 2 (necessary partial repairs) with costs estimated as XCD 2.72 million, XCD 2.675 million, and XCD 1.336 million respectively. Both the Karo and the Cayo River bridges suffered rail damage resulting from the the La Soufrière Eruption. Their inlets were completely blocked, dams were formed upstream of the bridge deck and the remnants of the wing walls have also been completely destroyed. The channel upstream of the bridge has been completely filled with river deposits of sand, gravel

and boulders with these deposits being in excess of 6'-8' upstream.

The Owia Big River Bridge sustained heavy damage to the carriageway section of the deck with the destruction of the bridge rails by the impact of boulders and other debris during the high flow events following the eruption. New boulders have been deposited upstream and the bridge inlet has been completely blocked enabling the river to flow on the bridge deck as a ford in its current state. Other components requiring partial repairs/reconstructions are the Owia Little River Ford and Fancy River Ford with an associated cost of XCD 2.135 million and XCD 2.36 million respectively. The Owia Little River Ford sustained heavy damage to the pedestrian foot bridge which was destroyed during a heavy river flow event. The Fancy River Ford, which has a pedestrian footbridge elevated on the upstream side, sustained additional damage since the last event in 2016. The foot bridge was blocked impeding the passage of the regular river channel flow in the extreme run off of April 29, 2021. Bridges as Jumby Point and Kramaku, and other river crossing components as Agrabay river ford, Sandy Bay ford, Sandy Bay ford, Owia ford, Fancy ford, among others, experienced low damage with costs ranging from XCD 16,800.00 to XCD 117,000.00.

Finally, in the Chateaubelair District, it is reported that fifteen river crossings structures require ash removal and cleaning interventions. All of those structures are bridges with the average cost of cleaning needed being XCD 12,500.00 per bridge. Given that in the PDNA methodology, cleaning activities are considered as a lost, this cost will be integrated in the *loss* section.

Damage in roads

The road network of the country did not present significant damage to its infrastructure. From the

most current information provided by BRAGSA, physical damage of some components of the road network has been observed in the Sandy Bay and Chateaubelair districts. Georgetown's roads were not in this sense affected given that damage has just been observed beyond Georgetown toward the north. It should be iterated at this point that this section is referring exclusively to physical damage of roads and cleaning and ash removal has not been considered in this section. Those cleaning costs are quantified below in the loss section as per the PDNA methodology.

In Sandy Bay, the section of the Windward Highway that crosses the red hazard zone required works for repairing drains and retaining walls with a cost estimated in XCD 215,000.00. London streets also requires repairs to drains, roadway and retain wall with an approximate value of XCD 295,100.00. The Magum Road from Main Road upward has experienced damage in its roadway estimated as XCD 178,500.00 while the upper Waterloo Road near to Sheep Pen and the other roads also require repairs to drain, roadway and retaining walls (approximately XCD 335,000.00).

In the Chateaubelair district, the roads that experienced damage and require repairs and construction of drains are the Richmond Road leading to the Sand Mining Site, the earthen road at Fall Piece Richmond and the earthen road at Hog Hole Richmond. The corresponding estimated costs of damage amount to XCD 81,100.00; XCD 386,240.00 and XCD 96,550.00 respectively. Repairs to retaining wall at Dark View Rose Bank opposite Keisha Shop are also needed as well as the construction of gabion-check walls and dry pack boulder wall.

Loss

In the PDNA methodology, in addition to forgone income, the loss component considers the

additional costs to keep the service running and thus, this includes the cost of cleaning and removal of the ash/debris caused by the volcanic eruption as well as the loss associated with changes in the economic flows caused by traffic interruption, change in toll rates, increase in the transportation costs as a consequence of use of alternative roads, among others.

Cleaning and ash removal from river crossing infrastructure

Based on information provided from the Ministry of Transport, losses of XCD 14.202 million regarding to removal of ash around bridges and fords in the three affected districts have been observed with actions including excavations and disposal of debris. In Georgetown, cleaning interventions amount to XCD 10.513 million, in Sandy Bay XCD 3.445 million and in Chateaubelair XCD 0.243 million

Cleaning and ash removal from roads.

One of the most relevant losses in the transport sector caused by the La Soufrière volcanic eruption is associated with cleaning and ash/debris removal from the road network of the mainland Saint Vincent. The cleanup assessment has conducted by BRAGSA.

To estimate the extent of road cleaning an approximate average road width is considered as for major roads 24 feet, Secondary roads 16 feet, and minor roads 12 feet. The average thickness of ash deposits was estimated as follows by zone: Green Zone 0.5 inches, Yellow Zone - 2 inches, Orange Zone - 4 inches, Red Zone - 12 inches. It was determined that the ash from roadways on the Windward side will go to Rabacca, and on the Leeward side will go to Richmond. The Global Rapid Post Disaster Damage Estimation (GRADE) report from the World Bank provides an estimated

ashfall accumulation map on St. Vincent Island (Annex, Figure 3).

BRAGSA estimated a total clean-up cost of the road network of XCD 1.1 million in the green zone, XCD 1.140 million in the yellow zone, XCD 0.811 million in the orange zone, and XCD 12.5 million in the red zone. The Georgetown and Sandy Bay districts were the most affected by the ash and the roads belonging to those districts is where the cleaning should be concentrated. Estimates suggest that the cost of cleaning and ash removal from major roads in Georgetown amount to XCD 6.7 million, XCD 4 million for minor roads and XCD 0.049 million for secondary roads. In the case of Sandy Bay, cleaning costs are exclusively attributed to minor roads and estimated at XCD 1.68 million.

In the census Districts of Barroaullie and Colonaire, both located in the yellow zone and the Chateaubelair census District located in the orange zone, the cost of cleaning has been estimated as XCD 491,415.00, XCD 648,585.00 and XCD 811,550.00 respectively. Kingstown, Suburb of Kingstown, Calliaqua, Marriaqua, and Bridgetown, districts located in the green zone, 60 percent of the cleaning cost corresponds to minor roads, 23 percent to secondary and the remaining 17 percent to major roads.

Drain and river mouth cleaning

The volcanic eruption triggered a need for a cleaning program with a focus on addressing drains that have ash deposits that may become problematic with rains. The costs estimated by BRAGSA also predicted that periodic cleaning would be necessary with the onset of future rainstorms. In the red zone, the cost of drain cleaning was estimated as XCD 6 million and for the green, yellow and orange zone this was estimated as XCD 3 million. Several watercourses

were silted, and some were blocked by heavy flow and volcanic deposits; this was especially visible in the red zone. The cost estimated to cleaning the river mouths reaches XCD 3.477 million.

Traffic disruption

The ash fall caused the closure of part of the road network of St. Vincent. Depending on the hazard zone, the disruption of the traffic lasted for a couple or even several days, at the end of July. The evaluation team conducted a field visit to both the Leeward and Fancy sites and it was confirmed that while most of the ash has been cleaned, in the north eastern part of Sandy Bay and Owia, the severe ash fall was still being cleaned. Given that the road network is the key component for the interaction among the economic sectors and population of the country, the blockage of road traffic triggers delays and a lack of inputs, which translate in losses for the different sectors (accounted within each corresponding sector). In the case of transport, the evaluation team has agreed that the most important loss brought about by the closure of roads is due to the loss of utility in the transport of passenger and cargo. This loss has been estimated as 25% of the operation costs with this being obtained based on information from ECLAC 2013 and subsequently updated. The annual average daily traffic in SVG was estimated based on "2000 Mouchel Preliminary Study Report

for Windward Highway" and other reports. From those data, and using the length of the roads, it was estimated that the total utility loss was of XCD 1.295 million with major utility loss derives from interruption of Georgetown's major roads.

Airport

The country's air space was closed because of the ash for about two weeks for passengers and five weeks for cargo flights. The airport closure can impact industries that rely on external visitors, especially the tourism industry which is also a large source of income for residents in Saint Vincent. The volcanic eruption further aggravated the already complex situation of the country already hit by the COVID-19 pandemic, this is captured in detail in the assessment of the Tourism Sector.

Ash removal and cleaning operations were required with this cost being covered by the airport budget and also by other private companies. The total cost of cleaning amounted to XCD 350,000.00. The Grenadines' airports were also closed on some days following the eruption, based on security protocols. Despite efforts to get the necessary information to estimate costs due to closure of the airports, until the completion of this report, this was not possible. Should this information be made available, loss figures are expected to increase.

Table 2. Summary of damage and losses

| Item | Damage (XCD) | | Loss (XCD) | |
|---|-------------------|----------|-------------------|------------------|
| | Public | Private | Public | Private |
| Damage | | | | |
| River Crossing Infrastructure incurred damage in Georgetown District | 16,430,930 | | | |
| River Crossing Infrastructure incurred damage in Sandy Bay District | 11,965,349 | | | |
| Road infrastructure incurred damage in Chateaubelair District | 580,694 | | | |
| Road infrastructure incurred damage in Sandy Bay District | 1,023,633 | | | |
| Loss | | | | |
| Cleaning river crossing structures of Chateaubelair District | | | 243,750 | |
| Removal of ash on river crossing structures in Georgetown District | | | 10,513,177 | |
| Removal of ash on river crossing structures in Sandy Bay District | | | 3,445,788 | |
| Ash removal and cleaning of roadways. Green zones | | | 1,099,600 | |
| Ash removal and cleaning of roadways. Yellow zones | | | 1,140,000 | |
| Ash removal and cleaning of roadways. Orange zones | | | 811,553 | |
| Ash removal and cleaning of roadways. Red zones | | | 12,513,833 | |
| Drain cleaning orange, yellow and green zones | | | 3,000,000 | |
| Drain cleaning red zones | | | 6,000,000 | |
| River cleaning costs green zone | | | 837,500 | |
| River cleaning costs yellow zone | | | 405,000 | |
| River cleaning costs orange zone | | | 660,000 | |
| River cleaning costs red zone | | | 1,575,000 | |
| Removal of fallen trees form roads | | | 217,000 | |
| Removal of ash from footpaths | | | 41,000 | |
| Loss of profit incurred from loss of mining activities at Rabacca Commercial Operations | | | 214,933 | |
| Loss of profit in land transport of passengers and cargo by traffic interruption | | | | 1,295,000 |
| Airports: ash removal and cleaning operations | | | 70,000 | 280,000 |
| Loss of airport revenues by cargo and passengers traffic interruption | | | NA | NA |
| TOTAL | 30,000,606 | - | 42,788,134 | 1,575,000 |

Source Transport Evaluation Team

4. Linking the effects to the human impact

Roads

The road network was impacted greatly in the red and orange hazard zones, as a result, residents evacuated in these regions cannot go back home and resume normalcy, with flow of goods also blocked. People living in areas close to the volcano rely mainly on agriculture and fisheries as their main source of livelihoods with obstruction of these roads makes it impossible for people living in this area to work, and even access to food being restricted. Agriculture and fisheries rely heavily on transport movement for the purpose to deliver the products from the coast to inland; moreover, agricultural and fishery products often have limited shelf life, so road damage and blockages will not allow them to be kept and arrive at the local markets in a best condition which can result in the quality worsening for several agricultural products. There are approximately 10,438 registered farmers operating in the country (see agriculture sector report), of which 27.5 percent are located in the red and orange zones and the remaining 72.5 percent in the yellow and green hazard zones. According to the agriculture sector report, 2,875 registered farmers and 278 fisherfolk were dislocated from the red and orange zones. Land traffic interruption increases the difficulties for recovery in those zones and can cause serious

drawbacks to the normal operation of the farmers which were not evacuated

Furthermore, some factories/businesses are unable to obtain the required raw materials/products in severely impacted area. As a result, enterprises in the area may be forced to suspend production, causing economic losses to the enterprises and reducing the employment for individuals. The interruption of income sources and great economic losses will impact livelihoods and the inaccessibility of workers and professionals to their work places due to the closure of roads also having a negative impact in the household incomes and in the operation of companies/institutions/factories.

Airports

The airports have been forced to close due to the impact of volcanic ash, which is an important external transport channel for the main island besides the seaport, especially The Argyle International Airport. It will also impact industries that rely on external visitors, especially the tourism industry which is also a very large source of income for residents in Saint Vincent. At the same time, the import and export of goods on the island can cause delays or cancellations in the absence of aerial route connections, and enterprises could suffer economic loss at a certain degree.

5. Recovery Needs and Strategy

Recovery needs section covers the necessary costs to overcome the identified damages and losses generated by the volcanic eruption with table 3 below summarising those costs identifying some of the relevant justifications and actions. The total needs amount to XCD 89.327 million, being XCD 36 million to cover the needs generated by the damage of physical infrastructure and XCD 53.3

million to account for the losses especially those for cleaning and ash removal needs. The recovery cost related to damage includes a suggested increase of 20% to account for all those improvements and modernizations to build back better and increase resilience to future catastrophic events. Note that approximately XCD 79.6 million of the recovery needs costs relates to needs specific to the red zone.

Table 3. Recovery Needs

| item | Damage | Loss | Justification. Needs coming from the analysis of effects and impacts. | Needs (XCD) |
|---|------------|---------|---|-------------|
| Damage | | | | |
| River Crossing Infrastructure incurred damage in George-town District | 16,430,930 | | <p>Excavation, Reinstate/repair road approach at Agrika River Bridge, Perseverance Bridge No. 3 and Karo Point Ford</p> <p>Reinstate/repair wing walls to Karo Point Ford, Agrika River Bridge, Waribishy River Bridge, Lady Jane River Bridge, Perseverance Bridge No. 2 and Perseverance Bridge No. 3</p> <p>Provide river training to Karo Point Ford, Agrika River Bridge, Noel River Ford, Tourama River Ford, Waribishy River Bridge, Rabacca (Dry River) Bridge, Lady Jane Bridge, Perseverance Bridge No. 2 and Perseverance Bridge No. 3</p> <p>Provision of scour protection and under pinning of bridges and fords</p> <p>Reinstate bridge rails for the Agrika River Bridge, Waribishy River Bridge, Rabacca (Dry River) Bridge, Lady Jane Bridge</p> | 19,717,116 |
| River Crossing Infrastructure incurred damage in Sandy Bay District | 11,965,349 | | <p>Excavation, reinstate road approach at Karo Bridge</p> <p>Reinstate bridge wing walls to Karo Bridge, Cayo Bridge, Owia Big River Bridge</p> <p>Provide river training to Karo River Bridge, Cayo River Bridge, Owia Big River Bridge & Fancy River Ford</p> <p>Provision of scour protection and under pinning of bridges and fords</p> <p>Reinstate bridge rails for the Karo River Bridge, Cayo River Bridge and Owia Big River Bridge</p> | 14,358,419 |
| Road infrastructure incurred damage in Chateaubelair District | 580,694 | | Reconstruction of roadways, retaining walls and drains due to lahars and buildup of volcanic ash on roadways and drains | 696,833 |
| Road infrastructure incurred damage in Sandy Bay District | 1,023,633 | | Reconstruction of roadways, retaining walls and drains due to lahars and buildup of volcanic ash on roadways and drains | 1,228,360 |
| Losses | | | | |
| Cleaning river crossing structures of Chateaubelair District | | 243,750 | Removal of ash on bridges; cleaning of rivers upstream and downstream of bridge. | 243,750 |

| | | | | |
|---|-------------------|-------------------|---|-------------------|
| Removal of ash on river crossing structures in Georgetown District | | 10,513,177 | Removal of ash on bridges and fords; cleaning of rivers upstream and downstream of bridge. | 10,513,177 |
| | | | Excavation and disposal of debris dammed at Karo Point Ford, Agrika River Bridge, Noel River Ford, Tourama River Ford, Waribishy River Bridge, Rabacca (Dry River) Bridge, Lady Jane Bridge and Perseverance Bridge No. 2 | |
| Removal of ash on river crossing structures in Sandy Bay District | | 3,445,788 | Removal of ash on bridges and fords; cleaning of rivers upstream and downstream of bridge. | 3,445,788 |
| | | | Excavation and disposal of debris dammed upstream of Karo Bridge, Cayo Bridge, Owia Little River Ford, Owia Big River Bridge and Fancy Ford | |
| Ash removal and cleaning of roadways - green, yellow and orange zones | | 3,051,153 | Ash removal and cleaning of roadways -green,yellow and orange | 3,051,153 |
| Ash removal and cleaning of roadways - red zone | | 12,513,833 | Ash removal and cleaning of roadways -red zone | 12,513,833 |
| Drain cleaning orange, yellow and green zones | | 3,000,000 | Drain cleaning of roads located in orange hazard zone | 3,000,000 |
| Drain cleaning red zones | | 6,000,000 | Drain cleaning of roads located in the red hazard zone in 2021 and plus the needs of cleaning of drains for 2022 and 2013. | 12,000,000 |
| River cleaning costs green, yellow and orange zones | | 1,902,500 | River cleaning costs for green, yellow and orange zone | 1,902,500 |
| River cleaning costs red zone | | 1,575,000 | River cleaning costs for green, yellow and orange zone in 2021 and plus the needs of cleaning of rivers for 2022 and 2013. | 5,770,000 |
| Removal of fallen trees from roads | | 217,000 | Clear the roads of the affected zones of fallen trees | 217,000 |
| Removal of ash from footpaths | | 41,000 | Removal of ash from footpaths from the affected zone | 41,000 |
| Airports: ash removal and cleaning operations | | 350,000 | Removal of ash and cleaning operation in the airports | 350,000 |
| | | | 1 Tractor for cleaning process within the airport and also to contribute with cleaning of roads. 2 circular sweepers | 278,100 |
| Total | 30,000,606 | 42,853,201 | | 89,327,028 |

Source: Transport Evaluation Team

The recovery needs prioritization matrix shown below grouped the cost of activities and interventions for the transport sector in short, medium and long term. Thus, for short term, the cost of the recovery needs was estimated as XCD 36.596 million, for intermediate actions XCD 8.5 million and for long term, XCD 44.226 million.

The totality of the cost for short and intermediate terms are interventions and activities with the highest priority related to cleaning and ash

removal from the roads, from river crossing infrastructures and from airports as well as the removal of fallen trees from roads and removal of ash from footpaths. The long-term budget for recovery in the transport sector considers repair/reconstructions of transport infrastructure and the continuity of cleaning along Georgetown, Sandy Bay and Chateaubelair Districts; 81 percent is designated to repair/recovery and 19 percent for cleaning.

Table 4. Recovery needs prioritization

| Intervention/Activity | Short Run | Medium | Long Run | Priority | Comment | Cost XCD |
|---|------------|--------|------------|----------|---------|------------|
| | | | | (1 a 5) | | |
| Damage | | | | | | |
| Repairs to River Crossing Infrastructure incurred damage in Georgetown District | | | 19,717,116 | 2 | | 19,717,116 |
| Repairs River Crossing Infrastructure incurred damage in Sandy Bay District | | | 14,358,419 | 2 | | 14,358,419 |
| Repairs to Road infrastructure incurred damage in Chateaubelair District | | | 696,833 | 2 | | 696,833 |
| Repair road infrastructure incurred damage in Sandy Bay District | | | 1,228,360 | 2 | | 1,228,360 |
| Loss | | | | | | |
| Cleaning river crossing structures of Chateaubelair District | 243,750 | | | 2 | | 243,750 |
| Removal of ash on river crossing structures in Georgetown District | 10,513,177 | | | 1 | | 10,513,117 |
| Removal of ash on river crossing structures in Sandy Bay District | 3,445,788 | | | 1 | | 3,445,788 |
| Ash removal and cleaning of roadways in green zone | 1,099,600 | | | 1 | | 1,099,600 |
| Ash removal and cleaning of roadways in yellow zone | 1,140,000 | | | | | 1,140,000 |

| | | | | | | |
|---|-------------------|------------------|-------------------|---|--|-------------------|
| Ash removal and cleaning of roadways orange in zones | 811,553 | | | 1 | | 811,553 |
| Ash removal and cleaning of roadways red zones | 6,256,917 | 3,128,458 | 3,128,458 | 1 | Washing of ash deposits on volcano slopes over time will require, short, immediate and long run attention | 12,513,833 |
| Drain cleaning orange, yellow and green zones | 3,000,000 | | | 1 | | 3,000,000 |
| Drain cleaning red zones | 6,000,000 | 3,000,000 | 3,000,000 | 1 | Washing of ash deposits from embankments over time will require, short, immediate and long run attention | 12,000,000 |
| River cleaning costs green zone | 837,500 | | | 1 | | 837,500 |
| River cleaning costs yellow zone | 405,000 | | | 1 | | 405,000 |
| River cleaning costs orange zone | 660,000 | | | 1 | | 660,000 |
| River cleaning costs red zone | 1,575,000 | 2,097,500 | 2,097,500 | 1 | Washing of ash deposits on volcano slopes over time will require, short, immediate and long run attention | 5,770,000 |
| Removal of fallen trees from roads | 217,000 | | | 1 | | 217,000 |
| Removal of ash from footpaths | 41,000 | | | 1 | | 41,000 |
| Airports: removal of ash and cleaning operations | 350,000 | | | 1 | Executed | 350,000 |
| Airports: Acquisition of a tractor for cleaning and 2 circular sweepers | | 278,100 | | 3 | Help to restore airport operations faster. Facilitate early arrival of international aid and reduce business interruption losses | 278,100 |
| TOTAL | 36,596,284 | 8,504,058 | 44,226,686 | | | 89,327,028 |

Source: Transport Evaluation Team

Sources of information, references

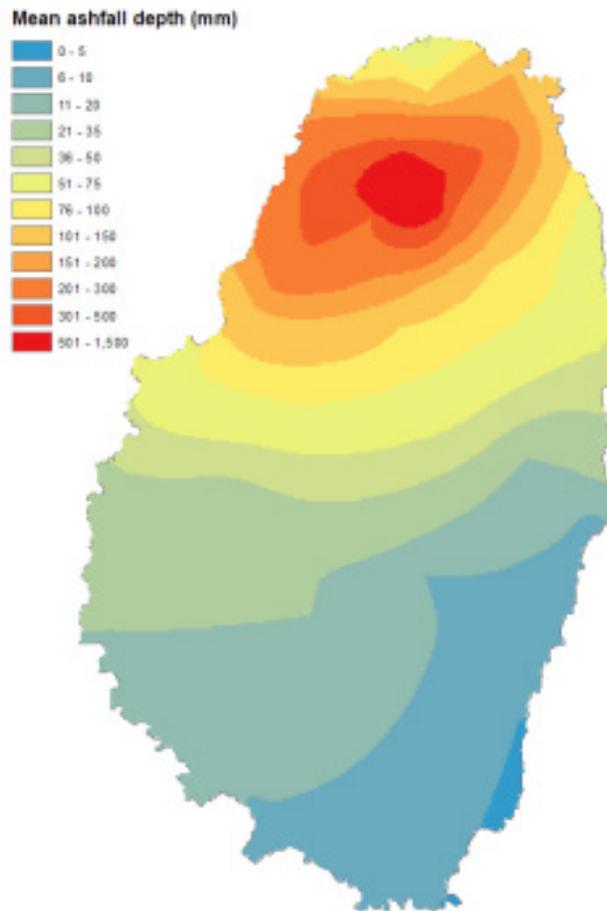
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Annex

Transport sector evaluation team

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Figure 3. Estimated ashfall accumulation map on St. Vincent Island as of April 26, 2021. Soufrière volcanic eruption. Source GRADE report – The Work Bank 2021.



Water, Sanitation and Hygiene - WASH Sector

1. Summary

The damage and loss experienced by the Water, Sanitation and Hygiene (WASH) sector as a consequence of the La Soufrière volcanic eruption was relatively low, coming in at XCD 1.64 million, which represents approximately two percent of the total effects, in terms of cost, to the infrastructure sector. The physical damage amounts to XCD 0.305 million while the loss incurred is approximately XCD 1.34 million. Damage in the WASH sector includes the cost for repairs such as rebuilding catchment areas, intake structures, pipework and damaged access roads while the costs associated with the loss in the WASH sector includes water service interruption, cleaning and ash removal activities, the use of trucks for delivering water to households and quality water testing to note a few.

Although the economic consequences of the volcano eruption have been relatively low for the WASH sector, there has been intermittent and even suspension of the water supply, especially in the red and orange zones. At the time of crafted this report and according to estimations of the Central Water and Sewerage Authority (CWSA), as at the time of writing this report, in the red zone, 1,380 inhabitants were offline from the water network and 2,713 inhabitants suffered 91 days of water interruption. In the case of the orange zone, 6,241 inhabitants have undergone disruption in water services for about 35 days, while 25,000 inhabitants for 7 days. In the green and yellow hazard zones, the disruption of water services ranged from 1 to 3 days and impacted around

60,000 inhabitants. Lack of water forced the population to reduce their water use which would have impacted personal hygiene, including hand washing practices, which is critical for coping with the COVID-19 pandemic.

Furthermore, relocation of people from the red and orange zones to the green and yellow zones caused a shift in the water demand to the water supply systems in some areas. For instance, extremely high usage from all coastal villages initially prevented water from reaching higher elevation inland villages such as Stubbs, Carapan, Diamond State, Biabou, Cedars, Bridgetown, Reeves Level, South Union, Choice village, Lower Calder, Park Hill, South Rivers, Chester Cottage, Colonaire.

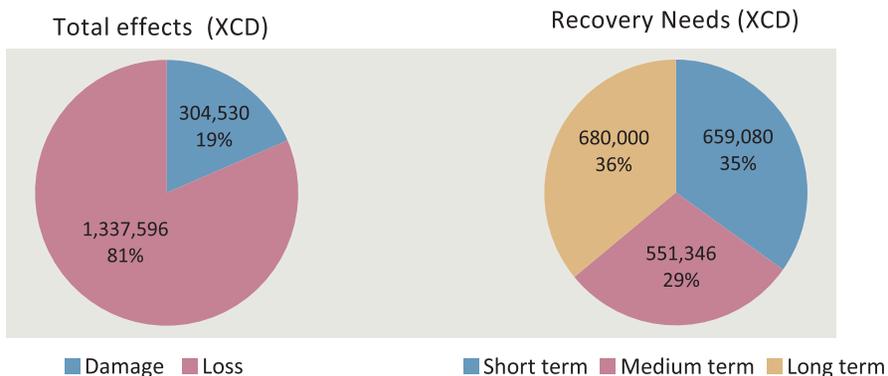
The total recovery needs were estimated to be XCD 1.89 million, with XCD 365,400 required to cover the needs generated by the damage to physical infrastructures, XCD 435,000 required to cover the needs related to cleaning interventions and losses incurred by trucking water, and XCD 1 million is required to improve the local technical capacities and the purchase of 2 tankers. The recovery cost related to damage includes a suggested 20% increase to account for the improvements and modernizations required to increase the resilience of the WASH sector to future catastrophic events (that is, build back better).

As expected, the priority of the intervention is given to the repair/reconstruction actions and ash removal to the Water Supply Systems

(WSS) located in the red zone (Fancy, Sandy Bay and Owia WSS) and those located in the orange hazard zone (Perseverance, Jennings and Hermitage WSS). Currently, 1,380 inhabitants in the red zone are still offline from the water network as a consequence of the disaster. Thus, restoring the water systems, maintaining water quality to acceptable WHO standards, testing, chlorination and the implementation of public education and awareness campaigns and starting with the upgrade of the system for the collection,

monitoring and management of hydrological and other data on water resources are the priority. The medium to long term needs are more related to targeted assessments to increase the capacity for water trucking/distribution, developing/enhancing the necessary legislation, codes and options for testing, storage and treatment of water. Based on this prioritization, the cost of the short-term recovery needs is estimated to be XCD 659,000; for intermediate actions XCD 551,300 and for long term actions, XCD 680,000.

Figure 1. Summary of effects and recovery needs



Source: WASH Evaluation Team

2. Context or Sector Background

Water Management Authority

The Government of St. Vincent and the Grenadines has majority ownership of the water sector being managed by the Central Water and Sewerage Authority (CWSA), which is a quasi-Governmental Organization within the Ministry of Health and the Environment. CWSA is also responsible for supply of water in the Grenadines, however, its operation has not materialized. There are several private desalination plant operators within Bequia, Cancun and Union Island operated mainly by the private sector but the populace practice rainwater harvesting. In addition, a minor percentage of

person living in the Grenadines use well water. Several other stakeholder agencies in SVG have responsibility and can impact the WASH sector such as the Environmental Health Division (EHD), The Ministry of Agriculture, Industry, Forestry, Fisheries and Rural Transformation, The St. Vincent and the Grenadines Bureau of Standards (SVGBS) and The Physical Planning Unit (PPU).

Water Availability

Availability and access to potable water supply is one of the fundamental determinants of health, quality of life and progress towards sustainable

development. Average national demand for water on the island is met mostly by the surface freshwater sources, through the abundance of rivers and streams ensuring that a surplus of water is generally available. In the drier islands of the Grenadines, on the other hand, streams and rivers are not available and water is mainly harvested from rainwater and underground water sources (SDG Progress Report, 2020). Therefore, while mainland St. Vincent does not experience severe water supply constraints, the Grenadines, however, are sometimes stressed during the dry season due to lack of available freshwater resources.

Water Usage/Demand

Water usage is primarily distributed among domestic, tourism, agriculture and commercial sectors. Consumption is greatest by the domestic sector (approximately 75%), followed by the tourism sector (15%) and finally the agriculture and commercial sector (10%) (CDB, 2013). Based on a population of 120,000 and a production of 27MLD, the consumption level is estimated at 225 l/p/c/d. A CEMI (2007) Report indicated that per capita consumption in the Grenadines varies from 46 l/p/c/d to 136 l/p/c/d (CDB, 2013).

Water Quality

Water quality monitoring is carried out to WHO Guidelines and PAHO Parameters; the most frequent parameters tested are pH, turbidity, residual chlorine, fecal and total coliform. Major operational challenges to maintaining water quality and supply continuity throughout all water supply systems are the rapid increase in raw water turbidity during severe rainfall events, which often ranges between 10-75 NTUs and can exceed 100 NTUs at times; there are some risks to the delivery of safe drinking water due to the state of the distribution network, for which the age, condition and level of maintenance are contributing factors (PAHO, 2013).

However, the recently completed SDG Voluntary National Review (2020) indicates that SVG is doing very well in the management of both water and sanitation services. The SDG VNR (2020) indicates that the proportion of population using safely managed drinking water services (2018) in whole SVG is 93.8 percent, being 90.6 in rural Saint Vincent, 96.2 in urban Saint Vincent and in the case of the Grenadines, 97.3%.

Water Supply Sources, Treatment and Distribution systems

The mainland Saint Vincent is relatively well served with water distribution networks, which includes 70 public standpipes located throughout the country which provide ready access to potable water as a basic requirement and serve the less fortunate residents (SDG VNR, 2020). The population is supplied by 12 drinking water systems with a total average daily production of 5.51 million Imperial gallons per day (mgd) (25,000 m³). The water sources for these systems comprises fifteen surface-water intakes of this system providing 94% of the production (PAHO, 2013). The 12 water supply systems include: Dalaway, Jennings, Majorca, John Hill, Mamoon, Montreal, Hermitage, Perseverance, Layou, Sandy Bay, Owia and Fancy. The latter three are located in the red zone, Perseverance and Jennings are located in the orange zone and Hermitage is very close to the boarder with the orange zone. The Dalaway water supply system, supplied by the Buccament Watershed, is the most important system for the population of St. Vincent, producing approximately 2.2 mgd (10,000 m³/day) of water, that is, about 40% of the total drinking water supplied including all communities in South Leeward and the Capital Kingstown. The Majorca water catchment area as well as the Majorca water supply system are the oldest ones, built in 1948, and provides approximately 13% of the total daily demand of St. Vincent island-wide. The most

recently constructed system is the Jennings Water Intake on the Jennings Valley River producing approximately 0.635 mgd (2,400 m³/day) serving 14,880 inhabitants (PAHO, 2013).

SVG's water supply and distribution system also include storage tanks which assist in providing continuous drinking water supply, including via the pipeline networks. St. Vincent's public water storage systems consist of storage at treatment plants, in the form of clear wells, and at distribution tanks located throughout the various water supply zones. Approximately 47 tanks provide a total storage capacity of 5.24 million gallons. These tanks are generally cleaned and flushed quarterly (PAHO, 2013).

The treatment plants as well as the surface water intakes use mainly gravity systems to the water distribution, harnessing the high altitudes where they are located. Water treatment processes range from sedimentation, slow sand filtration and chlorination, to chlorination only on most of the systems. A network of 128 miles (206 km) of pipelines, from 3" (75 mm) to 16" (406.4 mm) in diameter, distributes the water produced by the treatment facilities to 11 supply zones (PAHO, 2013).

Sources of supply of water in the Grenadines include rainwater storage tanks from roof catchments – private and public; public concrete rainwater catchments; seasonal ponds and wells; water transfers from property to property; and transfers by sea from Saint Vincent. The latter is particularly the case during drought periods. A number of wells and boreholes exist in the larger Grenadine islands either for test purposes (under the Groundwater Management Programme) or as a source of freshwater for domestic use by residents or commercial entities. Recently, desalination as a source of potable water is being used as an adaptation measure to climate change and to

guarantee freshwater supplies to large hotels, other tourism investments and community residents.

Sewage System

Predominantly throughout SVG and the Grenadines, sewage treatment consists of septic tanks for collection and treatment and soak-away systems for disposal of effluent. However, in central Kingstown and a small area in Arnos Vale, there is a municipal sewerage system (UNEP-CEP/RCU, 2010). This system was constructed in the early 1970s and is approximately 5.8 km of PVC sewers ranging in size from 6 inches to 24 inches. All sewers feed to collection tanks on the sea front, which has a capacity of 54,000 gallons. The sewage is pumped out to sea via a 400mm PVC outfall (CDB, 2013).

Wastewater reuse is not widely practiced in SVG and could be attributed to the fact that there is limited national policies and guidelines, legislation, and regulations to guide and regulate wastewater reuse (GEF, 2017). Under the GEF Caribbean Regional Fund for Wastewater Management (CReW Project), the SVG Belle Isles Correctional Facility was a pilot of a wastewater treatment facility (GEF, 2017) unfortunately this project is yet to materialize.

Other Sanitation Practices and Hygiene

Sanitation Facilities options in SVG include flush toilet linked to sewer - 12%, flush toilet linked to septic tank - 57% and pit latrine - 30% (Poverty Assessment Report 2007/2009). The SDG VNR (2020) indicates that the proportion of population using managed sanitation services, including a hand washing facility with soap and water (2017) in the entire SVG is 93.8 percent, being 87.3 percent in the rural Saint Vincent, 99.9 in the urban Saint Vincent and 97.3 percent in the case of the Grenadines islands.

WASH in Shelters

Due to the nature of this hazard and the resulting need for many individuals to move into shelters, this baseline highlights the WASH situation in shelters. An assessment of the WASH capacity of shelters³⁶ was performed in May 2021 that highlights the capacities that exist including those capacities before the volcanic eruption, that is, the baseline. The following key points should be noted: none of the 14 designated shelters visited were adequately prepared to accommodate the evacuees according to SPHERE standards (<https://spherestandards.org/>); for instance, approximately 18% of shelters do not have 3 days of water storage capacities. Whilst 100% had flush toilets, only

81% has functional locks on toilets and 50% did not have sanitation bins in female toilets. Further, capacities of the shelter in terms of the number of toilets per person, it was found that only 1 of the shelters assessed had more than 20 persons per toilet.

Impact of COVID-19 in the WASH Sector

COVID-19 promotional activities have increased the numbers of hand washing stations at public and private entities, as well as, engendering a sense of good personal hand hygiene among the populace. This has resulted in an increased demand for water.

Table 1. Summary of the WASH infrastructure in St. Vincent

| Type of facilities | Number |
|---------------------------------------|--------|
| WASH | Public |
| Surface water supply systems | 12 |
| Water – catchments: raw water intakes | 17 |
| Drinking water systems | 12 |
| Water distribution network (Km) | 206 km |
| Public standpipes | 70 |
| Sewage line (km) | 5.8 |
| Total | |

Source: WASH Evaluation Team

3. Effects

Damage and Loss

Damage and loss experienced by the WASH sector as a consequence of La Soufrière volcanic eruption was relatively low, coming in at XCD 1.64 million, which represents approximately two percent of the total effects cost in the

infrastructure sector. Damage includes the cost for repairs such as rebuilding catchment areas, intake structures, pipework and damaged access roads while the cost associated with loss includes water service interruption, cleaning and ash removal activities, the use of trucks for delivering water to households, quality water testing to note a few.

³⁶ Survey of 83 shelters in 5 regions in the Green Zone. 8 shelters not assessed either because no one was occupying the shelter or because there were COVID cases present and the team did not enter the premises (WASH LAC Report, 2021)

Total effects³⁷ have been estimated at XCD 1.642 million with 8% or XCD 1.338 million corresponding to loss³⁸. Notable XCD 1.192 million or 89% of the losses were incurred by the public sector and XCD 0.146 million or 11%, being incurred by the private sector. The private sector loss is primarily related to the use of trucks to deliver water to the affected population. In terms of Damage³⁹, approximately XCD 0.305 million was estimated to have been incurred by the public sector with a detailed breakdown of the effects being seen in Table 2.

Three of the smaller water production system located in the North Eastern Section of the island in the very high volcanic hazard (red zone) and serving a small rural population (4500) of majority indigenous Garifuna population, are the only ones to suffer major structural damage and long-term water disruption. All, approximately 4,500, residents were safely evacuated to the south of the island prior to the explosive eruption and this area remains largely uninhabited with no customers to supply. The damages to these systems were caused primarily by the resultant lahars during heavy rainfalls after the explosive eruption of the volcano. The river catchment structures at these three sources were fully destroyed and major pipelines partially destroyed. Efforts to complete temporary repairs are still being hampered by the recurring lahars. An alternative source using an existing Borehole in the area has been identified as a priority for medium to long term development to replace the Sandy Bay and Owia Water supply systems.

The Hermitage, Perseverance and Jennings catchments are in the high hazard (orange) zone and are much larger facilities than those

in the “red zone” with a combined production of approximately one third of the nation’s water supply. These sources suffered major ash deposits, falling trees in the catchment and along access road creating major siltation problems at the catchment sites. Considerable resources of chainsaws and large labour forces were deployed to clear and clean roadways, treatment plant facilities and catchments sites. Ensuing lahars created by rainfall severely damaged access roads and even a bridge to the Perseverance treatment plant restricting vehicular access to that site.

The Majorca, Montreal, and Dallaway catchments are located in the Low and Moderate Hazard zones and as expected their primary concerns were with the ashfall and the deterioration of quality as a result. These systems were out of commission for an average of three days while the quality of the water was verified through local and international testing with the assistance of entities such as Pan American Health Organization, Caribbean Water and Waste Water Association, Caribbean Water and Sewerage Association and the International Atomic Energy Agency.

A recorded total of 437,805 gallons of water was distributed via trucking from 11 to 30 April 2021 with the trucks being paid for by various public and private entities. A pumping, disinfection and distribution operation was set up using generator and emergency lighting as it operated on average 18 hours per day initially. Relocation of people from the red and orange zones to the green and yellow zones causing a shift in water demand for individual water systems.

Interruption of the water services as a consequence of the eruption induced a lack of water to certain

³⁷ as per the PDNA methodology which includes cost of damage, forgone income and additional costs

³⁸ forgone income plus the additional costs to keep the service going

³⁹ cost to replace or rebuild infrastructure and physical assets in the WASH sector

parts of the population and inconsistent supply. According to data provided by CWSA, in the red zone, Fancy and Owia water supply systems (WSS) are still offline and loss due to the interruption of service is estimated at XCD 139,989 to date. Sandy Bay water supply system, which is also located in the red zone, was offline for 91 days, which caused a loss of production estimated at XCD 188,540. In the case of the WSS located in the orange zone:

Perseverance (35 days offline), Jennings (7 days offline) and Hermitage (7 days offline), the loss were estimated to be XCD 210,161, XCD 115,312 and XCD 74,398 respectively. The WSS Dallaway, Montreal and Majorca within the yellow and green zones experienced combined losses by interruption of production of XCD 174,205. See details in Table 2.

Table 2. Summary of the Effects in the WASH Sector

| Item | Damage (XCD) | | Loss (XCD) | |
|--|----------------|----------|------------------|----------------|
| | Public | Private | Public | Private |
| Damage | | | | |
| Red Zone. Water supply systems Fancy, Owia and Sandy Bay. Major Damaged to catchment area, Intake structures and pipework. Still very vulnerable from Lahars during heavy rains | 241,600 | | | |
| Orange Zone. Water supply systems Perseverance, Jenning and Hermitage. Damaged to access roads and a bridge. | 62,930 | | | |
| Loss | | | | |
| Red Zone. Water supply systems Fancy cleaning and ash removal | | | 72,480 | |
| Orange Zone. Water supply systems Perseverance, Jenning and Hermitage. Removal of fell trees blocking access to plant and Intake. Major Ash clean-up operation at plant and intake | | | 26,970 | |
| Loss in sale revenue by water service disruption Fancy WSS. | | | 54,825 | |
| Loss in sale revenue by water service disruption Owia WSS. | | | 85,164 | |
| Loss in sale revenue by water service disruption Sandy Bay WSS. | | | 188,540 | |
| Loss in sale revenue by water service disruption Perseverance WSS. | | | 210,161 | |
| Loss in sale revenue by water service disruption Jennings WSS. | | | 115,312 | |
| Loss in sale revenue by water service disruption Hermitage WSS. | | | 74,398 | |
| Loss in sale revenue by water service disruption Dallaway WSS. | | | 107,303 | |
| Loss in sale revenue by water service disruption Montreal WSS. | | | 24,831 | |
| Loss in sale revenue by water service disruption Majorca WSS. | | | 42,071 | |
| Loss by trucks delivering water; private and public, hired by and paid for by Various entities | | | 145,570 | 145,570 |
| Cost of Water quality test required | | | 30,000 | |
| Cleaning of chemical toilets in shelters | | | 14,400 | |
| TOTAL | 304,530 | - | 1,192,026 | 145,570 |

Source: WASH Evaluation Team

4. Linking the effects to the human impact

The volcanic eruption has caused the suspension and intermittence of the water supply as well as a reduction of consumption in existing home connections in several zones of St. Vincent, especially in the red and orange hazard zones. Drinking water transmission production and services provided by CWSA were interrupted inducing a lack of water to certain part of the population and inconsistent supply to a much larger proportion of the population. According to estimations of CWSA, in the red zone, 1,380 inhabitants remain offline from the water network and 2,713 inhabitants suffered 91 days of water interruption. In the case of the orange zone 6,241 inhabitants have undergone disruption in water services for about 35 days, while 25,000 inhabitants for 7 days. In the green and yellow hazard zones, the disruption of water services ranged from 1 to 3 days and impacted around 60,000 inhabitants. Temporary disruption/reduction of water supply in those areas can lead to an increase in the cost of water, forcing the population to reduce the water use in personal hygiene and in general, deprive the households on their basic living condition.

Relocation of people from the red and orange zones to the green and yellow zones caused a shift in water demand for the water systems in some areas. Extremely high usage from all coastal villages initially prevented water from reaching higher elevation inland villages as Stubbs, Carapan, Diamond State, Biabou, Cedars, Bridgetown, Reeves Level, South Union, Choice village, Lower Calder, Park Hill, South Rivers, Chester Cottage, Colonaire. Population displacement usually triggers the need for significant humanitarian efforts, and also brings about a negative change in the standard of living which reduces the quality of life of households, especially for those displaced from the red zone. Furthermore, change in the

population density and displacements increase pressure on water and sanitation infrastructure, which in turn increases the risks of disease in the host community and in shelters. This did not present favorable conditions during a pandemic.

Solid waste services were suspended to several zones and communities as CWSA collection trucks could not access communities due to ash blocking the transport infrastructure which of course increased the risk of disease along the affected communities.

Regarding the living conditions within shelters, as reported by Detailed Damage Sectoral Assessment report, most shelters that were assessed did not have sufficient running water to cover the needs of the population being housed. People used water from the sea and nearby streams to augment water for bathing, laundry and general hygiene. There is a need for increased resources to support WASH in shelters. In addition, it is very important to ensure the adequate supply of hygiene supplies (soap, hand sanitizer, masks) and cleaning supplies (brooms, mops, toilet brushes, disinfectant etc.) to the affected communities.

After testing by PAHO and UNICEF field operatives, the CWSA managers were briefed about the low residual chlorine in the pipe-borne water and delivery trucks, which can increase the risk of water-borne diseases among the population. However, this issue was addressed and the free chlorine residual level in the public supply system was increased and mostly reached the recommended 0.5 mg/L standard. A quick response means a reduction of human impacts caused by the disaster.

Given the existing linkages between livelihoods and water supply, prolonged disruption to water

and sanitation services can be expected to have a disproportionate impact on women and girls via the social costs incurred through the time and

energy spent collecting water, threat of violence and sexual harassment, diminished childcare, among others.

5. Recovery Needs and Strategy

This type of volcanic eruption generates large amounts of airborne particulate matter which adversely affects open water tanks and treatment systems supplied by surface water sources. Volcanic ash and gases can contaminate water sources. The population movement from evacuated zones will generate differing demand needs for WASH systems putting stresses on existing infrastructure.

The costs of the recovery needs are based on the identified damage and loss caused by the volcanic eruption. Table 3 shown below summaries those costs along with some of the relevant justifications and actions. The total needs amount to XCD 1,890,426, with XCD 365,436 required to cover the needs generated by the damage to physical infrastructure⁴⁰ and XCD 434,990 required to support the continuation of some of the activities related to recurring costs (loss) such as cleaning, testing of water and trucking of water.

Needs amounting to XCD 1,090,000 is required to foster improvements for the WASH sector to

improve its overall resilience to disasters in the future. Also notable is that CWSA has estimated the need for an additional XCD 5,500,000 to support the development of alternative water source to replace the existing Sandy Bay and Owia WSS. This budget is based on the use of an existing borehole. This cost is not included in Table 3 since discussions are now underway to concretize the plan.

The recovery needs prioritization matrix shown below grouped the cost of activities and interventions for the water, sanitation and hygiene sector in short, medium and long term. The short-term WASH needs are primarily related to restoring/repairing the water systems in the red and orange zones, maintaining water quality to acceptable WHO standards through testing and chlorination, the implementation of public education and awareness campaigns and the upgrade the system for the collection, monitoring and management of hydrological and other data on water resources.

⁴⁰ The recovery cost related to damage includes a **suggested** increase of 20% to account for all those improvements and modernizations of build back better concept. It allows increasing the resilience to future catastrophic events.

Table 3. Recovery Needs

| Item | Damage (XCD) | Loss | Justification. Needs coming from the analysis of effects and impacts. | Needs (XCD) |
|---|----------------|----------------|--|------------------|
| Damage | | | | |
| Red Zone - Water supply systems Fancy, Owia and Sandy Bay. Major Damaged to catchment area, Intake structures and pipework. Still very vulnerable from Lahars during heavy rains | 241,600 | | Repair damage to Fancy, Sandy Bay and Owia Water supply Systems. | 289,920 |
| Orange Zone - Water supply systems Perseverance, Jennings and Hermitage. Damaged to access roads and a bridge. | 62,930 | | Repair access to the affected water treatment plants and rejuvenate damaged upper watershed (forest area). | 75,516 |
| Loss | | | | |
| Red Zone. Water supply systems Fancy cleaning and ash removal | | 72,480 | cleaning | 72,480 |
| Orange Zone. Water supply systems Perseverance, Jennings and Hermitage. Removal of fell trees blocking access to plant and Intake. Major Ash clean-up operation at plant and intake | | 26,970 | cleaning | 26,970 |
| Loss by trucks delivering water; private and public, hired by and paid for by Various entities | | 291,140 | trucks delivering water continues | 291,140 |
| Cleaning of chemical toilets (portable potties) in shelters | | 14,400 | cleaning | 14,400 |
| Water quality test | | 30,000 | Water quality test continues | 30,000 |
| Increase of resilience | | | | |
| Increase the capacity for water trucking/distribution. Tanker (2 – Leeward and Windward): | | | | 600,000 |
| Improve household water storage capacities and promote awareness of rainwater harvesting technology. Educational campaigns | | | Improve local capacities | 100,000 |
| Improve capacities and knowledge for chemical and bacteriological water testing. Support national hygiene education and promotion | | | Improve local capacities | 60,000 |
| Develop national plumbing codes | | | Improve local capacities | 100,000 |
| Upgrade the system for the collection, monitoring and management of hydrological and other data on water resources. | | | Improve local capacities and facilities | 150,000 |
| Review and amend legislation regarding water supply and usage | | | Improve local capacities | 80,000 |
| Total | 304,530 | 434,990 | | 1,890,426 |

Source: WASH Evaluation Team

The medium to long term needs are more related to increase the capacity for water trucking/distribution, developing/enhancing the necessary legislation, codes and options for testing, storage and treatment of water. Thus, for short term, the cost of the recovery needs was estimated at XCD 659,080 (excluding the cost of the 5.5 million project), for intermediate actions XCD 551,346 and for long term, XCD 680,000.

As expected, the priority of the intervention (Table 4, column 5) is given to the repair/reconstruction actions and ash removal to the water supply systems located in the red zone, those are Fancy, Sandy Bay and Owia WSS and those located in the orange hazard zone, Perseverance, Jennings and Hermitage WSS. In addition, CWSA has estimated that in the red zone, 1,380 inhabitants are still offline from water network which increases the priority of intervention in the red zone.

Table 4. Recovery needs prioritization

| Intervention/Activity | Short Run* | Medium* | Long Run * | Priority | Comment | Cost (XCD) |
|--|------------|---------|------------|----------|-----------------------------------|------------|
| | | | | (1 a 5) | | |
| Damage | | | | | | |
| Repair damage to Fancy, Sandy Bay and Owia Water supply Systems. | 289,920 | | | 1 | red zone | 289,920 |
| Repair access to the affected (Perseverance, Jennings and Hermitage) water treatment plants and rejuvenate damaged upper watershed (forest area). | 45,310 | 30,206 | | 1 | Orange zone | 75,516 |
| Loss | | | | | | |
| Cleaning and ash removal from Fancy, Sandy Bay and OIWA WSS. | 72,480 | | | 1 | Red zone | 72,480 |
| Water supply systems Perseverance, Jennings and Hermitage. Removal of fell trees blocking access to plant and intake. Major Ash clean-up operation at plant and intake | 26,970 | | | 1 | Orange zone | 26,970 |
| Trucks delivering water; private and public, hired by and paid for by Various entities | | 291,140 | | 3 | Trucks delivering water continues | 291,140 |
| Cleaning of chemical toilets (portable pot-ties) in shelters | 14,400 | | | 1 | Shelters | 14,400 |
| Water quality test | 30,000 | | | 1 | Continue with tests | 30,000 |
| Increase of resilience | | | | | | |
| Increase the capacity for water trucking/distribution. Tanker (2 – Leeward and Windward): | | | 600,000 | 2 | | 600,000 |
| Improve household water storage capacities and promote awareness of rainwater harvesting technology. Educational campaigns | | 100,000 | | 1 | | 100,000 |

| | | | | | | |
|---|----------------|----------------|----------------|---|--|------------------|
| Improve capacities and knowledge for chemical and bacteriological water testing. Support national hygiene education and promotion | 30,000 | 30,000 | | 2 | | 60,000 |
| Develop national plumbing codes plus ash concerns | | 100,000 | | 3 | | 100,000 |
| Upgrade the system for the collection, monitoring and management of hydrological and other data on water resources. | 150,000 | | | 2 | | 150,000 |
| Review and amend legislation regarding plumbing, water supply and usage, including for wastewater reuse. | | | 80,000 | 3 | | 80,000 |
| TOTAL | 659,080 | 551,346 | 680,000 | | | 1,890,426 |

Source WASH Evaluation Team

6. Sources of information, references

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7. Annex

WASH sector evaluation team

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Electricity Sector

1. Summary

La Soufrière 2021 volcanic eruption did not cause significant damage/loss to the electricity sector of the country. In fact, the effects were very low in comparison to the ones felt in other economic sectors such as transport, housing or agriculture. The total cost of disaster effects in this sector was estimated in XCD 1.020 million being the lowest within the whole infrastructure sector and of which, XCD 0.108 million corresponding to damage and XCD 0.911 million specific to loss.

According to VINLEC and the Detailed Damage Sector Assessment (DDSA) report carried out by the Government of St. Vincent and the Grenadines and CDEMA, the most relevant damage from the volcanic eruption on the power system was caused by the accumulation of ashes on transmission, distributions lines and other equipment. The total cost of the damage was mainly due to faults of poles and repairs made in transmission and medium voltage distribution network within the un-evacuated and evacuated area on the island. In the determination of the loss, under the PDNA methodology, several factors were taken into consideration, including foregone incomes and additional costs generated by the disaster as cleaning, reductions of electricity generation and/or reductions of electricity sales, fluctuations in the electricity prices, increment of tariffs paid by the customers and reconnections, among others.

At the time of the report, the power network in the red zone is still inaccessible and therefore maintenance personnel cannot enter to restore the operation of the network. Fortunately, most of the relevant power generation stations are not

located in the red zone.

The Provision of electric services to 43,525 households was the main effect caused by the eruption. The event caused an island-wide blackout of approximately 4 hours, while in the North-East of the mainland St. Vincent, the power outage was sustained for almost 2 days affecting more than 9,000 households. At the time of preparing this report there were around 1,231 households located in the red zone that are still without electricity since April 9th, 2021. Furthermore, as reported by the housing sector, there are some houses with poor electrical installations highly vulnerable and likely to be damaged by ashfall.

Recovery needs in the electricity sector covers the costs to overcome the identified damage and loss generated by the disaster. The total recovery needs amount to XCD 1.2 million⁴¹ of which, XCD 0.131 million corresponds to needs of repair/reconstruction of physical assets and XCD 1.09 million to cover the loss. Note that 40 percent of the total recovery needs is associated to the provision of electric services to new developments as some houses in non-mitigable risk sites have to be re-located. This is the cost estimated to relocate 50 houses. However, this could range from XCD 0.5 million to XCD 3 million for 50 to 400 houses or more. The real number of houses will be guided by the housing sector and government authorities. In terms of prioritization and sequencing of recovery needs, the following breakdown has been suggested; XCD 0.344 million as short-run interventions, XCD 0.563 million for the interme-

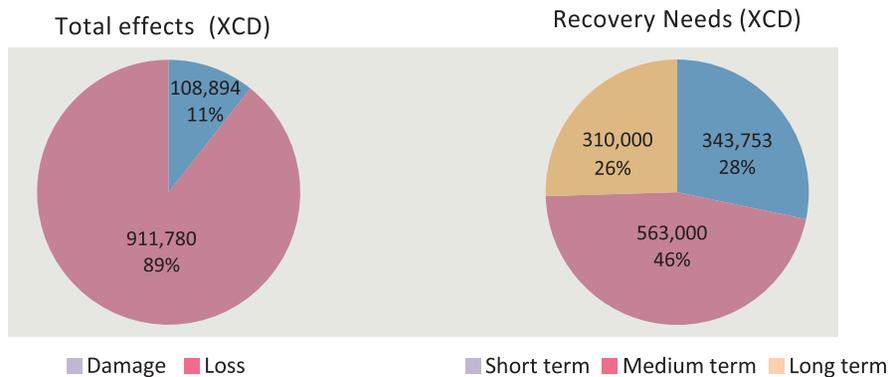
⁴¹ As discussed with VINLEC at report preparation, some of the damages to electricity components related to distribution lines in the north east of Saint Vincent were unable to be estimated given the inaccessibility to certain areas

mediate run and XCD 0.310 million for the long term. The most urgent interventions will include repair/reconstruction and ash removal on electrical facilities. The second one relates to repairing the grid in the affected zone as displaced population is moved back to their place of residence. Electrification of new development (relocation) sites, reconnection /Isolation of building and other customer services follow the priority order. Finally, the proposed interventions are based on the build back better principles, and therefore, the sector will seek to establish a resilient robust network to withstand geophysical and climate change hazards using the appropriate technology in vegetation management to protect the network. The

interventions proposed also include the strengthening of institutional capacities and improving knowledge and procedures with respect to legal contracts with users.

It was suggested the Infrastructure Sector Team Members that some of the recovery needs associated with improved knowledge and technical capacities in the sector could be incorporated/ overlapped with the ongoing project entitled: “St. Vincent and the Grenadines: Building Resilience of the Electricity Sector Infrastructure to Geophysical and Climate Related Hazards” managed by the Caribbean Development Bank, CDB.

Figure 1. Summary of effects and recovery needs



Source: Electricity Evaluation Team

2. Context or Sector Background

The Energy Unit and St. Vincent Electricity Services Ltd (VINLEC) are the major entities in the electric energy sector in St. Vincent and the Grenadines. The Energy Unit arose out of efforts to conserve energy, utilize indigenous resources and transform the 2008 oil crisis into opportunities for the state. They were charged with assisting the government with formulating and implementing policies related to energy and help coordinate specific renewable energy and energy-efficient projects. VINLEC is a state-owned registered company charged with

the responsibility of generating, transmitting, and distributing electricity throughout the state and operates generation, transmission, and distribution systems on St. Vincent and the Grenadines islands of Bequia, Canouan, Mayreau, and Union Island. There is however no interconnectivity between the electricity systems on the islands with the volcanic eruption and recent Hurricane Elsa only affecting the electric infrastructure on the island of St. Vincent.

Access to electricity

St. Vincent and the Grenadines have a population of approximately 110,000 persons of which ninety eight percent (98%) have access to these electricity networks. It is sometimes economic prohibitive to supply remote constructions and there are some within reach of the network who can't consistently or outright afford it. VINLEC serves a total of 46,000 customers (residential, industrial and commercial customers as per different tariff groups) of which almost 80 percent are located in the green hazard zone, 14 percent in the orange and yellow, and 6% were located in the red zone before the evacuation.

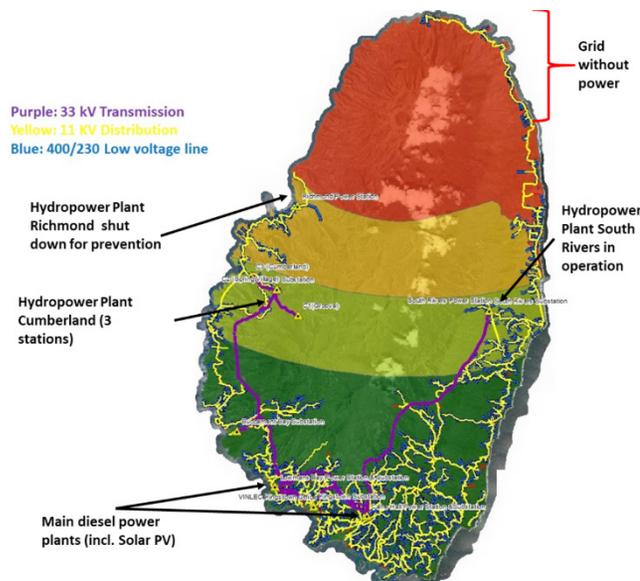
On-grid generation

The electricity generation system of St. Vincent and the Grenadines mainly consists of hydro, solar photovoltaic (PV) and diesel power plants. The installed capacity of generation is dominated by diesel technology, concentrating approximate the 80%. In the case of hydropower plants, they

account for 18% of the capacity of generation while the remaining 2% is covered by solar photovoltaic power plants. Figure 2 provides an overview of the location of the power stations (generation) with regards to the defined hazard zones of the volcanic eruption.

The Lowmans Bay diesel power plant has the largest production of electricity in St Vincent, producing approximately 82 GWH of energy in 2020 from an installed capacity of 17,400 kW. This represents 59% of the total island's production. The other diesel power plant is located in Cane Hall with an installed capacity of 12,540 kW producing around 23% of the electricity island-wide. The hydropower plants of South Rivers, Richmond and Cumberland together have an installed generation capacity of 5,650 kW, 900, 1,100 and 3,650 kW respectively; producing 16% of the island's energy. Finally, the three PV plants have an installed capacity of 224, 370 and 522 kWp respectively located in the Cane Hall, Lowmans Bay and in the Argyle International Airport. PV supplies 2% of the island's energy.

Figure 2. Geographic distribution of power network and stations in St. Vincent according to the hazard zones (source VINLEC-CDEMA/CARIELC)



Transmission network

Transmission is done at the 33KV voltage level via 8 circuits with lines of a total distance of 50Km connecting Eight (8) substations. Six of them are located at power stations, the main one is in capital Kingstown and the smallest (8th) feeds a hotel resort at Buccament. The transmission network is constructed on 50-foot class 2-foot wooden poles with single metal towers at five substations. Figure 2 shows an overview of the power network, transmission, medium and low voltage distribution with regards to the volcanic hazard zones and Figure 3, panel a, shows a summary of the meters, poles, streetlights, transformers, and stretches belonging to the transmission and distribution network of mainland St. Vincent.

Distribution

Primary distribution is achieved through 53 miles of lines at the 11 kV level with 17 radial feeders imitating from the substations with the possibility of interconnecting them for flexibility. There is an additional feeder that connects the Richmond hydro station to the Cumberland 3 substation and

the 19th one feeds the villages north of South Rivers power stations. Secondary distribution is at the 400 V three-phase and 230 V single phase via 242 miles of a conductor. There are 1100 distribution transformer points spread across the islands. The network is constructed on 35 and 45 class 5-, and 3-foot wooden poles respectively for the different voltage levels. There is one metal tower at South Rivers. Figure 3, panel b, shows a summary of powerline network belonging to the transmission and distribution network of mainland St. Vincent classified according to the volcano hazard zone.

Table 1 summarizes the most important components and facilities conforming the electrical sector of Saint Vincent and the Grenadines

Off-grid electricity services

There is believed to be less than 50 off-grid systems on the islands served by VINLEC. These would be homes situated in remote areas taking advantage of the reducing cost of PV and micro-wind generation. The biggest off-grid systems being two resorts on the island of Canouan.

Figure 3. Summary of the Transmission and Distribution Network of SVG by Volcanic Hazard zone

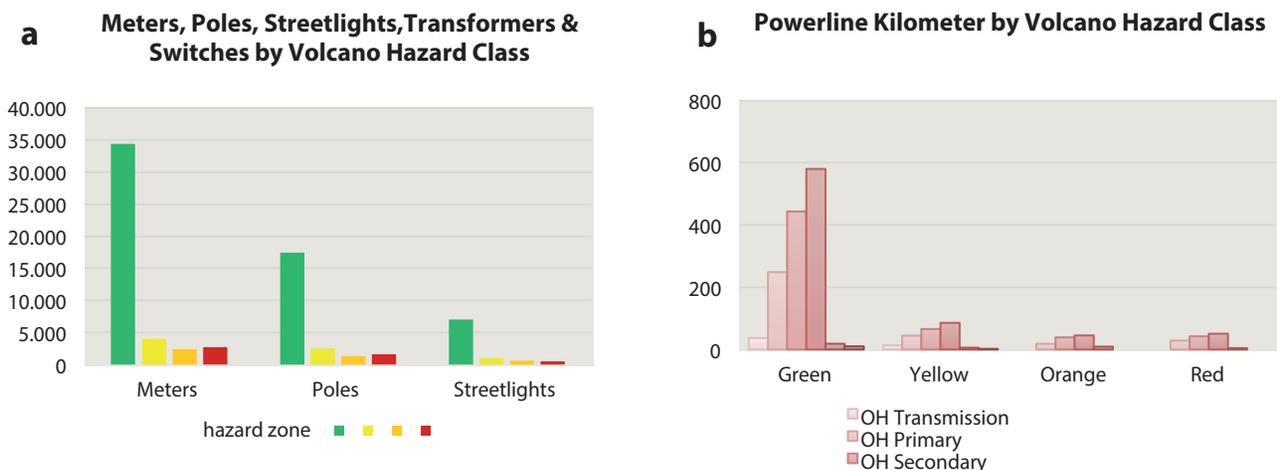


Table 1. Summary of Electrical Facilities in Saint Vincent

| Type of facilities | Number/Longitude |
|--|------------------|
| Electricity | Public |
| Hydropower Plants | 3 |
| Solar Plants | 3 ⁴¹ |
| Diesel Plants | 2 |
| 33 KV Transmission (Km) | 50 |
| 11 KV Distribution (Km) | 378 |
| 400/230 Distribution low voltage line (km) | 1,363 |
| Substation - 33 KV | 8 |
| Substation – 11 KV | 7 |
| Meters-set | 44,000 |
| Distribution poles | 26,000 |
| 33/11 kV distribution transformer-set | 9 |
| 11/0.4 kV distribution transformer-set | 1061 |

Source: Electricity Evaluation

Impact of COVID-19 in the Electricity Sector

PPEs and social distancing increase in work hours lost due to persons being sick or while test results were pending. It generates needs of installation of structures to accommodate sanitization. Furthermore, reduced productivity caused by people not being able to work in close proximity, work rotation, reduced work hours, delays on

project implementation and supplies, trigger concessions/ moratorium to affected customers. Additionally, there is an impact on demand and payments/receivables due to economic downturn in all sectors. The pandemic also generates delays in scheduling maintenance work given that it is difficult to take out lines for maintenance because of home schooling and the amount of people working from home.

3. Assessment of Disaster effects

The total effects as a consequence of La Soufriere 2021 volcanic eruption have been relatively low in the electricity sector as compared with those experienced by the transport sector, the most

affected infrastructure sector. The cost of the disaster for the electricity sector is estimated to be XCD 1,020,674.00 being XCD 108,894.00 attributed to damage and XCD 911,780.00 to losses.

⁴² This includes only the utility-scale power plants. There is an additional number of grid-connected, customer-

Damage

According to VINLEC and the Detailed Damage Sector Assessment (DDSA) report carried out by the Government of St. Vincent and the Grenadines and CDEMA/CARILEC, the most relevant effects from the volcanic eruption on the power system in St. Vincent was caused by the accumulation of ashes on transmission, distributions lines and other equipment. This ash accumulation combines with moisture forms a conductive layer that can cause short circuits and outages with the most important physical damages on electricity infrastructure being observed in the first days after the volcanic eruption. Strong ash falls in combination with heavy precipitation during the weekend of April 10 - April 11, 2021 was the most relevant cause of the observed effects. Several poles, insulator pins, insulators and connection lines were damaged on relevant transmission and medium voltage distribution lines, causing an island-wide outage for several hours. In certain areas of the island, the outages lasted days and at the time of generating this report there are customers in the red zone without power service.

In case of the Grenadine islands, electricity is mainly generated by individual power networks which, in fact, are not connected to each other. Fortunately, no damage and electricity outages were reported on the Grenadines.

In the red zone, just the communities located at the north-east coast are connected to the power network through medium and low voltage distribution lines. As reported by VINLEC, these parts of the power network are currently not in operation, due to damages occurred during the first eruption and to the shortfall of customers from evacuation. Currently, the power network in the red zone is still inaccessible and maintenance

personnel cannot enter to restore the operation of the network. Fortunately, the majority of the relevant power generation stations are not located in the red zone.

The total cost of the damage caused by the disaster amounts to XCD 108,894.00 mainly due to faults of poles and repair made in transmission and medium voltage distribution system (Table 2) network within the un-evacuated and evacuated area on the island. VINLEC however replaced/ repaired most of those components by the VINLEC line worker teams within the following 1-2 days after the reporting of the respective incidents. Table 2 summaries the costs of damages.

Some of the damages to electricity components related to distribution lines in the north east of Saint Vincent were not able to be estimated given the inaccessibility to certain zones.

Losses

The loss component of the Post Disaster Needs Assessment (PDNA) accounts for foregone incomes and additional expenses generated by the disaster to the electricity sector. In this case, it was considered the cost associated to cleaning, reduction of electricity generation and/ or reductions of electricity sales, fluctuations in the electricity prices, increment of tariffs paid by the customers and reconnection between others. The total loss estimated in the electricity sector is estimated at XCD 911,780.00 with Table 2 summaries the list of losses.

Although the power stations did not suffer physical damage as a consequence of the eruption, the presence of volcanic ashfall in the Power Station (PS) facilities made necessary extra work related to cleaning/clearing of the compound, equipment,

headworks, and vegetation. In addition, it was necessary to pay the salaries to workers which performed all those tasks. The Richmond and the Lowmans Bay power stations required more work with approximate expenses being XCD 21,021.00 and XCD 26,675.00 respectively. In order to ensure proper operation of the most power stations after the volcanic eruption, Cumberland PS, South Rivers PS, and Cane Hall PS also required extra work and maintenance interventions. Thus, the total cost associated with losses in all PS reaches XCD 80,525.00. Furthermore, it was necessary for the installation of electrical infrastructures to provide electricity to the facility of the WFP located at the old E.T Joshua airport tarmac. The installation of those facilities implied material, labor and others works had an estimated cost of XCD 34,692.00.

To reduce the impact to the volcanic disaster on the population of most affected zones, 1,068 and 2,762 electrical bill debts of customers were forgiven in the red and orange zones respectively, whose costs amount to XCD 154,000.00 and XCD 376,100.00 respectively. Although these debts forgiveness alleviate the burden on households, it increases the financing responsibilities of the state.

Other consequence of the disaster was that in some regions, meter readers were unable to work as a result of ashfall due to the volcanic eruption. In addition, VINLEC also provided food packages and other items for evacuees in shelters with a cost amount to XCD 21,700.00.

The eruption also caused sustained power outages which affected SVG's households in different scales depending on their location. Most important outages took place between April 10 and April 15, and even some continuing to this day. According to VINLEC and CDEMA/CARILEC report, 43,525 customers suffered a power outage for around 4 hours; 9,502 customers for 40 hours

and 1,231, located in the red zone, still have no electricity from April 9th, 2021. Damage to the network increased from the action of Lahars on pole infrastructure in the area and more recently Hurricane Elsa. The estimated loss in electricity sales to date has reached approximately four million units at XCD 0.77, including fuel surcharge. Subsequently, the foregone incomes by sales have been estimated as XCD 219,000.00, considering an operating profit margin of 8.42 percent (2020 profit margin).

Increase of electricity tariff: As described in the CDEMA/CARILEC DDSA report, hydropower and solar PV are currently the most cost-efficient types of electricity generation in St. Vincent. A high share of generation from these technologies contributes to lowering the total cost of electricity generation per delivered kWh and thus to lower the customer tariffs accordingly. The total generation cost per kWh changed after the volcanic eruptions from XCD 0.44 to XCD 0.48 per kWh, which represents an increase of 9.5%. The cost composition of the generation costs is quite a dynamic process, that not only depends here on the volcanic eruptions but also on fuel price trends (diesel), availability of water flow and weather conditions (cloud cover). The mentioned calculation presents only a snapshot of the moment and should be subject to long term monitoring and revision. Both, hydropower and PV generation have been impacted by the volcanic eruption and the weather events from April 10 to April 12, due to the need for preventive shutdowns (hydropower plants Richmond and Cumberland) and due to the reduced solar radiation caused by ash falls and heavy cloud cover (solar power plants). The customer tariffs could range between XCD 0.74 to XCD 0.86 including taxation. Maximum increase of customer tariffs has been estimated by CARILEC up to 8% in the worst future scenario as consequence of the volcanic eruption.

Effect in water service. Most of the water supply system in St. Vincent is gravity fed with surface water, electricity is not needed to assure the transport of the water supply to the population. Disinfection, sedimentation and filtration processes do not also require a significant amount of electricity. The water treatment facilities usually have the possibility to provide a minimum level of electricity supply during outages of the power networks through own emergency backup generators. However, there is a need to assure the water supply in more elevated areas. In times of low pressure through low discharge rates and limited availability of water, the system does not provide enough pressure to supply these zones. Therefore, as mentioned in CDEMA/CARILEC DDSA report, the representatives of the Energy Unit recommended investigating the possibility to ensure the supply of elevated storage tanks in such areas with individual solar pumps.

Increased risk - Hurricane Elsa. The effects of the volcanic eruption have been compounded with the impact of the Hurricane Elsa mainly

causing lahars which can caused damage to the electrical infrastructure. In fact, the damage to the T&D network in the north east zone of the St. Vincent has increased. In addition, the damage to roads and bridges is preventing access to do maintenance/restoration of the power network.

The direct damages and losses suffered by the electricity utility might not be much but the impact and losses to the customers are difficult to quantify especially in this area of home schooling and distance learning, telecommuting social distancing, use of social media, the proliferation of computer technology, cottage industry and considering home refrigerated medication to name a few. While it may not cost much to reinstate the network it is important to build its resilience to geophysical and climate change hazards to sustain livelihood and ease the human burden during and following an event and also with the ability to bounce back quicker. Seeing that we serve customers where they are it is important for them to be located outside the direct path of foreseeable tragedy.

Table 2. Summary of Damage and Losses

| Item | Damage (XCD) | | Loss (XCD) | |
|---|-------------------|----------|-------------------|----------|
| | Public | Private | Public | Private |
| Damage | | | | |
| Primary distribution - broken insulator pin | 922 | | | |
| Transmission - Burnt pole structure | 14,924 | | | |
| Primary distribution - Burnt pole structure | 3,862 | | | |
| Primary distribution - burnt pole top | 3,158 | | | |
| Primary distribution - Burnt cross arm | 1,388 | | | |
| Primary distribution - Damaged insulator pin and insulator | 684 | | | |
| Primary distribution - Damaged insulator pin and insulator | 956 | | | |
| Repair and reenergize damaged sections and components of the network within the un-evacuated area on the island | 45,000 | | | |
| Network repair to return power to critical infrastructure within the evacuated zone. | 38,000 | | | |
| Losses | | | | |
| Richmond PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | | 21,021 | |
| Cumberland PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | | 16,834 | |
| South Rivers PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | | 1,500 | |
| Lowmans Bay PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | | 26,676 | |
| Cane Hall PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | | 3,500 | |
| Miscellaneous | | | 10,995 | |
| Reconnection /Isolation of building and other customer services issues | | | 10,000 | |
| Reroute, disconnect and Clean-up sections of network in the none return zones | | | 10,000 | |
| installation of the electrical infrastructures to provide electricity to the facility of the WFP located at the old E.T Joshua airport tarmac | | | 34,693 | |
| Debt forgiveness to customers red zone | | | 153,566 | |
| Debt forgiveness to customers orange zone | | | 376,134 | |
| Meter readers were unable to work as a result of ashfall | | | 6,168 | |
| cost associated with food packages and other items for evacuees in shelters | | | 21,693 | |
| Loss of sales revenue (yellow, orange and red zone) -electricity | | | 219,000 | |
| TOTAL | 108,894.00 | - | 911,780.00 | - |

Source: Electricity Evaluation Team

Linking the effects to the human impact

About 43,525 households were directly affected by the volcanic eruption in the form of loss of electricity services. The event caused an island-wide blackout of approximately 4 hours, while in the North-East of the mainland St. Vincent, the power outage was sustained by almost 2 days affecting more than 9,000 households. Unfortunately, as reported by VINLEC, there are around 1,231 households located in the red zone that still have no electricity from April 9th, 2021. Furthermore, the housing sector report notes houses that have poor electrical installations are highly vulnerable to be damaged by ashfall.

Power outages has affected household especially in this area of home schooling and distance learning, telecommuting social distancing, use of social media, the proliferation of computer technology, cottage industry and considering home refrigerated medication. Loss of access to electricity has a direct bearing on people's ability to derive their livelihoods and generate income given that economic activities such as commerce, industrial production, services, etc. are limited.

The volcanic eruption has shown some needs of relocating electrical facilities in certain zones with

the current location of some facilities in the red and orange zones making them vulnerable to the population to the effect and impacts of volcanic eruption. Population living in those zones are more prone to temporary decline and deterioration of livelihoods, employment, and income, temporary increases in poverty.

Increase of electricity tariff could affect all population of SVG. As pointed out by CARILEC/CDEMA, Volcanic eruptions can lead a temporal closure of Hydropower and solar PV stations, which currently are the most cost-effective types of electricity generation. Further reduction of generation from the currently installed hydro and solar power plants may lead to an increase of electricity generation costs up to XCD 0.50 per kWh (13.3% increase) in the future, raising the cost of basic services for SV's users.

Loss of power can also have a negative impact on women who use electricity for household work and productive activities. Lighting works as a deterrent to violence, and in the absence of a steady power supply the population, especially women may face an added risk of violence.

Recovery Needs and Strategy

In the PDNA methodology, the recovery needs in the electricity sector cover the costs to overcome the identified damages and losses generated by the La Soufriere volcanic eruption as well as the cost of increase the resilience against future hazard events. The total recovery needs amount to XCD 1.216 million of which, XCD 0.130 million corresponds to needs of repair/reconstruction of physical assets and XCD 1.086 million to account the losses for cleaning of equipment, headworks,

salaries to workers and reconnections, as well as actions in favour of the DRR and the build back better concept. The recovery cost related to damage includes a suggested increase of 20% to account for improvements and modernizations with Table 3 presenting in detail the most relevant needs in the electricity sector. Note in table 3 that debts forgiveness to customers and loss in sales revenue are not part of the recovery needs budget given that they are lost incomes and not

costs to cover. It is important to mention that the electrification of new development as houses located in non-mitigable risk sites is the recovery needs which encompasses more that 40 percent of the total recovery cost.

Table 3. Recovery Needs

| Item | Damage (XCD) | Loss (XCD) | Justification. Needs | Needs (XCD) |
|---|--------------|------------|-------------------------------|-------------|
| Damage | | | | |
| Transmission and distribution network: broken pole, insulator and insulator pin | 25,894 | | repair/change w/ improvements | 31,073 |
| Repair and reenergize damaged sections and components of the network within the un-evacuated area on the island | 45,000 | | Repair w/improvements | 54,000 |
| Network repair to return power to critical infrastructure within the evacuated zone. | 38,000 | | Repair w/improvements | 45,600 |
| Losses | | | | |
| Richmond PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | 21,021 | cleaning | 21,021 |
| Cumberland PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | 16,834 | cleaning | 16,834 |
| South Rivers PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | 1,500 | cleaning | 1,500 |
| Lowmans Bay PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | 26,676 | cleaning | 26,676 |
| Cane Hall PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | | 3,500 | cleaning | 3,500 |
| Miscellaneous | | 10,995 | | 10,995 |
| Preparation of grid in affected zone for the return of residence. | | 38,000 | | 38,000 |
| Energize areas as satisfactory conditions permit | | 80,000 | | 80,000 |
| Reconnection /isolation of building and other customer services issues | | 20,000 | reconnection | 20,000 |
| Reroute, disconnect and Clean-up sections of network in the none return zones | | 20,000 | reroute/clean-up | 20,000 |
| installation of the electrical infrastructures to provide electricity to the facility of the WFP located at the old E.T Joshua airport tarmac | | 34,693 | installation | 34,693 |

| | | | | |
|--|-------------------|-------------------|---|---------------------|
| Meter readers were unable to work as a result of ashfall | | 6,168 | repair | 6,168 |
| Cost associated with food packages and other items for evacuees in shelters | | 21,693 | | 21,693 |
| Improvements, more resilience and built back better | | | | |
| Electrification of new development (relocation) site | | | Estimate for relocation of fifty houses. Number of houses might be more depending housing sector and governmental authorities | 500,000 |
| Procure appropriate equipment to wash Electric lines and substation | | | | 5,000 |
| Apply appropriate technology to vegetation management plan to protect network | | | | 160,000 |
| Strengthen institutional knowledge and procedures on pole loading calculations | | | | 80,000 |
| Strengthen legal contracts with joint pole users | | | Reduce the vulnerabilities of the network | 40,000 |
| TOTAL | 108,894.00 | 301,080.00 | | 1,216,753.00 |

Source: Electricity Evaluation Team

The recovery needs prioritization matrix shown below (Table 4) grouped the cost of activities and interventions for the electricity sector in short, medium and long term. Thus, for short term, the cost of the recovery needs was estimated as XCD 343,750.00; for intermediate actions XCD 563,000.00 and for long term, XCD 310,000.00. According to the defined priorities, as expected, the first interventions to undertake are related to repair/reconstruction actions and ash removal on electrical facilities. The second ones relate to repairing the affected grid in preparing for the return of residence. The electrification of new development (relocation) site, reconnection /

Isolation of building and other customer services follow in the priority order. Finally, the last actions to execute seek to provide a resilient robust network against geophysical and climate change hazards by means of the application of appropriate technology to vegetation management plan to protect the network, strengthen the institutional knowledge, procedures and the legal contracts with users. As part of this resilient network, it is proposed that for the long term to use mini grids and underground lines to provide a much better protection again volcanic eruption and in general to natural disasters. (EU is funding a similar activity in Dominica for better resilience to hurricanes).

Table 4. Recovery needs prioritization

| Intervention/Activity | Short Run | Medium Run | Long Run | Priority (1 a 5) | Comment | Cost (XCD) |
|---|-----------|------------|----------|---------------------|---|------------|
| | | | | | | |
| Damage | | | | | | |
| Repair/change pole, insulator and insulator pin of transmission and distribution network | 31,073 | | | 1 | | 31,073 |
| Repair and reenergize damaged sections and components of the network within the un-evacuated area on the island | 54,000 | | | 1 | Areas beyond in the occupied zone were isolated from the network | 54,000 |
| Network repair to return power to critical infrastructure within the evacuated zone. | 45,600 | | | 1 | Multiple times. None critical loads disconnected | 45,600 |
| Losses | | | | | | |
| Richmond PS. Cleaning of the compounds, equipment, headworks, salaries to workers | 21,021 | | | 1 | | 21,021 |
| Cumberland PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | 16,834 | | | 1 | | 16,834 |
| South Rivers PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | 1,500 | | | 1 | | 1,500 |
| Lowmans Bay PS. Cleaning, clearing of the compounds, equipment, headworks, salaries to workers | 26,676 | | | 1 | | 26,676 |
| Cane Hall PS. Cleaning of the compounds, equipment, headworks, salaries to workers | 3,500 | | | 1 | | 3,500 |
| Miscellaneous | 10,995 | | | 2 | | 10,995 |
| Preparation of grid in affected zone for the return of residence. | | 38,000 | | 2 | Isolation guided by Electrical Inspectorate. Several trips as road clears | 38,000 |
| Energize areas as satisfactory conditions permit | 40,000 | 40,000 | | 3 | | 80,000 |
| Reconnection /Isolation of building and other customer services issues | 10,000 | 10,000 | | 3 | | 20,000 |

| | | | | | | |
|---|-------------------|-------------------|-------------------|---|---|---------------------|
| Reroute, disconnect and Clean-up sections of network in the none return zones | | 10,000 | 10,000 | 5 | Depends on the extent of the restrictions | 20,000 |
| Installation of the electrical infrastructures to provide electricity to the facility of the WFP located at the old E.T Joshua airport tarmac | 34,693 | | | 3 | | 34,693 |
| Repair/reestablish meter readers not working as result of ashfall | 6,168 | | | 2 | | 6,168 |
| Cost associated with food packages and other items for evacuees in shelters | 21,693 | | | 1 | | 21,693 |
| Improvements, more resilience and built back better | | | | | | |
| Electrification of new development (relocation) site | 20,000 | 340,000 | 140,000 | 3 | Estimate for relocation of fifty houses. Number of houses might be more depending housing sector and governmental authorities | 500,000 |
| Procure appropriate equipment to wash Electric lines and substation | | 5,000 | | 5 | | 5,000 |
| Apply appropriate technology to vegetation management plan to protect network | | 120,000 | 40,000 | 4 | | 160,000 |
| Strengthen institutional knowledge and procedures on pole loading calculations | | | 80,000 | 5 | | 80,000 |
| Strengthen legal contracts with joint pole users | | | 40,000 | 5 | This will help reduce the vulnerabilities that the network is placed under thus increasing network reliability | 40,000 |
| TOTAL | 343,753.00 | 563,000.00 | 310,000.00 | | | 1,216,753.00 |

Source: Electricity Evaluation Team

Complementary to the recovery needs prioritization matrix, VINLEC provided a list of activities to execute as a guideline of the recovery strategies.

Short-term

To address immediate safety concerns and the needs of customers and Vincentians:

- Repair damages and restore power to the network in the un-evacuated zone. (In response to tracking, burnt pole hardware and effects of vegetation).
- Install critical electrical infrastructures to support relief efforts and people livelihood example: assist in electrifying Arnos Vale World Food Program relief hub
- Business continuity
 - Cover critical equipment from ash and Install filters on air aspirated equipment
 - Clean up ash at work sites; offices and power stations
 - Resume hydro generation at sites located on the fringes of the evacuated areas
- Reinstate power to critical infrastructure in the red zone, example:
 - Communication towers
 - Seismic monitoring stations
 - Police stations
- Fix faults on the network in readiness for the return of the villagers. Assistance is been received from NEMO (safety advice), the Government Electrical inspectorate office (property connection safety) and the agency with responsibility for roads (BRAGSA) for access.

- To fulfill corporate responsibility:
 - Moratorium on billing to persons in the evacuated areas,
 - Relief packages to evacuees in the early days of the dislocation.
 - Assistance to aid in the repair of damaged electrical circuits of homes in the red zone.

Medium-term

To cater for the electrical needs of people in the red zone and refocus on the maintenance necessary to limit damage to the electrical infrastructure.

- Rethink /adjust network design to protect electrical infrastructure that might be in the path of disruptive flows linked to the volcanic eruptions. The involvement of VINLEC will be impacted by the extent to which affected villages are resettled. Should the area be resettled, the focus could involve:
 - Knowledge of no or limited settlement zones, designing networks around the buildings that are permitted.
 - Salvaging and cleanup of unwanted electrical network infrastructure.

If the wholes village is relocated, then:

- line extension designs would be done in the medium term to electrify the buildings that would be at the new location.
- Observe vegetation growth along the line routes and manage their growth to limit the possibility of them shorting lines and causing outages when inundated with ash, wind or and rain.
- Procure specialized equipment to aid the washing of outdoors substation

Long-term

- To have a resilient robust network against geophysical and climate change hazards. Proper location, design and construction and adhering to established standards while expanding the network in the future would be important.
- Expand network to electrify the new housing area if the decision is made to relocate affected sections of the society.
- To have an effective monitoring and maintenance program in place that ensures the continued reliability of the network (its readiness to withstand the ravishes of these natural disasters).
- Use GIS and computer technology to develop, model, track and control vegetation growth so that the weight of ash and the effects of weather cannot use them to down power lines and cause outages. This would be more effective than patrol and priority maintenance schedule.
- Improve contracts to encourages joint pole users to take responsibility for maintaining the network standards or bear the cost to have it done (pole loading, vegetation growth and sagging in the path of Traffic)
- Enhance modeling and design of the network nodes and review of network standards.
- Promote community awareness of safety standards and disaster risk reduction and build a culture of resilience at the community level.

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Half a page

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Annex

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Cross- Cutting Sectors



Disaster Risk Reduction

1. Summary

St. Vincent and the Grenadines is one of the most vulnerable countries to natural hazards in the Eastern Caribbean. The country was classified by the World Bank in 2006 as among the top five most vulnerable countries to disasters, as it is susceptible to hurricanes, flooding, landslides, drought, earthquakes (both tectonic and volcanic), tsunamis and volcanic eruptions. In addition to the island's topography, damaged infrastructure has been a key challenge to reducing vulnerability to disasters. While natural hazards and Disaster Risk Reduction (DRR) considerations have been incorporated into infrastructure design and construction, these are mainly at the infancy stage.

An assessment of the impact on the volcano on the sectors was undertaken under the Disaster Risk Reduction (DRR) lens using four themes: 1) Coordination; 2) Resilient Pathways 3) Early Warning Systems and 4) Evacuation. A key observation is that the initial effusive eruption phase of the volcano provided sufficient time for national authorities to heighten public education and messaging on the potential scenarios for the volcano as well as update national plans.

Recovery needs in the sector were estimated based on the analysis of the damage and loss identified under the productive, social and infrastructure sectors with the concept of building back better being applied to counteract not only the damage caused by the volcanic ash fall but also to build resilience against any future catastrophic events. Total recovery needs equates to XCD 2.3 million represented by XCD 0.231 million in the short term and XCD 2.144 million in the intermediate period. In the short term recovery needs are tied to the national DRR plan update based on lessons learnt from the volcanic event and the continued maintenance of the seismic monitoring network. In the intermediate term, recovery needs includes updated risk and vulnerability assessments, DRM legislative review, training, and enhancing the information and EWS network on the island. The cost related to enhancing of the information and EWS network on the island represents 82% of the overall recovery needs identified. Based on data available at the time of report development cost estimates are included for only some of the proposed recovery interventions. Total recovery needs under the sector are likely to be higher once full estimates are provided.

Table 1: Recovery Needs

| | Short (XCD) | Intermediate (XCD) | Long Term (XCD) | Total (XCD) |
|-----------|-------------|--------------------|-----------------|--------------|
| TOTAL XCD | 231,166.52 | 2,144,098.51 | | 2,375,265.03 |

Source: DRR Evaluation Team

2. Context or Sector Background

Extreme weather events such as tropical storms, and in particular hurricanes, have been responsible for much of the disaster-related devastation that has occurred in St Vincent and the Grenadines. SVG has been affected by 14 hurricanes and storms between 1900 and 2013. La Soufriere, the active volcano on mainland St. Vincent, occupies much of the island's northern end; it is 1,234 metres high and has an open summit crater 1.6 km in diameter. Soufriere has recorded eruptions in recent history in 1718, 1812, 1902, 1971 and 1979. It is considered a relatively young volcano, and likely to erupt in the future with either effusive or violent explosive eruptions. A volcanic hazard zone map has been previously created dividing the island into four distinct zones represented by:

- Zone 1 (Red) – Very high hazard risk
- Zone 2 (Orange) – High hazard risk
- Zone 3 (Yellow) – Moderate hazard risk
- Zone 4 (Green) – Low hazard risk

Coordination and Resilient Pathways

The National Emergency and Disaster Management Act Chapter 388 of the Laws of St. Vincent and the Grenadines (Act No. 15 of 2006) and the Emergency Powers Act No. 45 of 1970 form the legislative basis for disaster risk management programmes and activities within all levels of Government in SVG. One of the key structures outlined in the National Emergency and

Disaster Management Act is the establishment of the NEMO, which consists of the

- 1) National Emergency Council – Chaired by the Prime Minister and is composed of Ministers, permanent secretaries, district representatives and key ex-officio members from government agencies, corporations, businesses and non-governmental organizations
- 2) National Emergency Executive Committee - is responsible for developing a strategic Policy Framework and monitors its progress and provides the technical implementation supervision required on behalf of the national council
- 3) NEMO Secretariat – Operationalisation of the Act
- 4) National Emergency Operations Centre - The NEMO is to function as the headquarters for activities undertaken in response to a disaster, and establishes and maintains supplementary Emergency Operations Centres (EOCs)
- 5) District/Local Disaster Management Committees - function at the local level and operate to implement planning and disaster response operations in their respective districts.

Additionally, the National Volcano Emergency Plan (updated February 2021), the National Emergency Management Operations Centre Multi-Hazard

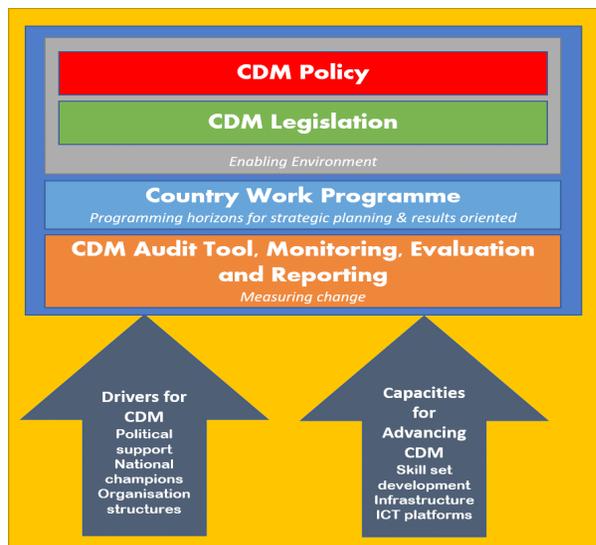
Standard Operating Procedures (updated April 2021) provides an updated planning instrument for coordination of the emergency events.

SVG as a CARICOM member state and a Participating State of the Caribbean Disaster Emergency Management Agency (CDEMA) embraces a Comprehensive Disaster Management (CDM) approach in the implementation of the disaster risk management (DRM) agenda. CDM recognizes the critical link between disaster management and sustainable development and the need for critical consideration of DRM in development planning and decision-making processes. The CDM BluePrint is being advanced in SVG with the development of the CDM Policy and the CDM Legislation. The national disaster management policy is congruent with the disaster legislation and provides relevant Ministers with sufficient authority to lead the sector to CDM. The CDM Audit which provides an assessment of the progress in country against CDM standards in mitigation, preparedness, response and recovery was applied in 2018 with a Country Work Programme (CWP) for the period 2020-2024 using a RBM approach currently being finalized.

As a CARICOM Member State, SVG is only in the initial stages of the implementation of the Resilience Pathway to the Comprehensive Disaster Management Strategy 2014 – 2024 agreed by the Caribbean Community in 2018. The framework focuses on five (5) pillars of Resilience which are (I) Social Protection for the Marginal and Most Vulnerable, (II) Enhancing Economic Opportunity (III) Safeguarding Infrastructure (IV) Environmental Protection (V) Operational Readiness and Recovery.

Early Warning Systems

In St. Vincent and the Grenadines, there is widespread acknowledgement of the need for a people centered end-to-end Multi-Hazard Early Warning System to provide timely alerts to the population given the vulnerability/exposure of the island to multiple hazards. NEMO has worked closely with the St. Vincent and the Grenadines Meteorological Services to enhance and disseminate early warning information for hazard events using the Common Alerting Protocol (CAP), since 2017, to complement warning messages disseminated via traditional and social media. In 2018 Sustainability dialogues and Interventions for Institutionalizing and Advancing Multi-Hazard Early Warning Systems (EWS) in St Vincent and the Grenadines were convened to provide the forum to examine opportunities and interventions on early warning and concrete actions to strengthen multi hazard early warning systems on the island. Presently, monitoring of the La Soufrière volcano is carried out by the Seismic Research Centre (SRC) of the University of the West Indies based in Trinidad and Tobago assisted by the Soufrière Monitoring Unit of NEMO. The monitoring network before the volcanic eruption consisted of seven seismic and two GPS stations and noting the heightened activity from the Volcano since December 2020 the SRC deployed personnel to install the additional equipment and provide on



the ground monitoring and advice to national authorities. This team was still in SVG at the time of the eruption.

Evacuation Management

A volcano evacuation plan for the La Soufrière is articulated in the National Disaster Response Plan for 2005 with the primary purpose of preventing the loss of life from a disruption. The National Volcano Plan was updated as the National Volcano Emergency Plan of 2014; was tested in 2019

during the TradeWinds Exercise and updated, with support from CDEMA; and approved by Cabinet in March 2021. This plan seeks to provide for the safe evacuation of the population (and specified property) from the designated areas at risk in a phased or spontaneous operation in the event that La Soufrière Volcano should threaten communities in these areas as well as provides an organizational framework upon which actions to be taken during a volcanic emergency can be based by the respective agencies

3. Assessment of Disaster Effects

Coordination

Coordination through the National Emergency Operations Centre (NEOC) for the event was satisfactory with evidence of adequate strategic leadership and built on the governance arrangements provided in the legislation. Support was also provided through CARICOM Operational Support Team (COST) of four (4) persons deployed over a period of 3.5 months

Nonetheless, spaces for improvement were identified which include⁴³:

- i. Improved congruence between the National Emergency Executive Committee (NEEC) and day to day reporting lines;
- ii. Ensuring that the Executive level of the NEOC structure is activated through the National Emergency Executive Committee to facilitate improved information flow between the policy and operational levels of the NEOC (DDSA report);
- iii. Improved integration of NGO, private sector

entities and international actors within the NEOC subcommittee structure

Moreover, coordination of the volcanic emergency response was undertaken in a multi-hazard environment - during the global COVID-19 pandemic and a subsequent rainfall event. The complexity of coordination of multiple hazards occurring simultaneously with cumulative and cascading impacts, for a prolonged duration cannot be ignored. Material deposited on the flanks of the volcano which can be remobilised by heavy rainfall producing lahars now poses and ongoing threat over the next few years. Additionally the COVID-19 pandemic required adjusted protocols and procedures for EOC and shelter management due to social distancing measures. Coordination arrangements has also focussed significantly on shelter management with thirty-three (33) shelters housing one thousand, four hundred and eight-three (1,483) persons still being managed as at the 13th August 2021. Providing safe shelter for the persons displaced by the volcanic emergency during the hurricane season remains a priority and thus limits the options for providing hurricane

⁴³ Detailed Damage Sectoral Assessment 2021

shelter for other vulnerable members of the general population on mainland St. Vincent.

Relief Distribution

This focused on an end-to-end relief management system and was generally satisfactory. However the influx of supplies overwhelmed the port system and challenges were noted in the coordination of movement of supplies and loopholes which could create accountability challenges. Some areas will therefore need attention during the prolonged period. The Arnos Vale Logistics Hub was considered a good practice for sorting, organizing, storing, coordinating and transporting relief supplies destined to shelters or beneficiaries throughout St. Vincent. The CDEMA Logistics System (CLS) software was live tested and enhanced through this emergency event. Support was provided by the CARICOM Disaster Relief Unit (CDRU) deployed for a period of six (6) weeks working in collaboration with the World Food Programme with the financial support of USAID.

Information Management

Information Management in the NEOC guided by plans and procedures was satisfactory with public information facilitated by the assignment of a lead within the NEOC. The prolonged duration of the emergency quickly highlighted some challenges including the availability of adequate human resources and the tedium of operating a manual information management system, which led to delays in access to and processing information for NEOC briefings, decision-making, public information and situation reports. Lack of IT equipment, access to data over IT networks and inconsistency in data for shelterees for example, resulted in challenges in information flow and management

Resilient Pathways

With reference to the CDM BluePrint, efforts to finalise the Country Work Programme process in keeping with the established criteria was derailed by the response efforts but also reinforced the need to advance the resilience agenda in keeping with resilience framework.

Early Warning Systems

With regard to early warning system performance, the onset of the eruption was predicted thanks to the upgraded seismic monitoring system and analysis by the scientist according to established protocols. The effusive nature of the eruption from December 2020 allowed sufficient time for the installation of necessary additional seismic monitoring equipment with warning information being shared by NEMO which provided residents and tourists with the necessary information (assembly points etc) to make informed decisions; which could save lives and properties. The information was relayed through the cap system, the NEMO Facebook page and API. At the community level NEMO convened a series of meetings with residents in the areas most likely to be affected, to update on the present situation and outline the official sources of warning information.

Warning information for subsequent eruptions from the volcano was also shared using the EWS with this being further bolstered through a daily radio programme convened with the Prime Minister and the SRC lead scientist outlining scenarios, warning information and more importantly what persons can expect from the volcano. It was mentioned that there is no feedback mechanism to measure the effectiveness of the warning messages disseminated at the time of writing the report, although it must be noted that the island has reported no deaths due to the volcanic eruption to date. While the population

received early warning of the impending explosive eruption, the mode of disseminating warning information to the most vulnerable including those differently-abled revealed some gaps which affected response times

Evacuation

Heightened volcanic activity prompted evacuations of persons from communities in the Red and Orange zones on mainland St. Vincent prior to the commencement of the explosive eruptions. The official evacuation order was received at 4pm on 8 April 2021 and commenced a mass evacuation from communities in the northeast and northwest of the island from the hazardous zones (red and orange) to public and private dwellings in safer zones located in the south of the country. The National Emergency Management Organization (NEMO) indicates that close to 20,000 persons were evacuated.

When advised to evacuate residents in the Red and Orange zones gathered at pre-designated

assembly areas and those needed were provided with vehicle support offered by the government for land and sea evacuation. Some persons however, fearing that their personal possessions may be stolen once they left, did not evacuate immediately and only accepted the need to evacuate following the explosive volcano eruption revealing low risk perception based on previous experiences.

Sea evacuation was also possible on the Leeward side of the island and as identified in the plans, this element was led well by the SVG Coast Guard. It was also reported that some persons believed the government offered transportation would be readily available once they reached the designated assembly area even though it was advised by NEMO that the transportation will be mobilized a minimum of 2 to 3 hours after the evacuation order, revealing a gap in communication and contributing to some frustration of individuals. While there were no deaths recorded directly related to the eruption and evacuation, some transportation injuries did occur.

4. Recovery Needs and Strategy

The critical link between disaster management and sustainable development is recognised as a holistic approach to managing multiple risks from all hazards, this is necessary to achieve resilient development. DRR ought to be a critical component of development planning, as well as sectoral strategies, programmes and work plans and although the damage and losses in some sectors are more visible than others, the recent increasing scale and frequency of hazards in the region has further shown that all sectors should develop an effective approach to reducing disaster risk and BBB in the post disaster recovery realm. For the Caribbean, resilience also connotes being able to bounce forward quickly in a manner

that reduces susceptibility (increased liability to additional harm) to the impact of the same hazard. In the context of the pillars of resilience identified, it is recognised that:

Social Protection for the Marginal and Most Vulnerable

Within St. Vincent and the Grenadines, a number of social protection schemes already exists. It is acknowledged that hazards often disproportionately affect the most vulnerable persons but also those who are on the margins of poverty as one shock can push this segment of the population below the poverty-line. Social protection schemes should identify and support

these segments of the population during recovery and encourage livelihood restoration including for those in the agricultural sector which have been significantly affected.

Safeguarding infrastructure

Critical Infrastructure such as roads, bridges and housing in the affected habitable areas will have to consider standards of safety in design criteria to address the volcanic hazard and associated risks. This will need careful consideration for implementation in the recovery programme.

Operational Readiness and Recovery

Operational readiness and recovery will be dependent on the level of resourcing of the system. Many of the operational readiness actions are treated under coordination which whilst adequate highlighted areas to be strengthened at the planning and operational level. Particular attention is required for information management. As it relates to recovery there will be a need to advance the Recovery Capacity Assessment, accelerate the National Recovery Framework to guide recovery actions and strengthen the institutional mechanisms to advance recovery which is being offered through CDEMA. Expertise to support recovery can be accessed through the soon to be launched Caribbean Resilient Recovery Facility (CRRF). Coordination plans for volcanoes,

hurricane, landslide and flood hazards exists in recognition of the multiple hazards which can impact St. Vincent and the Grenadines, however the complexity associated with the simultaneous and dynamic nature of the interaction, the prolonged impact and the uncertainty will require refinement of coordination arrangements which would have been predicated on the traditionally accepted hazard by hazard approach.

The provision of psychosocial support at all levels is important as socio-economic impacts during a complexed, prolonged emergency coupled with uncertainty can have profound psychological distress and will need to be addressed. Ultimately it is recognized that recovery is not just infrastructural, but has intense emotional and social dimensions that must be treated in recognition that the event is still ongoing and potential future hazard impacts can be linked to the volcanic eruption. The complexity of this event with cumulative and cascading impacts, is evidence of systemic risks and as such both the governance and operational environment should reflect this.

Based on data available at the time of report development cost estimates are included for only some of the proposed recovery interventions. Total recovery needs under the sector are likely to be higher once full estimates are provided.



| Intervention/Activity | Short Run* (XCD) | Intermediate* (XCD) | Long Run* (XCD) | Comment | Cost (XCD) |
|--|---------------------|------------------------|--------------------|---|---------------|
| Operational Readiness and Recovery | | | | | |
| Plan update including National Response Plan and review of the recently updated National Volcano Emergency Plan | X | | | A review of the recently updated National Volcano Emergency Plans will be required. In the context of the complex nature of the emergency, a review of multi-hazard contingency plans and standard operating procedures for managing multiple simultaneous hazard impacts should be considered. EOC Training at the Executive and Operational Levels and simulation exercises for complex emergencies will also be required. Review should also be extended to include an update to the Shelter Management Policy and Plan as well as the Emergency Housing Policy and Programme | |
| Maintenance of seismic network across the island to improve monitoring and forecasting capacity for volcanoes and seismic activity | 231,166.52 | | | Provision of this will support the agenda for risk informed development. Cost includes maintenance of the seismic network that has been progressively build-up by the SRC over the past few months (through purchase of spares; training of technicians, etc) and augmentation of this by other techniques (such as land-based fixed gas measurements. | 231,166.52 |
| Updated risk and vulnerability assessments for flooding, lahars and landslides | | 81,076.50 | | Deposited volcanic material and erosive lahars have altered the physical landscape of the impacted area and may potentially render current risk maps for flooding or landslides outdated, as well as have potentially generated new risks, the extent of which are uncertain and needs to be examined. | 81,076.50 |
| Review and enhance national evacuation plans | X | | | In terms of disaster response the event has revealed the need to establish new ways to treat to large-scale evacuation which will require a review of Standard Operating Procedures (SOPs) for evacuations | |

| | | | | |
|---|---|-------------------|--|---------------------|
| Training for DRM at national and community level | | 40,750.00 | Inclusive of enhancing technical capacity on the island to monitor seismic risks. This should also include EOC training at Executive and Operational levels | 40,750.00 |
| DRM Legislative Review (National Emergency and Disaster Management Act) | X | | There is a need to update the legislative framework in response to a changing environment and context which embraces resilience and takes cognizance of systemic risks. | |
| Enhancing of information and EWS network | | 1,961,272.00 | Emphasis should also be placed on the dissemination and response component within EW so community members and the country knows how to react, what path and where to react too once a warning message is received. Automation of the information management system to support situational awareness in the NEOC is required with these costs inclusive of some of these components. | 1,961,272.00 |
| Scenario-based simulation exercises to identify gaps and improve procedures | | 61,000.00 | | 61,000.00 |
| | | 231,166.52 | | 2,375,265.03 |

X – indicators recovery priority (i.e short, medium or long run). Also signifies no recovery cost estimate available at the time of preparation of the report total recovery needs under the sector are likely to be higher once estimates are identified

Source: DRR Evaluation Team

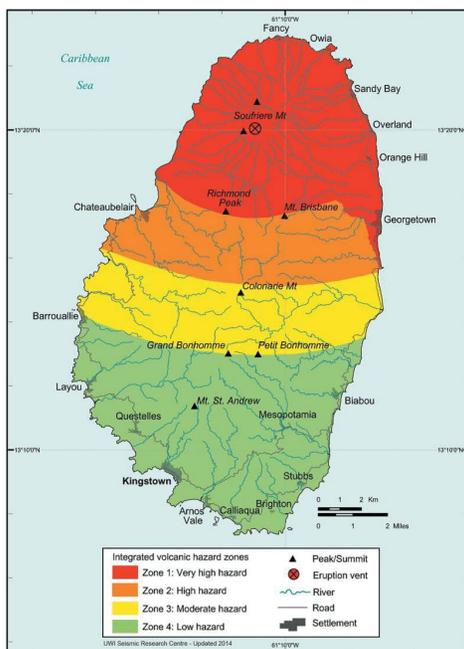
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Annex

Volcanic Hazard Map St. Vincent and the Grenadines



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Environment Sector

Pre-Disaster Baseline

Forests cover about 25-30% of St. Vincent and the Grenadines' total land area. This includes the Montane Rainforest, Coastal Dry-woodlands, Littoral Forest and the Elfin Woodlands forest types. Some of these forests are important to timber production, including high-value species such as the Blue Mahoe and Mahogany. They also provide important ecosystem services such as livelihoods or supplementary income to households; capture and supply of water for drinking, irrigation and hydroelectricity; and attraction for eco-tourism activities.

St. Vincent and the Grenadines has rich **biodiversity** with multiple endemics. There are 1,523 species listed on the IUCN Red List for St. Vincent and the Grenadines. Another 97 species are of great concern with one (1) extinct, 7 critically endangered, 14 endangered, 43 vulnerable, and 33 near threatened⁴⁴. Of the 21 critically endangered and endangered species, five are endemic to St. Vincent and the Grenadines; *Chironius vincenti*, *Gonatodes daudini*, *Pristimantis shrevei*, *Catharopeza ishop* and *Amerotyphlops tasymicris*. Both *Pristimantis shrevei* and *Catharopeza bishopiare* recorded as having declining populations.

There are 17 **recreational sites** managed by the National Parks Rivers and Beaches Authority. Six of these sites (Dark View Falls, La Soufriere Bamboo Range Trail Head and Trail, Owia Salt Pond Recreational Park, Falls of Baleine, Trinity Falls and Cumberland Nature Trail⁴⁵) are located within the red and orange high-risk zones.

Surface water is the major source of potable water and water for irrigation and industrial supplies. Average annual rainfall on the main island, St. Vincent, has so far been sufficient to meet local requirements (100m m³/year).

Mining and quarrying sector plays an important role in the country's overall development as these resources are vital inputs in the construction sector in the form of sand, aggregates and rocks. Boulders are mined at several points across the country; aggregate and sand mined at Rabacca and Richmond.

Land has traditionally been a major resource for development in St. Vincent and the Grenadines. Major land use activities include agriculture, mining (quarrying) and construction (housing and tourism development). These activities coupled

⁴⁴ St. Vincent and the Grenadines Revised Second NBSAP, 2016

⁴⁵ Note that the Falls of Baleine, Trinity Falls and Cumberland Nature Trail have been closed to visitors for about 5 years due to environmental hazards such as landslides and rock falls.

with population increase have placed great demands on the limited land that is available.

Environmental Governance issues

- There is a broad suite of environmental policies and legislations, but enforcement is weak due to limited human and financial resources.
- There is poor land-use planning
- Marine spatial planning just underway
- Institutional fragmentation and overlapping mandates hampers policy implementation

- Some policies are outdated and there are many draft policies and regulations which are yet to be adopted
- There is lack of citizen awareness about the environment
- Application of environmental impact assessment tools is currently limited
- Poor engagement of the private sector and civil society in environmental governance

The major environmental resource and impact of the volcanic eruption is presented in the table below.

Major Environmental Resource and Volcanic Impact

| Natural Resource | Coverage | Contribution to GDP (%) | Contribution to Labour Force (%) | Volcanic Impact Damage or Loss |
|--------------------------|---|-------------------------|----------------------------------|--|
| Water | 97% of population served by CWSA. 100m m ³ /year | 1.0 | 1.2 | 80%< supply loss during eruption |
| Fisheries | 36,000 km ² (EEZ) | 0.6 | Fisheries and Agriculture 15.1 | Richmond and Wallibou seine hauling sites destroyed |
| Agriculture | 7,200 ha | 6.5 | | (see agriculture sector) |
| Real Estate | | 2.0 | 0.1 | Damage to homes, loss of access to lands |
| Hotel/Restaurant | | 2.2 | 7.9 | Business closure and infrastructural damage |
| Mining | | 0.2 | 0.3 | Aggregate mining sites at Richmond and Rabacca damaged |
| Protected areas & Parks | 35 existing legally designated sites | | | Damage to facilities and loss of trails, signage, etc. |
| Forests and Biodiversity | | | | Destruction of approximately 23,000 acres of forest |

Source - Cross Cutting PDNA Evaluation Team

2. Disaster Effects

2.1 Damage to Environmental Resources

The total effects of the eruption of La Soufrière on the Environment Sector are still to be fully assessed. Because of its cross-cutting nature, elements of the environment such as forest, fisheries and soil have been captured under the Agriculture Sector while water resources were captured under the WASH Sectors. Elements of great significance but less ventilated include Biodiversity, Protected Areas and their supporting

structures (habitats and ecosystems), Soil, Air quality, and Ecosystems Goods and Services are the main focus of this section of the report. Cost relating to damage or loss for these elements are only mentioned in qualitative terms because of the absence of baseline values and the absence of proven quantitatively approaches. Many of these are informal but significant economic streams for rural people, they are not capture in the national economic assessment but their loss result in great economic hardship.



| Resource/Topic | Damage | Loss | Extent of Impact | Data needed to Estimate Cost* |
|--------------------------|---|---|------------------|--|
| Forests and Biodiversity | Habitats of endemic and endangered species destroyed. Plant and animal species lost. | Income streams from bird watchers, tours and forest products. Loss of access to non-timber forest products | Moderate | Annual loss in ecosystem services before natural regeneration Annual cost of restoration and monitoring initiatives Value of non-timber products |
| Protected Area | Forest Reserve in Colonaire, Cumberland and Richmond; Recreational areas including Owia Salt Pond, and Rabacca River Recreational Park have been severely damaged. All forest trails on the Soufriere hill have been destroyed. | Income streams for Ministry of Tourism, livelihoods for parks personnel and tour operators, recreational opportunities disrupted. | Moderate | Loss of net income for all stakeholders over a given period; rebuilding costs |
| Soil and Water | Loss of topsoil due to Lahars/mud flows eroding slopes, blocking and or destroying water ways and infrastructure; ash severely restricting water infiltration on farmlands | Income from agriculture and water resources. Economic cost of importing water | Severe | Data on extent top soil loss and impact on existing soil conservation measures (drains, grass barriers, bench terraces etc.); cost for their reestablishment |
| Sand Mining | Aggregate source at Rabacca and Richmond damaged. | Loss of construction material, livelihood opportunities and income from sale of aggregate. | Mild | Data on the income from sand and aggregate mining |
| Air Quality | Closure of roads and airports | Ash fall forcing persons indoors, health impacts, loss of air aviation services | Mild | Lost productivity due to business closures |
| Solid Waste Management | Large volume of mixed solid waste including potentially hazardous substances | | Moderate | Costs for hazardous waste management Ash clearing and disposal costs |

*Data is not yet available to undertake a costing exercise

Source: Cross Cutting PDNA Evaluation Team

3. Sector Recovery Strategy

3.1 Reconstruction Recovery Needs

For many environmental elements (soil, air quality, forest, marine and aquatic habitats) recovery is largely left to nature, however, human intervention can accelerate or hinder this process. In forestry, monitoring of the recovery process can allow for the control of invasive while reforestation of denuded slopes provide for economic investment in plantation forest. In the forest recovery plan it would be necessary to determine how long before the forest gets back to an ecologically functional position through natural restoration. This will help to further quantify the loss resulting from the eruption.

One recovery strategy for areas in the red zone is leaning towards turning previously farmed areas into conservation areas. This requires new governance structures/policies and finances to relocate, retrain, and equip persons who farmed in those areas for life elsewhere.

The damages due to the possible increase in soil erosion (and decrease in water retention) in agricultural land are NOT accounted for; additional cost for strengthening soil conservation, removal of ash and additional water conservation measures by keeping the ash on the land needs to be factored into the estimates and addressed in the reconstruction methodology.



| Environmental Recovery Strategy | | | |
|--|--|---------------------------------|-------------------|
| Objectives | Strategic Actions | Implementation Responsibility | Timeline |
| A. REBUILDING OF NATURAL ASSETS | | | |
| Forests and Biodiversity restoration | <ul style="list-style-type: none"> More effective management of invasive species. | Forestry Division | Medium- Long term |
| | <ul style="list-style-type: none"> Develop effective valuation system for forest and biodiversity products. | | Medium- Long term |
| | <ul style="list-style-type: none"> Add forest and biodiversity contribution to national budgets. | | Medium- Long term |
| Water Resources management | See Section in WASH | CWSA | |
| Soil Fertility | <ul style="list-style-type: none"> Incorporation of ash into soil, where ash-fall was light; | Ministry of Agriculture | Immediate |
| | <ul style="list-style-type: none"> Sustainable application of fertilizers, soil amendments and compost; | | Immediate |
| | <ul style="list-style-type: none"> Establishment/re-establishment of grass barriers, contour drains, bench terraces | | Immediate |
| B. RESTORING ACCESS TO ENVIRONMENTAL GOODS AND SERVICES | | | |
| Ensure availability of environmentally sustainable, high-quality and affordable construction materials (sand, aggregate, pumice stone/rocks) | <ul style="list-style-type: none"> Identification of alternative mining sites and establishment of appropriate transportation infrastructure | Ministry of Transport and Works | Medium term |
| | <ul style="list-style-type: none"> Production of fine to coarse sands by improving crushing and screening equipment at new and existing mines. | | Medium term |
| Restore and protect damaged marine habitats | <ul style="list-style-type: none"> Identify habitats that were affected by the volcanic eruption and institute moratorium/temporary no-take areas while the necessary restoration work and monitoring are being undertaken. | Fisheries Division | Immediate |

| | | | |
|--|---|---|--|
| <p>Restore and protect aquatic habitats</p> | <ul style="list-style-type: none"> · Conduct rapid biological assessment of the impacts of the eruption on aquatic life · Initiate stakeholder engagement plan including education and capacity building to restore tri-tri industry. Identify harvesting areas, remove logs and derelicts. · Temporary ban on aquatic fisheries (crayfish) to allow for regeneration? | <p>Forestry Division</p> | <p>Immediate</p> <p>Immediate</p> <p>Immediate</p> |
| <p>Restore access to forest and non-timber products</p> | <ul style="list-style-type: none"> · Strengthen forest management and the reintroduction of non-timber products lost to the eruption. Restore trails and access roads. | <p>Forestry Services Division</p> | <p>Immediate</p> |
| <p>Protect pollinators and other keystone species to ensure proper ecosystem functioning</p> | <ul style="list-style-type: none"> · Conduct biodiversity inventory/census · Encourage apiculture | <p>Ministry of Agriculture</p> | <p>Medium-Long term</p> |
| <p>C. RESTORING ENVIRONMENTAL RESOURCES THAT SUPPORT LIVELIHOOD SYSTEMS</p> | | | |
| <p>Development and Enhancement of Ecotourism Product in Rural Communities</p> | <ul style="list-style-type: none"> · Capitalize on unique geological landscape (e.g. through development of a natural field guide · Rebuilding of trails and amenities at protected areas/ ecotourism sites | <p>Ministry of Tourism National Parks, Rivers and Beaches Authority</p> | <p>Medium-Long</p> <p>Immediate</p> |
| <p>Restore access to prime fishing ground and identify alternatives, where necessary</p> | <ul style="list-style-type: none"> · Survey of fishing grounds · Targeted cleaning of seabed · Coral Restoration | <p>Fisheries Division</p> | <p>Immediate</p> <p>Immediate</p> <p>Medium-term</p> |

| D. ADDRESSING NEW AND EXISTING CHALLENGES | | | |
|---|--|---|--|
| Strengthening environmental governance | <ul style="list-style-type: none"> Improve the effectiveness of environmental decision-making Improve transparency in environmental decision-making Build Improve environmental awareness and stewardship amongst the general public Enhance the legal and institutional framework to combat the environmental drivers of risk and vulnerability | Physical Planning Unit Training Division; Sustainable Development Unit | Medium-term Medium-term Immediate Medium-Long term |
| Improving waste management | <ul style="list-style-type: none"> Waste and debris management (removal, transportation, and disposal of debris) Ash removal and recovery Hazardous waste separation and establishment of systems for transportation and disposal (especially for e-wastes, ash and rubble) Introduce incentives for increased recycling of plastics and other recyclables | Solid Waste Management Unit; BRAGSA, MoHWE. | Immediate Immediate- medium term (depending upon the location) Immediate- medium term Immediate |
| Surface water management | <ul style="list-style-type: none"> Mapping of changing surface water flows; adjusting to new flood zones Monitoring of ground water quantity, quality and availability Investigate change in soil stability and water retention | Forestry Division; Fisheries Division; CWSA; National Parks, Rivers and Beaches Authority | Immediate Medium-term Immediate |

Source: Cross Cutting PDNA Evaluation Team

Environment Evaluation Team

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Impact Assessment

Human Impact Assessment

Summary

The Human Impact analysis of the effects of the la Soufrière Volcanic eruption suggests a number of areas for concern. Among those are the loss of income and resulting possible increases in income poverty; the loss of access to the backyard economy and the increase in food insecurity; the invisible yet present psychosocial trauma suffered by the population at large. Poor women who are heads of households will be particularly affected and so too their families, thereby exacerbating the structural inequalities and persistence of intergenerational poverty.

The government has in place an established social protection programme which could benefit from enhanced co-ordination and streamlining for greater efficiency and effectiveness. It needs to be repurposed to serve as a tool for social transformation not just as a safety net.

The population needs capacity-building at all levels, to better enable them to participate in and contribute to the building of a more resilient society.

Context

Prior to the eruption of the La Soufrière volcano, the people of St. Vincent and the Grenadines (SVG) had been coping with the health and socio-economic issues arising from the COVID-19 pandemic⁴⁶ and the dengue outbreak during which 1,000 persons were affected and resulted in the loss of eight lives. The outbreak demanded additional human and financial resources to control.

Table 1. Selected social indicators

| | |
|---------------------------|----------|
| Poor (2007/8) | 30.2 % |
| Vulnerable (2007/8) | 48.2 % |
| Indigent (2007/8) | 2.9 % |
| Gini Coefficient (2007/8) | 0.4 |
| GDP per capita USD (2019) | 7,457.51 |
| HDI (2019) | 0.738 |

Source: Poor, Vulnerable, indigent, Gini Coefficient, https://www.caribank.org/sites/default/files/publication-resources/Study_The-Changing-Nature-of-Poverty-and-Inequality-in-the-Caribbean-New-Issues-New-Solutions.pdf; GDP per capita- World Bank; HDI - http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/VCT.pdf

As if these two hazards were not sufficient, the population was burdened by the effects of tropical Storm Elsa in early July which contributed to the formation of the lahars from the ash, making life even more difficult.

Vincentians, however, have the reputation across the region for being a hardy sea fearing people. Their resilience has certainly been tested this time around.

According to the last Country Poverty Assessment, undertaken in 2007/2008, approximately 30 percent (%) of the population was categorized as poor and a small proportion, some 3 % experience indigence (see table 1 of selected social indicators). A worrisome proportion of the

⁴⁶ From February 2020 to July 2021 St Vincent and the Grenadines reported 2,307 cases and 12 deaths

population, 48 % are defined as vulnerable and 52 % of poorer households are mostly headed by women. Women-headed households account for approximately 39 % of all households⁴⁷. Available data, points to high levels of income inequality, with a Gini coefficient of 0.40, though this is lower than in the previous decade when it was estimated at 0.56 (UNDP, 2010).

Disasters always affect the poor more harshly than the non-poor, as the poor usually have less capacity to withstand the impacts, and once a disaster occurs, less resources to act as a buffer until such time as they are able to recover following an event.

Despite these challenges, SVG can boast of a medium to high Human Development Index, ranking 97 out of 189 countries in 2019. According to the UNDP HDI note on construction of the Index, “between 1990 and 2019, Saint Vincent and the Grenadines’ life expectancy at birth increased by 2.0 years, mean years of schooling increased by 1.2 years and expected years of schooling increased by 2.1 years. The country’s GNI per capita increased by about 96.2 percent between 1990 and 2019.”⁴⁸

Effects

Of the 109, 188 persons who account for the population of SVG, females comprise some 49 % and males 51 %, respectively⁴⁹. According to data from *The Displaced Family Household Verification Assessment*, coordinated by Ministry of National

Mobilization (MoNM) in collaboration with the World Food Programme (WFP), some 21 % of the population or 23,032 persons were evacuated from the red and orange zone, as a result of the eruption of La Soufriere volcano (See table 2). The NEMO was pleased to report that there were no deaths or injuries as a direct result of the eruption⁵⁰. It should be noted however, that the entire population has been affected by the eruption: either through damage suffered to their homes, shortages of water supply, through interruptions of power supply, or loss of livelihoods, or food insecurity resulting from the loss of backyard gardens.⁵¹ Less visible but no less significant is the psychosocial trauma suffered by large segments of the population which may linger over an extended period of time.⁵²

Table 2. Evacuated Individuals

| | Total population | Evacuated individuals |
|----------|------------------|-----------------------|
| Total | 109,188 | 23,032 |
| Males | | 10,671 |
| Females | | 12,361 |
| Children | | 7,756 |

Source: The Displaced Family Household Verification Assessment Survey

Of Those evacuated households, some 77% indicated that they were in private residences with relatives or friends. Accommodation centres/shelters were set up under the MoNM

⁴⁷ St. Vincent and the Grenadines, Population and Housing Census 2012

⁴⁸ http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/VCT.pdf

⁴⁹ St Vincent and the Grenadines 2012 Population and Housing Census, Preliminary Report

⁵⁰ DDSA SVG_ Soufriere_ REPORT Jun 2021

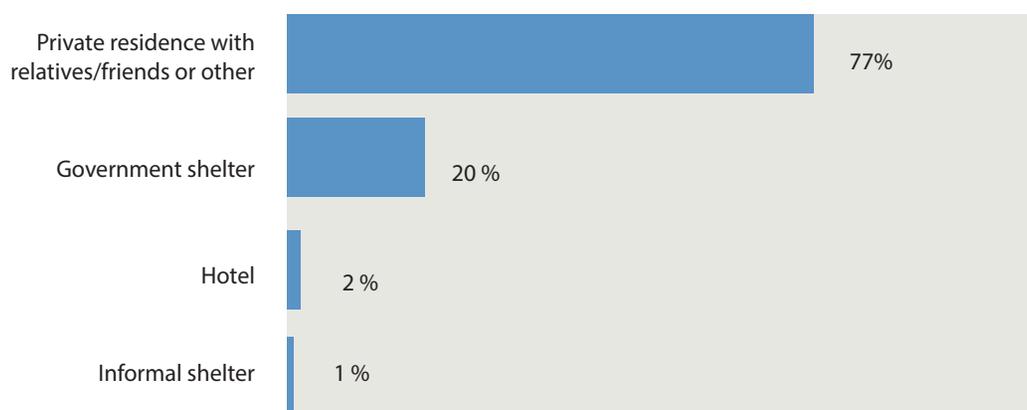
⁵¹ PDNA Sector reports provide details of the disruption in access to good and services as a result of the eruption of the la Soufriere volcano.

⁵² DDSA SVG_ Soufriere_ REPORT Jun 2021

to accommodate persons who were displaced and were not accommodated in private homes with NEMO having overarching responsibility for those persons who were placed in public shelters. Figure 1 illustrates the distribution of evacuated households as a result of the volcanic eruption. Some 19,390 individuals were relocated to private residences. Twenty percent or 4,606 individuals

stayed in Government shelters, 2 % or 460 persons stayed in hotels and 1 % or 230 persons, stayed within informal shelters. Through the MoNM some 22,033 Food Packages were distributed to displaced families in private homes. It should be noted that some 2,817 families or 9,426 individuals from the orange zone, were able to return home after the All Clear was issued by Government.

Figure 1: Current residence of the evacuated households



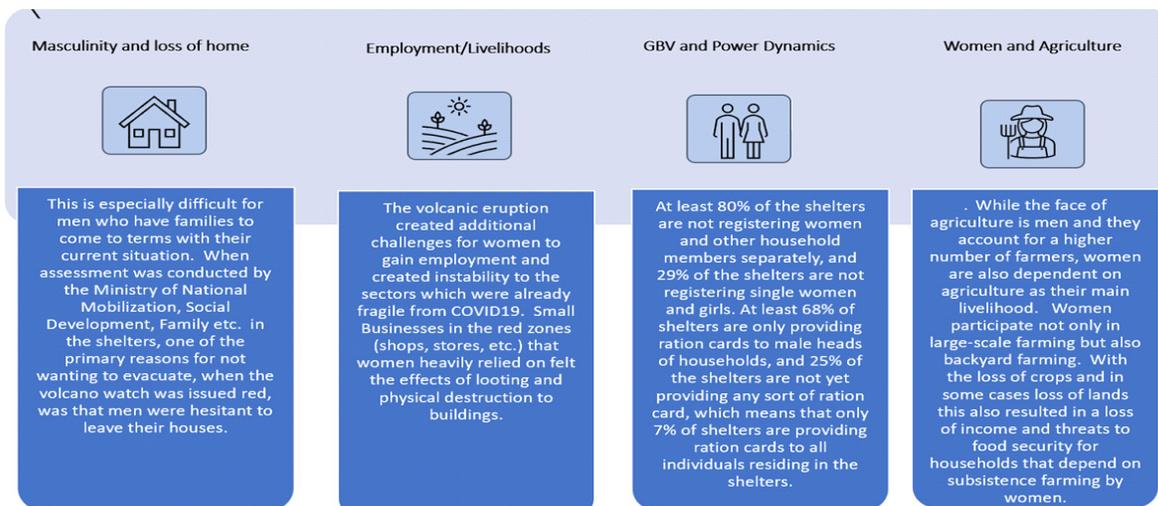
Source: The Displaced Family Household Verification Assessment Survey

Gender Relations and Gender-Based Violence

In disasters, all vulnerable groups such as the elderly, LGBTQI+, persons living with HIV/AIDS are at risk for Gender-Based Violence (GBV). However, women and girls were more at risk to GBV as a result of the La Soufrière volcanic eruption. There were several reported cases of GBV within the shelters during the months April to July and in all cases, women were the victims.⁵³ Survivors of GBV to a greater extent, victims of domestic violence were at risk of increased violence due to tensions arising from displacement, trauma, lack of

finance and/or unemployment and grief and loss. Given societal pressures on men to be providers and protectors, their inability to fulfill either role, compounded their difficulty in adjusting to the conditions. It was reported that 80 percent of the shelters are not registering, and 29 percent are not registering single women and girls. A GBV safety audit was conducted by the Gender Affairs Division in collaboration with UNFPA that indicated the prevalence of GBV within the shelters. Figure 2 illustrates and highlights issues arising from the audit regarding gender relations and GBV.

Figure 2: Issues of Gender Relations and GBV



Source: Gender Affairs Division

Employment Livelihoods and Social Protection

Displacement was not the only effect. Loss of employment and livelihoods was also a significant effect of the eruption. Prior to the volcanic eruption, Labour Force data indicated a 24.9 % unemployment rate with female unemployment (30%) significantly higher than that of male (20.7%). Youth unemployment was almost double that of the adult population at 40 %, see Table 3. Interestingly, some 80% of Medium, Small and Micro Enterprises (MSMEs) can be found in the informal sector, which employs large proportions of women.

Due to the COVID-19 pandemic, a significant proportion of those persons in the labour force and employed both in the formal and informal sector, would have lost jobs. Some 48 % of those persons interviewed who had been evacuated indicated that they were unemployed. 24% indicated that they were employed, as illustrated in Figure 3. Among those who had reported being currently unemployed, 21% indicated that they had been unemployed prior to the volcanic eruption as illustrated in Figure 4.

Figure 3. Current Employment Status

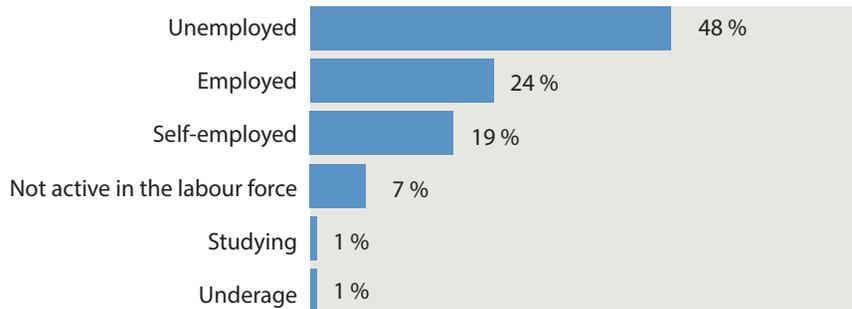
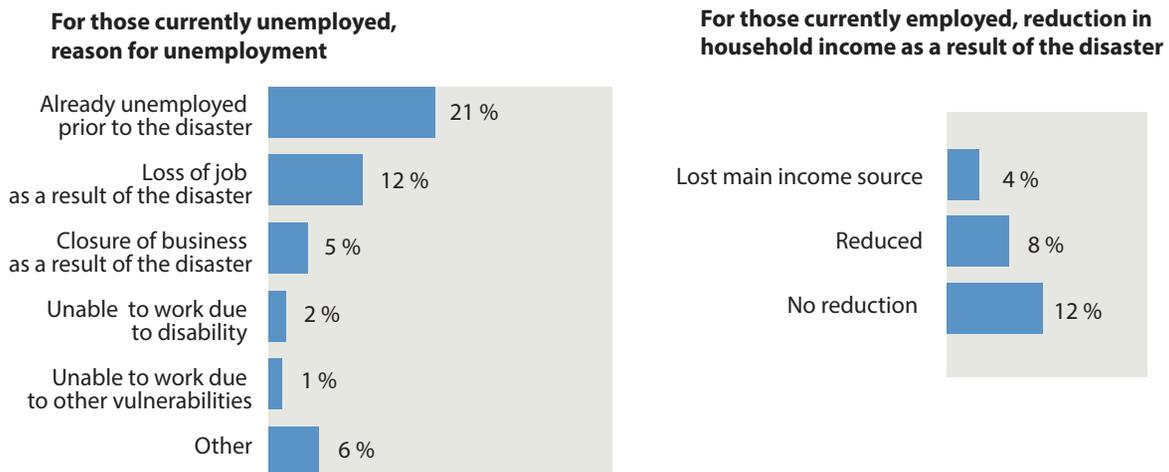


Figure 4: Reasons for unemployment and reduction of income



Source: The Displaced Family Household Verification Assessment Survey

Loss of income during a disaster is sometimes the weight that tilts vulnerable households and individuals from being just above the poverty line to falling below the line, and those who were surviving in poverty to falling into indigence, with significant consequences for wellbeing.

Table 4 presents estimates of income lost in three sectors as a result of the volcanic eruption, amounting to some XCD\$56 million. The loss represents the income forgone for the seven-month period following the eruption.

Table 3: Personal income lost

| Personal Income Lost : Employed Population by Selected Industrial Groups and income lost due to volcanic eruption | | | | | | |
|--|------------------------------------|---|--|-----------------------|--|------------------------------|
| Selected Industrial Group | Estimated Number of Workers | Estimated number of affected workers | Average monthly personal income | | Estimated number of months lost | Income Lost (million) |
| | | | Low (860) | Average (1500) | | |
| Agriculture, Forestry and Fishing | 12212 | 3158 | | x | 7 | XCD 33.16 |
| Wholesale and Retail Trade | 10142 | 1724 | x | | | 10.38 |
| Accommodation and Food Service activity | 4578 | 2070 | x | | | 12.46 |
| Total | | | | | | 56.00 |

Note: Categories are based on International Standard Industrial Classification of All Economic Activities Revision 4 (ISIC)

Source: *Statistical Office of St Vincent and the Grenadines*

Estimates of affected workers based on PDNA Sector Reports (Agriculture); VNA reported loss of job(12%) and closure of

Estimates of Number of workers based on 2019 Labour Force (57953) World Bank data

Estimates for Accommodation and Food Service based on 2019 estimates of 21%

Source: Estimates based on Government of St Vincent and the Grenadines data

The three sectors Agriculture Forestry and Fishing, Wholesale and Retail Trade and Accommodation and Food Service activity were severely affected as a result of both COVID-19 and the Volcanic eruption. Table 4, seeks to capture only income lost as a result of the eruption of the volcano and not income lost prior to this event.

The survey undertaken by the MoNM with the support of WFP, noted that some 17 % of those who reported to be unemployed as a result of the volcanic eruption, gave as reasons either loss of job (12%) or closure of business (5%). In Agriculture, Forestry and Fishing, men comprise the majority of the workforce (21%) while women comprise the smaller share (7.8%). The personal income loss amounted to some XCD\$33 million. The loss of livelihoods due to displacement, particularly in the agricultural sector was felt deeply by women, who participated in farming, many of whom were single heads of households.

In Wholesale and Retail Trade, where women make up the largest share (21.1%) and men the smaller share (14.6%), the personal income loss amounted to some XCD \$10.3 million. In the Accommodation and Food service activity (which is often used as a proxy for the tourism sector), women have the larger share (11.25%) and men the smaller (5.2%), the loss of personal income amounted to XCD\$12.46 million. The data suggests that more women would have suffered a disproportionate loss of income relative to their male counterparts as a result of the volcanic eruption, except in Agriculture, Forestry and Fishing.

The volcanic eruption presented additional challenges for women's employment as it created instability in the sectors which were already fragile as a result of from COVID19 impacts and where women engaged in low-income employment in large numbers. Small businesses in the red zones (shops, stores, etc.) that women heavily relied on

for employment felt the effects due in part to looting and the physical destruction of buildings.

Women also suffered the hardship of loss of income due to the receipt of lower remittances from countries such as the United Kingdom, United States of America and Canada. Data suggests that 11% of males depend on non-employment income from abroad, compared to nearly 20% of females. For females in particular, remittances are the most important source of non-employment income.⁵⁴

Government responded to the hardship experienced by the population through its social protection programmes and other interventions delivered with the support of development partners. Figure 5 presents a snapshot of some of the programmes conducted in partnership.

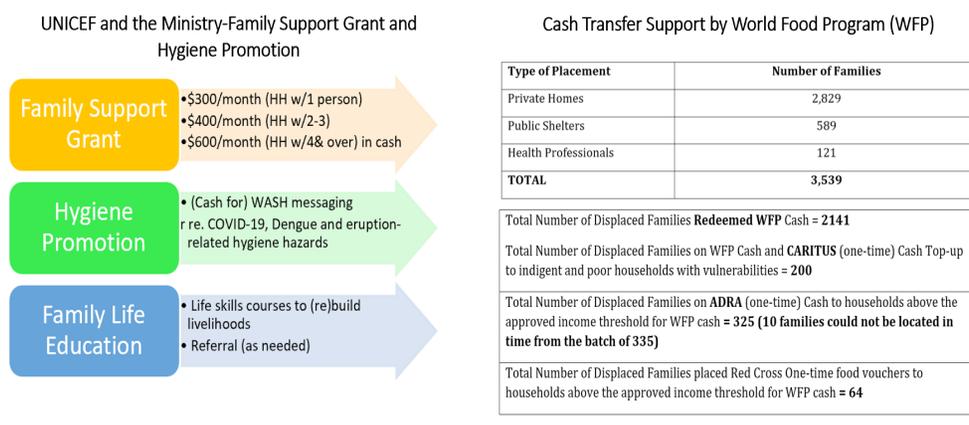
In response to the needs for psychosocial support, a Psychosocial Family Life Education Programme, funded by UNICEF and implemented by MoNM - Social Protection Division, commenced on August 1, 2021 for 500 Displaced Families from the Red Zone. It will be a three-month long programme

focused on modules of coping skills development, parenting education and awareness-building. The awareness-building will comprise child abuse awareness, gender role development, disability awareness and hygiene education.

Data from the Soufriere Relief Cash grant programme administered by the MoNM and the World Food Programme (WFP), the Adventist Development and Relief International (ADRA), CARITAS International and The Red Cross is also presented in Box 5. The estimated value of transfers to be provided by WFP was expected to be US\$2.9m (cash transfers) with US\$ 670,000 in vouchers over a four-month period, reaching some 3,539 families and representing 17,492 individuals. The other three programmes supported an additional 585 families.

Approximately 5,100 households were surveyed for potential inclusion through the Displaced Family Household Verification Assessment Survey. The Soufrière Relief Grant will assist people’s well-being as they cope with and recover from the disaster and lay groundwork for longer term support through social assistance.

Figure 5 Social protection programmes in partnership



Source: Ministry of Social Mobilization

In response to the reported cases of domestic violence the Gender Affairs Division also provided a three (3) month engagement on Gender-Based Violence in the shelters that are more prone to domestic violence. This engagement served as awareness building for evacuees, while at the same time educating them on the services available for victims and how to safely access these support services. A psychosocial component was also included along with a skills training programme to build the technical capacity of person within the shelters.

Data from the Soufriere Relief Cash grant programme administered by the MoNM and the World Food Programme (WFP), with additional cash transfers provided by the Adventist Development and Relief International (ADRA), CARITAS International and The Red Cross was provided. The estimated value of transfers to be provided by WFP was expected to be US\$2.9m (cash transfers) with USD 670,000 in vouchers over a four-month period, reaching some 3,539 families and representing 17,492 individuals. The other three programmes supported an additional 585 families.

Approximately 5,100 households were surveyed for potential inclusion through the Displaced Family Household Verification Assessment Survey. The Soufrière Relief Grant will assist people's well-being as they cope with and recover from the disaster and lay groundwork for longer term support through social assistance.

The social protection programmes target indigent persons, those with disabilities, children, the elderly, and insured National Insurance Scheme (NIS) contributors. The Social Protection Division

provides a range of specialized services, catering primarily to the needs of the poor, indigent and vulnerable persons in society. The objective of the array of social safety nets available is to improve the social and economic condition of the most vulnerable and to enhance their standards of living.

Figure 6 presents Government expenditure on social protection measures through MoNM, suggesting that the 2021 expenditure, which represents mid-year expenditure is likely to be greater than that of 2020.⁵⁵

Table 5: Government expenditure on Social Protection Measures (XCD)

| 2019 | 2020 | Actual to date 2021 |
|------------|------------|---------------------|
| 17,382,790 | 20,388,082 | 12,113,611 |

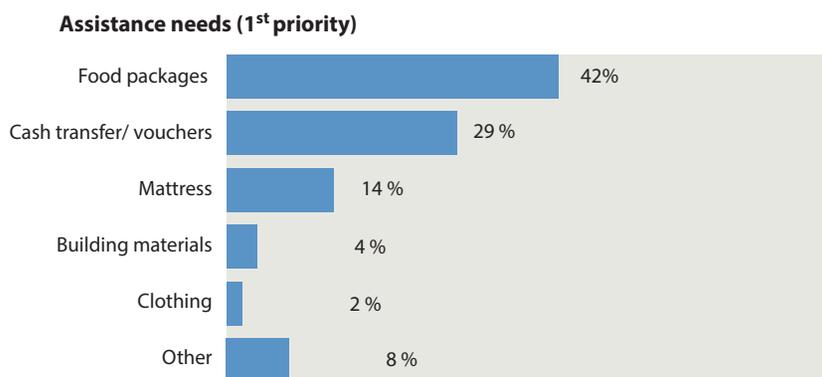
Source: Ministry of National Mobilisation, Social Development, Gender, Youth, Housing and Informal Human Settlement

The Survey undertaken by the MoNM with the support of WFP noted that some 72% of persons who had been evacuated, identified food as their highest priority need, and when asked what assistance needs did they have 42% responded that food packages was the first priority need, cash transfers/vouchers were reported by 29% of respondents, as second (see Figures 6 and 7). A regional CARICOM/WFP survey conducted in 2020, found that a third of respondents from SVG reported that they were eating less or skipping meals. The threat to food security as a result of the volcanic eruption would have increased the existing issues of affordability, accessibility and availability.⁵⁶

⁵⁵ Expenditure on programmes administered by the National Insurance Scheme have not been included.

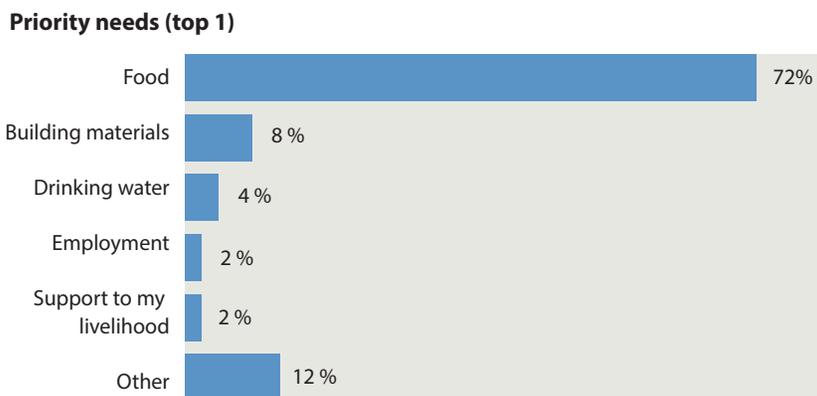
⁵⁶ The Minister of Agriculture, Forestry and Fishing Mr Saboto Caesar noted, when speaking before the Special Advisory Commission on Management Issues (SACMI) of the Inter-American Institute for Cooperation on Agriculture (IICA), that SVG "have problems that affect food security and sovereignty".

Figure 7. Priority Assistance Needs



Source: The Displaced Family Household Verification Survey

Figure 8. Priority needs



Source: The Displaced Family Household Verification Survey

Recommendations for Recovery

| Strategic Lines of action | Interventions | Timeframe for Action |
|---|--|----------------------|
| Re-engineering economic growth | Increase investments in renewable energy to diversify the energy mix and reduce fossil fuel dependency and cost, to households particularly the poor and vulnerable | Long |
| | Provide training and skills enhancement opportunities for citizens' participation in renewable energy initiatives to reduce the carbon footprint and greening the economy in line with SDG targets | Medium |
| Enabling Increased Human and Social Development | Strengthen social protection systems by enhancing delivery of coordinated programmes | Medium |
| | Linking Cash Transfer Programmes with training and skills development for capacity-building to increase human capital and improve beneficiaries' opportunities for higher-level labour market participation | Short |
| | Provide opportunities for women to obtain employment in the formal labour market; to participate in National Insurance Schemes while working in the informal sector; and for greater remuneration equality in sectors that are traditionally male-dominated. | Medium |
| Improving Physical Infrastructure, Preserving the Environment and Building Resilience to Climate Change | Rebuilding homes that are climate-resilient | Medium |
| | Resettlement of vulnerable households from the Red Zone and providing necessary support services to assist them to establish a sense of community in the new location/s ensuring a gender responsive approach to recovery. | Medium |

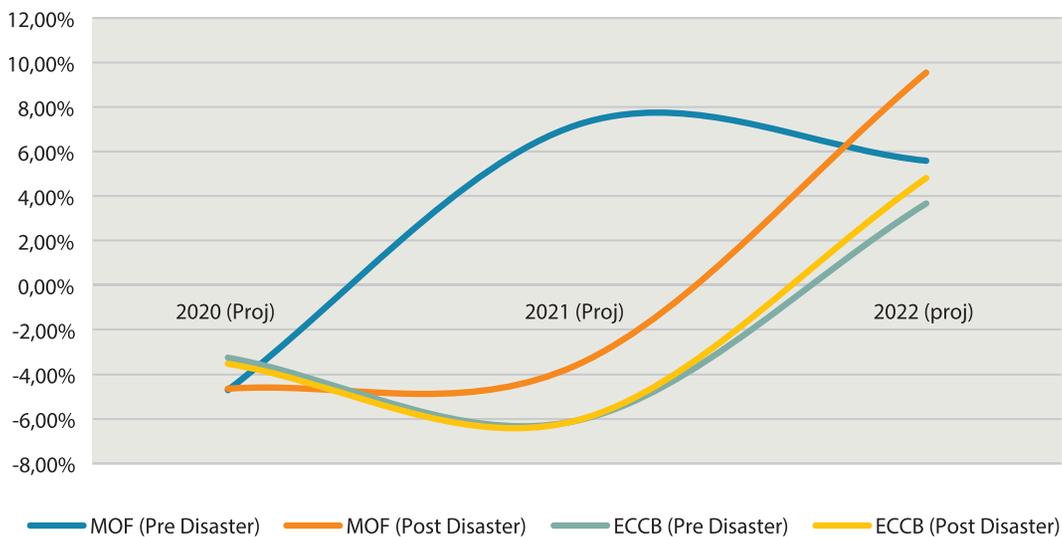
Macro-economic impact analysis

Executive summary

The La Soufrière Volcanic Eruption had a pervasive and substantial impact on the St. Vincent and the Grenadines macroeconomy with a total sum of damages of XCD 416.07 million and losses of XCD 218.57 million which cumulatively are equivalent to 18.1% of the country’s 2020 GDP.

This is estimated to negatively affect the economy with a decline projected to be between -3.58% and 6.07%, depending on the underlying assumptions from the Ministry of Finance (MOF) and the Eastern Caribbean Central Bank (ECCB) relative to the respective baselines in 2021 and 2022.

Figure 1. GDP Alternative performance scenarios



This disruption to economic output is projected to continue for at least 24 months as the country recovers, though volcanic activity continues to pose a threat to the island economy and a source of uncertainty for planning. Sectors most affected in terms of losses were Agriculture, Livestock and Forestry, which are the sectors that are expected to decline further following previous years contractions.

In terms of damages the most affected was to the housing stock of 18 percent mainly on the mainland. Most homes were affected by ash accumulated on roof structures. Notable is that even after the eruptions subsided, red and orange zone communities were still being affected by lahars. The housing sector has the largest estimated recovery needs of XCD 356 million or 48.8 percent of the total recovery needs.

Also, severely affected in terms of damage and losses were the Agriculture and Transport sectors with an estimated total damages and losses of XCD 230.1 million and \$74.4 million. Physical damages to road structures and bridges accounted for 42.1 percent of the total damage while the rebuilding of road, river crossing infrastructure, bridges and changes in economic flows and removal of ash accounted for 57.9 percent of the total loss cost. Recovery needs for the transport sector amounted to XCD 89.6 million.

Fiscally, both the decrease in GDP and the necessary recovery expenditures are projected to have a short-term negative impact. In the Quarter 1 period, January to March 2021, Current Revenue decreased by 4% as compared to the same period in 2020. The Fiscal Outlook for the remainder of 2021 projects that Current Revenue will grow by XCD 17.14m. In 2021, Recurrent Expenditure is projected to increase by 3.4 percent of GDP. As a result, the Overall Deficit is anticipated to increase from -5.7 percent of GDP for the year 2020 to -10.0 percent of GDP for the year 2021, and the Primary Deficit is expected to move from \$72.85m -3.3 percent of GDP to -7.9 percent of GDP.

Externally, the eruption has also led to a disruption in trade mostly in goods: Exports in the category of "Food & Live Animals" for the period January to June 2021 fell by 8.50% relative to the similar period of 2020. This is largely attributed to the fact that 27.5% of all registered farmers are in the "Red and Orange Zones" where mandatory evacuations

were conducted for several months prior to and after the volcanic eruptions. Additionally, damages to the crop sub-sector accounted for 56.9% of the damage to the agricultural sector.

Exports of travel services were not seriously affected as most of the island's accommodation are in the "green zone" where no significant damages were recorded in this regard. However, several tourist sites were inundated with ash and would need rehabilitative efforts. Therefore, SVG's capacity to attract its regular tourism travellers, in the near to medium term, may be diminished if most were attracted by the touristic sites. Given the importance of travel to SVG's trade in services, the trade balance is likely to deteriorate in the near to medium term. In the longer term, SVG may be able to target niche of travellers who are interested in the after-effects of a volcanic eruption.

In the short term the negative impact in the external sector is being compensated by inbound remittances which for the period for the first five months (January to May) for 2018 to 2021 generally trended upwards. Increases in 2020 and 2021 are possibly attributed to remittances spurred by COVID-19 stimulus grants in source countries such as the USA as well as the diaphora's efforts to mitigate the financial burden inflicted by COVID-19 and the volcanic eruptions in SVG. Additionally, Outbound remittances for the period January to May 2018 to 2021 trended downwards leading to a lesser flow of resources to the exterior.

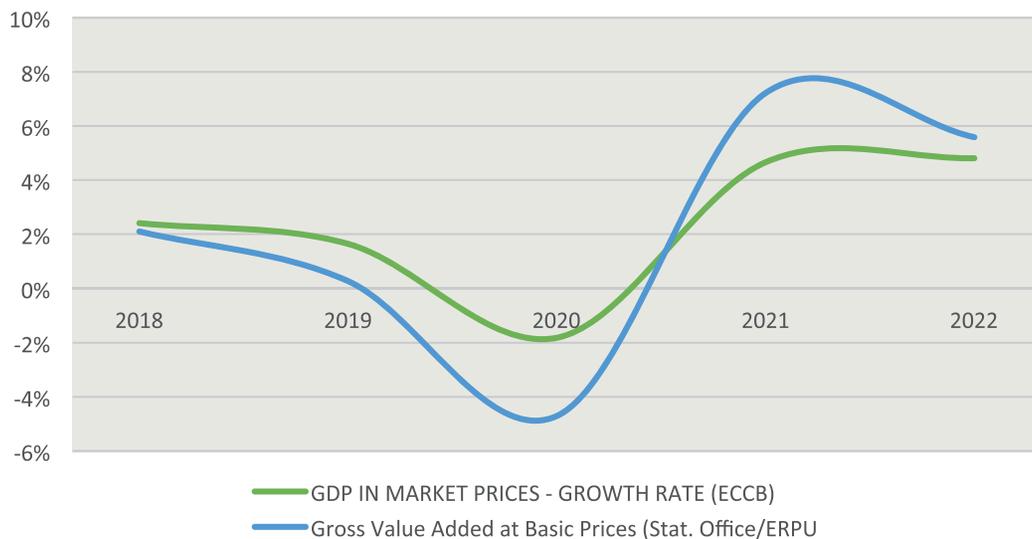
Context and baseline

Economic performance

In 2018, real GDP grew by 2.2 percent but declined to 0.49 percent in 2019 as a result of contraction of the construction and manufacturing sectors. Notwithstanding, the overall economic performance of St. Vincent and the Grenadines (SVG) was expected to improve in 2020 driven

by expansions in tourism arrivals, construction activities and an increase in exports of non-traditional crops. As a result of the spread of the Covid-19 pandemic there was a sharp decline in economic performance in 2020 as borders closed and lockdowns were implemented by a number of the country's main trading and tourism partners.

Figure 2. Baseline Observed and expected GDP



Share of main productive sectors in GDP (See annex II)

Being a services economy, wholesale and retail trade amount to more than 14% of GDP, based on their average contribution for the period 2018-2020 (see table 2). The contribution of the agricultural sector to GDP has essentially declined from 6.5 percent in 2018 to 5.8 percent in 2020 representing a decrease of 11.38 percent. Basic services (comprising electricity & water) contribute to less than 4.5%, while construction weighs more than 8%. Tourism, in spite of its contribution to

foreign exchange and marketing strategies; (hotels and restaurants) amount to 2.1% of GDP. While hotel and restaurants share of GDP is relatively small, the direct effects on the non-tradable sectors such as construction, transport and real estate is much larger accounting for 8.2 percent, 12.2 percent and 17.1 percent respectively. Public administration represents slightly more than 12 percent of GDP.

Table 1. Main sectors' contribution to GDP in St. Vincent and the Grenadines (average 2019-2020)

| SECTOR | 2018 | 2019 | 2020 | Average 2018-2020 | Average % |
|---|-----------------|-----------------|-----------------|----------------------|----------------|
| | Revised | Preliminary | Projected | | |
| Agriculture, Hunting & Forestry | 101.72 | 102.31 | 98.45 | 100.83 | 6.74% |
| Mining & Quarrying | 3.66 | 3.70 | 3.62 | 3.66 | 0.24% |
| Manufacturing | 66.98 | 57.82 | 51.59 | 58.80 | 3.93% |
| Electricity & Water | 61.98 | 64.07 | 65.01 | 63.69 | 4.26% |
| Construction | 126.21 | 122.97 | 120.51 | 123.23 | 8.24% |
| Wholesale & Retail Trade | 225.02 | 206.53 | 204.20 | 211.91 | 14.17% |
| Hotels & Restaurants | 34.64 | 38.40 | 20.75 | 31.26 | 2.09% |
| Hotels | 23.18 | 24.94 | 9.98 | 19.36 | 1.29% |
| Restaurant | 11.47 | 13.47 | 10.77 | 11.90 | 0.80% |
| Transport, Storage & Communications | 196.64 | 208.83 | 145.63 | 183.70 | 12.28% |
| Financial Intermediation | 115.16 | 117.64 | 123.14 | 118.65 | 7.93% |
| Real Estate, Renting and Business services | 252.21 | 257.43 | 260.01 | 256.55 | 17.16% |
| Renting of machinery and equipment | 7.90 | 9.70 | 9.80 | 9.14 | 0.61% |
| Computer related services | 4.37 | 4.60 | 4.65 | 4.54 | 0.30% |
| Business services | 29.46 | 30.58 | 30.88 | 30.31 | 2.03% |
| Public Administration , Defence and | 176.77 | 182.36 | 189.48 | 182.87 | 12.23% |
| Education | 73.47 | 74.15 | 77.46 | 75.03 | 5.02% |
| Health & Social Work | 44.27 | 48.40 | 51.76 | 48.14 | 3.22% |
| Other Community, Social & Personal services | 39.65 | 40.44 | 41.05 | 40.38 | 2.70% |
| Private Households with Employed Persons | 3.38 | 3.42 | 3.45 | 3.42 | 0.23% |
| TOTAL/OVERALL | 1,516.41 | 1,520.59 | 1,448.99 | 1495.33 | 100.00% |

Source: Ministry of Finance, Economic Planning and Information Technology

External sector and balance of payments.⁵⁷

⁵⁷ The trade in goods services statistics are provided in additional details, in an Annex. Goods are classified as per the Standard international trade classification (SITC).

External sector and balance of payments⁵⁸

Overview

An analysis of trade statistics for Saint Vincent and the Grenadines for the period 2017 to 2020, show positive balances for trade in services. This positive performance of trade in services is largely attributed to good performances in the travel category, valued at more than 70% of GDP over the period under consideration. It is consistent with the structure of most small open economies, highly dependent on the export of tourism services. Trade in goods, on the other hand, recorded negative balance of trade for the period 2017 to 2020.

Trade in Services

The trade in services for Saint Vincent and the Grenadines (SVG) over the period resulted in a positive balance of trade (*see Figure 3 and Table 2*). Total exports surpassed total imports for 2017 to 2020. This is reflective of the country's classification as a predominantly service-based economy. Whilst there were small fluctuations, both imports and exports generally trended upwards from 2017 to 2019, after which they both declined in 2020.

"Transportation" and "Other Business and Services" maintained their position as SVG's highest valued imported services over the period, accounting for an average of 35.48 and 21.32 percent respectively of total imports over the period. Travel remained

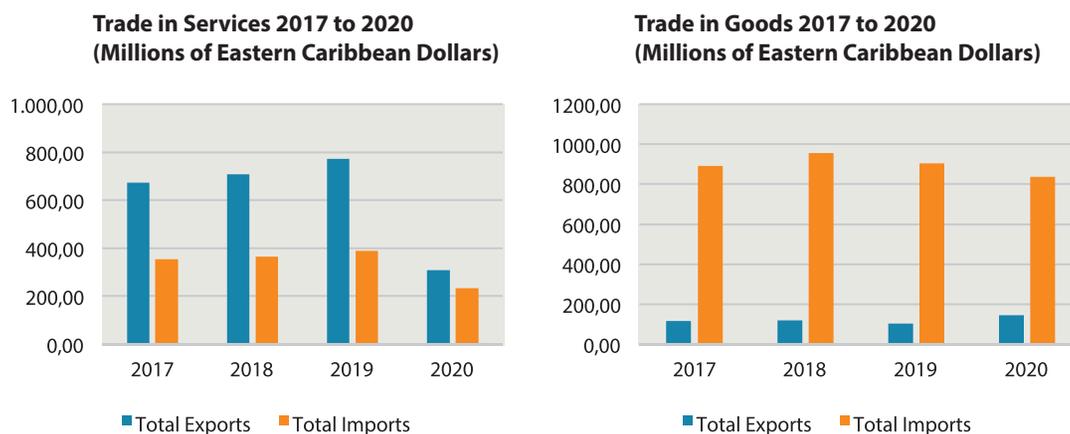
the highest valued exported services over the period, accounting for an average of 85.95% of total exports from 2017 to 2019 before falling to 72.58% in 2020.

Trade in Goods

Trade in goods presents the opposite image of trade in services, maintaining a negative balance of trade for the period under consideration (*see Table 2*). Total imports exceed total exports over the period. Imports trended upwards from 2017 to 2018, largely because of a 64.17% increase in the category of "Mineral Fuels & Related Materials". Subsequently, total imports trended downwards from 2018 to 2020 (*see Table 2*), attributed to declines in most of the categories but particularly "Food and Live Animals" which registered the largest decrease. Similar dynamic was observed for exports trended upwards over the period 2017 to 2018 before declining in 2019 and then spiking to 146.4m in 2020. The 2020 spike is largely attributed to an increase in the category of machinery and transport equipment while the upward trend in 2018 was largely attributed to increases in "Beverages and Tobacco" and "Manufactured Goods".

Total goods exported as a percentage of GDP trended upwards from 5.36 percent in 2017 to 8.08 percent in 2020 (*see Table 2*). Total goods imported as a percentage of GDP trended downwards from 49.99% in 2017 to 46.18% in 2020.

58 The trade in goods services statistics are provided in additional details, in an Annex. Goods are classified as per the Standard international trade classification (SITC).

Figure 3. External trade of St. Vincent and the Grenadines

Source: Trade in Services Data, Eastern Caribbean Central Bank

Table 2: Summary of Trade in Goods and Services 2017 to 2020

| Trade in Services in Millions of Eastern Caribbean Dollars | | | | |
|--|----------|----------|----------|----------|
| | 2017 | 2018 | 2019 | 2020 |
| Total Exports | 672.48 | 707.73 | 771.16 | 307.22 |
| Total Imports | 354.32 | 364.36 | 388.77 | 234.37 |
| Balance of Trade | 318.16 | 343.37 | 382.39 | 72.85 |
| Trade in Goods in Millions of Eastern Caribbean Dollars | | | | |
| Total Exports | 114.70 | 117.90 | 103.18 | 146.41 |
| Total Exports as % of GDP | 5.36 | 6.47 | 5.58 | 8.08 |
| Total Imports | 890.87 | 954.84 | 905.16 | 836.94 |
| Total Imports as % of GDP | 49.99 | 52.40 | 48.98 | 46.18 |
| GDP at current market prices | 2,138.88 | 2,190.51 | 2,226.74 | 2,186.14 |
| Balance of Trade | -776.17 | -836.94 | -801.98 | -690.53 |

Source: Trade in Service, Visible Trade Statistics and GDP Data, Eastern Caribbean Central Bank

Trends in Total Remittances

Total inbound remittances trended upwards for the period 2017 to 2020 (see table 3 and top panel of table 7). As shown in “A” in table 4, the USA maintained its position as the main source country for the largest inbound remittances over the period 2017 to 2020, with an average share of 42%, followed by Canada and the UK. The remaining is derived from various other countries which collectively represent the second highest source of remittances over the period, with an average of 30%. Inbound remittances as a percentage of GDP trended upwards from 5.61% in 2017 to 7.33% in 2020 (see Figure 4).

Total outbound remittances declined at a reducing rate over the period 2017 to 2020, registering declines of 11.27%, 9.65% and 7.15% for 2018, 2019 and 2020 respectively (see Table 3). The countries which received the most remittances from SVG are those classified under the category of “others” (See Table 4). Remittances to these countries trended downwards from 56% in 2017 to 51% in 2020. The US followed as the next highest recipient country, recording an average receipt of 32%. Outbound remittances as a percentage of GDP trended downwards from 1.34% in 2017 to 0.98% in 2020 (see Figure 4).

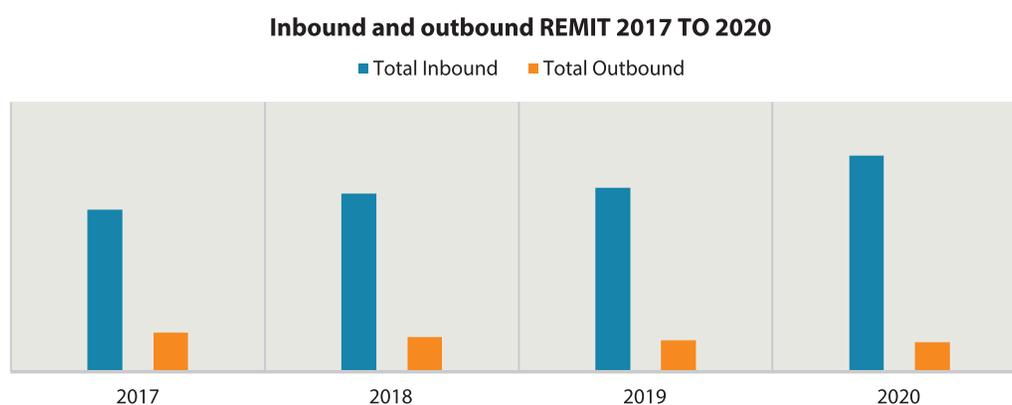
Table 3: Total Remittances 2017 to 2021

| Total Remittances for SVG 2017 to 2021 in Eastern Caribbean Dollars (XCD) | | | | |
|---|----------------|----------------|----------------|----------------|
| | 2017 | 2018 | 2019 | 2020 |
| Total Inbound | 120,014,764.95 | 131,799,850.16 | 136,389,513.92 | 160,252,480.58 |
| % change (Inbound) | | 9.82% | 3.48% | 17.50% |
| Total Outbound | 28,694,991.21 | 25,460,730.43 | 23,003,312.99 | 21,358,032.28 |
| % Change (Outbound) | | -11.27% | -9.65% | -7.15% |

Source: SVG FSA

Table 4: Inbound and Outbound Remittances 2017 to 2020

| A. Inbound Remittances Per Source Country 2017 to 2020 | | | | | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------|--|--|--|--|
| | 2017 | 2018 | 2019 | 2020 | Totals Per Country | | | | |
| USA | 49,692,709.37 | 53,107,324.41 | 57,605,953.42 | 70,109,955.58 | 230,515,942.78 | | | | |
| UK | 10,406,608.23 | 11,526,097.60 | 12,101,458.46 | 16,548,593.65 | 50,582,757.94 | | | | |
| Canada | 21,937,104.78 | 23,456,262.43 | 23,653,848.95 | 34,535,988.44 | 103,583,204.60 | | | | |
| Other | 37,978,342.57 | 43,710,165.72 | 43,028,253.09 | 39,057,942.91 | 163,774,704.29 | | | | |
| Total Outbound Remittances Per Year | 120,014,764.95 | 131,799,850.16 | 136,389,513.92 | 160,252,480.58 | 100% | | | | |
| B. Outbound Remittances Per Source Country 2017 To 2020 | | | | | | | | | |
| | 2017 | 2018 | 2019 | 2020 | Totals Per Country | | | | |
| | Value Per Country | Value Per Country | Value Per Country | Value Per Country | % of Total | | | | |
| USA | 8,961,395.02 | 8,217,086.28 | 7,587,784.28 | 6,906,692.91 | 32% | | | | |
| UK | 1,286,806.26 | 971,434.88 | 1,260,436.04 | 1,101,339.78 | 5% | | | | |
| Canada | 2,431,859.32 | 2,388,196.42 | 2,398,330.52 | 2,434,235.14 | 11% | | | | |
| Other | 16,014,930.61 | 13,884,012.85 | 11,756,762.15 | 10,915,763.45 | 51% | | | | |
| Total Outbound Remittances Per Year | 28,694,991.21 | 25,460,730.43 | 23,003,312.99 | 21,358,031.28 | 100% | | | | |

Figure 4: Inbound and Outbound Remittances 2017 to 2020 – graph and table representation

| Remittances as a percentage GDP (in Millions of Eastern Caribbean Dollars) | | | | |
|--|----------|----------|----------|----------|
| | 2017 | 2018 | 2019 | 2020 |
| Total Inbound Remittances (IB) | 120.01 | 131.8 | 136.39 | 160.25 |
| Total IB as percentage of GDP | 5.61% | 6.02% | 6.13% | 7.33% |
| Total Outbound Remittances (OB) | 28.69 | 25.46 | 23% | 21.36 |
| Total OB as percentage of GDP | 1.34% | 1.16% | 1.03% | 0.98% |
| GDP at market prices (Current) | 2,138.88 | 2,190.51 | 2,226.74 | 2,186.14 |

Source: SVG FSA & ECCB/ SVG Statistical Office

Public Finances

Over the last three fiscal years, the overall fiscal position of the government has deteriorated from year to year, from a deficit 0.9% of GDP in 2018 to a deficit of 5.7% of GDP in 2020. This performance reflected the growth in recurrent and capital expenditure. Annual increase in revenues moderated the impact of the rising expenditure on the overall balance. Corresponding with the worsened overall deficit, the level of Public Debt also increased over the period.

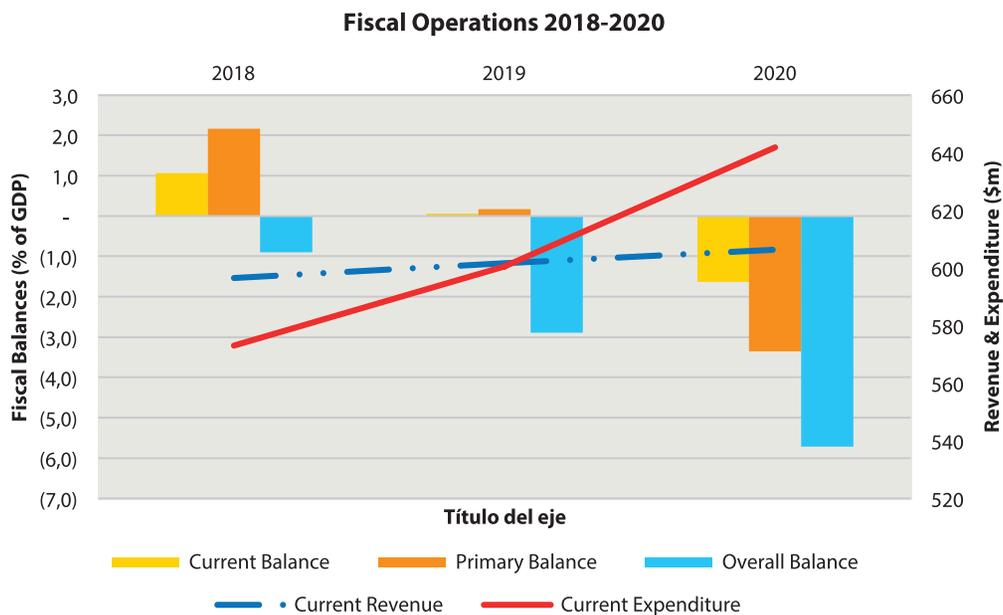
Current Revenue for St. Vincent and the Grenadines grew by less than 1.0% annually over

the period 2018-2020, moving from XCD 596.40 million in 2018 to XCD 601.72 million in 2019 and XCD 606.27 million in 2020. On the capital side, a notable increase in revenue was recorded as it moved from XCD 40.65 million in 2018 to XCD 78.30 million in 2019, and XCD 109.41 million in 2020. The growth in capital revenue in 2019 was mainly on account of an increase in grants which went up by 86.7% in 2018 to XCD 74.09 million in 2019. In 2020, capital revenue grew by 39.7% mainly driven by the sale of the Buccament Bay Resort for XCD 34.30 million and an XCD 10.00 million draw down from the contingencies fund to aid in financing the Government's Covid-19 response package.

Growth in Recurrent Expenditure outpaced that of Current Revenue, moving by 4.4%, on average, per annum. Outlays increased from XCD 572.96 million in 2018 by 4.8% to XCD 600.44 million in 2019 and a further 6.9% to XCD 641.81 million in 2020. The growth in expenditure from 2018 to 2019 was mainly reflective of a 5.6% increase in Compensation of Employees which was influenced by salary enhancements during the period along with changes in allowances and increments. An increase of 6.9% in recurrent expenditure from 2019

to 2020 was mainly on account of a 6.4% growth in spending on Compensation of Employees and 47.6% increase in Social Assistance Benefits. Compensation of Employees was positively impacted by a 2.0% salary increase paid to public servants from January 2020. This was a result of filling critical posts across the public sector and changes in increments and allowances during the period. Higher amounts were expended on Social Assistance Benefits as part of the government’s COVID-19 response package.

Figure 5: St. Vincent and the Grenadines Fiscal Operations 2018-2020



Source: Ministry of Finance, Economic Planning and Information Technology

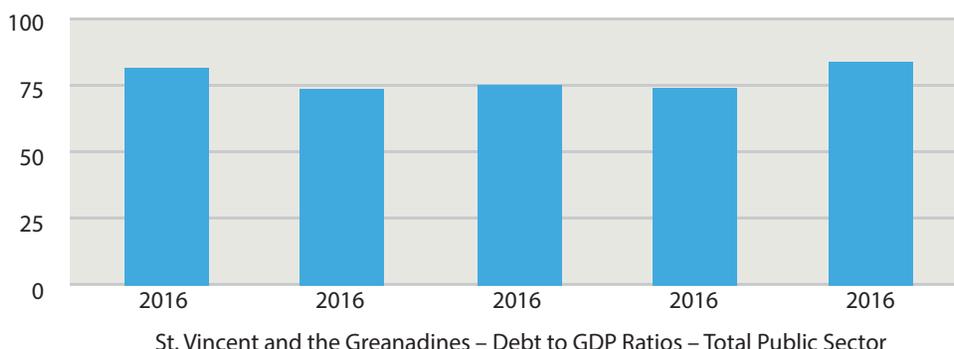
Spending on the Public Sector Investment Programme expanded significantly between 2018 and 2020. Capital Expenditure increased by 61.3% from XCD \$98.89m in 2018 to XCD \$159.56m in 2019 and by 32.4% to XCD211.18m in 2020. The increase was mainly on account of spending for the following projects:

- Geothermal Project (XCD32.88m) in 2019
- Regional Disaster Vulnerability Risk Reduction Programme (XCD21.73m) in 2019
- Regional Disaster Vulnerability Risk Reduction Programme (XCD44.06m) in 2020

- Acquisition of Buccament Bay Resort (XCD31.44m) in 2020

The country has a large Public Sector indebtedness, which increased substantially from XCD 1.66 billion in 2018 to XCD 1.87 billion in 2020, a 12.7% increase over the 2-year period. The public sector debt to GDP ratio which stood at 75.7% in 2018, declined in 2019 to 73.6%. However, the ratio returned to a higher level in 2020 (84.9%) largely due to the resources required to cushion the effects of the economic fall out as a result of the Covid-19 pandemic.

Figure 6: Public Sector DEBT to GDP (%)



The majority of Public Debt is external amounting to 65.1%, 70.7% and 68.9% of obligations, for the periods 2018, 2019 and 2020 respectively. The increase in debt was mainly attributed to disbursements on existing external loans, most notably, the World Bank’s Regional Disaster Vulnerability Project in the amount of XCD41.09 million and a Fiscal Reform and Resilience Development Policy Financing in the amount of XCD54.00 million. Financing from

the IMF amounted to XCD43.13 million in the form of a Rapid Credit Facility specifically to aid in the response to Covid-19. CDB also disbursed XCD12.69 million for Covid-19 emergency response support.

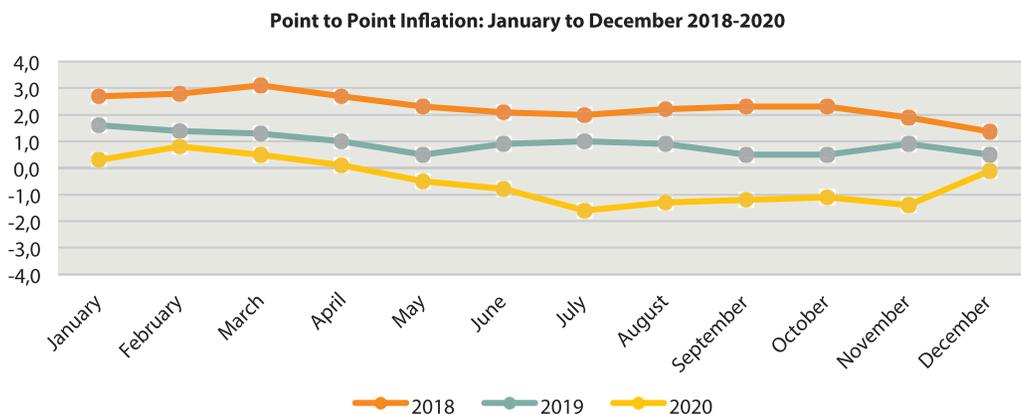
Total securities issued amounted to XCD99.22 million. Domestic Borrowing were from GOSVG and ECCB in the amounts of XCD20.00 million and XCD10.00 million, respectively.

Price Fluctuations

The Consumer Price Index for the years 2018, 2019 and 2020 showed that the annual average “point-to-point” inflation rates were 2.3%, 0.8% and negative 0.5% respectively (see Annex 111). For

all months of 2018 and 2019 positive values were recorded (see Figure 7). Overall changes in the inflation rate were driven mostly by movements of prices of “Food and Non-Alcoholic Beverages”, “Housing, Water, Electricity, Gas and Other Fuels” and “Transport”.

Figure 7: Point to Point of Inflation rate, January - December 2018-2020



Source: The Statistical Office, Ministry of Finance, Economic Planning and Information Technology

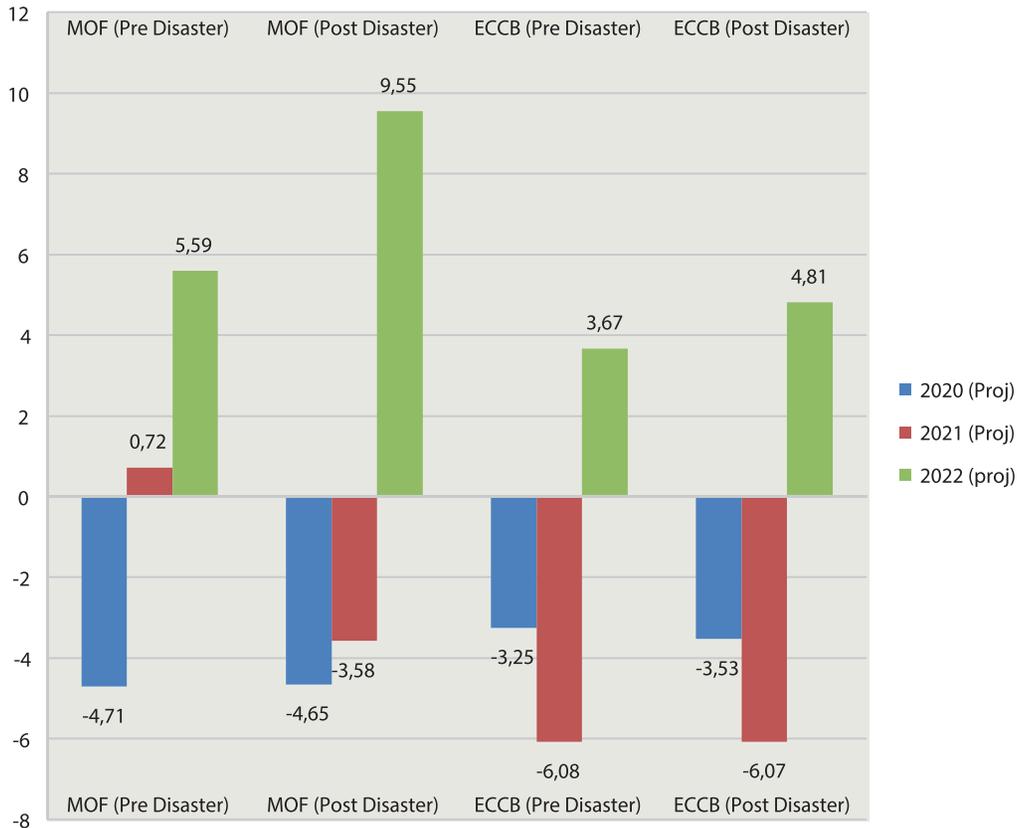
Post-eruption estimated impact and recovery scenarios

Economic performance

As at the end of 2020, it was projected that the economy would begin to recover in 2021 with an estimated growth of 0.72 percent and -3.52 percent based projections by the Ministry of Finance (MOF) and the Eastern Caribbean Central Bank (ECCB) respectively. However, post eruption estimates were revised and growth rates are negatively projected from the MOF and ECCB at -3.58 and -6.07 percent respectively. This is on account of expected declines in government

revenue as a result of reduction in economic activity influenced by contractions in major sectors such as Agriculture, Fishing, Transport and Storage, Manufacturing and Tourism. Increased government expenditure as rehabilitation and reconstruction of damaged infrastructure is expected to intensify in the aftermath of the volcanic eruption by the end of the year will mostly be reflected in accelerated growth rate in 2022 of 9.55 and 4.81 percent based on the MOF and ECCB projections.

Figure 8. comparing projected GDP Growth Rate for Ministry of Finance (MOF) and Eastern Caribbean Central Bank (ECCB)



Source: Ministry of Finance, Economic Planning and Information Technology

Sectors directly affected by the volcanic eruptions, such as the Agriculture, Livestock and Forestry sector are expected to decline further following previous years contractions of 1.26 and 12.58 percent in 2019 and 2020, respectively. The total effects to this sector are estimated at XCD 230.1 million. The production of ‘Other Crops’, such as plantains, root crops (dasheen, eddoes, yams, sweet potatoes, ginger, arrowroot, cassava, tannia, carrots and peanuts), fruits and vegetables and fruit trees were adversely affected with a recorded loss of 100 percent in the red and orange zones. The amount needed for recovery to this sector is estimated at XCD 258.8 million

The housing sector was also affected with an estimated damage to housing stock of 18 percent mainly on the mainland. Loss estimates in the housing sector correspond to three main categories: a) costs for removal of rubble, b) costs associated to the provision of temporary housing therefore operation and maintenance of shelters, and c) foregone income from rental housing. Most homes were affected by ash accumulated on roof structures and on the houses. Notable is that even after the eruptions subsided, red and orange zone communities were still being affected by lahars. The housing sector has the largest estimated recovery needs of XCD 356 million or 48.8 percent of the total recovery needs.

Losses for the tourism sector is estimated at XCD 12.2 million mainly from ash falls which affected 8 main tourism sites. The assessment team estimated the losses as the difference between income earned from each affected site during April and May 2021 with the income earned during 2020, and the remuneration to their staff from April to June 2021 and renovations to be done at recreational sites. The total recovery needs for the tourism sector are projected at XCD 1.5 million.

Electricity on an average contributes 3.09 percent towards GDP with a projected contribution of 3.34 and 3.42 percent for the years 2020 and 2021 respectively. The accumulation of ash on transmission, distributions lines and other equipment resulting in short circuits and island wide outages. These damages are estimated to cost XCD 0.1 million. Losses were also incurred of approximately XCD 0.9 million associated with cleaning, reductions of electricity generation and/or reductions of electricity sales, fluctuations in the electricity prices, increment of tariffs paid by

the customers, reconnections, between others. Recovery needs in the electricity sector covers the costs to overcome the identified damages and losses generated by the La Soufriere volcanic eruption. The total recovery needs amount to XCD 1.2 million.

Transport, storage and communication contributed on average of 13.35 percent to GDP. This sector was mostly affected by the volcanic eruption with an estimated total damage and loss of XCD 74.4 million. Physical damages to road structures and bridges accounting for 42.1 percent of the total damage and lost estimate while the rebuilding of road, river crossing infrastructure, bridges and changes in economic flows and removal of ash accounted for 57.9 percent of the total damage and loss cost. Recovery needs for the transport sector amounted to XCD 89.3 million.

The table presents the damage and losses, as well as the recovery needs estimated by the PDNA teams, broken down by main sectors affected and suffered by both the public and private sector:

Table 6. Summary of La Soufrière volcanic eruption damage and losses and recovery needs

| Sector | Damage (XCD) | Loss (XCD) | Total Effects (XCD) | Recovery Needs (XCD) |
|----------------------------------|--------------------|--------------------|---------------------|----------------------|
| SOCIAL | 281,286,577 | 33,421,158 | 314,707,735 | 384,565,074 |
| Housing | 263,542,495 | 32,333,364 | 295,875,859 | 355,994,870 |
| Health | 3,151,203 | 358,150 | 3,509,353 | 10,329,105 |
| Education | 14,592,879 | 729,644 | 15,322,523 | 18,241,099 |
| INFRASTRUCTURE | 30,414,030 | 46,612,510 | 77,026,540 | 92,434,207 |
| WASH | 304,530 | 1,337,596 | 1,642,126 | 1,890,426 |
| Transport | 30,000,606 | 44,363,134 | 74,363,740 | 89,327,028 |
| Electricity | 108,894 | 911,780 | 1,020,674 | 1,216,753 |
| PRODUCTIVE | 104,378,880 | 138,541,537 | 242,920,417 | 260,353,540 |
| Agriculture, Forestry, Fisheries | 103,848,380 | 126,296,910 | 230,145,290 | 258,855,290 |
| Tourism-Accom. | - | 11,810,000 | 11,810,000 | - |
| Tourism-Parks | 530,500 | 434,627 | 965,127,327 | 1,498,250 |
| CROSS CUTTING | | | | |
| Disaster Risk Reduction | | | | 2,375,265 |
| TOTAL | 416,079,487 | 218,575,205 | 634,654,692 | 739,728,086 |

Source: Mission sectoral teams

External Sector

Remittances (Post Eruption Period)

Inbound remittances for the period for the first five months (January to May) for 2018 to 2021 generally trended upwards, with reductions registered only from countries classified in the category of “others (see Table 7). In keeping with the annual trends, the highest remittances over the period originated from the US. Notably, the largest increase in inbound remittances was for the period January to May 2021. Increases in 2020 and 2021 are possibly attributed to remittances

spurred by COVID-19 stimulus grants in source countries such as the USA as well as the diaspora’s efforts to mitigate the financial burden inflicted by COVID-19 and the volcanic eruptions in SVG. While remittances increased from the USA, UK and Canada in the 2021 period, the highest increase was 60.49% from the UK followed by 53.37 from Canada. The inbound remittances from the countries classified as “others” declined but did so by a smaller percentage in 2021 relative to 2020.

Outbound remittances for the period January to May 2018 to 2021 trended downwards, as shown by “B” in Table 7 below. In keeping with the annual

trends in remittances, the countries included in the category of “other” are those receiving the most remittances from SVG. Interestingly, outbound remittances increased in 2021 relative to 2020 with Canada being the beneficiary of the biggest increase. This increase is possibly attributed to

households and businesses using remittances to capitalize on the government’s policy to which reduced or eliminate duties on some classes of imports during the aftermath of the eruption of the La Soufriere Volcano.

Table 7: Remittances in Millions of Eastern Caribbean Dollars

| A. Inbound Remittances January to May 2018 to 2021 | | | | | | | |
|---|------------|------------|-----------------|------------|-----------------|------------|-----------------|
| | 2018 | 2019 | % Change (2019) | 2020 | % Change (2020) | 2021 | % Change (2021) |
| USA | 20,329,341 | 24,253 | 19.30 | 25,787,307 | 6.32 | 35,681,939 | 38.37 |
| UK | 4,370,837 | 4,876,919 | 11.58 | 5,571,308 | 14.24 | 8,941,311 | 60.49 |
| Canada | 8,784,356 | 9,094,736 | 3.53 | 10,623,348 | 16.81 | 16,293,296 | 53.37 |
| Other | 16,673,14 | 18,997,849 | 13.94 | 15,663,204 | -17.55 | 15,648,221 | -0.10 |
| B. Outbound Remittances January to May 2018 to 2021 | | | | | | | |
| | 2018 | 2019 | % Change (2019) | 2020 | % Change (2020) | 2021 | % Change (2021) |
| USA | 3,075,776 | 2,945,543 | 4.23 | 2,145,951 | -27.15 | 2,336,598 | 8.88 |
| UK | 327,042 | 456,376 | 39.55 | 388,868 | -14.79 | 400,677 | 3.04 |
| Canada | 872,946 | 825,772 | -5.40 | 779,053 | -5.66 | 955,548 | 22.66 |
| Other | 5,827,770 | 5,148,863 | -11.65 | 4,002,687 | -22.26 | 4,191,950 | 4.73 |

Source: FSA, SVG

External sector and balance of payments

Trade in Goods

Exports in the category of “Food & Live Animals” for the period January to June 2021 fell by 8.50% relative to the similar period of 2020. This is largely attributed to a reduction of 24.63% and 23.57% respectively in the sub-categories of “Vegetables and fruit” and “cereals and cereal preparations. The changes in “Food & Live Animals” associated to the fact that 27.5% of all registered

farmers are in the “Red and Orange Zones” where mandatory evacuations were conducted for several months prior to and after the volcanic eruptions. Additionally, damages to the crop sub-sector accounted for 56.9% of the damage to the agricultural sector.

Trade in Services

Exports of travel services accounted for 82.11% of average trade in services over the period 2018 to 2021⁵⁹ and is therefore the trade category which

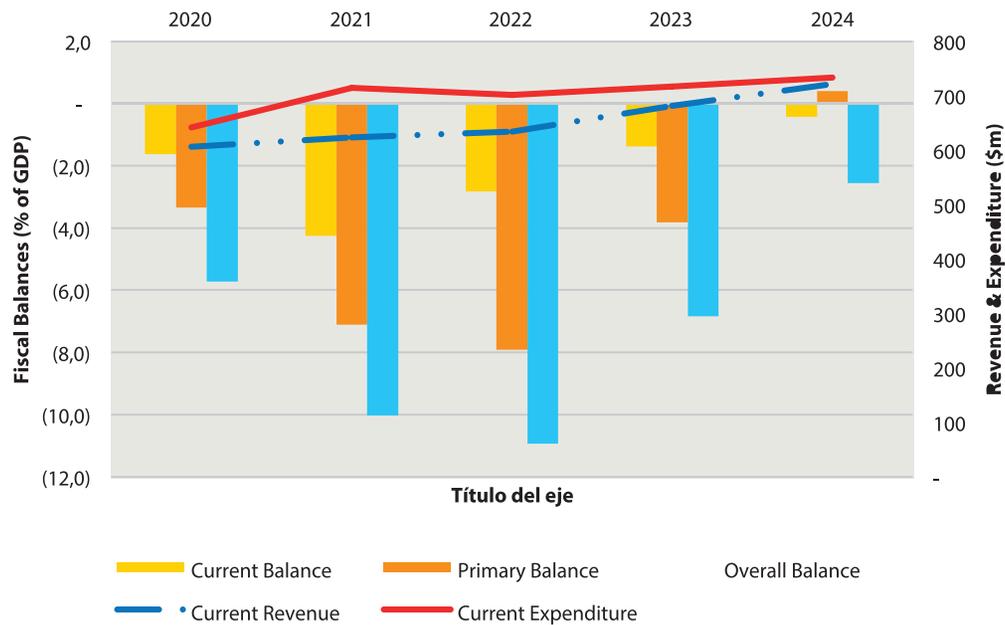
⁵⁹ Data available for 2021 are projected, prior to the volcanic eruption and is sourced from the Eastern Caribbean Central Bank.

is discussed to inform the impacts of the volcanic eruption on SVG’s trade in services. Given that most of the island’s accommodation are located in the “green zone” no significant damages were recorded in this regard. However, several tourist sites were inundated with ash and are in need of rehabilitative efforts. Therefore, SVG’s capacity to attract its regular tourism travellers, in the near

to medium term, may be diminished if most were attracted by the touristic sites. Given the importance of travel to SVG’s trade in services, the trade balance is likely to deteriorate in the near to medium term. In the longer term, SVG may be able to target niche of travelers who are interested in the after-effects of a volcanic eruption.

Public Finances

Figure 9: Medium Term Fiscal Operations



Source: Ministry of Finance, Economic Planning and Information Technology

Fiscal Outlook and annual projections post eruption

The April 2021 eruption of the La Soufrière Volcano is projected to have an adverse impact on the fiscal operations for the remainder of 2021, however the outlook for the first half of 2021 tells a different story.

In the period Quarter 1, January to March 2021, Current Revenue decreased by 4% as compared

to the same period in 2020. This was on account of lower receipts from Taxes on Good and Services, which saw a 10.1% decrease from the 2020 period. Capital Revenue increased significantly by 660% from XCD 0.61 million in 2020 to XCD 4.7 million in the same period of 2021. This was attributed to the inflow of grants for COVID-19 relief and other capital revenue. Current Expenditure remained relatively unchanged for the period as there was only a 0.2% increase from XCD 147.0 million in 2020

to XCD 147.3 million for the same period in 2021 while Capital Expenditure increased by XCD 1.6 million or 16.2% as projects continued.

Table 8. Fiscal Outlook

| Quarter 1 (Jan-Mar) | | | |
|---------------------|-------------------|--------|----------|
| | 2021 | 2020 | |
| | \$ Millions (XCD) | | % change |
| Current Revenue | 141.26 | 147.12 | -4.0% |
| Current Expenditure | 147.29 | 147.02 | 0.2% |
| Capital Revenue | 4.66 | 0.61 | 660.6% |
| Capital Expenditure | 11.30 | 9.72 | 16.2% |
| Current Balance | -6.03 | 0.10 | -6012.7% |
| Primary Balance | -1.60 | 4.70 | -134.1% |
| Overall Balance | -12.67 | 8.80 | -244.0% |
| Quarter 2 (Apr-Jun) | | | |
| Current Revenue | 181.561 | 135.72 | 34% |
| Current Expenditure | 168.796 | 160.17 | 5% |
| Capital Revenue | 40.49 | 7.14 | 467% |
| Capital Expenditure | 60.232 | 32.38 | 86% |
| Current Balance | 12.765 | -24.45 | -152% |
| Primary Balance | 12.555 | -31.16 | -140% |
| Overall Balance | 0.038 | -42.89 | -100% |

Source: Ministry of Finance, Economic Planning and Information Technology

In contrast, the period Quarter 2, April to June 2021, saw significant increases in both revenue and expenditure due to the impact of the eruption of the La Soufrière volcano in April 2021. Current Revenue increased by 34% from XCD 135.7 million in 2020 to XCD 181.6 million 2021. This was on account of higher receipts in taxes on property, up to XCD 45.1 million from XCD 2 million. Capital Revenue increased from XCD 7.1 million in 2020 to XCD 40.5 million in 2021. This was mainly

attributed to a 15 million drawdown from the Contingencies fund and the inflow of disaster relief funds. Current Expenditure increased by 5% while Capital Expenditure significantly increased by 86% from XCD 32.4 million in 2020 to XCD 60.2 million in 2021.

The Fiscal Outlook for the remainder of 2021 projects that Current Revenue will grow by \$17.14m. This is attributable to a forecasted 77.5 percent increase in taxes on property (a total of XCD 72.47 million). In contrast, lower receipts from Taxes on Income & Profits, Taxes on Goods & Services and Taxes on International Trade are expected as a reflection of the slowdown in domestic economic activity as a result of the COVID-19 pandemic and the April 2021 volcanic eruption.

In 2021, Recurrent Expenditure is projected to increase by 3.4 percent of GDP, as all categories of expenditure are projected to grow during the period. Capital Expenditure is projected at XCD 215 million and is expected to grow and remain high in 2022 and 2023 on account of the anticipated implementation of the Port Redevelopment project. After this, Capital Expenditure is forecasted to fall back to its historical levels.

As a result, the Overall Deficit is anticipated to increase from -5.7 percent of GDP for the year 2020 to -10.0 percent of GDP for the year 2021. Similarly, the Primary Deficit is expected to move from 72.85 million -3.3 percent of GDP to -7.9 percent of GDP.

Proposed Medium Term Fiscal Framework

In 2022 the Overall Deficit is expected to worsen to XCD 298.36 million as the majority of spending on the Port Redevelopment Project will be undertaken during that year. Following this, it is anticipated that the Overall Deficit will improve consistently with revenue growth and lower expenditure on capital projects.

Based on Table 9, Current Revenue is projected to average 27.1 % of GDP in the Medium Term, while Capital Revenue is expected to average 2.9% of GDP. This is under the assumption of increased economic activity in the various sectors as the

economy continues to return to some form of normalcy following the negative shocks from COVID-19 and the eruption of the La Soufrière volcano.

Table 9. Proposed Macroeconomic and Fiscal Forecast for 2022-2024

Table 2. Proposed Macroeconomic and Fiscal Forecast for 2022-2024

| | 2022 | 2023 | 2024 | Avg. | |
|----------------------------|-----------------|-----------------|-----------------|-----------------|------------|
| | \$ Millions | | | \$m | % of GDP |
| Current Revenue | 634.629 | 681.736 | 721.494 | 679.286 | 27.1 |
| Current Expenditure | 700.912 | 716.511 | 733.036 | 716.820 | 28.6 |
| Capital Revenue | 94.366 | 61.738 | 62.038 | 72.714 | 2.9 |
| Capital Expenditure | 298.357 | 213.683 | 132.784 | 214.941 | 8.6 |
| Current Balance | (66.284) | (34.775) | (11.542) | (37.53) | (1.5) |
| Primary Balance | (185.715) | (96.275) | 10.689 | (104.67) | (4.2) |
| Overall Balance | (256.274) | (172.519) | (67.788) | (179.76) | (7.2) |
| GDP @ Market Prices | 2,343.88 | 2,522.95 | 2,655.68 | 2,507.50 | 100 |
| Real GVA Growth (%) | 9.5 | 5.5 | 3.4 | 6.2 | |

Source: Ministry of Finance, Economic Planning and information Technology

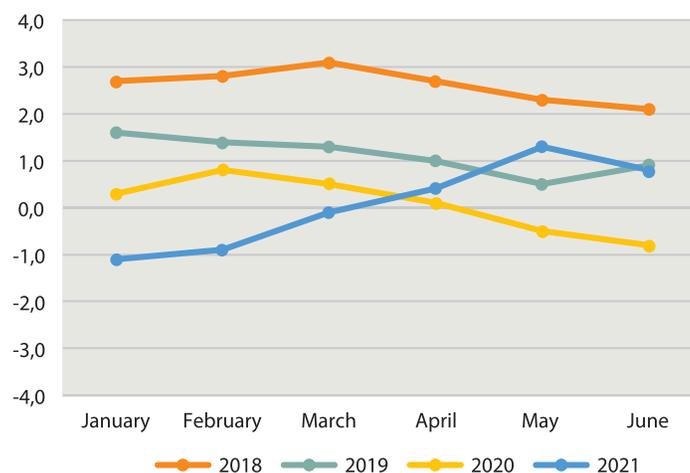
Current Expenditure is expected to increase in the medium term by an average of 28.6% of GDP while, Capital Expenditure is projected to decrease yearly, although the average will still account for 8.6% of GDP. This annual decrease is projected due to the fall out of expenditure on the Port Development project.

Over the period, the primary balance is expected to average 4.2% of GDP. This is under the assumption that existing government policies continue without change.

Price fluctuations (CPI)

For the first six months of 2021, the “point to point” inflation rate fluctuated with increases

of 0.4 percent ,1.3 percent and 0.8 percent for the months of April, May and June respectively (*See Table III in Annexes*). This was fuelled by movement in five groups. These were “Housing, Water, Electricity, Gas and Other Fuels”, “Transport, “Food and Non-Alcoholic Beverages”, “Health” and “Recreation and Culture”. As of June, “Housing, Water, Electricity, Gas and Other Fuels” recorded the largest increase of 1.9 percent on account of a rise in the price for electricity (10.6%), cooking gas (9.3%) and varnish (69.4%). The increase in the price for electricity is a result of a higher fuel surcharge rate of 40.55 cents per kilowatt hour for June 2021 compared to 31.91 cents per kilowatt hour for May 2021. The price of petrol grew by 8.0 percent while diesel grew by 5.0 percent.

Figure 10. Point to point inflation: January to June 2018-2021

Source: The Statistical Office, Ministry of Finance, Economic Planning and Information Technology

Conclusions and recommendations

Economic prospects have worsened appreciably as a result of the Soufrière eruption on 9th April 2021. Although, economic activity was only stopped temporarily, the effects on the economy may be more far reaching in relation to the reduction in potential output in the short-run and adverse impacts on infrastructure and debt sustainability in the medium to long-term. The agriculture sector production was the most severely impacted along with the housing sectors and public infrastructure having suffered the most damages, particularly in the more vulnerable zones.

Losses in agriculture are estimated to be very significant, however, of equal concern to policy makers would be the potential on future output given the need to relocate some of the productive activities from the high risk zones. The process of relocating households key to the agricultural sector will require deft negotiations with affected persons in the context of climate change considerations and stipulated zoning and risk mitigation requirements.

A positive development in agriculture may be the added incentive to intensify efforts to support local production, which already increased its market share during the pandemic as imports fell relatively faster than exports. As for the post-eruption scenarios the projections vary providing a range of forecasts from a more conservative less dramatic fall in output outlined by the Central Statistics Office/Ministry of Finance and Economic Planning, and more pessimistic outlooks from the CDB, IMF and the ECCB. It bears reminding that the eruption adds to the negative effects that the Covid-19 Pandemic had over the country in economic and human terms in 2020.

Current and Capital revenue are anticipated to decrease, largely attributed to the prolonged effects of the COVID 19 pandemic and the volcanic eruption which have placed additional pressure on public finances. Government expenditure will likely increase to support displaced persons and for reconstruction and rehabilitation. Notwithstanding, the country had

an uptick in revenue in the first six months of 2021 on account of higher property taxes associated with the purchase of high valued properties in the Grenadines and Mustique as well as grants to support the ongoing disaster relief effort. By the end of 2021, the Public Sector Investment Programme is expected to remain robust as there will be an increase in spending arising from the supplementary expenditures approved in response to the volcanic eruptions and special warrants during the period.

External balance of payments, highly dependent on services, did not show a major downturn;

and the country received an influx of external resources due to the purchases referenced earlier from foreigners and the funds for reconstruction received from several sources. Remittances also showed a positive evolution since 2020.

Finally, recovery needs framed in a recovery strategy will put additional pressure on the government's investment budget, leading to an increase in indebtedness that is being partially mitigated by the increase in revenue and the availability of recovery funds from IFIs and other foreign income that include insurance payments and remittances from Vincentians abroad.



Annexes:

I. Detailed share of sector in GDP

St. Vincent & The Grenadines Percentage Contribution of Gross Value Added by Economic Activity, at Basic Prices, in Constant (2006) Prices: 2018-2020

| SECTOR | 2018 Revised | 2019 Preliminary | 2020 Projected | Average 2018-2020 | % |
|--|--------------|------------------|----------------|-------------------|--------|
| Agriculture, Hunting & Forestry | 101.72 | 102.31 | 98.45 | 100.83 | 6.74% |
| Crops | 80.43 | 78.47 | 74.40 | 77.77 | 5.20% |
| Bananas | 1.33 | 0.76 | 0.57 | 0.88 | 0.06% |
| Other Crops | 79.10 | 77.71 | 73.83 | 76.88 | 5.14% |
| Livestock | 20.58 | 23.14 | 23.37 | 22.36 | 1.50% |
| Forestry | 0.71 | 0.70 | 0.69 | 0.70 | 0.05% |
| Fishing | 8.60 | 8.83 | 10.60 | 9.34 | 0.62% |
| Mining & Quarrying | 3.66 | 3.70 | 3.62 | 3.66 | 0.24% |
| Manufacturing | 66.98 | 57.82 | 51.59 | 58.80 | 3.93% |
| Electricity & Water | 61.98 | 64.07 | 65.01 | 63.69 | 4.26% |
| Electricity | 46.33 | 47.56 | 48.41 | 47.43 | 3.17% |
| Water | 15.65 | 16.52 | 16.60 | 16.26 | 1.09% |
| Construction | 126.21 | 122.97 | 120.51 | 123.23 | 8.24% |
| Wholesale & Retail Trade | 225.02 | 206.53 | 204.20 | 211.91 | 14.17% |
| Hotels & Restaurants | 34.64 | 38.40 | 20.75 | 31.26 | 2.09% |
| Hotels | 23.18 | 24.94 | 9.98 | 19.36 | 1.29% |
| Restaurant | 11.47 | 13.47 | 10.77 | 11.90 | 0.80% |
| Transport, Storage & Communications | 196.64 | 208.83 | 145.63 | 183.70 | 12.28% |
| Transport & Storage | 153.27 | 165.02 | 101.96 | 140.08 | 9.37% |
| Road | 106.14 | 115.36 | 63.86 | 95.12 | 6.36% |
| Sea | 20.67 | 20.97 | 18.67 | 20.10 | 1.34% |
| Air | 1.79 | 1.88 | 0.75 | 1.47 | 0.10% |
| \Auxiliary transport activities and storage | 24.67 | 26.82 | 18.68 | 23.39 | 1.56% |

| SECTOR | 2018 Revised | 2019 Preliminary | 2020 Projected | Average 2018-2020 | % |
|--|-----------------|------------------|-----------------|-------------------|----------------|
| Communications | 43.37 | 43.80 | 43.67 | 43.62 | 2.92% |
| Telecommunication | 41.93 | 42.28 | | 42.10 | 2.82% |
| Postal & Courier Services | 1.45 | 1.53 | | 1.49 | 0.10% |
| Financial Intermediation | 115.16 | 117.64 | 123.14 | 118.65 | 7.93% |
| Banks & Other Financial Institutions | 73.28 | 75.56 | 80.45 | 76.43 | 5.11% |
| Insurance and pension funding | 37.08 | 37.22 | 37.78 | 37.36 | 2.50% |
| Activities auxiliary to financial intermediation | 4.81 | 4.86 | 4.90 | 4.86 | 0.32% |
| Real Estate, Renting and Business services | 252.21 | 257.43 | 260.01 | 256.55 | 17.16% |
| Owner Occupied Dwellings | 180.18 | 181.98 | 183.80 | 181.99 | 12.17% |
| Real Estate activities | 30.30 | 30.57 | 30.87 | 30.58 | 2.04% |
| Renting of machinery and equipment | 7.90 | 9.70 | 9.80 | 9.14 | 0.61% |
| Computer related services | 4.37 | 4.60 | 4.65 | 4.54 | 0.30% |
| Business services | 29.46 | 30.58 | 30.88 | 30.31 | 2.03% |
| Public Administration, Defence and Compulsory Social Security | 176.77 | 182.36 | 189.48 | 182.87 | 12.23% |
| Central | 167.36 | 172.54 | 179.51 | 173.13 | 11.58% |
| Local | 2.93 | 3.00 | 3.05 | 2.99 | 0.20% |
| NIS | 6.48 | 6.83 | 6.93 | 6.74 | 0.45% |
| Education | 73.47 | 74.15 | 77.46 | 75.03 | 5.02% |
| Public | 63.62 | 64.16 | 67.31 | 65.03 | 4.35% |
| Private | 9.85 | 10.00 | 10.15 | 10.00 | 0.67% |
| Health & Social Work | 44.27 | 48.40 | 51.76 | 48.14 | 3.22% |
| Public | 33.44 | 36.59 | 39.77 | 36.60 | 2.45% |
| Private | 10.83 | 11.81 | 11.99 | 11.54 | 0.77% |
| Other Community, Social & Personal services | 39.65 | 40.44 | 41.05 | 40.38 | 2.70% |
| Private Households with Employed Persons | 3.38 | 3.42 | 3.45 | 3.42 | 0.23% |
| Less FISM | 13.96 | 16.64 | 17.72 | 16.11 | 1.08% |
| TOTAL | 1,516.41 | 1,520.59 | 1,448.99 | 1495.33 | 100.00% |

SOURCE: St. Vincent & the Grenadines Statistical Office \ ECCB, Date: 16 October 2020

II. Detailed tables of trade

Trade in Services

| | Imports | | | | | Exports | | | | | Balance in Trade | | | | |
|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|------------------|---------------|---------------|--------------|--------------|
| | 2017 | 2018 | 2019 | 2020 | 2021 | 2017 | 2018 | 2019 | 2020 (Pr) | 2021 (P) | 2017 | 2018 | 2019 | 2020 (Pr) | 2021 (P) |
| 1. Manufacturing services on physical inputs owned by others | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2. Maintenance and Repair Services (n.i.e.) | 0.25 | 0.25 | 0.25 | 0.25 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.25 | -0.25 | -0.25 | -0.25 | -0.26 |
| 3. Transportation | 129.88 | 138.17 | 123.04 | 82.90 | 82.99 | 32.70 | 36.78 | 35.03 | 15.33 | 15.80 | -97.18 | -101.38 | -88.01 | -67.57 | -67.19 |
| 4. Travel | 65.60 | 66.75 | 67.86 | 23.42 | 23.02 | 568.28 | 609.34 | 672.80 | 222.97 | 171.31 | 502.68 | 542.58 | 604.94 | 199.55 | 148.29 |
| 5. Construction services | 13.60 | 9.48 | 50.47 | 12.66 | 13.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -13.60 | -9.48 | -50.47 | -12.66 | -13.30 |
| 6. Insurance services | 44.79 | 43.44 | 39.16 | 34.24 | 31.85 | 11.35 | 10.56 | 10.87 | 10.93 | 11.20 | -33.44 | -32.88 | -28.28 | -23.31 | -20.65 |
| 7. Financial services | 2.18 | 2.56 | 2.60 | 1.79 | 1.59 | 9.16 | 9.14 | 9.65 | 8.68 | 7.68 | 6.99 | 6.59 | 7.05 | 6.90 | 6.09 |
| 8. Charges for use of Intellectual property | 7.29 | 7.23 | 7.34 | 6.49 | 5.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -7.29 | -7.23 | -7.34 | -6.49 | -5.77 |
| 9. Telecommunications, Computer and Information services (Combined) | 11.85 | 12.44 | 12.65 | 9.45 | 7.53 | 21.37 | 14.60 | 15.04 | 15.19 | 15.57 | 9.52 | 2.16 | 2.39 | 5.74 | 8.04 |
| 10. Other business services | 70.49 | 75.42 | 76.62 | 53.00 | 54.94 | 25.38 | 23.69 | 24.08 | 19.34 | 18.49 | -45.11 | -51.73 | -52.54 | -33.66 | -36.45 |
| 11. Personal, cultural, and recreational services | 0.07 | 0.05 | 0.06 | 1.61 | 1.69 | - | - | - | 11.17 | 11.69 | -0.07 | -0.05 | -0.06 | 9.56 | 10.00 |
| 12. Government services, n.i.e. | 8.32 | 8.58 | 8.72 | 8.56 | 8.96 | 4.23 | 3.63 | 3.69 | 3.62 | 3.79 | -4.10 | -4.95 | -5.03 | -4.94 | -5.17 |
| Totals | 354.32 | 364.36 | 388.77 | 234.37 | 231.89 | 672.48 | 707.73 | 771.16 | 307.22 | 255.53 | 318.16 | 343.37 | 382.39 | 72.85 | 23.64 |

Notes

Pr = preliminary, P= projected

Source: Visible trade statistics, Eastern Caribbean Central Bank

Trade in Goods in SITC

| | Imports | | | Total Exports | | | Balance of Trade | | | | | |
|--|---------------|---------------|---------------|---------------|---------------|---------------|------------------|---------------|----------------|----------------|----------------|----------------|
| | 2017 | 2018 | 2019 | 2020 | 2017 | 2018 | 2019 | 2020 | 2017 | 2018 | 2019 | 2020 |
| 0. Food & Live Animals | 209.9 | 209.04 | 213.04 | 180.17 | 64.06 | 59.33 | 59.33 | 59.39 | -145.84 | -149.71 | -153.71 | -120.78 |
| 1. Beverages and Tobacco | 33.1 | 34.97 | 36.45 | 36.29 | 16.42 | 17.97 | 12.3 | 9.9 | -16.68 | -17.00 | -24.15 | -26.39 |
| 2. Crude Materials, Inedible Except Fuels | 22.43 | 22.15 | 24.04 | 23.03 | 0.42 | 0.88 | 0.62 | 1.22 | -22.01 | -21.27 | -23.42 | -21.81 |
| 3. Mineral Fuels & Related Materials | 82.84 | 136 | 106.11 | 95.92 | 0.03 | 0.03 | 0.04 | 0.01 | -82.81 | -135.97 | -106.07 | -95.91 |
| 4. Animal & Vegetable Oils, Fats & Waxes | 3.98 | 4.48 | 4.24 | 3.61 | 0.02 | 0.03 | 0.04 | 0.05 | -3.96 | -4.45 | -4.20 | -3.56 |
| 5. Chemicals & Related Products | 71.39 | 78.28 | 73.76 | 76.24 | 0.9 | 0.97 | 1.12 | 1.04 | -70.49 | -77.31 | -72.64 | -75.20 |
| 6. Manufactured Goods | 163.83 | 170.02 | 153.14 | 137.36 | 18.08 | 27.43 | 14.48 | 14.66 | -145.75 | -142.59 | -138.66 | -122.70 |
| 7. Machinery & Transport Equipment | 203.36 | 183.77 | 191.91 | 189.43 | 12.7 | 8.72 | 10.94 | 54.51 | -190.66 | -175.05 | -180.97 | -134.92 |
| 8. Miscellaneous Manufactured Articles | 100.02 | 116.09 | 102.47 | 94.89 | 2.07 | 2.54 | 4.31 | 5.63 | -97.95 | -113.55 | -98.16 | -89.26 |
| 9. Commodities & Transactions not classified elsewhere in SITC | 0.02 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 | -0.02 | -0.04 | 0.00 | 0.00 |
| Totals | 890.87 | 954.84 | 905.16 | 836.94 | 114.70 | 117.90 | 103.18 | 146.41 | -776.17 | -836.94 | -801.98 | -690.53 |

Source: Trade in services, Eastern Caribbean Central Bank

III. Monthly CPI

Point to point inflation rate January to December 2018 – 2020 and January to May 2021

| | Jan - Dec 2018 | Jan – Dec 2019 | Jan – Dec 2020 | Jan – May 2021 |
|----------------|----------------|----------------|----------------|----------------|
| January | 2.7 | 1.6 | 0.3 | -1.1 |
| February | 2.8 | 1.4 | 0.8 | -0.9 |
| March | 3.1 | 1.3 | 0.5 | -0.1 |
| April | 2.7 | 1.0 | 0.1 | 0.4 |
| May | 2.3 | 0.5 | -0.5 | 1.3 |
| June | 2.1 | 0.9 | -0.8 | 0.8 |
| July | 2.0 | 0.1 | -1.6 | |
| August | 2.2 | 0.9 | -1.3 | |
| September | 2.3 | 0.5 | -1.2 | |
| October | 2.3 | 0.5 | -1.1 | |
| November | 1.9 | 0.9 | -1.4 | |
| December | 1.4 | 0.5 | -1.0 | |
| Average | 2.3 | 0.8 | -0.5 | |

SOURCE: St. Vincent & the Grenadines Statistical Office

IV. Summary of Fiscal Operations (2018-2021)

| Details | Jan-Dec 2018 | Jan-Dec 2019 | Jan-Dec 2020 |
|-------------------------------------|---------------|---------------|----------------|
| TOTAL REVENUE & GRANTS | 637.06 | 680.02 | 715.68 |
| CURRENT REVENUE | 596.4 | 601.72 | 606.27 |
| Taxes on Income and Profits | 147.8 | 140.29 | 143.2 |
| Taxes on Property | 37.43 | 27.11 | 40.83 |
| Taxes on Goods and Services | 163.92 | 186.49 | 185.82 |
| Taxes on International Trade | 162.14 | 160.1 | 153.2 |
| Property Income | 7.15 | 9 | 10.42 |
| Sales of Goods and Services | 66.94 | 65.7 | 61.43 |
| Other Revenue | 11.03 | 13.04 | 10.62 |
| CAPITAL REVENUE & Grants | 40.65 | 78.3 | 109.41 |
| Grants | 39.68 | 74.09 | 63.24 |
| Other Revenue | 0.96 | 4.21 | 46.17 |
| TOTAL EXPENDITURE | 671.85 | 760 | 852.99 |
| CURRENT EXPENDITURE | 572.96 | 600.44 | 641.81 |
| CAPITAL EXPENDITURE | 98.98 | 159.56 | 211.18 |
| CURRENT BALANCE | 23.45 | 1.28 | -35.55 |
| PRIMARY BALANCE | 32.39 | -10.12 | -72.85 |
| OVERALL BALANCE | -19.71 | -66.03 | -124.51 |

Source: Ministry of Finance and Economic Planning

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Elements for Disaster Recovery Strategy

The St. Vincent and the Grenadines Recovery Strategy presents elements to be considered as a road map for the country to rise from the ashes caused by the La Soufriere volcanic eruption as a resilient, resilient, climate-responsive society that equitably stimulates human capabilities, sustainable opportunities, and improved quality of life. The recovery strategy promotes inclusive growth, builds the adaptive capacities of households and communities, increases the resilience of vulnerable sectors and communities, and optimizes disaster mitigation and climate change opportunities with a view to promoting the welfare and security of the population.

The recovery process is to be guided by good governance principles within the context of poverty alleviation and environmental protection. It recognizes the need for partnerships for effective delivery of support to the people of the country - that is, working together through the complementation of resources. In this context, the Government, engaging the participation of civil society organizations (CSO), regional and international organizations, the private sector and volunteers in the government's resilience-building programmes is part and parcel of the national recovery strategy.

The Recovery strategy highlights the need for institutionalizing resilience-building policies, structures, coordination mechanisms and programmes with continuing but greater budget appropriation on DRM and CCA from national to local levels. Thus, the strategy outlines the activities which shall strengthen the capacity of personnel of national government, district and local government units and partner stakeholders and build the disaster resilience of communities. It also outlines institutionalized arrangements and

measures for reducing disaster risks, including projected climate risks, and enhancing disaster preparedness and response capabilities at all levels.

The recovery strategy also highlights the importance of mainstreaming DRM and CCA measures in the development processes such as policy formulation, socio-economic development planning, budgeting and governance, particularly in the area of environment, agriculture, water, energy, sanitation and hygiene (WASH), health, education, poverty reduction, land-use and urban planning and public infrastructure and housing among others. Mainstreaming also puts forth the need to develop common tools to analyse the various hazards and vulnerability factors that expose the communities and people to harm.

Competency and science-based capacity building activities are likewise incorporated into the recovery strategy, along with the nurturing of continuous learning through knowledge development and management of good DRM and CCA practices on the ground.

A critical component of the recovery strategy will be the need to establish measurable, quantitative and qualitative targets for achievement, which should be phased to facilitate optimal sequencing of activities and to ensure complementarities, within a specific period.

Finally, the recovery strategy incorporates systemic risk and systemic opportunity into the recovery interventions of policies and critical investments in infrastructure and physical assets. This is a recognition that current approaches to risk measurement and management are inadequate to meet the challenges of the

multifaceted interconnectedness of hazard, the barely understood breadth of exposure, and the profound detail of vulnerability; this inadequacy must be addressed if we are to do more than simply treat the symptoms. The era of hazard-by-hazard risk reduction is over; present and future approaches to managing risk require an understanding of the systemic nature of risk. This entails quantum improvements in our understanding of anthropogenic systems in nature to identify precursor signals and correlations to better prepare, anticipate and adapt.⁶⁰

The critical link between disaster management and sustainable development is also recognised as a holistic approach to managing multiple risks from all hazards, which is necessary to achieve resilient development. DRR ought to be a critical component of development planning, as well as sectoral strategies, programmes and work plans. Although the damage and losses in some sectors are more visible than others, the recent increasing scale and frequency of hazards in the region have further shown that all sectors should develop an effective approach to reducing disaster risk and Building Back Better (BBB) in the post-disaster recovery realm. For SVG, resilience also connotes being able to bounce forward quickly in a manner that reduces susceptibility (increased liability to additional harm) to the impact of the same hazard. In the context of the Lines of Action (pillars of resilience) identified, it should be recognised that the recovery strategy is predicated on addressing issues related to systemic risks in SVG. This approach is further demonstrated by the nature of the intervention strategies that are proposed.

Through a participatory process involving approximately 65 team members from the public and private sectors, key regional and international organizations and the civil society that participated

in the assessment, the key elements that will form the basis for the formulation of a comprehensive recovery strategy were discussed and agreed upon. This framework agreed upon includes a vision statement, three guiding principles and three strategic intervention lines, in which all the sectoral needs and their cost were determined and integrated into a holistic framework of actions. The recovery strategy is aligned to all relevant national and sectoral policies, strategy and development plans.

6.2 Vision

As indicated above, through a participatory process the below Vision Statement was agreed upon, which has provided the foundation for the formulation of a recovery strategy for the country.

“Rising out of the ash as a resilient climate-responsive society that

Equitably stimulates human capabilities, sustainable opportunities,

And an improved quality of life.”

6.3 Guiding Principles

The following three principles were selected to guide the development and implementation of the Recovery Strategy:

- Build resilience and reduce risks, promoting green/blue economies and energy efficiency.
- Ensure equity and accessibility and promote gender equality in decision making, service delivery and recovery.
- Rebuild people’s livelihoods.

6.4 Strategic Lines of Action

The alignment of the objectives and outcomes of the recovery strategy three strategic lines of action with identified objectives of the National Economic and Social Development Plan of St. Vincent and the Grenadines is presented in **Table 6.1** below.

Table 6.1: Alignment of the Recovery Strategic Lines of Action with National Economic and Social Development Plan 2013-2025

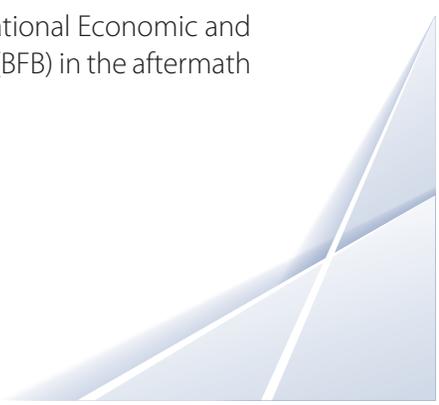
| RECOVERY PLAN STRATEGIC LINES of Action | | NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN |
|---|---|---|
| Objective | Outcomes | Objective Number (OBJ #) |
| Strategic Line of Action #1: Re-engineering Economic Growth | | |
| To enhance the country's economic development agenda in an inclusive and comprehensive manner, by ensuring the sustainability of the productive value chains that incorporate new and better technologies, through the development of effective and efficient governance mechanisms, human capacities and support services, and the strengthening of the financial sector. | 1.1 Financial sector mechanisms strengthened and financial and/or material resources for economic activities required for recovery were provided. | OBJ #1.1; and OBJ #1.4 |
| | 1.2 Economic activities that expand and diversify production chains, save/earn foreign exchange, create employment and expand demand are promoted. | OBJ #1.2; OBJ #1.3; OBJ # 1.5; OBJ #1.8; OBJ #1.9; OBJ #1.10; and OBJ #1.11 |
| | 1.3 Governance mechanisms strengthened, and disaster risk management (DRM) and climate change adaptation (CCA) mainstreamed within national, regional, community and sectoral policies, strategies and plans. | OBJ #1.2; OBJ #1.3; OBJ #1.8; and OBJ #1.11 Gaps identified in the Objective matrix for BBB and Building Forward Better (BFB). |
| | 1.4 Operational readiness and recovery frameworks strengthened. | Gaps identified in the Objective matrix for BBB and BFB. |

| Strategic Line of Action #2: Enabled Increased Human and Social Development | | | |
|---|------------|---|--|
| To enhance inclusive human and social development in SVG aimed at increasing the quality of life for the entire population, especially the poor. | 2.1 | Poverty reduced through the creation of jobs, promotion of income and gender equality, development of an adaptable, functional and literate population, facilitation of cultural and economic development at the community level, and the empowerment of youth to participate meaningfully in and contribute to national development. | OBJ #2.1; OBJ #2.1; OBJ #2.3; OBJ #2.5; and OBJ #2.6 |
| | 2.2 | Self-care intervention and healthy lifestyle practices promoted | OBJ #2.4 |
| | 2.3 | Social protection promoted for marginalized and vulnerable groups | OBJ #2.8 |
| Strategic Line of Action #3: Improving Physical Infrastructure, Preserving the Environment and Building Resilience to Climate Change | | | |
| To reduce the risk and vulnerabilities of the physical infrastructure to natural disasters and climate-related disruptions by building resilience, and to conserve the natural resources of the country through climate-smart utilization and management | 3.1 | Risk reduction and resilient infrastructure are promoted in the reconstruction efforts to reduce vulnerabilities to future disasters | OBJ #4.2; OBJ #4.4; OBJ #4.10 |
| | 3.2 | Resilience fostered through the safeguarding of physical infrastructure and assets from planning to functional operations and management. | OBJ #4.5; and OBJ #4.9 |

Details of the recovery strategy, with their respective objectives, outcomes and intervention strategies are presented in table 6.2, under three broad areas

- Re-engineering Economic growth.
- Enabled Increased Human and Social Development.
- Improving Physical Infrastructure, Preserving the Environment and Building Resilience to Climate Change.

It is important to note that the recovery strategy is aimed at adding value to the National Economic and Social Development Plan by building back better (BBB) and building forward better (BFB) in the aftermath of the La Soufriere volcanic eruption.



5.5 Next Steps

The Post-Disaster Recovery Needs Assessment (PDNA) provides a solid foundation for quantifying damage and loss and estimating recovery needs. However, it also offers the opportunity to go beyond estimating the costs required for recovery: It provides the basis for the formulation of a realistic recovery framework, based on national priorities and capacities.

The vision, guiding principles and the intervention strategies proposed under the three strategic lines, together with the budgeted recovery needs are the starting point for the formulation of a solid action plan. It is important to note that another critical aspect of the recovery framework is the identification of an entity to lead the recovery process, which may be a line ministry, or an agency created expressly for that purpose.

In the context of the above, five (5) broad next steps have been identified to provide the blueprint for ensuring an efficient and effective recovery process namely:

- Development of an actionable plan for recovery considering the overlapping effects of ongoing Covid-19 and hurricane season early effects.
- Identification of resources gap for funding for the recovery programme.
- Harmonization of the assessment process from humanitarian response to recovery.
- Improvement of data collection and management system.
- Capacity strengthening for recovery.

TABLE 6.2: ELEMENTS OF ST. VINCENT AND THE GRENADINES VOLCANIC ERUPTION RECOVERY STRATEGY MATRIX

Strategy: To provide a re-engineered landscape that promotes economic growth through diversification of the economy, strengthening of the enabling environment and alleviation of structural constraints that hamper growth potential.

| OBJECTIVE | OUTCOMES |
|--|---|
| To enhance the country's economic development agenda in an inclusive and comprehensive manner, by ensuring the sustainability of the productive value chains that incorporate new and better technologies, through the development of effective and efficient governance mechanisms, human capacities and support services, and the strengthening of the financial sector. | 0.1 Financial sector mechanisms strengthened and financial and/ or material resources for economic activities required for recovery were provided. |
| | 1.2 Economic activities that expand and diversify production chains, save/earn foreign exchange, create employment and expand demand are promoted. |
| | 1.3 Governance mechanisms strengthened, and disaster risk management (DRM) and climate change adaptation (CCA) mainstreamed within national, regional, community and sectoral policies, strategies and plans. |
| | 1.4 Operational readiness and recovery frameworks strengthened. |

Outcome 1.1: Financial sector mechanisms strengthened and financial and/ or material resources for economic activities required for recovery provided

| OUTPUT | INTERVENTION |
|--|---|
| 1.1 Financial Sector strengthened to provide a range of Financial Services to Support the Disaster Risk Management Cycle | 1.1.1 Enhance the provision of microcredit for recovery for Small and Medium Enterprises |
| | 1.1.2 Strengthen the risk transfer products and mechanisms especially with the domestic insurance industry to improve the national capabilities for serving the country. |
| | 1.1.3 Improve the range of financial services provided through strengthening the banking technology, including mobile banking to enhance the speed of the recovery process. |
| | 1.1.4 Explore the potential for the establishment of Village Savings and Loan Associations (VSLAs) to improve the availability of resources at the community level for recovery ⁶¹ . |
| | 1.1.5 Provide financial support to the Ministry of Health to develop a comprehensive long-term storage or warehousing solution to accommodate both routine and emergency supplies |

⁶¹ Village Savings and Loan Associations (VSLAs) - a type of local financial institution that has been standardized by CARE and is increasingly being promoted by a host of different organizations - take many of the elements of rotating savings and credit associations (ROSCAs) and add more flexibility in savings and loans, standardize the governance structure and reinforce accountability elements

Outcome 1.2: Economic activities that expand and diversify production chains, save/earn foreign exchange, create employment and expand demand are promoted

| OUTPUT | INTERVENTION |
|---|---|
| <p>1.2 Strengthened national economic environment in place that enhances production and contributes to the achievement of the targets established for key macro and microeconomic variables for recovery process.</p> | 1.2.1 Provide income support to producers of goods and services in all sectors based on income loss and additional cost incurred as a result of the volcanic eruption |
| | 1.2.2 Promote education reform that adequately prepare people for entrepreneurship through the incorporation of business and innovation in the curriculum. |
| | 1.2.3 Provide technical support to the productive sectors (agriculture, tourism, manufacturing and trade) to increase their productivity, cost efficiency and competitiveness. |
| | 1.2.4 Stimulate growth in the tourism industry by promoting the resilience of yachting industry and resorts of The Grenadines. |
| | 1.2.5 Promote the Volcanic Site as a tourist attraction by reinforcing the hiking sites around the Volcano. |
| | 1.2.6 Develop and implement a comprehensive plan for recovery and rebuilding of a modern, competitive agricultural sector, including land reform to address critical issues of land use, tenure and distribution. |
| | 1.2.7 Provide the policy framework and related fiscal incentives, and necessary infrastructure and market intelligence to build a modern agricultural sector |
| | 1.2.8 Strengthen the institutional support and coordination framework (e.g., through contract farming, nucleus/satellite farming) and infrastructural facilities (central collection, grading and packaging) to link farmers to market and ensure consistency in quality and quantity of agricultural products supplied to the growing tourist market |
| | 1.2.9 Implement alternative livelihoods initiatives for displaced farm and fisher families and illegal uses of the forest. |
| | 1.2.10 Optimize the contribution made by the blue economy, especially the fisheries sub-sector |
| | 1.2.11 Provide support for agriculture-related production input (Planting materials, fertilizers, chemicals, feeds, veterinary drugs and supplements, etc.). |
| | 1.2.12 Provide temporary employment for the cleaning and removal of ashfall, debris and boulders from private and public properties. |

Outcome 1.3: Governance mechanisms strengthened, and disaster risk management (DRM) and climate change adaptation (CCA) mainstreamed within national, regional, community and sectoral policies, strategies and plans

| OUTPUT | INTERVENTION |
|---|---|
| <p>1.3 Clear vision, plans, competence and coordination are in place within SVG, that foster collaboration among institutions in the implementation of disaster risk management and climate change adaptation measures.</p> | <p>1.3.1 Institutional mechanisms for the efficient and effective coordination of DRM and CCA tasks within SVG, including those related to emergency and disaster response issues, strengthened at the national, regional and local/community levels</p> |
| | <p>1.3.2 Define with clarity, roles and responsibilities across all relevant organizations involved in resilience building to ensure better coordination of pre-event planning and preparedness, event response and post-event activities</p> |
| | <p>1.3.3 Strengthen the institutional regulatory frameworks</p> |
| | <p>1.3.4 Develop protocols to guide the involvement of publicly owned, managed or regulated services and the co-option of infrastructures.</p> |
| | <p>1.3.5 Promote and provide incentives, as relevant, for actions by persons, households, communities and businesses in resilience building.</p> |
| | <p>1.3.6 Establish/strengthen the necessary mechanisms and incentives to ensure high levels of compliance with the existing safety-enhancing provisions of sectoral laws and regulations, including those addressing land use and urban planning, building codes, environmental and resource management and health and safety standards, and update them, where needed, to ensure an adequate focus on resilience building.</p> |
| | <p>1.3.7 Enhance the data capture and information management systems at the national, sectoral and institutional levels, to include Sex-and-Age disaggregated data points.</p> |
| | <p>1.3.8 Implement communication and information dissemination strategies on issues related to risk mitigation and develop and implement national-level training programmes in risk assessment, management and administration within the context of a multi-sectoral approach and from a multidisciplinary and multidimensional lens.</p> |
| | <p>1.3.9 Enhance the Information and Early Warning network, including expanding the PAHO and CARPHA supported Early Warning and Response System (EWARS), which is currently being implemented and tested, in the intermediate and long term to boost the existing surveillance mechanisms</p> |
| | <p>1.3.10 Conduct a technical assessment of several logistics supply chain information systems in place in the country, including a pharmaceutical and medical supplies management system, to determine the most practical option to be implemented.</p> |

| | |
|--|--|
| | 1.3.11 Mainstream DRM and CCA into national, sectoral, district and local development policies, strategies, plans and budgets |
| | 1.3.12 Strengthen the existing sustainable sources of fund for resilience building, to include a provision in the DRM policy guidelines of a % of both public and private institutions' budget dedicated to resilience-building activities |
| | 1.3.13 Implement contingency planning and training and establish a Contingency Fund for post-disaster recovery (a "rainy day" fund). |
| | 1.3.14 Promote innovative risk transfer tools and instruments to better manage the fiscal impacts of disasters, such as catastrophe bonds and parametric insurance products, as well as alleviate the key constraints to the access of international insurance and capital markets |
| | 1.3.15 Review and integrate DRM and CCA considerations integrated into cross-cutting issues such as environmental management and gender equality policies, plans, programs and projects. |
| | 1.3.16 Develop training materials and build national and institutional capacities (private and public sectors) in business continuity protocols and plans. |

Outcome 1.4: Operational readiness and recovery frameworks strengthened

| OUTPUT | INTERVENTION |
|--|---|
| 1.4 The Recovery Capacity Assessment process advanced and the National Recovery Framework accelerated in order to guide recovery actions and strengthen the institutional mechanisms to advance the recovery process which is being offered through CDEMA. | 1.4.1 Update relevant Plans, including National Response Plan and conduct a review of the recently updated National Volcano Emergency Plan for robustness |
| | 1.4.2 Maintain seismic network across the island to improve monitoring and forecasting capacity for volcanoes and seismic activity |
| | 1.4.3 Update risk and vulnerability assessments for flooding, lahars and landslides |
| | 1.4.4 Review and enhance national evacuation plans |
| | 1.4.5 Provide training in PDNA and DRM at the national and community level |
| | 1.4.6 Review DRM Legislative (National Emergency and Disaster Management Act), with a view to update |
| | 1.4.7 Conduct Scenario-based simulation exercises to identify gaps and improve procedures |



Strategy: To promote the design, plan, implement and sustain an inclusive and equitable economic **development agenda that unlocks the full potential of the economy by dismantling barriers and expanding opportunities for all, including the vulnerable and poor**

| OBJECTIVE | OUTCOMES |
|--|---|
| 2 To enhance inclusive human and social development in SVG aimed at increasing the quality of life for the entire population, especially the poor. | 2.1 Poverty reduced through the creation of jobs, promotion of income and gender equality, development of an adaptable, functional and literate population, facilitation of cultural and economic development at the community level, and the empowerment of youth to participate meaningfully in and contribute to national development. |
| | 2.2 Self-care intervention and healthy lifestyle practices promoted |
| | 2.3 Social protection promoted for marginalized and vulnerable groups |

Outcome 2.1: Poverty reduced through the creation of jobs, promotion of income and gender equality, development of an adaptable, functional and literate population, facilitation of cultural and economic development at the community level, and the empowerment of youth to participate meaningfully in and contribute to national development.

| OUTPUT | INTERVENTION |
|--|--|
| 2.1 The level of poverty reduced among the population, especially among the vulnerable poor groups | 2.1.1 Exploit the opportunities available in building a resilient society to create decent jobs within the context of DRM and CCA programmes and projects |
| | 2.1.2 Promote gender equality in the recovery process as it relates to access to resources (land, labour and credit), production inputs and markets |
| | 2.1.3 Increase the rate of implementation of capital projects, including those related to the recovery process. |
| | 2.1.4 Develop and implement adaptable curricula consistent with the development needs of the country, including the use of ICT in the delivery of the curricula |
| | 2.1.5 Facilitate increased social, cultural and economic development at the community level as it relates to the agriculture, forestry, fisheries and tourism and natural parks sectors/sub-sectors, fish fries, agro-ecotourism and health/organic product solutions. |
| | 2.1.6 Empower the youth to participate more meaningfully in and contribute to national development, including the development and implementation of a programme of incentives (increased marketable skills through training, and access to land and credit) to encourage young people into farming |
| | 2.1.7 Scale-up community water harvesting, storage and use, including irrigation |

Outcome 2.2: Self-care interventions and healthy lifestyle practices promoted

| OUTPUT | INTERVENTION |
|---|--|
| 2.2 Increased health and productivity of the country's population | 2.2.1 Reassess the primary health care and services with a view for improvement |
| | 2.2.2 Review the human resource strategy for nurses and health staff to engage persons trained and unemployed |
| | 2.2.3 Promote OECS regional approach to health worker training and exchange along with regional risk-sharing to reduce evacuation and overseas health care costs |
| | 2.2.4 Promote the use of telemedicine for sharing key specialists between the islands |
| | 2.2.5 Improve the housing and living conditions of the population by increasing homeownership, decreasing homelessness and sub-standard living conditions, reducing the number of squatter settlements, and making the homes more resilient hurricanes and other natural disasters |
| | 2.1.6 Reduce the incidence of NCDs by establishing exercise facilities in public and private spaces to increase the wellness and physical fitness of the nation |

Outcome 2.3: Social protection promoted for marginalized and vulnerable groups⁶²

| OUTPUT | INTERVENTION |
|--|--|
| 2.3 Enhanced social protection program (SP) designed to build resilience to disasters and climate shocks and natural disasters | 2.3.1 Promote effective formal communication channels and linkages among social protection, disaster management, and relevant sectoral ministries/agencies, including those responsible for early warning systems to ensure that a coordinated institutional platform is in place for delivery of benefits |
| | 2.3.2 Establish clearly defined roles and responsibilities of all ministries/agencies and other implementing partners, including international, non-governmental, civil society, and private sector organizations to ensure efficiency and effectiveness in the delivery of benefits |
| | 2.3.3 Promote linkages and information-sharing arrangements with the broader humanitarian response system, such as the United Nations-led emergency cluster system |
| | 2.2.4 Promote scalability and flexibility in the administrative mechanisms used to mobilize and deploy contingency financing and human resources, transfer benefits, manage fiduciary risks, and identify and register affected people |

62 Based heavily on the World Bank: Building Resilience to Disasters and Climate Change through Social Protection, 2013

| | |
|--|--|
| | 2.2.5 Establish a mechanism to ensure the targeting of households that are most vulnerable to natural disasters and climate change-related risk, using a combination of targeting strategies to ensure efficiency and effectiveness in the process |
| | 2.2.6 Promote the effective participation in decision making by communities and vulnerable groups |
| | 2.2.7 Promote greater community involvement in the design and implementation of inclusive policies and social safety-net mechanisms |
| | 2.2.8 Ensure food and nutrition security |
| | 2.2.9 Support viable livelihood enhancement programmes at the community and household levels |

Strategy: To plan, design, build and operate physical infrastructure in a way that anticipates, prepares for, and adapts to risks and vulnerabilities to future natural disasters and related changing climate conditions

| OBJECTIVE | OUTCOMES |
|---|--|
| 3. To reduce the risk and vulnerabilities of the physical infrastructure to natural disasters and climate-related disruptions by building resilience, and to conserve the natural resources of the country through climate-smart utilization and management | 3.1 Risk reduction and resilient infrastructure are promoted in the reconstruction efforts to reduce vulnerabilities to future disasters |
| | 3.2 Resilience fostered through the safeguarding of physical infrastructure from planning to functional operations and management. |
| | 3.3 The protection of the natural environment is promoted. |
| | 3.4 Digital and connectivity gap reduced by strengthening human capital, facilitating connectivity and access to information, raising awareness and generating an innovation culture to promote human, technological, and social development |



Outcome 3.1: Risk reduction and resilient infrastructure are promoted in the reconstruction efforts to reduce vulnerabilities to future disasters

| OUTPUT | INTERVENTION |
|---|--|
| <p>3.1 Risks to physical infrastructure reduced by locating assets in areas that are less exposed to hazards, and by making the assets better able to cope with disaster impacts when they materialise by making trade-offs between risk minimization and cost, where it becomes more expensive and increasingly technically challenging to prepare for events that are very unlikely to occur.</p> | <p>3.1.1 Repair/rehabilitate, reconstruct and maintain the physical infrastructure of the social sector (education, housing, health), productive sector (Agriculture and Tourism/natural Parks), and infrastructure service networks (Electricity, Water, Sanitation and Hygiene, Transport and Works), with improved resilience to potent new risks and vulnerabilities, utilizing affordable technologies, within the context of building back better.</p> |
| | <p>3.1.2 Specifically for the Transport and Works sector, repair the road infrastructure (Sandy Bay, Chateaubelair Districts) and river crossing infrastructure in (Georgetown, Sandy Bay and Chateaubelair Districts)</p> |
| | <p>3.1.3 Develop and where applicable, implement guidelines for the relocation and resettlement of communities located in high risk and vulnerable areas to address issues such as lands, housing, related infrastructure and services, including electrification of new development (relocation)</p> |
| | <p>3.1.4 Develop and implement a plan of action for the rehabilitation/ relocation of agricultural stations/ germplasm plots (Assets and operations)</p> |
| | <p>3.1.5 Implement the Forest and Wildlife Recovery Programme through reforestation, soil conservation, clearing of waterways and stabilisation of stream banks. Replanting of plantation forests in the lower slopes, such as in Orange Hill. Protection and conservation of gullies where housing existed, to include agroforestry for the generation of livelihoods for displaced residents.</p> |
| | <p>3.1.6 Update the building codes to account for ashfall during a volcanic eruption as an additional load factor to consider in roofing.</p> |
| | <p>3.1.7 Conduct research and development of agro-ecological models for sustainable commercial agriculture in the red and orange zones.</p> |
| | <p>3.1.8 Introduction of new and appropriate resilient technology and innovation in sectoral assets and production systems</p> |
| | <p>3.1.9 Scale-up community-level water harvesting, storage and irrigation</p> |
| | <p>3.1.10 Implement the interventions outlined in Outcome 1.3 above to strengthen governance mechanisms and mainstreaming disaster risk management (DRM) and climate change adaptation (CCA) within national, regional, community and sectoral policies, strategies and plan</p> |

| | |
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| | 3.11 Promote innovation as a fundamental pillar for social and productive transformation, through coordinated and multi-sectoral actions that allow problem-solving through research and development of technologies, among other aspects, such as new materials, adapting production methods and social interactions during disasters |
|--|--|

Outcome 3.2: Resilience fostered through the safeguarding of physical infrastructure from planning to functional operations and management⁶³

| OUTPUT | INTERVENTION |
|--|--|
| 3.2 Infrastructure safeguarding is established as part of the planning process, designed to ensure that assets that have been identified for major infrastructure projects are protected from conflicting developments | 3.2.1 Accelerate the national and regional building codes enhancement, adaptation and implementation processes |
| | 3.2.2 Implement a process of constant review of the teaching and training programmes for built environment services by Higher Education Institutions (HEIs) and selected experts |
| | 3.2.3 Consolidate for application the efforts of HEIs and others for materials testing and certification systems |
| | 3.2.4 Review Built Environment legislation and regulations to address issues of market surveillance, enforcement and accountability |
| | 3.2.5 Create incentives for research and development of new materials and services for SMART development, alternate energy, energy efficiency, water resources management, greening and associated areas |
| | 3.2.6 Enhance public education and information on safe and resilient communities |

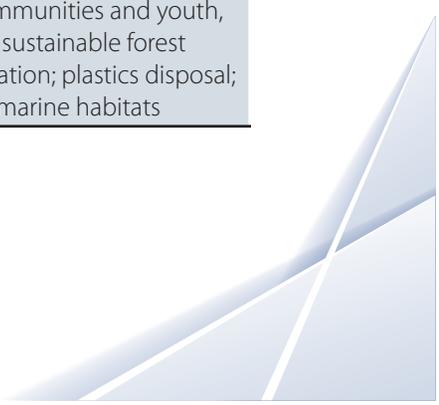
⁶³ Based mainly on CEDMA, 2018. Building a Caribbean Pathway for Disaster Resilience in the Caribbean Community (CARICOM)



Outcome 3.3: The protection of the natural environment is promoted

| OUTPUT | INTERVENTION |
|--|--|
| <p>3.3 Natural resources and the existing natural environment are conserved and, where possible, damage is repaired and trends are reversed through the rebuilding of natural assets, restoring access to environmental goods and services, restoring environmental resources that support livelihoods systems, and addressing new and existing challenges</p> | <p>3.3.1 Restore forests and biodiversity through more effective management of invasive species, the development of effective valuation system for forest and biodiversity products, and the incorporation of forest and biodiversity contribution to national budgets.</p> |
| | <p>3.3.2 Support the forests and biodiversity restoration process through the cleaning of rivers and streams, especially in the upper watersheds of the red and yellow zones</p> |
| | <p>3.3.3 Enhance soil fertility through the incorporation of ash into the soil, where ash-fall was light; Sustainable application of fertilizers, soil amendments and compost; and Establishment/re-establishment of grass barriers, contour drains, bench terraces</p> |
| | <p>3.3.4 Ensure availability of environmentally sustainable, high-quality and affordable construction materials (sand, aggregate, pumice stone/rocks through the identification of alternative mining sites and establishment of appropriate transportation infrastructure, and production of fine to coarse sands by improving crushing and screening equipment at new and existing mines.</p> |
| | <p>3.3.5 Restore and protect damage marine habitats through the identification of habitats that were affected by the volcanic eruption and the institution of moratorium/temporary no-take areas while the necessary restoration work and monitoring are being undertaken.</p> |
| | <p>3.3.6 Restore and protect aquatic habitats through the conduct of rapid biological assessment of the impacts of the eruption on aquatic life; the initiation of stakeholder engagement plan including education and capacity building to restore tri-tri industry; the identification of harvesting areas, removal logs and derelicts; and the placement of a temporary ban on aquatic fisheries (crayfish) to allow for regeneration</p> |
| | <p>3.3.7 Restore access to forest and non-timber products through the strengthening of forest management and the reintroduction of non-timber products lost to the eruption. Restore trails and access roads.</p> |
| | <p>2.2.8 Protect pollinators and other keystone species to ensure proper ecosystem functioning through the conduct of biodiversity inventory/census and the promotion of apiculture</p> |
| | <p>3.3.9 Development and enhancement of Ecotourism Product in Rural Communities through capitalizing on unique geological (e.g; through a natural field guide), and the rebuilding of trails and amenities at protected areas/ecotourism sites.</p> |

| | |
|--|---|
| | <p>3.3.10 Restore access to prime fishing ground and identify alternatives, where necessary, through surveying of fishing grounds, target cleaning of the seabed, and coral restoration.</p> |
| | <p>3.3.11 Strengthen environmental governance by improving the effectiveness of environmental decision-making, improving transparency in the environmental decision-making process, improving environmental awareness and stewardship amongst the general public, and enhancing the legal and institutional framework to combat the environmental drivers of risk and vulnerabilities</p> |
| | <p>3.3.12 Improve waste management, including waste and debris management (removal, transportation, and disposal of debris); ash removal and recovery; hazardous waste separation and establishment of systems for transportation and disposal (especially for e-wastes, ash and rubble); and introduction of incentives for increased recycling of plastics and other recyclables.</p> |
| | <p>3.3.13 Improve surface water management through mapping of changing surface water flows adjusting to new flood zones; monitoring of groundwater quantity, quality and availability; and investigating change in soil stability and water retention</p> |
| | <p>3.3.14 Monitor the quality of the air during the implementation of recovery activities</p> |
| | <p>3.3.15 Strengthen the capacity of the Ministry of Health for monitoring environmental conditions and undertaking actions to mitigate against outbreaks of food-water-and vector-borne diseases, including the provision of additional environmental health and vector control officers, vehicles, insecticide application equipment, insecticides, rodenticides, PPEs and communications materials for dissemination of information to the public.</p> |
| | <p>3.3.16 Promote improved enforcement through the development of new and/or the updating of existing legislation in the critical areas such as environmental impact assessment (EIA), waste management and land use, for example phasing out the use of single-use plastics by 2025/2030, and integrated water resource management</p> |
| | <p>3.3.17 Promote greater integration of environmental information in informal education, which is targeted to key groups of stakeholders</p> |
| | <p>3.3.18 Develop incentives to encourage environmentally friendly practices, targeted to the private sector, communities and youth, including sustainable agricultural practices; sustainable forest management practices; mangrove rehabilitation; plastics disposal; recycling; and creation or enhancement of marine habitats</p> |



Outcome 3.4: Digital and connectivity gap reduced by strengthening human capital, facilitating connectivity and access to information, raising awareness and generating an innovation culture to promote human, technological, and social development

| OUTPUT | INTERVENTION |
|--|---|
| 3.4 A digital platform established to enhance the recovery process by providing for the delivery of essential services such as education and healthcare, the promotion of increased opportunities for women’s empowerment and environmental sustainability, enhanced government transparency and accountability, and the fostering the social development of communities, including within the broader global context. | 3.4.1 Expand the coverage, access and connectivity of the entire population to networks and digital platforms |
| | 3.4.2 Develop training materials and conduct training events for Trainers aimed at strengthening the human capital for the development and use of new technologies, applications, virtual platforms and other tools (ICT) |
| | 3.4.3 Implement a technology literacy strategy for students, public and private workers and the community in general |
| | 3.4.4 Provide the necessary portfolio of fiscal incentives to promote access and connectivity to networks and digital platforms |

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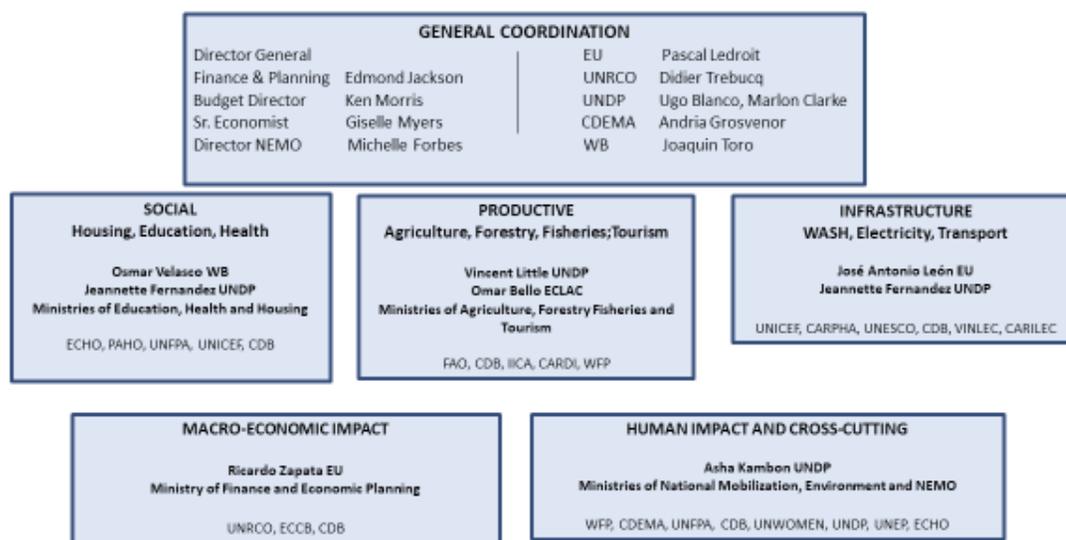
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