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Adapting to Climate Change at the National Level in St. Vincent and the Grenadines

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ABSTRACT

Small island developing states (SIDS) are distinctively more vulnerable to the impacts of climate change than other developing countries. The focus of this paper is the Caribbean region that is described as one of the most vulnerable regions in the world and highly affected by the impacts of climate change. This paper applies a case-study approach and focuses on the island of St. Vincent and the Grenadines (SVG). With limited efforts to understand the adaptation, vulnerabilities, and challenges at the national level in these SIDS, this paper helps to fill this gap and has two main aims. First, it identifies SVG's main focus on climate change adaptation. Second, it identifies the barriers to climate change adaptation in SVG. To fulfil the aims of this paper, content analysis, and semi-structured interviews with 32 stakeholders from the public and private sector were applied. This paper finds that SVG is mainly adapting to changes in hurricane, rainfall, drought, and soil and coastal erosion patterns. It also finds that many factors are limiting national-level adaptation. The three main reported barriers are a lack of financial, human resources, and technical capacity. These findings are important for the government of SVG and international donors and agencies. This will help them to identify and fill the gaps in their adaptation actions and prioritising finance. This paper's findings also highlight the importance of mainstreaming climate change adaptation in sectoral plans and work programs and improving SVG's access to international climate change adaptation funding.

Keywords: climate change adaptation, small island developing states (SIDS), vulnerabilities, St. Vincent, and the Grenadines.

1.0 INTRODUCTION

Climate change is an imposing challenge and an existential threat to small island developing states (SIDS) [1]. The most vulnerable countries around the world, especially SIDS, are already experiencing the impacts of climate change [1]. SIDS are distinctively more vulnerable to the impacts of climate change than other developing countries. Though SIDS vary in physical features and socioeconomic characteristics, they all have a comparative degree to the threats of climate change [1]. They are physically exposed to such impacts while struggling to achieve sustainable development which together give rise to extreme vulnerability to climate change [2,3]. Over the years, SIDS have been exposed to numerous climate change impacts including changing precipitation patterns, sea-level rise, increased sea and air temperatures, decreased availability of freshwater sources, and increased intensity of tropical storm - well illustrated by Hurricanes Irma and Maria (2017) in the Caribbean [4] and Winston (2016) in the Pacific [5]. The annual damages caused by hurricanes in the Caribbean is estimated at \$835 million [6]. While the increased intensity of tropical storms is an imminent threat to SIDS, various studies have shown that sea-level rise is apparently the most imposing challenge facing SIDS, especially those whose majority of the population are along the coastal zone [7,8]. According to the UNWTO [9], approximately seventy percent of the Caribbean population live in coastal cities, towns, and villages. Apart from large coastal population, one has to consider the vulnerable groups that include the elderly, women, children, and impoverished communities [10]. The vulnerabilities faced by SIDS can be further compounded by poor development planning and maladaptation [11].



As a result, policies that are developed mustn't further hamper the vulnerable groups and to a more significant extent, the country's adaptive capacity.

SIDS vary in their vulnerabilities and adaptive capacities for effective climate change adaptation and resilience-building [12]. According to Nurse et al. [1], the high level of vulnerability of small islands to multiple stressors, both climatic and non-climatic exist due to the inherent physical characteristics of these islands. For this paper, vulnerability is adopted from the International Panel on Climate Change (IPCC) and is defined as “the propensity or predisposition to be adversely affected” [13]. The vulnerabilities faced by SIDS have comprised of economic, social, environmental, and political domains [14]. These vulnerabilities are inevitably linked to adaptive capacity, defined as “the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences” [13]. With the need for effective and sustainable adaptation on SIDS becoming increasingly critical [1, 15], adaptation is an imperative component for the sustainable development of SIDS [16].

Adaptation is most likely best understood as “the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects” [13]. Hence, at the national level, governments and other stakeholders have to work together to achieve the required adjustments across multiple sectors [17, 18].

The nation of St. Vincent and the Grenadines (SVG) is equally vulnerable to the impacts of climate change as the rest of the wider Caribbean [19]. To understand how SVG is adapting to climate change and identify the barriers to climate change adaptation, the Second

National Communication (SNC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) is analysed. The United Nations [20], Article 4 (b) states that all Parties signatory to the Convention are required to “formulate, implement, publish and regularly update national and where appropriate, regional programmes to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change” and 4 (j) that parties are required to “communicate to the Conference of the Parties information related to implementation, in accordance with Article 12”. The communication tool applied by the Convention is the National Communications. Breidenich [21] expressed that National Communications is the Convention’s essential platform for Parties to provide updated information on the progress made on the implementation of targets. SIDS are encouraged to include information on their vulnerabilities to the impacts of climate change, their uncertainties, and their adaptation strategies in their National Communications [22]. Therefore, in accordance with Gagnon-Lebrun and Agrawala [23], National Communications are viewed as an essential source of data at the national level. As policy documents, National Communications are vital to assess the government’s progress on their adaptation actions [22]. Hence, it provides a comprehensive dataset that can be used to analyse and compare the vulnerabilities, uncertainties, priorities, and actions towards climate and climate-induced risk and impact across SIDS.

A qualitative content analysis, as described by Elo and Kyngas [24], was applied to identify national-level climate change adaptation actions reported in the document.



The process included thoroughly reading through the chapters related to climate change adaptation and using manual open coding procedures to understand what is being adapted to (climate-induced and non-climate-induced vulnerabilities), which sectors are adapting, and what are the barriers to adaptation. These three key questions allow for the ‘unpacking’ of the critical elements of adaptation in SIDS [25,26].

This study aims to gain an understanding of climate change adaptation in SVG. Through a qualitative content analysis of the SNC, supplemented by semi-structured interviews from policy-makers, experts, and stakeholders from the public and private sectors, this paper identifies the way SVG is adapting to climate change and it identifies the barriers to climate change adaptation in SVG.

2.0 METHODOLOGY

2.1 SELECTING THE DOCUMENT

SVG’s SNC submitted to the United Nations Framework Convention on Climate Change (UNFCCC) was selected for this study because it is a national scale policy document that focuses on the adaptation actions, vulnerabilities, and the barriers to adaptation. National Communications are regarded as official policy documents and are essential for understanding the country’s vulnerabilities to climate change, their adaptive capacities, and their adaptation actions implemented [22]. This document was further vetted by the policy-makers, experts and other stakeholders who participated in the interview based on the fact that the document was under the guidance of a steering committee.

2.2 SELECTING PARTICIPANTS AND INTERVIEW STRUCTURE

The study uses SVG as a unit of analysis. The 32 interviewees selected by purposive sampling [27] met four criteria: (1) head of a climate change, environment and/or development portfolio in a national government ministry, department or agency, (2) head of a climate change, environment and/or development project under a national government ministry, department or agency, (3) had ten or more years of experience and (4) confirmed to be a part of the interview. Taking into consideration the climate change niche of SVG, the total number of interviews is considered sufficient for ascertaining interviewees’ expertise and represents a broad spectrum of personnel within the fields of climate change, environment, and/or development. Therefore, interviewees were sampled to exhaustion to obtain valid and quality data.

Interviews were semi-structured; this allowed for a more conversational setting [28]. A key benefit is that participants are more likely to be more comfortable in expressing their points of view [29].

2.3 ANALYSING SNC AND INTERVIEW RESPONSES

A summative content analysis was applied to analyse the SNC. First, the relevant chapters were read three times. Second, the adaptation actions implemented at a national level were manually coded and counted according to the vulnerabilities and sectors described. GraphPad prism (SD, CA, USA) and Microsoft Excel software were used to analyze the data, while descriptive statistics generated graphs that facilitated the explanation of the findings.



The same technique was also applied to the relevant chapters of the SNC to analyse the climate change adaptation barriers in SVG. First, each related chapter was read three times. Second, the occurrence of the word 'barrier' in regards to one or more of the seven keywords which include 'adapt', 'risk', 'constrain', 'limit', 'threat', 'obstacle' and 'hinderance' was counted. GraphPad prism (SD, CA, USA and Microsoft excel software were also used to analyze the data while descriptive statistics generated graphs that facilitated the explanation of the findings.

Conventional content analysis was applied to analyse the data from the interviews. First, each interview was listened to twice. Second, initial interpretive and descriptive classifications were established. Third, these classifications, comprising initial manual codes, were utilized to recognized further patterns in the data. Fourth, broad themes were distinguished from grouping a single interviewee's responses. Fifth, these broad themes were examined across all interviews.

2.4 LIMITATION OF METHODS

The selected methods have two main limitations. First, using National Communications as the primary source of data to analyse and understand how SVG is adapting to climate change and their challenges and barriers is not ideal because the Report may be prone to under and/or over-reporting. Despite the limitation, National Communications are presently the most consistent source of nationally reported adaptation actions across SIDS [22]. Second, the SNC and interview data were manually coded and analysed – manual coding is more prone to human error [30]. Data triangulation and within-method triangulation of the SNC and interview data collected were used to increase the quality and comprehensiveness of the research findings [31].

2.5 DATA VALIDATION

To ensure the robustness and credibility of the research findings, two measures were employed: (1) data triangulation (2) within-method triangulation. Data triangulation [31] was used where the sources of data came from the SNC and Semi-structured interviews. After the interview data was analysed, the data was then sent back to the interviewees to ensure that my interpretations of the dataset were understandable and not misleading. For the SNC, after the data was analysed it was sent to a focus group comprised of 10 members from within the selection of the participants from the interview to confirm the interpretation of the data. On the other hand, within-method triangulation [31], was used when analysing the data, where both summative and conventional content analysis was used.

3.0 RESULTS

The results of this paper are divided into two parts. The first part of the results looks at the climate change adaptation trends in SVG, while the second part looks at the barriers faced by SVG to adapt to the impact of climate change. Climate change adaptation trends incorporate both climate-induced and non-climate-induced vulnerabilities. The results from the interviews are relevant to both the first and second part of the results. Therefore, it is included holistically in the overall scope of the results.

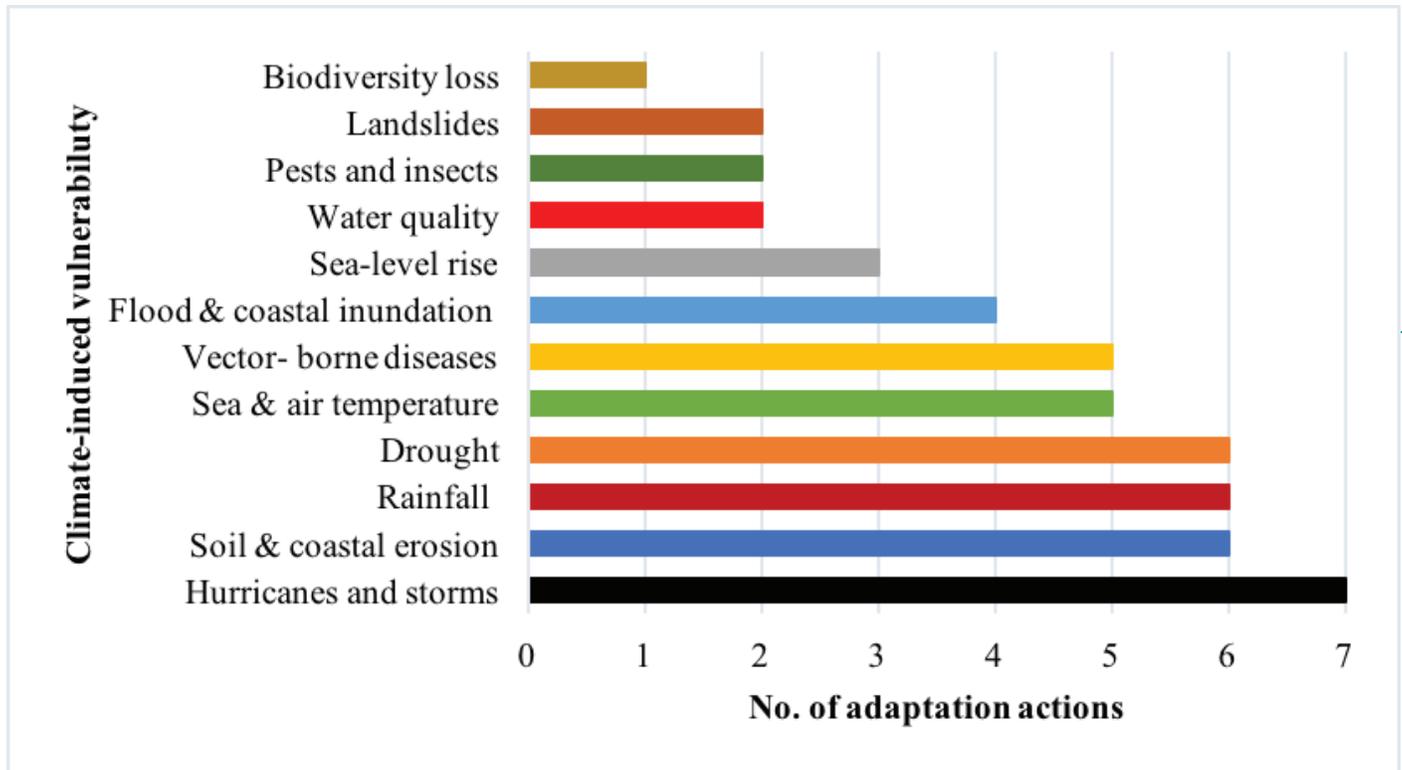


Figure. 1 Number of adaptation actions by climate-induced vulnerability addressed in SVG.

3.1 SVG’s Climate change adaptation trend

Using SVG as the case study for this paper, seventy-three national-level adaptation actions (49 climate-induced vulnerabilities and 24 non-climate-induced vulnerabilities) were counted from the SNC. Figure 1, above, shows a count of climate-induced vulnerabilities addressed by SVG. SVG reported to taking action on twelve different types of climate-induced vulnerabilities. The four main climate-induced vulnerabilities for which most action was reported are changes in hurricanes and storms (14%), soil and coastal erosion, rainfall and run-off, and drought (12% each). Biodiversity loss accounted for the least number of adaptation actions for climate-induced vulnerabilities.

Figure 2 contains the count of non-climate-induced vulnerabilities addressed by SVG. SVG reported to taking on ten different types of non-climate-induced vulnerabilities. The four main non-climate-induced vulnerabilities addressed by SVG are economic constraints (25%), energy (17%), food security and the impacts of development and infrastructure (13% each). Pollution and waste, deforestation, overfishing, and land-use change had the least amount of adaptation actions for non-climate-induced vulnerabilities with 4%. Figure 3, below, shows the count of adaptation actions by sector in SVG. The sectors taken into consideration from the reports of the SNC are the agriculture, coastal zone, water, health, economic, and tourism sectors.

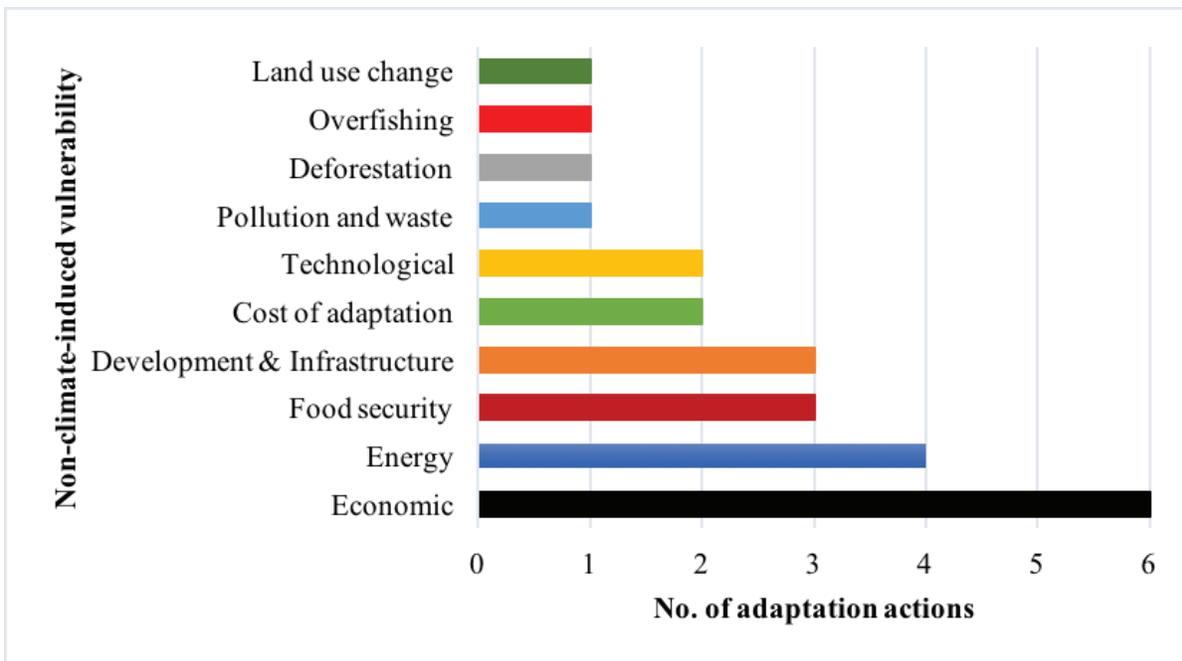


Figure. 2 Number of adaptation actions by non-climate-induced vulnerability addressed in SVG.

Figure 3, below, shows that the agriculture sector reported the highest number of adaptation actions with 44 %. This was followed by adaptation actions in the coastal zone sector (15%) and the health sector (12%). There were no adaptation actions reported for the social sector.

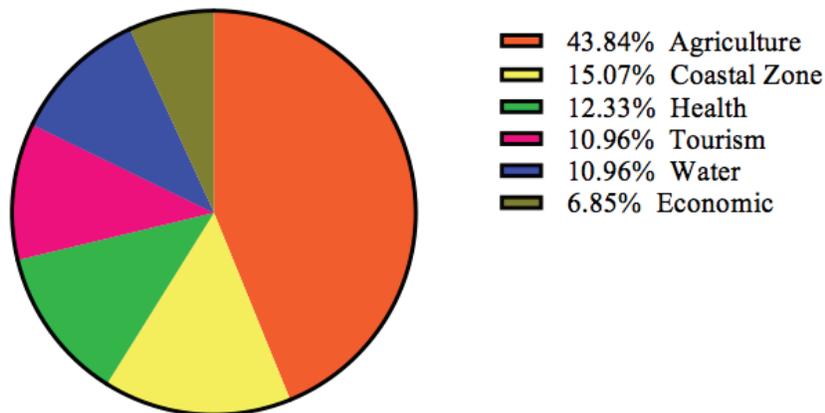


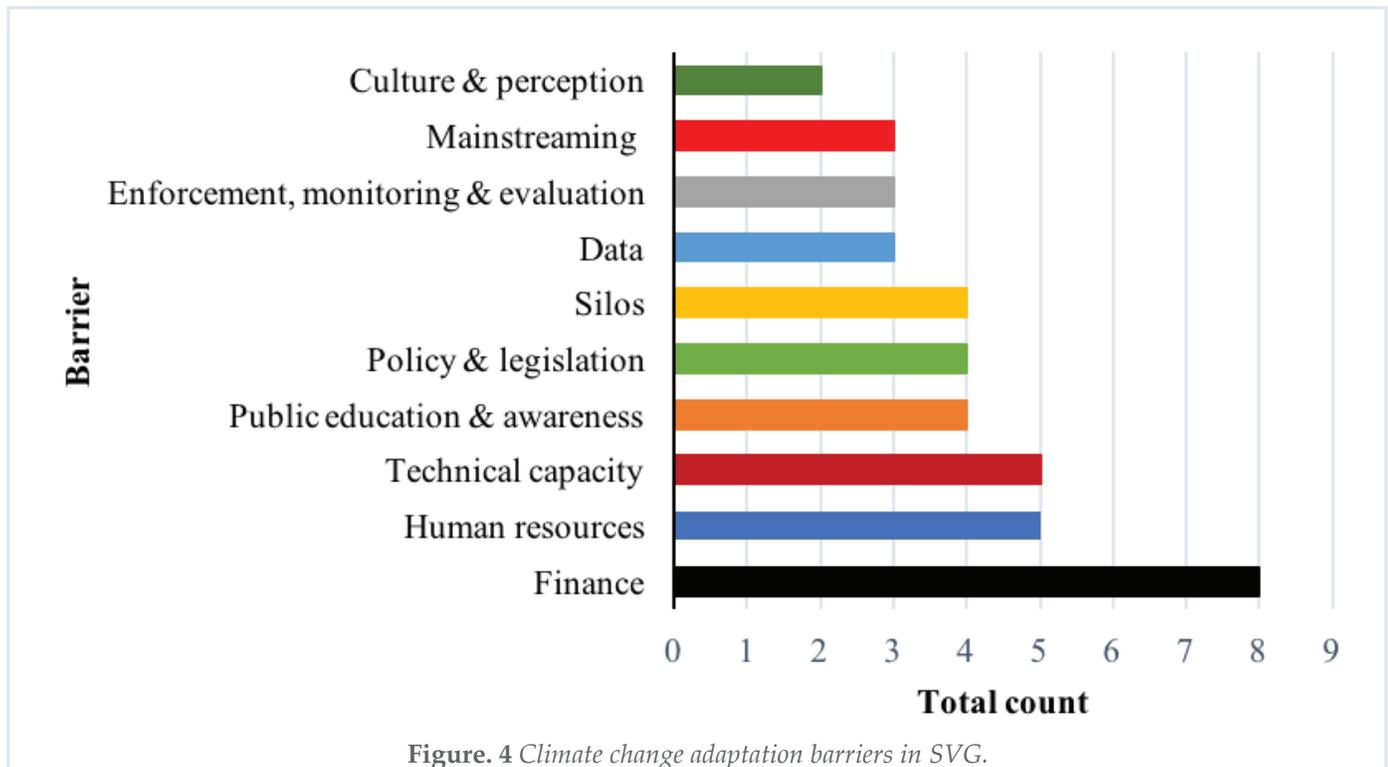
Figure. 3 Number of adaptation actions by sector in SVG.



When asked about the way SVG is adapting to the impacts of climate change, 70% of the interviewees mentioned stakeholder workshops and consultations, 50% indicated public education and awareness, and 20% said risk and impact assessments. The interviewees who mentioned stakeholder workshops and consultation stated that if there is a project in a community that there will be meetings held in the community. Also, a lot of workshops were held at different levels to build capacity, share information, and obtain feedback for those invited. In terms of public education and awareness, interviewees listed examples which included, interfaces with primary and secondary school (e.g., clean-up campaign), interface with the general public (e.g., photo competition), TV and radio campaigns, and capacity building. In regards to risk and impact assessment, interviewees alluded to the need for updated laws and policies so that Environmental Impact Assessments can be done before any major development takes place. Also, the need to develop climate change policies and integrate climate change into sectoral policies.

When asked about the sector in which most adaptation is done in SVG, there was an overwhelming majority (90%) of the interviewees who agreed that most adaptations were being undertaken in the agriculture, tourism, and coastal zone sectors. Many interviewees cited that they believe these are the most vulnerable sectors, especially to hurricanes and tropical storms, and they think that's why the focus is placed on those sectors to reduce climate vulnerability. Also, several interviewees stated that those sectors are the main economic sectors of the country. In terms of climate-induced vulnerabilities, most interviewees identified the intensity of hurricanes and storms as the most critical climate change impact for SVG (80%). Interviewees cited the extent of the effects of hurricanes and storms on the economy, health,

livelihoods, housing, and the general safety of the public. Other interesting focus were sea-level rise (50% of the interviewees), drought (45%), and coastal erosion (40%). Interviewees pointed to the fact that each of these climate-induced vulnerabilities has significant implications on the country. Interviewees were able to give insights on the adaptation actions that were implemented to adapt to hurricanes and tropical storms. According to these interviewees, projects implemented include slope and riverbank stabilization in various parts of the country, satellite warehouses built in rural areas for decentralization purposes and to have readily availability of supplies in areas most affected in the event of natural disasters. In the case of coastal erosion, Interviewees were able to give insight on projects implemented such as coastal defenses in various parts of the country, passing of legislation to ban sand mining in various parts of the country, monitoring of reef conditions, legislations passed so that coastal development need to provide environmental impact assessment, and also the rehabilitation of mangrove ecosystems. In terms of drought, interviewees were able to provide information on projects implemented. Such projects include watershed management for the Cumberland and Perseverance watersheds which include among other things reforestation under the European Union Global Climate Change Alliance. Under the Japan international Cooperation Agency (JICA) project, on the Grenadines island of Mayreau, projects for drought include fifty 1000 gallons water tanks given to residence on the island and installation of ten 1000 gallons water tanks to increase the communal water tank system capacity from 80,000 gallons to 90,000 gallons. Also, under the same project, within the Agriculture sector, there is the rehabilitation of the Langley Park irrigation scheme where farmers are provided with solar panel water pumps and tanks. Other implementation includes drought-resistant plants and animals.



On the other hand, in terms of non-climate induced vulnerabilities, all interviewees agreed that SVG faces multiple issues that include economic, environmental, and social issues that hinder the country’s adaptation plans and ultimately, the country’s sustainable development goals.

3.2 SVG’S BARRIERS TO CLIMATE CHANGE ADAPTATION

Base on SVG’s SNC, forty-one national-level climate change adaptation barriers were counted. The three main national-level adaptation barriers reported by SVG are finance (20%), human resources and technical capacity (12% each). Culture and perception were the

least commonly reported national-level adaptation limits and challenges (5%). Figure 4, above, contains the full results of the barriers to climate change adaptation in SVG.

The majority of the interviewees (80%) agreed that finance and the lack of communication between government sectors are the two major barriers to climate change adaptation in SVG. Interviewees cited that while the majority of funding for climate change adaptation in SVG is from international donors, the lack of communication between sectors leads to duplication of efforts and like-minded projects that can be integrated to maximise the limited finance better. Interviewees also mentioned that since the government budget has to service all sectors,



priorities are not given to climate change adaptation which leads to more dependency on international funding to implement projects on the ground. Although there is an inherent financial barrier, interviewees noted the effort of the government in its readiness preparation to have the Ministry of Finance, Economic Planning, Sustainable Development, and Information Technology accredited under the Green Climate Fund. Therefore, for example, more of the monies allocated would be used for implementation instead of paying third parties. Also, interviewees were able to give insight on a more integrated approach to climate change adaptation across sectors, where projects are screened in an attempt to avoid duplication, and maximize the funding by pooling projects together with similar objectives and deliverables.

Fifty percent of the interviewees mentioned a lack of technical capacity in-country. Three interviewees noted that while there are a lot of people employed within the public sector, there are not enough specialized personnel with the capacity to help with the issues of the impacts of climate change. Other interviewees noted that brain-drain compounds the problems because of a lot of the trained individuals who go off to study usually stay in the country of their studies or migrate to another country in search of better opportunities.

Another factor raised by the interviewees (44%) was the lack of political will exhibited by those with the power to effect change. These interviewees cited the fact that the political machinery is every five years, hence the focus is mainly placed on short term goals with immediate impact to maximise voters. Another important factor mentioned by the interviewees is the mindset of the people. They stated that climate change is not a household name, so the mindset of the people is still one of which they see it as a government problem, which leads to environmental degradation.

On the other hand, thirty percent of interviewees noted that finance is not a major issue, instead, it's the lack of institutional organization that is causing the problem at a national level. Interviewees cited that climate change needs to be mainstreamed in workplans so that the already overwhelmed public servants wouldn't see it as additional work but as an integral part of their work plans. Also mentioned was the lack of climate change entity or mechanisms to track climate change projects, among other things that will help to avoid duplication of efforts, help with the integration of climate change policies into sectoral plans, and help to prioritize the country's adaptation focus.

These views suggest that non-finance-related factors such as poor governance, lack of political will, lack of communication among sectors, and the mindset of the people are potentially playing an equal or more significant role in limiting adaptation in Caribbean SIDS.

4.0 DISCUSSION

St. Vincent and the Grenadines is used in this study to investigate and analyse the national-level climate change adaptation focus, its vulnerabilities, challenges, and barriers to the impact of climate change. The discussion is divided into two parts to include the importance of climate change adaptation in national and sectoral plans, and to improve the country's access to international climate change adaptation funding.



4.1 THE IMPORTANCE OF MAINSTREAMING CLIMATE CHANGE ADAPTATION IN NATIONAL AND SECTORAL PLANS

In this paper, mainstreaming adaptation refers to the incorporation of climate change adaptation objectives into national and sectoral policies and plans [32]. Mainstreaming climate change into national policies, plans, and development projects contributes to (1) a reduction in vulnerability to climate impacts and variability, (2) an increase in adaptive capacity of communities and national activities facing climate impacts, and (3) ensuring sustainable development and avoiding decisions that will generate maladaptation [33].

The results from the analysis of this study show that SVG is primarily adapting to the changes in hurricanes from a climate-induced perspective, and economic constraints from a non-climate induced perspective. SVG, like the rest of the Caribbean region, is vulnerable and exposed to the impacts of climate change. In recent years, extreme weather events have devastated the region, and single handily wiped out the economy of several countries. Antigua and Barbuda, for example, suffered losses and damages over US\$222 million as hurricane Irma wreaked havoc. At the same time, Dominica sustained approximately US\$ 1.3 billion in losses and damages after Hurricane Maria devastated the small island state. This accounted for 224% of Dominica's gross domestic product (GDP) [34]. SVG's economy is heavily dependent on the climate-sensitive sectors of tourism and agriculture. To build resilience to the impacts of climate change at a national level in SVG, there is a need for the country to mainstream national-level climate change adaptation into national and sectoral plans. According to Huq and Reid [35], mainstreaming climate change is one of the primary governance approaches to increase countries' ability to adapt to climate change effectively. SVG's national

economic and social development plans 2013-2025 [36] paves the way for the mainstreaming of adaptation in the national and sectoral plans. However, progress has been very slow. Sixty percent of the interviewees stated the need for the integration of climate change adaptation into work plans. One interviewee applauded the government's effort in establishing the sustainable development unit (SDU), under the umbrella of the Ministry of Finance, Economic Planning, Sustainable Development, and Information Technology; however, it was pointed out how understaffed the unit is.

Mainstreaming climate change adaptation into national and sectoral planning has several expected benefits that include the avoidance of policy conflict, the reduction of risk and vulnerabilities, improved efficiency as compared with managing adaptation separately, and leveraging more financial flows in sectors affected by the impacts of climate change than the amounts available for financing adaptation separately [37]. Climate change adaptation policies need not develop specific and detailed response options, but rather facilitate their development and implementation as part of existing sectoral policies [38]. Such benefits can help SVG to be a more climate-resilient state to the impacts of climate change. One interviewee cited that climate change adaptation actions are done in an ad-hoc manner, while departments and agencies work in silos. The interviewee went on to point out the lack of technical capacity and mechanisms to facilitate interagency coordination.

Mainstreaming adaptation is perceived as a multi-year, multi-stakeholder activity that exemplifies the role of climate change adaptation in the promotion of well-being, pro-poor economic growth, and the attainment of the Sustainable Development Goals (SDGs) [39]. It also involves working with different stakeholders in the field of development.



Adaptation processes require a regular revisiting of development policies, plans, and projects as climate and socio-economic conditions change [40]. This iterative attribute of mainstreaming makes it a development-oriented approach appropriate for addressing climate change adaptation challenges [41].

Given the points mentioned above, an overarching mechanism to assess the institutional arrangement and capacities to facilitate mainstreaming would be beneficial for the country to build adaptive capacity and resilience to the impacts of climate change, priorities adaptation goals, and maximise adaptation funding.

4.2 IMPROVING ACCESS TO INTERNATIONAL CLIMATE CHANGE ADAPTATION FUNDING FOR SVG

This study finds that finances account for 20% of adaptation limits reported by SVG in its Second National Communications. On the one hand, there is a need for mainstreaming climate change adaptation into national and sectoral plans for its benefits, as mentioned above. On the other hand, however, SVG needs to improve its access to international funding for climate change adaptation. One interviewee cited that the Caribbean is extremely vulnerable and exposed to intense hurricanes that have the potential to wipe out the entire economy. While another stated that SVG appears to not have the technical capacity and mechanisms in place to maximise adaptation funding. With that said, Caribbean SIDS, like SVG, appears to be missing out on principal financing. The results from a study done by Robinson et al. [42], shows OECD DAC members reported that between 2010 and 2014, an estimated US\$2 billion was committed towards international adaptation financing for SIDS which was roughly 6% of the total allocation of funds committed to all developing

countries (US\$35 billion). Robinson et al. [42] further stated that the allocation of funds was highly disproportionate with Cabo Verde, Dominican Republic, Haiti, Guyana, and Timor-Leste receiving the largest commitments. Furthermore, Cabo Verde and the Dominican Republic accounted for 26% of the total commitments [42]. Therefore, in the Caribbean, SIDS, except for the Dominican Republic, Haiti, and Guyana are receiving a disproportionate allotment of the international financing that is allocated globally for SIDS. Studies done on adaptation financing within the Pacific SIDS also highlighted the same conclusions [43, 44].

The responses from the interviewees raised the curiosity as to why SVG, and by extension, the wider Caribbean have been allocated disproportionate international funding for climate change adaptation. Could it be that some countries are more climate-ready to secure financing? For example, five interviewees mentioned that SVG alluded to the fact that SVG is now putting measures in place to access the Green Climate Fund, that has the potential for the country to be able to get more international funding, but on the other hand, they indicated that the procedures to access those funds are very rigorous and a lot of capacity building will be needed. One interviewee mentioned that climate change is relatively a new term in the Caribbean; however, it's a 'sexy topic', so everyone wants to do something to get funding". This brings forth the next point, on the readiness of some countries to access funding. As several interviewees highlighted the government's step in the right direction with the establishment of the Sustainable Development Unit, they also noted that it is poorly staffed. Therefore, climate change adaptation on the national level needs good institutional arrangements and good mechanisms in place to prioritise and secure funding.



Another important point that came out of the interviews is the economic classification of SIDS in the Caribbean. SVG is classified as an upper-middle-income economy with a per capita gross national income (GNI) of between US\$4,036 and \$12,475 [45], which makes it ineligible to access some funding sources. However, the economy of SVG is very vulnerable as it is highly dependent on climate-sensitive sectors such as tourism and agriculture. One interviewed pointed to the fact of the devastation that was caused to the Caribbean islands of Dominica, Antigua and Barbuda, and Puerto Rico by hurricane Maria and Irma. Another interviewee highlighted the fact that SVG has high public debts, and it is very difficult to secure concessional financing because it is very limited for middle-income countries and non-existent for high income Caribbean SIDS. Studies done in the Caribbean shows that most of the Caribbean SIDS are highly indebted [46]. While per capita income has been demonstrated to absolutely correspond with the volume of aid received [47], the interrelated and complex nature of the vulnerabilities of SIDS should be considered in allocation decisions as opposed to basing these fundamentally to national incomes.

Therefore, from the points mentioned above, SVG needs to focus on its institutional arrangement and equip the SDU with the human resources and technical capacity to prioritise the adaptation pathway and capitalize on the international funding sources available.

5.0 CONCLUSION

This paper took a case-study approach to achieve two main aims ultimately. They include identifying how SVG is adapting to climate change, and, identifying the barriers to climate change adaptation in SVG. The paper found that seventy-three national-level adaptation actions were reported in the SNC. Forty-nine of those adaptation actions reported addressed climate-induced vulnerabilities while twenty-four addressed non-climate-induced vulnerabilities. The paper also found that SVG is mostly adapting to the changes in hurricanes and storms, soil and coastal erosion, rainfall, and drought from a climate-induced perspective while in terms of non-climate-induced vulnerabilities, it is mostly adapting to economic constraints, energy, food security, and the impacts of development and infrastructure, and the most adaptation measures are being implemented in the agriculture, coastal zone, and health sectors. It further found that the main barriers to climate change adaptation at the national-level are finance, human resources, and technical capacity. The findings of this paper are important for the government and policymakers of SVG and SIDS in the region. These findings can help SIDS in their climate change adaptation aspirations by identifying gaps, making informed decisions, reasons for mainstreaming climate change adaptation into national and sectoral plans, and considerations into their financial mechanisms to access climate change funding.



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Examining Solid Waste Practices and Littering at the University of the West Indies, St. Augustine Campus

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ABSTRACT

Littering is a rampant problem and rooted in human behaviour. This study aims to record, categorise, and examine spatial patterns between pieces of litter and trash and recycling bins across the University of the West Indies, St. Augustine Campus. The geographic location of pieces of litter and bins (trash and recycling) were recorded and georeferenced to a campus base-map. A total of 10, 889 pieces of litter were recorded over the 7-day survey. The majority of litter was plastic (47.6%) and cigarettes (24.1%). The litter on campus was not evenly distributed. The kernel density estimation demonstrated that there was an obvious hotspot in the south-east of campus at the student activity centre (SAC), where there were more than 5 pieces of litter per sq. meter. The total of 182 bins were recorded and the mean distance between bins was 13.0 meters. Most of the bins were clustered in the southwest end of the hotspot, near the SAC. In addition, there were no recycling bins placed in this location. A recycling bin should be located in the SAC, as there are the most littering offenses, and recycling success with plastic items can be improved. Using a uniform colour for trash bins may increase proper solid waste disposal and reduce littering.

Keywords: Geographic information systems, kernel density estimation, environmental behaviour, littering, solid waste management

1.0 INTRODUCTION

Municipal solid waste management is particularly important in small island developing states (SIDs), such as Trinidad and Tobago. With a fixed area and an increasingly urban population, socio-economic and environmental impacts are reliant on land and waste management trends. Treated and untreated solid waste deposition at government-owned disposal sites and illegal dumping are the primary methods of waste management in Trinidad and Tobago. Most of the solids waste facilities are operational for approximately 70 years, surpassing their 20-year lifespan. Additionally, leachate produced contaminates its environs as there is improper drainage in some of these areas. The application of a national integrated solid waste management system would benefit the country as there are inefficiencies in both the private and public sectors.

Studies showed that the average Trinbagonian citizen-generated 1.4 kg of waste daily [1]. A 2009 solid waste characterization study assessed four of the country's landfills [2]. The study revealed that of the 700,000 tonnes of solid waste that was recorded at the landfills in Trinidad; Approximately 84.0% of all items were recyclable or compostable. Similarly, the landfill in Tobago contained 52.0% recyclable or compostable materials. More recently, surveys conducted between 2013 and 2015 indicated that many citizens generated



between 0 to 50 kg or litres of waste including organics, paper, or beverage containers annually [3,4]. When considering the recycling programmes alone, approximately 321 million dollars was invested in facilities management, and extra labour was required for sorting and cleaning recyclables items and then transporting these items. As most waste in Trinidad and Tobago is recyclable or compostable, there are many opportunities for waste recovery [5].

A few studies have examined solid waste on university campuses. There are many reasons for examining solid waste in this niche environment. Universities and colleges typically have young adults between the ages of 18 to 23, with different demographic, social, and environmental ideals. Armijo de Vega et al., 2008 notes that “colleges and universities have the moral and ethical obligation to act responsibly towards the environment, they would be expected to be leaders in the movement for environmental protection”. The university environment is one that is geographically small and adoption of potential ideals, such as recycling and ‘waste to energy’ opportunities are easier than in a municipality or cooperation. One study conducted at Mexicali I campus estimated that approximately 1 ton of solid wastes is produced per day, with more than 65% of these wastes were recyclable or potentially recyclable [6]. It was determined that during the 2007–2008 academic year, the Prince George campus of the University of Northern British Columbia (UNBC), Canada produced between 1.2 and 2.2 metric tonnes of solid waste per week, the majority (70%) were recyclable or compostable materials [7]. In many cases, it would take little effort to separate waste or implement changes as the solid waste is usually concentrated. At the University of Ghana, the mean distance between litter and trash bins was 50 meter, with most of litter was clustered in student activity areas and food courts [8].

This study characterises the improperly disposed solid waste or litter at the University of the West Indies, St. Augustine Campus. The geographic location of the trash and recycling bins and each piece of litter within the perimeter of the campus was recorded. Hub distance and nearest neighbour analyses were then conducted to examine the clustering of litter and infer patterns pertaining to littering behaviour.

2.0 METHODOLOGY

The methodology employed comprised of data collection, georeferencing and cluster analyses.

2.1 DATA COLLECTION

Solid waste surveys were done over a 7-day period in March 2019 at the University of the West Indies, St. Augustine Campus. The mobile application, Litterati was used to photograph, record the geographic location and metadata. A dataset was then imported into excel and each entry comprised an identification number, geographic coordinates, the time recorded, and category of litter. There were eight categories of litter (Table 1). Two other datasets were also completed for the trash and recycling bins. The three datasets were then saved as CSV files.

Table 1: Survey of the relative number of pieces of litter and percentage (%)

Category	Number of Pieces of Litter	Percentage (%)
Textile	51	0.5
Organic	68	0.7
Glass	102	1.0
Other	110	1.1
Metal	414	4.1
Paper	2111	20.9
Cigarette	2429	24.1
Plastic	4804	47.6
TOTAL	10089	100

2.2 GEOREFERENCING

The litter, trash, and recycling bins datasets were imported in QGIS (QGIS 3.4.6 'Madeira'), then georeferenced to a campus base-map retrieved from OpenStreetMap. All layers were then saved in World Geodetic System (WGS84) reference coordinate system.

2.3 CLUSTER ANALYSES

The mean distance between the pieces of litter and trash bins was determined in a preliminary analysis to see if the littering behaviour was consistent throughout campus. Then three additional tools were used: the nearest neighbour analysis, nearest hub algorithm, and the distance matrix analysis. The nearest neighbour analysis measured the distance between pieces of litter in the same category. This computation was also done to examine the distance between adjacent trash and recycling bins on campus. The nearest hub algorithm created thiyessen polygons for the trash and recycling bins. The pieces of litter were then weighted per polygon. A kernel density estimation was then used to examine the density of

litter and hotspots, where the maximum litter is found. Heat maps were used to illustrate the hotspots relative to the location of trash and recycling bins. The distance layer analysis determined the distance between pieces of litter and trash and recycling bin on campus. All results are expressed in meters.

3.0 RESULTS AND DISCUSSION

Pieces of litter during the 7 days in March 2019 were recorded and classed into eight categories (Table 1). A total of 10,889 pieces of litter were recorded during the time period. Textiles (0.5%) and organic (0.7%) categories accounted for less than 1.0% of the total litter. Glass (1.0%), other miscellaneous items (1.1%) and metal (4.1%) accounted for a small portion of the litter. The majority of litter was paper (20.9%), cigarettes (24.1%) and plastic (47.6%). Plastics were visually dominant (Figure 1). Although plastics dominated the St. Augustine Campus, it was the fifth most abundant at Trinidad's landfills in 2010 [2].

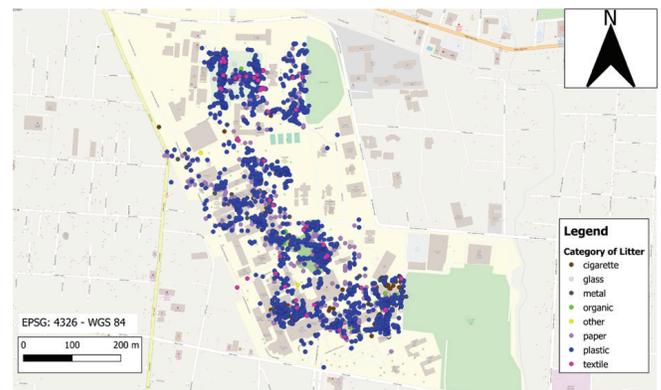


Figure 1: Individual pieces of litter recorded during the 7-day survey at the University of the West Indies, St Augustine Campus.

Litter on campus was not evenly distributed (Figure 2). There was the highest number of pieces of litter in the south of campus, where numbers were greater than one thousand. A total of 2,569 pieces of litter were recorded at the student activity centre (SAC). In the general area of the JFK quadrangle, 1,133 pieces of litter were recorded. The football playing field was the only place in the north end of campus that had greater than one thousand pieces of litter (Figure 2).

The 10,889 recorded points were observed to be 0.60 meters from each other, where the expected mean distance if the litter was uniformly distributed was 3.0 meters. The kernel density estimation demonstrated that there was an obvious hotspot in the south-east of campus, where there were more than 5 pieces of litter per sq. meter (Figure 3). There were a total of 182 recorded bins and the mean distance between bins was 13.0 meters. From the nearest hub analysis, the mean distance from a piece of litter and a bin was 21.8 meters. The minimum distance of solid waste from the bin was 0.0 meters while the maximum was 102.2 meters. Most of the bins were clustered in the southwest end of the hotspot, at the SAC. There were no bins in the north or east ends of campus (Figure 4). In addition, there were no recycling bins placed in this location. A recycling bin should be located in the SAC, as there are the most littering offenses, and recycling success with plastic items should improve.

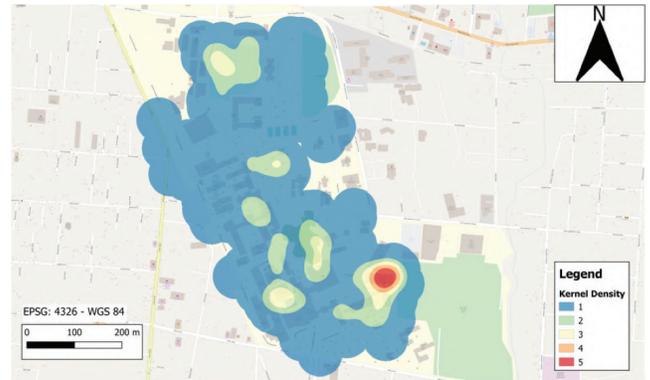


Figure 3: Clusters generated based on kernel density estimation

Most of the campus' trash bins were green coloured in the sports areas and high traffic areas. However, black and red general trash bins were observed in the food court and student activity centre. Indiscriminate use of colours may confuse passers-by and not facilitate easy appropriate disposal of litter. Other studies showed that solid waste management improved with having uniform coloured trash bins [9]. Bins should be redesigned to consider aesthetics, daily capacity, and utility. A colour-coded bin system would allow the seamless management of recycling and composting without the risks of contamination.

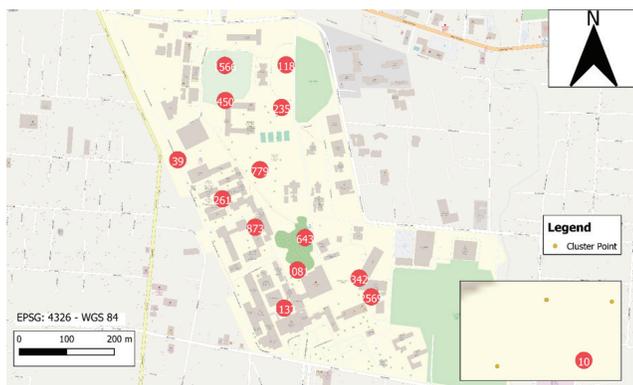


Figure 2: Clusters generated based on the 7-day survey at the University of the West Indies, St Augustine Campus

The factors influencing the littering behaviour at the University of West Indies, St Augustine Campus were not examined and outside the scope of this study. However, many other studies have established aesthetics, positioning, the use of graphics and video games increase appropriate litter disposal [10, 11, 12, 13]. Incorporating video gaming and increasing signage should increase success, especially in a campus environment, where most students are young adults. Education is also an important part of any long-term litter prevention and solid waste management strategy.

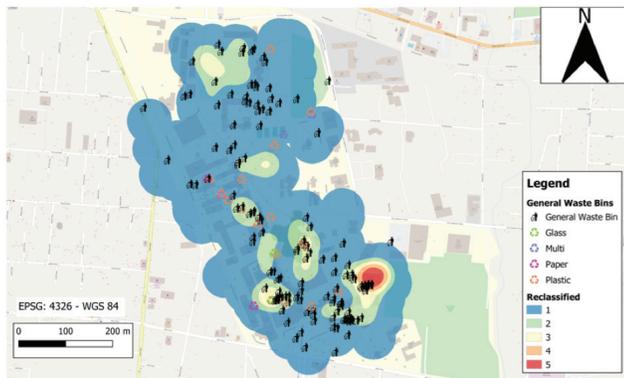


Figure 4: Clusters generated based on kernel density estimation and trash and recycling bin locations

4.0 CONCLUSION

A total of 10,889 pieces of litter were recorded during the 7-day survey on the campus of the University of the West Indies, St Augustine. Plastic (47.6%) and cigarettes (24.1%) accounted for the majority of litter. This litter was not evenly distributed. The density of litter was highest in the south of campus. Most of the bins were clustered in the southwest end of the hotspot, at the SAC. There were no recycling bins in the SAC, where most of the plastic litter is generated. Indiscriminate use of colours may confuse passers-by and not facilitate easy appropriate disposal of litter. Incorporating video gaming and increasing signage should increase successful disposal on campus settings.



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Building Resilient Caribbean Small-Island Developing States through Community-Based Disaster Risk Perceptions

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ABSTRACT

The Caribbean's susceptibility to natural disasters was reinforced after the multi-hazard impact of the 2017 hurricane season. Multiple disasters have caused severe physical, social, and economic loss in the region since the Caribbean's disaster susceptibility encompasses more than physical exposure. These susceptibilities, however, have not translated into heightened disaster data collection or risk assessments. The fact is that the region currently lacks a standardized methodology to assess risk. In response to this absence, the 'Caribbean Risk Information Tool' (CRIT) was developed by the International Federation of Red Cross and Red Crescent Societies. Since assessing risk is a key aspect to increase resilience, this study seeks to investigate the usefulness of this community-based risk information tool, within the Caribbean context. The paper accordingly aims to examine the role of community-based and local-level approaches using a small island developing state case study. The present results are significant in at least three major respects. From the information collected through the CRIT in the Sangre Grande regional corporation, it was possible to identify the peak months of disasters, the hazards with the highest impact in the regional corporation, the most susceptible communities, the communities that are in immediate danger or crisis, as well as the natural and man-made triggers of the most impactful disasters. The continuous collection of this qualitative data hopes to, therefore, consistently

inform mitigation and resilience strategies in the Caribbean

Keywords: Community-Based, Risk Assessment, Disaster Risk Perceptions, Small Island Developing State.

1.0 INTRODUCTION

The Caribbean is subjected to multiple hazards including hurricanes, floods, landslides, earthquakes, storm surges, coastal erosion and volcanoes which possess the potential to significantly stunt growth and development in the region on a social, economic, physical, and environmental level [14]. After the 2017 hurricane season where Hurricane Irma and Maria caused severe physical, social, and economic damage to Dominica, the British Virgin Islands, and Barbuda, the need for further enhancement of disaster resilience in the built environment was reinforced. Islands in the Caribbean are highly susceptible due to their exposure to a wide variety of hazards as well as other socio-geographical factors that dampen their ability to mitigate against and recover from disasters [19].

For instance, these islands are typically small in size with mountainous terrain, which results in a significant percentage of the population settling in highly vulnerable coastal areas or building settlements on



hazardous steep hillsides. Their spatial location and the warm waters in the Atlantic Basin also create a favourable environment for the formation of tropical cyclones. With the ever-present threat of climate change causing rising sea levels and temperatures, there is evidence to support that there will be an increase in frequency, duration, and variability of the islands' weather events [27]. In addition to weather events, the region is subjected to tectonic activity such as subduction occurring at the boundaries of the Caribbean and North American plates, which makes the region also vulnerable to volcanic and earthquake activity [10].

In addition, to these physical and environmental shortcomings, there are also social and economic issues that increase vulnerability within the region [31, 27]. The volatile economies, large public debts, little to no cohesiveness amongst institutions, and inadequate disaster resilience legal frameworks of Caribbean countries, pose major problems within the region that have the potential to significantly impact pre and post-disaster recovery operations [30]. Therefore, to reduce the level of risk in the region, a holistic approach to disaster management that combines the main tenets of preparedness, mitigation, response, and recovery, while strengthening the region's capacity is critical to increasing resilience and coping capacity [17].

For effective disaster management, the first step in the process is risk identification, which is undertaken through Disaster Risk Assessments and Risk Analysis [21]. Risk is a function of exposure and vulnerability consequences, and therefore these risk assessments use suitable and relevant indicators as a means of assessing existing levels of risk [5]. Identification of risks allows for the implementation of suitable

mitigation and response strategies that can aid in the prevention and reduction of the impacts of natural disasters [5].

Throughout the Caribbean, there is evidence to support that there is an absence of a standard methodology to assess risk within the region [31]. Therefore, to overcome this absence the Office of Disaster Preparedness and Management (ODPM) of Trinidad and Tobago, in conjunction with the Caribbean Disaster Emergency Management Agency (CDEMA), has considered using the Caribbean Risk Information Tool (CRIT) assess risk. For this reason, the CRIT, a Semi-Quantitative Risk Assessment tool, was designed and developed by the International Federation of Red Cross and Red Crescent Societies and the CDEMA Caribbean Disaster Emergency Management Agency. Previous iterations of the tool encompassed a smaller number of data collection components. These were tested in Jamaica, Mexico, and India. However, it was deemed necessary to include additional components to facilitate the collection of more robust data for local disaster resilience decision-makers.

The CRIT, a Semi-Quantitative Risk Assessment tool, aims to utilize local communities' perceptions and experiences on disasters, vulnerability, and risk to identify local disaster susceptibilities; to identify community-based social vulnerabilities that require immediate intervention and development; and finally, to have an information-based decision-making process that will prioritize local disaster preparedness, mitigation, and response strategies in order to reduce disaster risk.



This study, therefore, seeks to examine the suitability and application of CRIT using a Caribbean case study. The paper accordingly aims to determine if the previously listed aims and approaches can be achieved in the Caribbean context. This is needed due to the increased intensity, frequency, and types of disasters being faced by local communities in the Caribbean. Most studies analysing the Caribbean tend to focus on the region's heightened fragilities and vulnerabilities. Few studies mention the Caribbean's lack of disaster data. The absence of regional and national risk assessment methods and disaster loss databases that are standardised, sustainable, continuous, publicly accessible, and quality assured supports the need for more disaster risk assessments grounded in a Caribbean lens. While existing Caribbean databases satisfy one or more of these characteristics, very few achieve all. As articulated by De Groeve [9], disaster data collection coupled with national disaster loss databases, establish a historical baseline from which disaster impacts can be measured [9]. Therefore, the collection of disaster impact data has a critical role in measuring the success or failure of existing disaster risk reduction initiatives in the Caribbean.

In the absence of such quantitative data collection efforts, the collection of local qualitative data becomes a meaningful and necessary initiative in every data deficient disaster vulnerable society. The collection of local qualitative data also represents the shift from the former myopic routine of disaster response to proactive risk identification and mitigation strategies [1]. Moreover, the involvement of communities in qualitative data collection realigns risk resilience strategies from the top-down approach, where communities solely seek the provision of risk resilience strategies and disaster rescue, to the

bottom-up approach where communities are made aware of their own risk. They, consequently, drive, implement, and maintain their disaster resilience initiatives [34]. The collection of community-based disaster data will also assist in the transparent allocation of resources as well as reduce the duplication of efforts by multiple DRR stakeholders. Thus, for disaster risk resilience to be effective, it is critical to involve locals in the initial stages since their involvement not only affords substantial forms of disaster information that is otherwise absent, but also, the involvement of locals encourages the fulfilment and continuation of the risk resilience efforts [33].

2.0 DEVELOPING COMMUNITY DISASTER RESILIENCE

One common factor that keeps resurfacing in international and regional frameworks for disaster management is the necessity of incorporating the community into each stage of the planning process [28, 29]. Community-Based Disaster Risk Management (CBDRM) sometimes used interchangeably with Local Level Disaster Risk Management (LLDRM), is a method of incorporating grassroots or localised knowledge of the existing social, economic, and environmental circumstances in the community, regarding vulnerability and risk [16]. It is a humanistic approach to the disaster management process that includes the layperson in the entire risk management cycle from preparation to recovery and rehabilitation. CBDRM has become necessary as risk, hazard, and vulnerability are space and place dependent. Additionally, there is significant spatial and temporal variation in the impact of



disasters. Consequently, for disaster response and recovery to be successful, it is critical to involve locals in the assessment stage. They provide the most substantial forms of qualitative information as these are the persons that live in and experience hazardous conditions and are well aware of the existing shortcomings [2, 18]. This information can be applied to tailor and create suitable and sustainable disaster management strategies while building the capacity within the area of concern [30].

The concept of CBDRM gained traction mobility internationally during the 1990 International Decade for Natural Disaster Reduction, and further emphasis was placed on the concept via the use of the 2005-2015 Hyogo Framework for Action. The Hyogo Framework placed special emphasis on building the resilience of nations and communities through the incorporation of stakeholders at all levels, as well as the promotion of a culture of disaster resilience [27]. This concept was used with a Caribbean focus and on a regional scale, in the comprehensive disaster management (CDM) strategy contributed by CDEMA. As such their fourth CDM strategy outcome states, "Strengthened and sustained capacity for a culture of safety and community resilience in Participating States" [7].

The initial step in CBDRM requires accurate disaster risk and vulnerability assessments. These types of assessments are one of the components that can be used to help improve the coping capacity of the area of concern [7]. When carrying out these disaster risk assessments there must be suitable and relevant indicators present that can provide a comprehensive overview of the level of vulnerability and risk present in a community [4]. These indicators can typically be divided into broad groups, which are Ecological, Economical, Social, Institutional, Infrastructural, and

Community Competence [8]. Beccari [3] provided a more in-depth list of indicators that included but were not limited to Governance, Education, Health, Information and Communication, and Coping Capacity. Persons' response to these indicators would be dependent upon their perception of current risks. The collection of risk perception data, a qualitative form of data collection, typically depends upon individual awareness, social status, economic standing, and levels of immunity.

In Thailand, CBDRM qualitative data collection methods, such as focus groups and participatory observation techniques, were used to study existing flood risk in flood-prone communities, as well as to collect community-risk management solutions [23]. Similarly, Chinese case studies also employ a qualitative scoring system in their CBDRM assessments [34]. Their scoring system assessment methodology was used to increase public awareness of disaster prevention and to implement the standardization of disaster development strategies. Thus far, these Chinese CBDRM methodologies have produced policies that document standards on national comprehensive disaster reduction demonstration communities. This has resulted in improved overall disaster development processes in risk mitigation, emergency preparedness, response, and recovery. The CBDRM data collection process, therefore, facilitated significant improvements in China's coping capacity [33].



3.0 RATIONALE OF RESEARCH AND STUDY AREAS

In comparison to the Thailand and Chinese case studies, Trinidad also requires improved disaster risk resilience development processes at the community level [25]. In Trinidad, regional corporations are first-level administrative boundaries that encompass multiple relatively high-density urban areas and low-density communities. For this reason, CRIT was applied and tested in a regional corporation of Trinidad and Tobago. Moving forward, it is expected that the disaster management units of each regional corporation will have the responsibility to implement the use of the CRIT in Trinidad. Due to the community-based nature of the tool, and the existing community networks and relationships between the disaster management units of the regional corporations and the communities, resources are readily available to implement the tool at this level.

The Sangre Grande regional corporation was selected for this study. Four main factors governed the study area selection process. The most critical of these was the availability and willingness of local community participants and the local disaster unit of the regional corporation. Also, as the hazard profile will support, this regional corporation experiences a high frequency and a wide variety of hazards.

Despite Trinidad's high disaster susceptibility, declaring disaster zones are rare occurrences that are reserved for the most severe disasters. In the past ten years, only two regional corporations have declared their regions as disaster zones. Sangre Grande is one of these two regional corporations. Its high exposure to a broad range of high intensity and frequent hazards such as floods, landslides, earthquakes, coastal erosion, high winds, storm surge, and forest fire emphasises the need for disaster risk resilience efforts in this regional corporation.

Furthermore, the Sangre Grande regional corporation currently lacks high-resolution hazard, vulnerability, or risk maps that delineate the areas susceptible to hazards. Hazard and risk maps aid in spatially demarcating the intensity, scope, and probability of hazard events. More than ten years ago, national-level flood and landslide hazards, as well as landslide risk maps, were designed and developed. Since then, the urban landscape, road densities, drainage density, and rainfall patterns have altered. Therefore, more updates are required to support decision making.

4.0 HAZARD PROFILE OF STUDY AREA

The regional corporation of Sangre Grande is situated to the north-east of Trinidad. Figure 1 displays this municipality. It is 927 square kilometres (km²) in area, represents 18% of Trinidad's total land space. Its relatively large landscape, with 41 communities and 5.7% of the national population lends to the rural and semi-rural character of the municipality. The population is evenly distributed with a female population of 49% and a corresponding male population of 51% (CSO 2013). There is generally a youthful population since 57% of the municipality's populace is under the age of 35 years, of which 25% are under the age of 15 years [6].

Within the last two census periods, the area has experienced a 36.6% increase in the number of households, and by extension the numbers of persons in the area [6]. The youthful population explains this recent growth in the Sangre Grande municipality. Despite these increases, the 41 communities are rural and semi-rural. The municipality, however, has the third-lowest household income per capita per annum in the country. The local fisheries are the main source of livelihood for the Sangre Grande municipality.

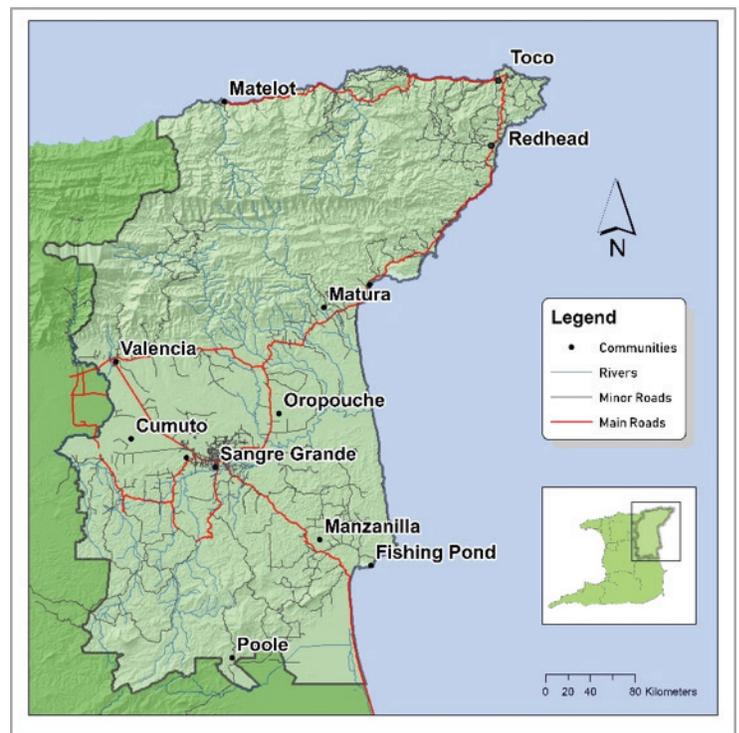


Figure. 1 Map of Study Area, Sangre Grande Corporation, Trinidad.



As shown in Figure 1, the 927 km² of the municipality includes 101 km² of coastline, which is 24% of Trinidad's coastline. It follows that geographically, it is the largest administrative region in Trinidad and Tobago. This geography of the municipality also highlights the region's hazards susceptibility.

Sangre Grande Regional Corporation is subjected to a variety of hazards, which include but are not limited to floods, landslides, coastal erosion, and strong winds. However, these hazards vary spatially and temporally throughout the municipality due to factors such as seasonal changes, topography, proximity to the coast, infrastructure, and population density.

The Oropuche community of the Sangre Grande Regional Corporation has a history of being impacted by flooding. These floods typically occur during the period October to December such as, the flood of October 2017 that affected over 80 families and resulted in the loss of livestock, when the Oropuche River burst its banks. According to an article published in the local newspapers, the Chairman of the Sangre Grande Regional Corporation identified unplanned settlements via squatters and developers who constructed buildings in natural drainage networks and as a result, became some of the main contributors to the flooding event [24].

The Toco Fishing Pond, another community located within the Sangre Grande regional corporation is impacted by a multitude of hazards including, mainly flooding, landslides, and strong winds. These hazards also typically occur from October to December. In November of 2010, 2013, 2014, and 2016 residents of the region were frequently impacted by the flooding that resulted in persons being trapped and displaced from their residences. In November of 2013 in particular, homes were not only flooded but also, housing material, livestock, and appliances were lost and damaged after two days of flooding [25].

Landslides in the region typically result in erosion and blockage of roadways, with homes and bridges being destroyed. As a result, these landslides also result in communities being marooned due to impassable roadways. In December of 2011, a 67-year-old man lost his life when debris fell on his home resulting in it caving in and trapping him. During the same hazard event, a 68-year-old woman was also displaced as her home was affected by mud and debris [22]. Strong winds have also caused roofs to be blown off and trees being blown over. [26].

Participants of the exercise indicated that the Sangre Grande community, which is located within the boundaries of Sangre Grande municipality, has also been subjected to flooding, fires, and crime. Flooding, similar to the rest of the region, occurs mostly during October, November, and December. This flooding is typically a result of heavy rainfall, poor drainage, and the river overflowing its banks. This leads to devastation, as residents' homes and the surrounding areas are flooded, endangering residents and livestock. Sangre Grande is also vulnerable to storms and hurricanes that cause severe damage even without direct impact. This occurred during the passage of outer bands from Tropical Storm Bret, which resulted in a roof being blown off and trees being torn down in the region.

The Manzanilla coastal community of the Sangre Grande Regional Corporation is mainly subjected to coastal flooding, however, due to its proximity to the coast, it is also highly vulnerable to strong winds and the passing of tropical disturbances. This coastal flooding typically makes roadways impassable and cuts off access to communities within the area. During intense weather events such as in November 2014, flooding and storm surges can and did cause significant erosion of the roadway, the collapse of homes, and significant agricultural losses that cost approximately \$20 million TT dollars [11].



5.0 THE CRIT

Group interviews have evolved into a well-known, and widely used technique for the collection of qualitative data [15]. They are used to examine people's perceptions, experiences, feelings, and ideas about a topic. Through in-depth group discussions, the goal is to reach a consensus for each question among all the participants. When the group dynamics are successful, participants work with the researcher to explore and clarify pertinent issues that are familiar to them. The volunteer sampling was used in this research. Thereby encouraging participation from a wide range of contributors, particularly those who are usually reluctant to conduct one-on-one interviews [15].

It should, however, be noted that it is not possible to implement the CRIT within any study area without the buy-in from local disaster managers or community members. At times, it is difficult to obtain community as well as technocrat buy-in to undertake such data collection exercises. Though wider communities stand to gain from the assessment of local hazards and risk, more often than not, it is difficult to translate the importance of such studies to persons who do not foresee a tangible economic, social or environmental benefit to enhance their everyday lives.

For the application of CRIT in Sangre Grande, there was the buy-in from local disaster managers who encouraged residents of this community to partake in this exercise. Due to these advantages, a focus group was used to obtain qualitative risk information for the CRIT. The focus group consisted of 26 persons who volunteered to partake in the research. 21 persons were residents of the Sangre Grande region, 5 persons were technical staff working with the Sangre Grande Regional Corporation. The technical staff, who were

predominantly male, included the Chief Executive Officer Chairman of the corporation, the Senior Disaster Management Coordinator, and the Disaster Management Coordinator. In total there were 10 males present at the focus group. Also, 70% of the focus group was over the age of 40 years old. Although it was not an ideal situation for both technocrats and community members to partake in exercise at the same time, both parties indicated that there was a level of comfort between the two parties that facilitated the completion of this task.

All the employees of the Sangre Grande regional corporation that participated in the CRIT exercise have held their position at that regional corporation for at least five years, and for some, more than ten years. These employees have traversed the study area for many years, observing the geographical landscape and the people who live there while the regional corporation was at the peak of disasters as well as days that preceded and followed the disasters. Additionally, the residents who participated in the exercise resided in that regional corporation for more than thirty years. Each of the participants has seen the Sangre Grande regional corporation evolve into Trinidad's largest geographical regional corporation with 41 communities. As expressed by the participants, some of them are older than a few of the communities that currently exist in the Sangre Grande regional corporation. As a result, they possess in-depth knowledge and experience on the following:

- The magnitude and impact of past disasters in the study area.
- The physical, social, and environmental impacts of past disasters in the study area.
- Existing mitigation, preparedness, and risk reduction strategies in the study area and surrounding areas.



It is therefore assumed that the data to be collected is a true spatial representation of the current geographic and social environment.

The CRIT guided the exercise through a combination of open-ended and scaled close-ended questions, which the participants answered. Consensus between the technical staff and residents of the study area was necessary before the respective answers were inserted into the CRIT workbook. It should be noted that, in most instances, a consensus was easily attained between both parties.

The CRIT worksheet is divided into four main sections. These four sections are Hazards, Vulnerability, Child-Centered Vulnerability, and Capacity under which there were a series of sub-sections. For example, as shown in Table 1, the Hazards section was further subdivided into Natural and Man-Made Hazards sub-sections.

Table 1: Showing the Sub-Sections of the Natural and Man-Made Hazards Categories of CRIT

Type of Hazard	Component	Subcomponent
Natural	Hydro-meteorological	Hurricanes
		Floods
		Droughts
		Severe Storms
		Extreme Temperatures
		Hailstorms
	Geological	Strong Winds
		Earthquake
		Landslides
		Tsunamis
		Volcanic Eruption

Type of Hazard	Component	Subcomponent
Man-made	CBRNE	Explosions
		HAZMAT Spills
		Fires
		Gas Leaks
		Radioactive Emissions
	Health/ Ecological	Intoxication
		Poisoning
		Epidemics
		Plagues
		Air Pollution
		Water Pollution
		Soil Contamination
		Extinction of Flora and Fauana
	Other	Civil Unrest
		Crime/Homicidal Rates

Under Natural Hazards, the first component assessed was Hydro-meteorological hazards with the subcomponents Hurricanes, Floods, Droughts, Severe Storms, Extreme Temperatures, and Hail Storms. Under the Geological component of Natural Hazards, the subcomponents addressed were Earthquakes, Landslides, Tsunamis, Strong Winds, and Volcanic Eruptions. Under the Man-Made section, the first component was the Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE), under which the subcomponents were Explosions, HAZMAT Spills, Fires, Gas Leaks, and Radioactive Emissions. The second component was Health/Ecological under which the subcomponents were Intoxication, Poisoning, Epidemics, Plagues, Air



Pollution, Water Pollution, Soil Contamination, and Extinction of Flora and Fauna. The last component under Man-Made was Other, and the subcomponents under this were Civil Unrest and Crime/Homicidal Rates. In each of these components, participants were asked to provide a rating of frequency, severity, and scale. The ranked range of frequency, scale, and severity responses are listed in Table 2.

These scaled close-ended questions aid in qualitatively identifying and ranking the relevant hazards, the frequency of hazards, and the scale of the impacts. When the responses are combined, they are quantified and calibrated into one statistical risk score for each hazard. To demonstrate how this was all incorporated for a flood hazard, suppose the participants provide the responses of “occurs every year” with regards to the frequency subcomponent, “affects less than half the population” with regards to scale subcomponent, and “some deaths, injury, or major public health” with

Table 2: Showing the Predefined Response Options for the Frequency, Scale, and Severity Categories

Frequency	Scale	Severity	Respective Score
Occurs every year	Affects all of the population	Catastrophic death, injury, or public health	10
Occurs most years	Affects most of the population	Some deaths, injury, or public health	8
Occurs once or twice a year	Affects less than half of the population	Few deaths, injury or public health	6
Has occurred but a long time ago	Affects small groups of houses	Minor injuries only; OR minor damage/losses	4
Has never occurred but could occur	Affects individual houses	No impact on humans OR damage to infrastructure	2
Not applicable	Nothing affected	Not applicable	0



regards to the severity subcomponent, the respective individual scores will be 10, 6, and 8. Since each score has the same weighting, the overall risk score for flood would be 7.83. Conversely, if for the drought hazard, the participants provide the responses of “occurs most years” with regards to the frequency subcomponent, “affects all of the population” with regards to scale subcomponent, and “minor injuries only or minor damages” with regards to the severity subcomponent, the respective individual scores will be 8, 10, and 4. The overall risk score for drought would then be 6.84. From these scores, it can be concluded that in the Sangre Grande regional corporation, floods hazards are more severe than droughts.

The second section in the CRIT, displayed in Table 3, was Vulnerability, where there were six sub-sections. These were Ecological, Economic, Functional, Non-Structural, Structural, and Social. Under these sections, a variety of components were assessed through various indicators that were listed in the tool. For example, the ecological vulnerability component sought to assess the existence of municipal land-use policy or plan. Participants were asked to indicate whether the plans or policies were “enforced”, “enacted only existed in draft form”, or “did not exist”. Once again, the response from this scaled close-ended question was quantified into a numerical score for this vulnerability indicator. The “no laws or policy” response resulted in an ecological vulnerability score of 10 whereas the “enforced policy” resulted in a score of 1.

Table 3: Showing the Sub-Sections of the Vulnerability Categories of the CRIT

Type of Vulnerability	Vulnerability Component
Ecological	Land Use
Economic	Employment Levels
Functional	Planning Arrangements
	Availability of Resources
Non-Structural	Legal Instruments

	Protection for Properties and Livelihoods
Structural	Infrastructure
Social	Gender Ratio
	Social Services
	Education
	Health
	Water and Sanitation
	Security
Child Centred Vulnerability	Education
	Health

The last section of the tool was Capacity. This section assessed how effective existing disaster management strategies are in this study area. It was divided into Institutional and Operational capacities, and then further subdivided into Governance, Comprehensive Disaster Management, Operational Resources, Operational Personnel, and Early Warning Systems. For example, the early warning system component is a subcomponent of the operational capacity component. The EWS has one question. This scaled open-ended question provides the participant with five different levels of existing comprehensive early warning systems, from which one should be chosen. The first option, “the existence of a multi-hazard early warning system” yields a risk score of 1, whereas, the absence of an early warning system yields a score of 10. Thus, the more comprehensive the EWS, the lower the risk score. As with the previous sections, the response of each participant is converted to a quantifiable score.

Table 4: Showing the Sub-Sections of the Vulnerability Categories of the CRIT

Type of Capacity	Vulnerability Capacity
Institutional	Governance
	Comprehensive Disaster Management
Operational	Operational Resources
	Operational Personnel
	Early Warning System (EWS)



The introduction of the quantifiable scores for each of the Hazard, Vulnerability, and Capacity components, as well as the various sub-components, facilitates the identification of the most frequent hazards, the intensities of the hazards, and the most severe hazards. Moreover, the CRIT classifies and singles out the most socially and economically vulnerable in the community. Finally, yet importantly, deficiencies in operational and institutional capacities are also individually pinpointed. The tool also details the strengths and effective approaches used in the community.

The presence of this information, if undertaken for multiple communities, aids in the identification of the most at-risk communities, the selection of disaster risk reduction initiatives, in assessing the efficacy of existing disaster management systems, and in the reduction of redundant risk reduction efforts.

6.0 THE APPLICATION OF CRIT

The participants were asked to identify which hazards impacted the study area along with the frequency, scale, and severity of each hazard. The scores shared by local participants were inputted into the CRIT worksheet.

The Risk was ranked on a scale from 1 to 10 for each section of the tool, where the higher the score highlighted, the higher the level of risk. Thus, a score of 9 or more corresponds to a 'very high' risk, scores between 6 and 8 correspond to a 'high' risk, scores between 4 and 6 correspond to a 'moderate' risk, scores between 2 and 4 correspond to a 'low' risk, and scores between 0 and 2 correspond to a 'very low' risk. The scores, outputs, and information collected were then utilised to determine the level of risk that exists within the Sangre Grande Regional Corporation.

7.0 CRIT RESULTS

The data collected using the CRIT from the focus group participants in the Sangre Grande municipality is presented and discussed in the following sections.

7.1 NATURAL HAZARDS

The first component assessed using the CRIT was Natural Hazards. This was subdivided into hydro-meteorological and geological hazards. Under this section, for the hazards identified, frequency, score, and severity were assessed on a combined risk scale of 1 to 10. As shown in Figure 2, based upon the response of the members of the focus group the consensus for this component was that the Sangre Grande Regional Corporation was most at-risk for landslides, with a total score of 8, a high-risk rating. This was as a result of the landslides that were certain to occur every year, affecting the entire region of Sangre Grande, and thus having the potential to result in injury and death. Floods, extreme temperatures, and earthquakes all tied with a risk factor score of 7, a relatively high-risk rating. Flooding was believed to have a high frequency as it occurs annually, and has the potential to result in structural damage.

Other high ranked hazards included climatic hazards such as hurricanes, strong winds, and severe storms. Hurricanes and strong winds obtained a risk score of 4.58 and 6.84 respectively. Residents expressed that strong winds typically impacted the Toco area, in that they typically broke tree branches, which in turn dismantled electricity lines. Overall the natural hazard section generated a score of 6. Thus, despite the very-high and high-risk ratings of landslides, floods, and earthquakes, the low-risk ratings of the other natural hazards, reduced the overall risk ratings of Natural Hazards to a moderate score.

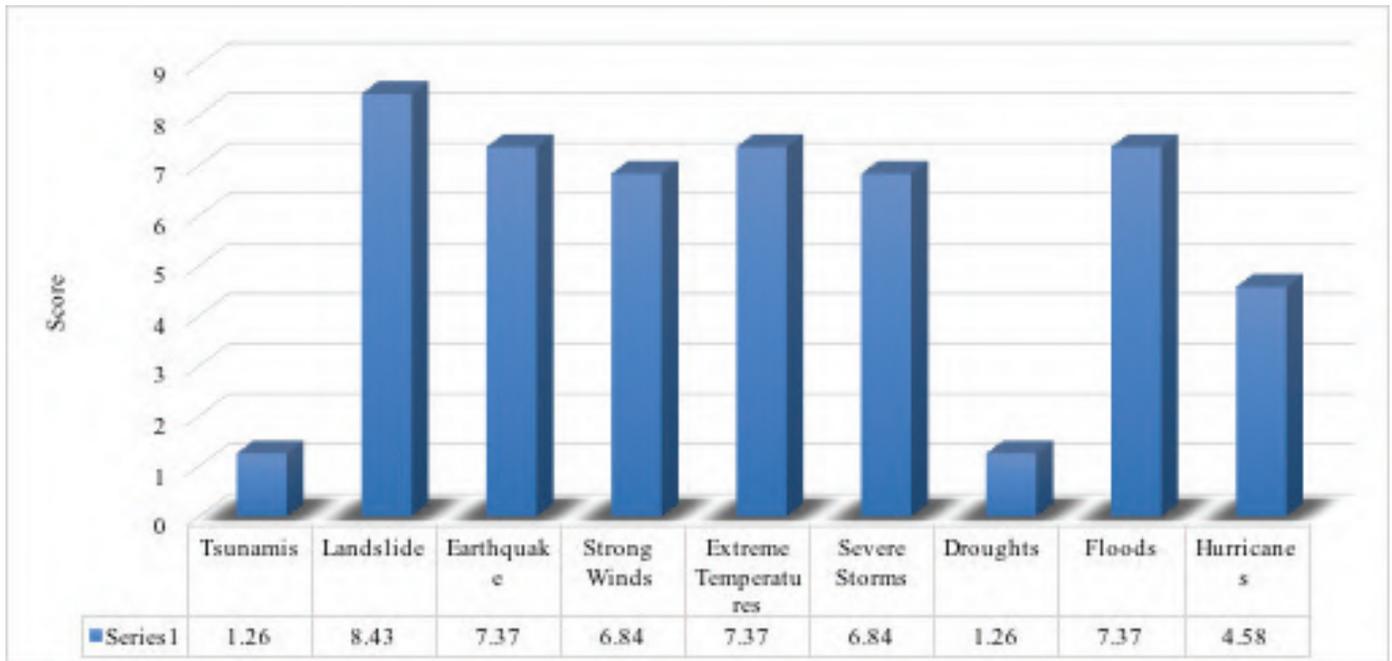


Figure 2: Illustrating the Natural Hazards Risk Perception Scores in Sangre Grande

One of the key areas of concern identified by the participants, as being highly vulnerable to flooding, was Vega de Oropuche, an agricultural-based community in the Sangre Grande Regional Corporation. Focus group participants also stated that the agriculture sector was impacted as crops displayed signs of wilting and animals suffered heat strokes during the drier months of the year.

For the earthquakes and their related impact, the members agreed that they occurred annually, affecting the entire region and that they could result in minor injury and loss. Additionally, the subcomponents that fell within the category of minimal risk were tsunamis and droughts with scores of 2, because although they have never occurred, the possibility of them occurring and producing a devastating impact still existed. Hailstorms and volcanic eruptions did not apply to the

region of Sangre Grande and they were therefore given a score of zero.

7.2 MAN MADE HAZARD

This second component was divided into two sub-sections, which were CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosives) and Health/Ecological. Under CBRNE the region was most vulnerable to Forest Fires, which received a score of 7, that is, a moderate risk rating. The members of the focus group stated that these fires occurred regularly, affecting most of the population and were typically set by homeless persons.

The most vulnerable areas to forest fires were the Vega de Oropuche and Tamana communities in the Sangre Grande Regional Corporation. Explosions and



HAZMAT Spills, which obtained scores of 4.00 and 4.58 respectively, two low-risk ratings, have occurred in the past where a small portion of the population was impacted, and which resulted in minor injuries and damages to infrastructure.

Radioactive Emission attained a score of 1.26, a low-risk rating. This was because this hazard has never occurred, but there is the potential of it occurring in the future. Under the Health/Ecological Components based upon the responses, Intoxication, Poisoning, Epidemics, and Air and Water Pollution regularly occurred in the region, however Poisoning gained the highest score with 8.0, a high-risk rating. This was because there was a high potential for death via poisoning with animals such as fishes and dogs being particularly vulnerable. For Intoxication the residents stated that the population frequently indulges in drinking and smoking as a form of recreation, giving it a score of 7. Epidemics possessed the second-highest score with 7.83, a high-risk rating, as the residents believed that it was a major health issue especially with the occurrence of viruses such as Zika and Dengue. It was believed that they typically occurred as a result of the lack of maintenance of the environment.

Water Pollution possessed a score of 7, as it was certain to occur annually, affecting most of the population of the regional corporation and resulting in minor injuries. The participants stated that this pollution typically results in the eutrophication of ponds and the pollution of the river course due to the dumping of waste and silt from quarrying.

Air Pollution and Soil Contamination were also certain to occur and possessed scores of 7, a high-risk rating, and 4.31, a low-risk rating respectively. For the Extinction of Flora and Fauna, the members were not aware of this occurring however they did believe that fires had the potential to result in a loss of biodiversity along with the death and displacement of animals.

Regarding Crime and Unrest, the members became very enthusiastic to express their opinions about criminal activities in the region as well as potential solutions. It gained a score of 9 with the corresponding very high-risk rating because it was a regular occurrence and had the potential to result in major injury and death. The overall risk score for the Man-Made Hazard Section was 5.

7.3 VULNERABILITY

The Vulnerability section of the CRIT was divided into six components, namely, Ecological, Economic, Functional, Non-Structural, Structural, and Social.

Based upon the responses for the Ecological component, there are no known municipal and land-use policies in the Sangre Grande region and this resulted in a risk score of 10. Employment levels within the region were estimated to be at approximately 30% - 50% and this was given a score of 5. It was suggested that employment opportunities did exist however persons in the region were not interested in the available types of employment.

Under the Functional component, the residents stated that there are no known emergency plans or traffic plans for the Sangre Grande region. When asked about the availability of resources the members became very passionate and stated that there is limited access to resources for the community if a disaster is to occur. They also stated that there were issues of delivery and distribution, as these resources tend to arrive days after the event and not to those truly in need. These sub-components were given risk scores of 10 and 3 respectively.

For the Non-Structural component of the vulnerability section, the residents stated that they are unsure of laws related to planning in the community, while some



highlighted the fact that there was government planning but no enforcement of the laws in the area. The members became passionate as well about this topic as they believed that there is no cohesion amongst state institutions. Also, because of financial cuts, institutions are not capable of funding enforcement. Furthermore, less than 25% of the residents possessed property insurance thereby resulting in a risk score of 5.

Social was the last component assessed under Vulnerability. When asked about the ratio of the employed person in the community, the members stated that the ratio was approximately greater than 1:5 and this gained a score of 10. Laughingly, the participants responded to the question of social services, to which they stated that there were no existing social safety nets in the community. When discussing the percentage of the population that possessed a secondary level education, the participants all agreed that it was greater than or equal to 50%. They also stated that there are 15 functional clinics in the entire Sangre Grande Regional Corporation.

Under the subcomponent Water and Sanitation, when asked about the percentage of households that have access to potable water, those that rely on river water as the main source of potable water, those with available drinking water within a 30-minute walk, and the percentage of households that have basic sanitation facilities; the results were >50%, >20%, >50%, and >75%, respectively, with an overall score of 3. They stated that there were functional methods in place to dispose of waste from sanitation facilities in the community. However, they became very passionate as they expressed that the only dumping site in the region was Guanapo. When this dumping site is at maximum capacity, they are forced to take their refuse to the Beetham landfill, which is located 37 km away. Sometimes instead of doing this, they admitted to disposing of unwanted materials in nearby rivers, which in turn exacerbates the flooding hazards in the study area. Lastly, in this section under Security, the

members rated the crime ratio as a medium. Overall this vulnerability section gained a score of 6.

7.4 CAPACITY

This section was divided into broad categories of Institutional and Operational Capacity. Under Institutional for the Governance component, the Level of Organisation possessed the highest level of risk with a score of 10. The question on Legal Framework was given a score of 10, due to the lack of existing natural hazard, and risk laws, and policies. Under the CDM component, the members stated that awareness was integrated into the work plan however the number of existing plans was unknown. The total risk score for Institutional Capacity was 6. For the Operational component, members were asked various questions based upon Information and communications technology (ICT) in the region. Based on the responses of the members, the proportion of individuals that use mobile telephones was approximately greater than 75%. It was also stated that approximately 50% of households have access to the Internet. The participants were asked their opinion on the proportion of households that possessed electricity, radio, and TV. The results obtained were >75%, 50%, and >75% respectively. The score obtained for this section of the CRIT was 8.36.

7.5 DISTRICT RISK SCORES

As seen in Figure 3, based on the results obtained from the participants of this assessment and the CRIT, the district Hazard profile score was 5.53, the District Vulnerability score was 5.59, and the District Capacity score was 6.93. Utilising the scores generated, based upon the responses for the various indicators, the tool calculated the overall District Risk Score for the Sangre Grande Region to be 5.98.

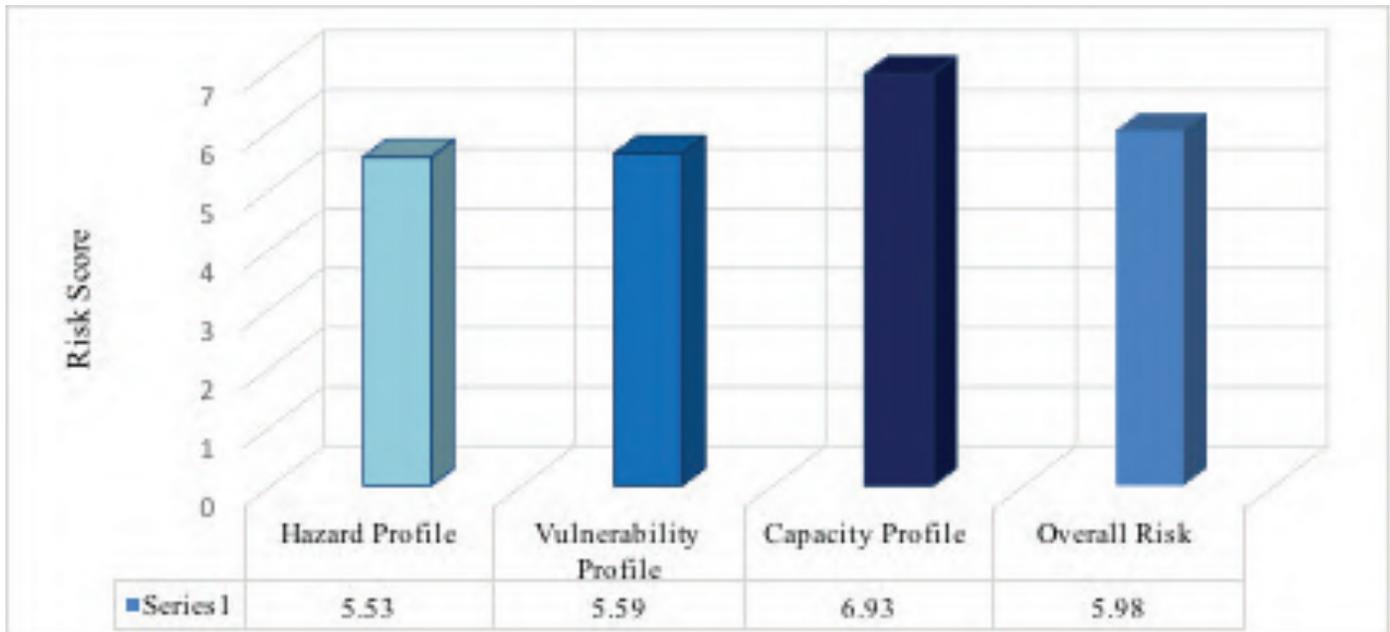


Figure 3: District Risk Score for the Sangre Grande Regional Corporation

8.0 DISCUSSION

Through the production of the hazard profile, correlated with the statements of the residents and results of the CRIT, it was observed that some areas within the Sangre Grande Region are repeatedly subjected to specific hydroclimatic and geo-hazards. October, November, and December were observed to be peak times for flooding and landslides. The hazard with the highest risk score was landslides and based upon the responses of the residents and assessment of the hazard profile, Toco was identified as the most vulnerable area.

There is also an abundance of landslide occurrences in Sangre Grande and Valencia. Overall landslides in this region typically occur due to heavy rainfall which

results in saturated soil, combined with faulty drainage and unstable slopes. However, they may also be the result of man-made activities such as quarrying, debris littering, cutting into the hillside to create roads, and other urban land uses. Therefore, particularly in the Toco region, where the main route is one road in and out, the vulnerability of these persons was heavily highlighted through the use of the CRIT.

The CRIT also showed the devastating impacts associated with flooding in the study area. Moreover, the CRIT identified the most flood-prone communities in the Sangre Grande Regional Corporation. This acute level of susceptibility was attributed to poor drainage, and the presence of the Vega de Oropuche



River, and its tributaries that run through the region. Based on information obtained from residents, severe storms and strong winds occur every year and affect the population in the study. Winds typically come as a result of tropical waves and cyclones. Cumana, Grand Riviere, Salybia Village, Matura, and Matelot have been identified as the areas most affected by strong winds. Storms are not a regular occurrence, however, there are numerous tropical disturbances and due to their proximity to the coast, the region is subjected to the out-lying storm bands passing near Trinidad.

The next major component assessed was Vulnerability; this can be influenced by several factors inclusive of, but not limited to, prior experiences, education, and perception of development. Within the assessment, Vulnerability was categorised into ecological, economic, functional, non-structural, structural, and social for analysis purposes. Currently, there are no implemented, well-known or publicized municipal plans or policies for the municipality of Sangre Grande. In contrast, there is a Sangre Grande Regional Municipality Draft Development Plan proposed for 2010-2020. There is also a National Spatial Development Strategy for Trinidad and Tobago. These plans, however, are only frameworks and their level of use is unknown. The lack of planning and policies dedicated specifically to the current issues in the region hinders future development in the region.

Contingency planning is a management tool that requires the input of the ODPM, CDEMA, government bodies, the Sangre Grande Regional Corporation, and the participation of civilians. This type of planning aims to, prepare an organization to respond to a disaster and its potential social impact. It is hoped that this information will be used to prepare, analyse, develop, implement, and review potential plans for the area. The absence of an endorsed contingency plan resulted in a risk score of 10, which poses a significant risk for the study area.

Another aspect of social vulnerability is the availability of local social safety nets. Social safety nets act as a means of promoting equitable development outcomes, by improving the country's social safety net programs through institutional reforms, capacity building, and improved monitoring and evaluation [13]. Based upon the response of the residents there are currently no existing social safety nets in the region; thereby, decreasing population resilience, and increasing population vulnerability, for the study area. In determining the nets needed for the municipality, factors such as community data, the competence of disaster management bodies, and previous policies and programs should be taken into consideration. The social safety net aims to offer a smooth transition from hazard to relief and recovery in the most vulnerable areas. It was recommended that the social safety nets be incorporated into the municipality plan and contingency plans because they are more effective when they are reinforced through planning systems.

The present results are significant in at least three major respects. From the information collected through the CRIT in the Sangre Grande Regional Corporation, it was possible to identify the peak months of disasters, the hazards with the highest impacts in the regional corporation, the most susceptible communities, the communities that are in immediate danger or crisis, as well as the natural and man-made triggers of the most impactful disasters. Moreover, the tools aided in qualitatively ascertaining the current disaster operational and disaster institutional capacity of this regional corporation. CRIT highlighted and documented the absence of social safety nets, disaster risk resilient policies, multi-hazard early warning systems, and the ad-hoc access to some operational pieces of equipment.

These findings, while preliminary, are critical to determining the most effective course of action, where several alternative disaster risk reduction possibilities exist. Therefore, the information collected and collated



by CRIT assists in efficiently channelling risk reduction efforts to the most vulnerable communities. The qualitative ranking in the CRIT can help in communicating the basis on which resources are allocated to stakeholders, including communities, the reasons for selection or non-selection for support. It also supports the resolution of intervention type and length.

Finally, as previously mentioned, there was the participation of respondents that is, a combination of local residents and technical personnel of the Sangre Grande Regional Corporation provides. This implies the application of the bottom-up or community-based research which takes into account local people's perceptions and beliefs that are less visible through a top-down quantitative approach. This type of application creates an environment where stronger interpersonal ties between the regional corporation and the community are encouraged. The intra-personal ties in the community are also ripe with opportunities. Thus, having strong implications for both disaster research and policies since it may stimulate community-based protection measures that empower self-protective behaviour in that community.

9.0 LIMITATIONS OF CRIT

Despite these promising results, to develop a more comprehensive picture of disasters in study areas, it is important to address specific elements of the CRIT that require further development. One limitation of the CRIT is the absence of the disasters' spatial information. For example, a spatial aspect that facilitates the mapping of hazards and past disasters by residents will aid in enhancing the quality of data

acquired. Moreover, given that the data is collected from the members of the community, it follows that the collated data should be returned to the community. It is hoped that the awareness of disasters and vulnerabilities within the communities would support self-mitigating and community-based disaster resilience in the study area. The communities would now be aware of the limited institutional and operational capacities faced by local disaster management agencies. Therefore, encouraging self-protective and self-mitigating behaviour that is rooted in community-based disaster resilience.

Another possible element of development that will prove to be a fruitful area for future studies is the inclusion of questions that will stimulate mitigation, preparedness, response, and recovery strategies from residents. For this case study, technical experts led the CRIT exercise. In the future, the CRIT exercises should be community-led where yearly comparisons of the results will assist in evaluating the value and sustainability of implemented resilience strategies.

10.0 CONCLUSION

This study set out to examine the usefulness of CRIT within the Caribbean context. The paper accordingly aimed to analyse the role of community-based and local-level approaches using a Caribbean small island developing a state case study. The study found that the utilization of the community as the initial source of information for the Semi-Quantitative Risk Assessment provided a variety of useful results relating to levels of disaster risk, vulnerability, and resilience of the Sangre Grande Region. This information along with the compilation of secondary information on past hazards facilitated the provision of a holistic overview of the current relative disaster



exposure, vulnerability, and resilience of the study area.

The hazard profile served to reinforce the results of the tool and the information gained from the participants of the focus group. Undertaking a risk analysis based on the information obtained would aid the development of interventions that would strengthen communities and in that way build resilience if the measures were successful.

The CRIT tool facilitated the identification and ranking of potential hazards that can affect the study area, as well as assisted in ascertaining the causative factors of disasters in the study area. Additionally, the tool, with the guidance of the participants aided in establishing the most vulnerable regional corporation in the country along with pinpointing the weaknesses in the existing mitigation and preparedness strategies.

The continuous collection of this qualitative data serves to inform consistent risk assessment, and mitigation strategies, which should be developed. It is hoped that the CRIT data collection process is iterative. This suggested since informed disaster risk decision-making is especially necessary in the changing global environment due to climate change. Overall the CRIT is capable of providing a useful comparison amongst study areas across different regions. Thus, allowing the allocation of scores with relative identification of risk, disaster susceptibility, and social vulnerability that is, at that time, already grounded in local knowledge and experience.

The information gathered can also be used to manage available disaster management resources within the community. Not only will resources be channelled away from the low-risk communities to the more vulnerable who are severely impacted by disasters but the required resources to mitigate and respond to disasters in the community would also be determined.

This is suggested since the tool identifies their relative strengths and weakness. These strengths and address weaknesses can be used to develop assistance measures within the community. This will also improve the deployment, access, and use of resources throughout the different phases of any disaster.



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The Regional Disability Index and Strengthening Resilience of Persons with Disabilities in the Anglophone Caribbean

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ABSTRACT

In 2019, the University of the West Indies Centre for Disability Studies (UWICDS) released the results of the first Regional Disability Index (RDI). The RDI was developed with the primary aim to track and rank countries within the Caribbean in terms of their efforts to implement the provisions of the Convention on the Rights of Persons with Disabilities (CRPD) and by extension, the Sustainable Development Goals (SDGs). The RDI used a quantitative methodological framework employing a survey among government and non-governmental organizations catering to persons with disabilities in the Anglophone Caribbean to capture the data. In this paper, this researcher conducts an assessment of the major findings of the RDI in the context of building resilience among persons with disabilities in certain fundamental areas of Caribbean life. Findings relating to legislative protection, education, employment, public transportation, health care, and access to information are highlighted. The RDI, among other things, revealed that St. Vincent and the Grenadines is the top country in the Anglophone Caribbean in terms of their efforts to implement programmes and policies for persons with disabilities. We compare and contrast the findings regionally to that which is taking place in the global landscape for persons with disabilities.

Keywords: persons with disabilities, Regional Disability Index, Resilience, Anglophone Caribbean

1.0 INTRODUCTION

Persons with disabilities are among the most vulnerable in any society [34]. Their vulnerability exposes them to diverse risk such as those being attributed to climate change across the world [28]. Efforts must be made to strengthen the resilience of these vulnerable individuals, thus bolstering their capacity to withstand the rigors of climate change.

Countries across the world have recognized these challenges impacting persons with disabilities and have put in place mechanisms to deal with them. In 2006, States Parties through the United Nations General Assembly adopted the Convention on the Rights of Persons with Disabilities [30]. This is a legally binding global instrument to protect the rights and dignity of persons with disabilities. In 2015, countries also agreed to the Sustainable Development Goals at the United Nations [29]. All of these instruments have expressed provisions for persons with disabilities to be brought in the mainstream of society, thus bulwarking their capacity to deal with challenges such as climate change.

Countries within the Anglophone Caribbean have signed and ratified these global treaties. They, therefore, are obliged to implement the provisions contained within these legally binding international instruments. For example, countries that have signed and ratified the CRPD in the Anglophone Caribbean must put in place legislation to protect the rights and dignity of members of this vulnerable community.



Recognizing the existential threats to persons with disabilities in the Anglophone Caribbean, the University of the West Indies Centre for Disability Studies (UWICDS) established a Regional Disability Index to track and rank countries within the region in accordance to their effort to implement programmes and policies for persons with disabilities. The following constitute the aim and objectives of the RDI from the perspective of the UWICDS:

The main aim of this project is to establish a special measurement index to track and rank countries that have signed and ratified the UN Convention on the Rights of Persons with Disabilities from the Caribbean in accordance with the progress they have made to improve the quality of life for persons with disabilities. The aim is supported by the following objectives:

1. To develop a regional measurement instrument that will be able to track the progress made by countries on improving the quality of life for persons with disabilities residing in the Caribbean.
2. To use the UWI Centre for Disability Studies office as the hub for coordinating and implementing the measurement index.
3. To ensure that State Parties that have signed and ratified the UN Convention on the Rights of persons with disabilities within the Caribbean are making meaningful progress in improving the quality of life for persons with disabilities.
4. To use the various articles of the CRPD to develop a model questionnaire for testing the progress made by countries within the region

5. To publish the findings in a biennial publication and use it as a means of encouraging countries to implement programmes and policies for persons with disabilities [32].

The research has conducted a qualitative assessment of the findings of the RDI in the context of strengthening the resilience of persons with disabilities, with particular focus on legislative protection, education, employment, awareness-raising and access to information. Cumulatively, these factors have the potential of reinforcing the potential of persons with disabilities and capacitating them to withstand the vagaries of climate change. This researcher benchmark these results with that of what is taking place internationally to push the global disability agenda.

2.0 THE THEORETICAL FRAMEWORK

In conducting this qualitative assessment of the results from the RDI, three theoretical frameworks are interrogated.

1. **Social constructionism Theory** - Social constructionism concerns the meaning, notion or connotation placed on an object or event by society and adopted by the members of that society based on how they relate or deal with the object or event [15]. People tend to formulate meaning based on their social construct and relate to things/individuals based on their lived reality.

Social constructionism has its origins in symbolic interactionism and phenomenology. It gained its foothold in academia through a publication from



Berger and Luckmann entitled “The Social Construction of Reality” in 1966. In this book, Berger and Luckmann postulated that society is created by humans and human interaction, which they treat as habitualization. Habitualization is the process by which any frequently repeated action becomes cast into a pattern, which can then be performed again in the future in the same manner and with the same economical effort [4]. Berger and Luckmann further opined that not only do we build our society but we accept it as it is because previous generations had created it. Society, therefore, according to Berger and Luckman is a habit [4]. The work of Berger and Luckmann was critical to the paradigmatic shift that took place in the disability landscape and this contributed to the social model of disability [21].

The social perspective of disability posited the view that it was social factors that contributed to the disability that individuals experienced [21]. Scholars such as McGinley and Cooper have made this view pellucidly. They have stated: “society creates [identity] categories and imbues them with meanings, which often change across place and time”; society makes people’s attributes into materially consequential “disabilities” by labelling them as such [14]. In this paper, for the resilience of persons with disabilities to be strengthened, there have to be some fundamental changes in Caribbean societies. There are plethora of barriers that have been created in Caribbean societies by non-disabled individuals that restrict persons with disabilities in maximizing their full potential and these have to be eradicated if the resilience of members of this vulnerable community is to be strengthened.

2. **Resilience Theory** - The concept of resilience refers to an innate quality of hardiness, including the capacity to recover from difficulties over time. From the natural science perspective, it is the ability of a substance or object to spring back into shape [24]. From a social science panorama, Unger (2008) postulates that resilience is a theory that can inform action. It is a concept that changes our focus from the breakdown and disorder attributed to exposure to stressful environments, to the individual characteristics and social processes associated with either normal or unexpectedly positive psychosocial development [26]. Persons with disabilities are human beings and therefore have the capacity to overcome challenges. They can spring back from whatsoever adversities that confront them. What is required is for the barriers created in society to be removed and with the appropriate support, such as the use of modern technologies, they will be able to maximize their full potential and live productive lives.
3. **Human Rights Theory** - This is a theory that postulates the view that all human beings are endowed with certain fundamental human rights and these rights must be protected [31]. These rights include but are not limited to: the right to life, the right to education; the right to work, and the right to information. All of these rights have been reaffirmed in the Convention on the Rights of Persons with Disabilities [30].



If these rights are enforced, the resilience of persons with disabilities will be strengthened and therefore be able to deal with the diverse challenges of life.

This researcher thus conflates these theories to capture the quintessence of the argument being adumbrated from the findings of the RDI. Countries within the Anglophone Caribbean came out of a particular social construct and this determined the way persons with disabilities are perceived and treated [12]. Individuals within the society fail to understand the bodily functions in that, if one loses a particular sense, the individual can function in society with the requisite support. Human beings by nature are naturally resilient (resilience theory) and are therefore able to spring back from the loss of any body part. Persons with disabilities are human beings and irrespective of losing any body part must be allowed to exercise their rights in society on an equal basis with others [30].

To buttress the resilience of persons with disabilities, various global treaties have been formulated. The Convention on the Rights of Persons with Disabilities (CRPD) and the Sustainable Development Goals (SDGs) are two such instruments. If the provisions of the CRPD and the goals of the SDGs are efficaciously implemented and attained, the quality of life of persons with disabilities will be significantly improved. It is within this context that the UWICDS established the RDI to track and rank the progress of countries within the Caribbean to assess their efforts to improve the quality of life of persons with disabilities.

The Methodological Framework for the RDI

1. In order to develop the regional index, a systematically designed methodology was prepared by the UWICDS. This was done to ensure the capturing of credible data. Consequently, the main instrument for collecting data was a questionnaire.
2. In developing the questionnaire, the distinctive articles as spelt out in the UN CRPD; was used to format the questions. The questions were coded and the answers were given a score. The scores were tallied to determine the ranking.
3. There was a pre-testing of the questionnaire in one of the Anglophone Caribbean countries.
4. Two (2) sets of institutions were targeted in each country: A government institution with responsibility for persons with disabilities and the other being a non-governmental institution with independence from the governmental structure. The scores from both of these institutions were added and the average used as the final figure to give the ranking on the index for each country. In some instances, only one response came from particular countries and this has impacted the final score since the average from each country was used to determine the ranking.
5. In collating and analysing the data, consideration was given to the general principles expressed in the CRPD. These included: Legislation, Discrimination, Gender Discrimination, Child Discrimination & Justice, Awareness, Accessibility, and Access to Information, Justice, Education, Health, Employment, Social Protection, Political Participation,



Data Collection, International Cooperation and Monitoring. These are the categories that capture the essential elements of the CRPD.

6. An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (192-225), Very Good (154-191), Good (116-153), Average (78-115) Poor (39-77) and Very Poor (0-38).

The table below shows the ranking based on the average score that each country gained with effort. The highest possible score on the completion of the list of questions was 225. An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (192-225), Very Good (154-191), Good (116-153), Average (78-115) Poor (39-77) and Very Poor (0-38).

3.0 FINDINGS

The following constitutes a snapshot of some of the findings of the survey conducted among countries in the Anglophone Caribbean. Ten countries responded to the questionnaire and these are: Jamaica, Barbados, Guyana, Trinidad and Tobago, Grenada, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines and Montserrat

Table 1: *Regional Inclusiveness Ranking Standings, and Ratification*

Countries	Average Score	Regional Inclusive Ranking	Standings	UNCRPD
St. Vincent and the Grenadines	134.5	1	Good	Not ratified
Jamaica	124.5	2	Good	Ratified
Barbados	113	3	Average	Ratified
Guyana	104	4	Average	Ratified
St. Lucia	104	4	Average	Not Ratified
Grenada	104	4	Poor	Ratified
Montserrat	104	4	Very Poor	Ratified
Dominica	104	4	Very Poor	Not Ratified
Trinidad and Tobago	18	9	Very Poor	Not Ratified
St. Kitts and Nevis	17	10	Very Poor	Ratified

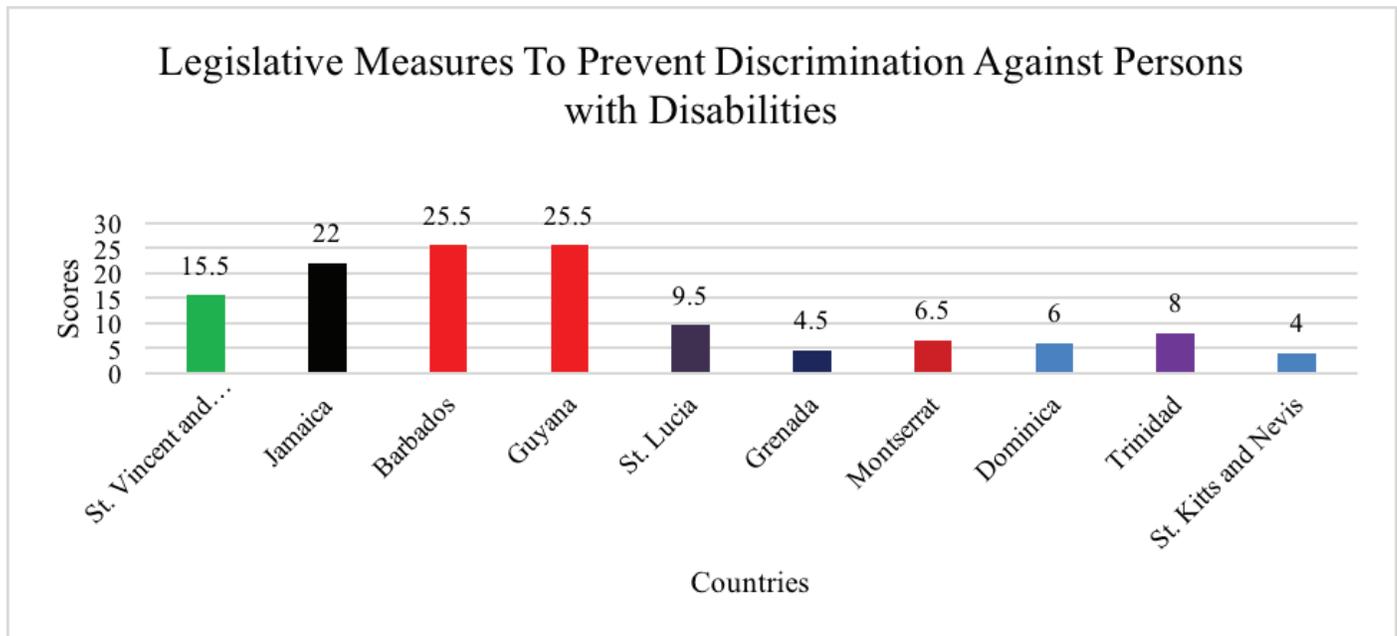


Figure 1: Legislative Measures to Prevent Discrimination

Article 4

Article 4.1.b indicates: “States Parties undertake: To take all appropriate measures, including legislation, to modify or abolish existing laws, regulations, customs, and practices that constitute discrimination against persons with disabilities”.

TOTAL SCORE 40

Graph 1 above displays the score the countries received for legislative measures that were implemented to improve the lives of persons living with a disability. Barbados and Guyana recorded the highest score of 25.5. Jamaica scored the second-highest of 22, followed by St. Vincent & the Grenadines with 15.5, St. Lucia 9.5, Trinidad & Tobago 8, Montserrat 6.5, Dominica 6, Grenada 4.5 and St.

Kitts & Nevis 4. An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (33.5-40), very good (26.9-33.5), good (20.2-26.8), average (13.5-20.1), poor (6.8-13.4) and very poor (0-6.7).

AWARENESS RAISING

Article 8 Article 8, 1a indicates that: “States Parties undertake to adopt immediate, effective and appropriate measures: To raise awareness throughout society, including at the family level, regarding persons with disabilities, and to foster respect for the rights and dignity of persons with disabilities”.

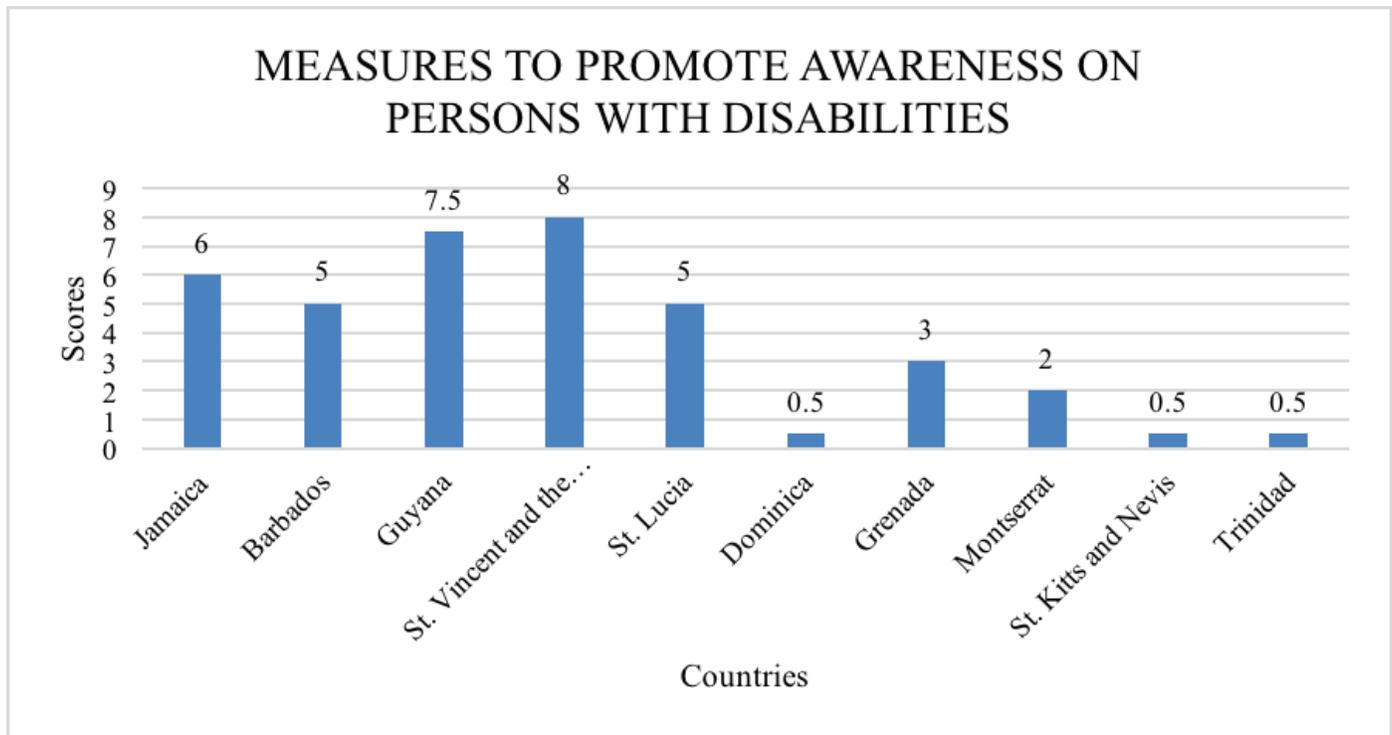


Figure 2: Measure to Promote Awareness

TOTAL SCORE 10

Figure 2 above displays the score the countries received for measures to promote awareness about persons living with a disability. The highest score recorded was 8 by St. Vincent & the Grenadines. Guyana had the second-highest score of 7.5, followed by Jamaica with 6, Barbados and St Lucia 5, Grenada 3 and Montserrat 2. Dominica, St Kitts & Nevis, and Trinidad & Tobago had the lowest score of 0.5.

An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (8.5-10), very good (6.9-8.5), good (5.1-6.8), average (3.5-5.1), poor (1.8-3.4) and very poor (0-1.7).

ACCESSIBILITY TO INFORMATION

Article 9

Article 9.2.f states: “Promote other appropriate forms of assistance and support to persons with disabilities to ensure their access to information”.

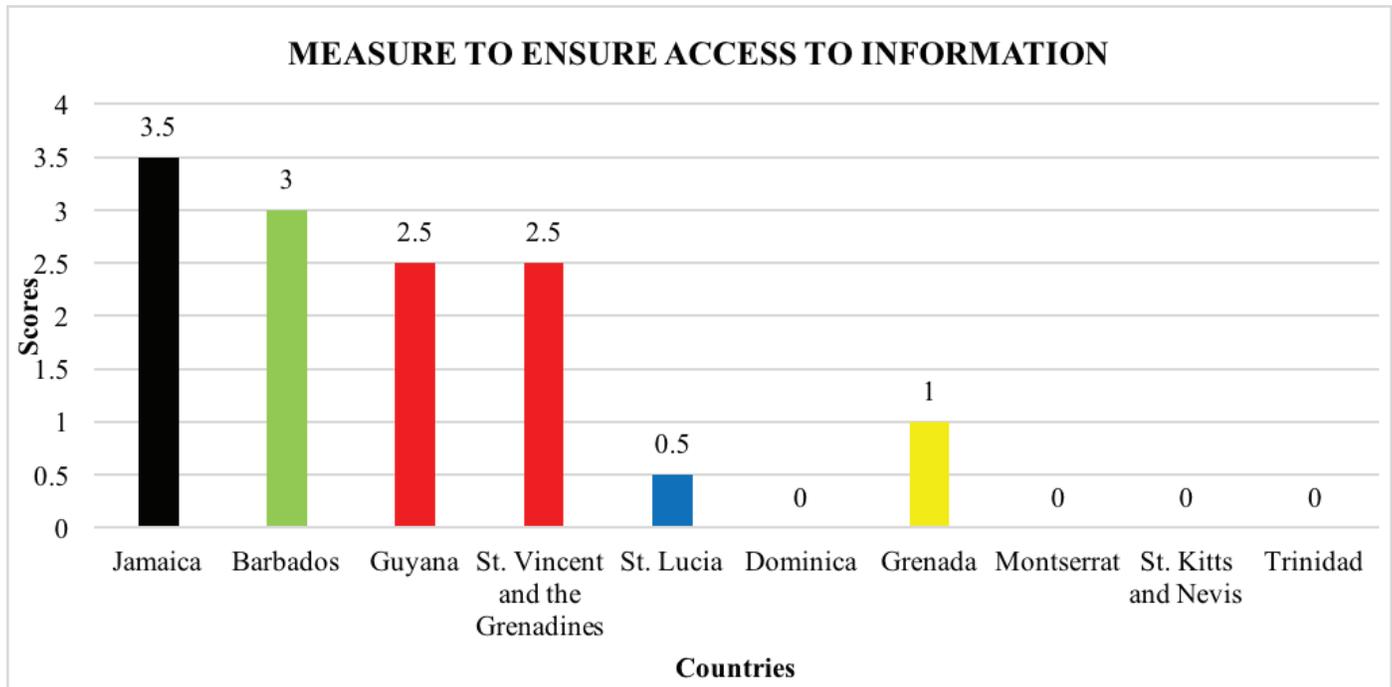


Figure 3: Measure to Ensure Access to Information

TOTAL SCORE 5

Figure 3 above shows the score the countries received for the measure to ensure access to information for persons living with a disability. Jamaica recorded the highest score of 3.5. The second highest was by Barbados with a score of 3, followed by St. Vincent & Grenadines and Guyana at 2.5, Grenada 1 and St. Lucia 0.5. Montserrat, St Kitts & Nevis, Dominica and Trinidad & Tobago from the data collected seem to have zero measure in place to ensure information accessibility for persons with disabilities.

An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (4.1-5), Very Good (3.3-4.0), Good (2.5-3.2), Average (1.7-2.4), Poor (0.9-1.6) and Very Poor (0-0.8).

EDUCATION

Article 24

Article 24.2a opines: “States Parties shall ensure that persons with disabilities are not excluded from the general education system based on disability and that children with disabilities are not excluded from free and compulsory primary education, or secondary education, based on disability.”

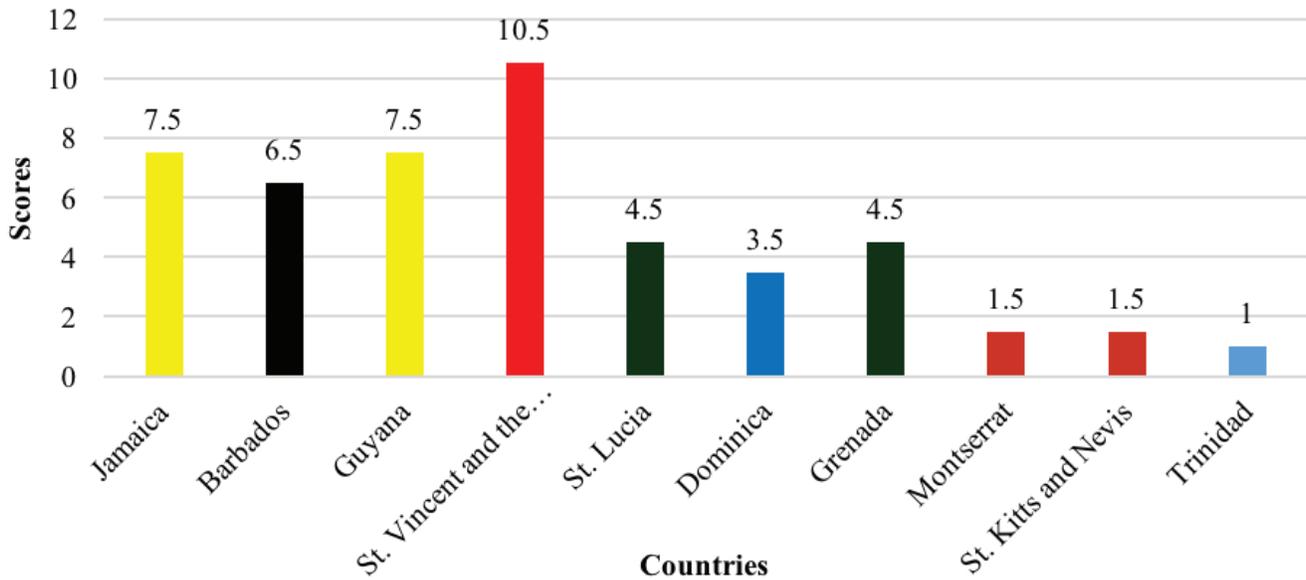


Figure. 4 Measure to Ensure Accessible Education

TOTAL SCORE 12

Figure 4 above shows the scores that countries received for efforts to ensure education is accessible to persons living with a disability. St. Vincent & Grenadines had the highest score of 10.5, followed by Jamaica and Guyana with a score of 7.5. Barbados had a score of 6.5, St. Lucia and Grenada 4.5, Dominica 3.5, Montserrat and St Kitts & Nevis 1.5 and Trinidad & Tobago 1. An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (10.5-12.0), Very Good (8.5-10.4), Good (6.5-8.4), Average (4.5-6.4), Poor (2.5-4.4) and Very Poor (0-2.4).

HEALTH

Article 25

Article 25.a. states that: “Provide persons with disabilities with the same range, quality and standard of free or affordable health care and programmes as provided to other persons, including in the area of sexual and reproductive health and population-based public health programmes”.

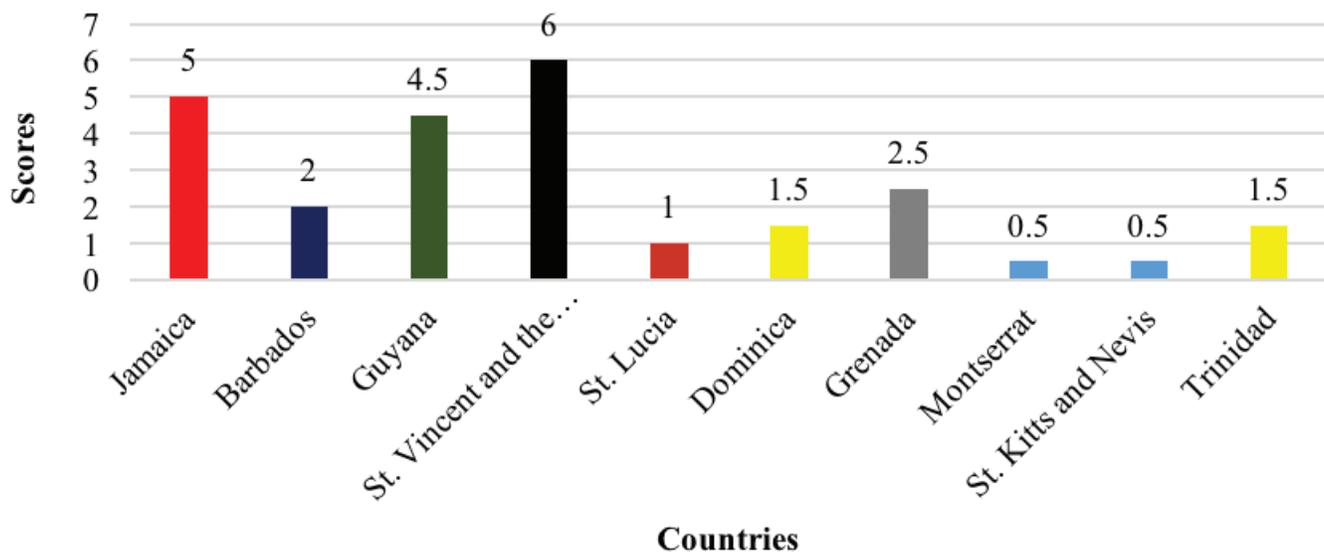


Figure. 5 Measure to Ensure Accessible Health Care System

TOTAL SCORE 7

Figure 5 above illustrates the score the countries received for efforts to ensure health care system is accessible to persons living with a disability. A high score of 6 was recorded by St. Vincent & Grenadines. Jamaica was second with a score of 5, followed by Guyana 4.5, Grenada 2.5, Barbados 2, Dominica and Trinidad & Tobago 1.5 and St. Lucia 1. Montserrat and St Kitts & Nevis had the lowest score of 0.5. An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (6.1-7.0), Very Good (4.9-6.0), Good (3.7-4.8), Average (2.5-3.6), Poor (1.3-2.4) and Very Poor (0-1.2).

WORK AND EMPLOYMENT

Article 27

Article 27.1.e states that: “Promote employment opportunities and career advancement for persons with disabilities in the labour market, as well as assistance in finding, obtaining, maintaining and returning to employment”.

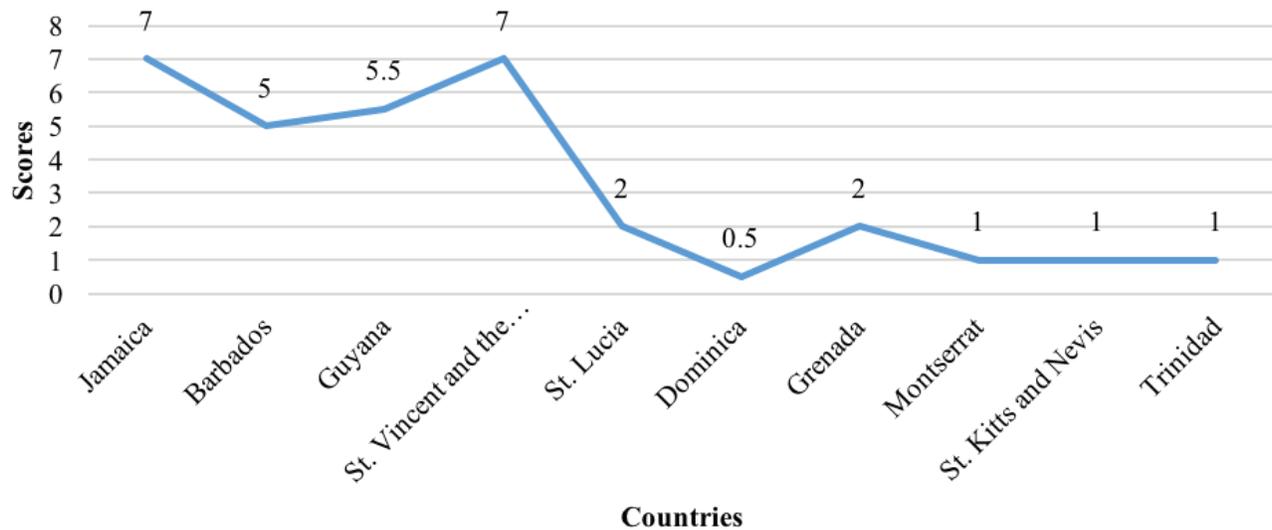


Figure. 6 Equal Opportunity for Employment for Persons with Disabilities

TOTAL SCORE 12

Figure 6 above displays the score the countries received for measures to provide equal employment opportunities for persons living with a disability. The highest score of 7 was recorded by St. Vincent & Grenadines and Jamaica. Guyana was second with a score of 5.5, followed by Barbados 5, St. Lucia and Grenada 2, while Montserrat, St Kitts & Nevis and Trinidad & Tobago had a score of 1. Dominica had the lowest score of 0.5. An arithmetic operation was done to create an ordinal performance strength scale which is represented by Excellent (10.5-12.0), Very Good (8.5-10.4), Good (6.5-8.4), Average (4.5-6.4), Poor (2.5-4.4) and Very Poor (0-2.4).

4.0 ANALYSIS OF FINDINGS

In Graph 1, it shows how countries are doing in the region where legislation is concerned. The maximum score that could have been attained by each country on the implementation of legislative measures to improve the lives of people living with disabilities is 40. On this basis, Barbados, Guyana, and Jamaica have done good work implementing this measure, while St. Vincent and the Grenadines seems to have done an average job. In contrast, the data collected suggest that St. Lucia and Trinidad & Tobago have made a poor effort while Montserrat, Dominica, Grenada, and St. Kitts & Nevis have demonstrated very poor performance in implementing legislative measures to improve the



lives of people living with disabilities is 40. On this basis, Barbados, Guyana, and Jamaica have done good work implementing this measure, while St. Vincent and the Grenadines seems to have done an average job. In contrast, the data collected suggest that St. Lucia and Trinidad & Tobago have made a poor effort while Montserrat, Dominica, Grenada, and St. Kitts & Nevis have demonstrated very poor performance in implementing legislative measures to improve the lives of persons with disabilities. It must be noted that of the countries that have responded to the questionnaire, only Guyana and Jamaica have enacted legislation to protect the rights and dignity of persons with disabilities. Four other Caribbean countries have enacted legislation to specifically protect persons with disabilities and these are The Bahamas, Antigua, Haiti, and the Cayman Islands [6]. Trinidad and Tobago has an Equal Opportunities Act that includes some protection of persons with disabilities but this is not disability-specific legislation. Barbados has drafted legislation to protect persons with disabilities however; this has not been enacted by their Parliament.

All the countries in the Caribbean need to establish legislation to protect the rights and dignity of persons with disabilities as stipulated by the CRPD and amplified in the Declaration of Petion Ville [1]. Data from the United Nations is pointing to over 150 countries/areas with some form of legislation to protect the rights and dignity of persons with disabilities [27]. Some of these legislations have mushroomed since the formation of the CRPD in 2006. Legislation is imperative in the transformation and social inclusion process because it sets a legal framework that protects these vulnerable individuals against discrimination and makes it mandatory for

individuals to act appropriately when dealing with these citizens in society [3]. If persons with disabilities are to be brought in the mainstream of Anglophone Caribbean society and the barriers eradicated so that persons with disabilities can withstand the challenges of climate change, then based on the human rights perspective [30] and that of the social model [21], legislative action is quintessential.

Graph 2 shows the maximum score that could have been attained by each country on measures to promote awareness about persons living with a disability which is 10. On this premise, the data suggest that St. Vincent & the Grenadines and Guyana have displayed a very good performance in the enactment of this measure, while Jamaica, Barbados, and St. Lucia have thus far presented a good performance. In Contrast, Grenada and Montserrat have done a poor job, while Dominica, St Kitts & Nevis, and Trinidad & Tobago seem to have performed very poorly.

There are profound negative myths, stigmata, and perceptions of persons with disabilities in the Caribbean [1]. For these myths, stigmata, and perceptions to be eradicated and persons with disabilities included in Caribbean society, there must be a consistent public awareness campaign to sensitize the varying publics on issues relating to this vulnerable group [2]. Governments and non-governmental organizations catering to the needs of persons with disabilities must design and implement public awareness campaigns that are directed at changing these negative attitudes and perceptions [25]. The public awareness campaigns should be directed at the inclusion of persons with disabilities in their society, the participation of these individuals in all aspects of life and non-discrimination against these individuals as articulated in the CRPD and supported by the social model of disability.



This must take place with a degree of urgency if the provisions of the CRPD, SDG and the Declaration of Petion Ville are to be realized and the resilience of persons with disabilities be strengthened to deal with the rigours of climate change.

In Graph 3, the maximum score that could have been acquired by each country on measures to ensure access to information for persons living with a disability is 5. On these measures, a very good performance was reported by Jamaica, while Barbados, St. Vincent & Grenadines and Guyana demonstrated a good outcome. In contrast, the data suggest that Grenada has done a poor job while St. Lucia, Montserrat, St Kitts & Nevis, Dominica, and Trinidad & Tobago have performed very poorly in implementing these measures.

Again, the top five countries are indicating some progress in their efforts to make persons with disabilities have greater access to information. The results corroborate with that of the Global Initiative for Inclusive ICT [10]. On that Index, Jamaica is the top country in the region in terms of access and inclusion of ICT for persons with disabilities: a similar status that the country enjoys on the RDI. Barbados and Guyana also have positive ratings on the G3ICT from the region.

We are living in the information age and those citizens with access to information are the ones who are going to have the greatest opportunities to prosper and progress [16]. There have been significant improvements in modern technologies to aid in access to and the processing of information from the vista of persons with disabilities [13, 6]. These technologies are bolstering the resilience of persons with disabilities by making it easier for them to communicate with

non-disabled individuals and function more effectively in society. However, the issue of cost for these technologies has impacted on the ability of persons with disabilities to purchase such technologies in order to access information [19]. Governments within the region must play a lead role in correcting this situation in order to realize the provisions and targets of the CRPD, the SDGs and the Declaration of Petion Ville and bolster the resilience of these vulnerable individuals so that they can deal with the vagaries of climate change. One way of doing so is to ensure that funds from Universal Service Funds (USFs) are used to assist persons with disabilities in securing modern technologies for education and employment as in the case in Jamaica [16, 19].

In Figure 4, the maximum score that could have been attained by each country for efforts to ensure that education is accessible to persons living with a disability is 12. On this basis, the data shows St. Vincent & Grenadines with an excellent performance. Jamaica, Guyana and Barbados demonstrated a good performance, while St. Lucia and Grenada have done an average job. However, the data is suggesting that Dominica has displayed a poor performance and Montserrat, St Kitts & Nevis, and Trinidad & Tobago have performed very poorly in employing these measures.

Education is an extremely important tool in the transformation and empowerment of persons with disabilities [11]. This is what is going to prepare the person with a disability for the world of work and to ensure that he or she can be fully integrated into society. This is why it is listed as one of the fundamental rights under the CRPD [30] and seen as an empowerment tool under the social model of disability [21].



From the data provided, St. Vincent and the Grenadines ought to be commended for receiving an excellent score for their effort to provide education for persons with disabilities. Similarly, data from Jamaica, Barbados and Guyana have suggested that progress is being made. There is a definite need however, for most of the countries to significantly improve their education systems for the members of this vulnerable community. In this context and where practicable, countries should move towards the establishment of an inclusive education system where persons with disabilities are taught in the same settings as their non-disabled counterparts [20]. This is important to assist in changing the negative stigmata and myths associated with persons with disabilities. It will demonstrate to other students that persons with disabilities have the capacity to learn and function effectively in a normal environment. We are fully conscious of the fact that there are individuals with profound disabling conditions that would not be possible for a regular school environment. In these circumstances, special education facilities would be appropriate. However, persons with disabilities must be given a quality education wherever they are placed [28].

In Graph 5, the maximum score that could have been acquired by each country for efforts to ensure health care systems are accessible to persons living with a disability is 7. On this basis, St. Vincent & Grenadines and Jamaica have a very good performance, while Guyana has done a good job and Grenada average. However, Barbados, Dominica, Trinidad & Tobago from the data, seems to have performed poorly, while St. Lucia, Montserrat and St Kitts & Nevis have performed very poorly in their efforts.

From the data presented, St. Vincent and the Grenadines, Jamaica, Guyana and Grenada ought to be commended for their efforts to provide accessible

health care for persons with disabilities. Contrastingly, other Caribbean countries need to significantly improve their health systems to make them more responsive to the needs of persons with disabilities. Persons with disabilities are regular users of health care facilities [34]. Good health and well-being are indispensable to strengthening the resilience of any individual and this includes persons with disabilities. Proper health ensures that the person is mentally and physically strong, thus enabling the individual to deal with any challenge that the phenomena of climate change has to offer. It is therefore incumbent for governments across the Caribbean to ensure that all health facilities are accessible and responsive to the needs of persons with disabilities [5, 6].

Figure 6 shows that the maximum score that could have been attained by each country for measures to provide equal employment opportunities for persons living with a disability is 12. On this basis, St. Vincent & Grenadines and Jamaica demonstrated a good job, while, Guyana and Barbados displayed an average performance in the implementation of these measures. In contrast, St. Lucia, Grenada, Montserrat, St Kitts & Nevis, Trinidad & Tobago and Dominica have demonstrated very poor performance in the implementation of equal opportunities concerning employment for persons with disabilities.

In order for persons with disabilities to survive, they must have a sustainable source of income [28]. Employment is one means by which persons with disabilities are able to earn a decent income and standard of living [7]. It is through employment that members of this vulnerable community will best strengthen their resilience and ultimately be capacitated to respond to issues of climate change.



5.0 CONCLUSION

For persons with disabilities to be brought in the mainstream of Caribbean society, greater efforts have to be made to implement the provisions of the CRPD, SDG and the Declaration of Petion Ville. It will require individuals who do not have an impairment to understand that it is a society that creates a disabling environment for these vulnerable citizens through the multifarious barriers that they formulate. These barriers prevent persons with disabilities from being integrated in society on an equal basis with others.

The barriers that are created by human beings can be eradicated. However, these have to be done within the context of legislative action, access to information, education and training, quality health care, and employment. These are unequivocal pre-requisites for strengthening the resilience of persons with disabilities. This is why global treaties such as the CRPD have been developed to entrench the fundamental rights and freedoms of persons with disabilities and the above-mentioned factors are enshrined as rights. But even then, countries within the Anglophone Caribbean have not been moving at the pace that is required to radically transform the landscape for these vulnerable citizens. This is why the UWICDS developed the RDI to track and rank countries in the region as to the progress that they are making in implementing the provisions of the CRPD. The first RDI inter alia, revealed that though some countries have been making progress to improve the lives of persons with disabilities, most of the countries have significant work to do to ensure that these individuals are brought in the mainstream of their society. Legislative action, public awareness, access to information and technology, investment in education, health care and employment are some of the areas that need immediate attention if the lives of persons with

disabilities are to be radically improved and their resilience be strengthened. This must happen if we are going to capacitate these citizens to be more responsive to the vicissitudes of climate change.



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