Measuring Vulnerability: A Multidimensional Vulnerability Index for the Caribbean

CDB Working Paper No. 2019/01

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May 2019

JEL codes: E60, E61, O10, O57

Keywords: Multidimensional Vulnerability Index, Caribbean, Borrowing Member Countries, Caribbean Development Bank.

ISBN 978-976-96338-0-3 (e-book)

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Disclaimer

Acknowledgements

We gratefully acknowledge our colleagues at the Caribbean Development Bank (CDB) and Professor Winston Moore (The University of the West Indies) for sharing their insights, expertise and thoughtful reviews during the development of this paper. Special thanks to the attendees who provided feedback within the CDB Economics Department Seminar Series held in May 2019. Our gratitude is also expressed to Sonia Hampden (CDB) and Klao Bell-Lewis (Consultant) for their editorial support.

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Abbreviations

BMCs	-	Borrowing Member Countries
CDB	-	Caribbean Development Bank
CVSS	-	Common Vulnerability Scoring System
DCVM	-	Dara Climate Vulnerability Monitor
ECLAC	-	Economic Commission for Latin America and the Caribbean
EM-DAT	-	Emergency Events Database
EVI	-	Economic Vulnerability Index
FDI	-	Foreign Direct Investment
GDP	-	Gross Domestic Product
IMF	-	International Monetary Fund
MVI	-	Multidimensional Vulnerability Index
ODA	-	Official Development Assistance
PCA	-	Principal Component Analysis
SAMOA	-	Small Island Developing States Accelerated Modalities of Action
SDF	-	Special Development Fund
SIDS	-	Small Island Developing States
SISI	-	Strategic Imports Sub-Index
SITC	-	Standard International Trade Classification
UN	-	United Nations
UNCDP	-	United Nations Committee for Development Policy
UNCTAD	-	United Nations Conference on Trade and Development
UNDESA	-	United Nations Department of Economic and Social Affairs
UNDP	-	United Nations Development Programme
UNOHRLLS	-	United Nations Office of the High Representative for Least Developed Countries, Landlocked Developed Countries and Small Island Developing States
VRCP	-	Vulnerability and Resilience Country Profile
WB	-	World Bank

Executive Summary

This paper updates and revises the Caribbean Development Bank's (CDB) Vulnerability Index previously estimated by Crowards (2000) and Hartman (2011) and widens the scope to include social vulnerability and climate change components. This paper seeks to quantify and gain deeper understanding of the relative vulnerabilities of CDB's Borrowing Member Countries (BMCs). It aims to answer the questions:

(a) How vulnerable are Caribbean small states?

(b) Where are the vulnerabilities concentrated?

(c) What can we do to build resilience in these economies?

Among the main findings are that BMCs, on average, can be considered middle-to-high vulnerability countries with an average vulnerability index score of 0.54 for 2017, slightly above the score of 0.52 for 2016. The vulnerabilities are concentrated in the areas of dependence on a few major export products and trading partners, high levels of energy imports and related products, social challenges, such as crime, and exposure to natural hazards and climate change. Although resource-rich countries had lower vulnerability scores, the paper notes that these economies have unique challenges related to sharp boom and bust cycles and higher levels of inequality, among others.

1. Introduction

The challenges among small states are well known and include: trade openness; dependence on energy; limited diversification; susceptibility to natural disasters and climate change; restricted access to external capital; and weaknesses in institutional capacity. Recent research[1] by the Caribbean Development Bank (CDB) elaborated on these challenges for small states in the Caribbean Region and articulated a vision for regional economic transformation. Although these challenges are not new, in recent years small states are taking a collective stand to highlight their development challenges in international fora, draw attention to their concerns, and spur support for their need of increased concessionary international development assistance.

Small states seek increased access and eligibility to concessional development finance to address their vulnerabilities and development challenges. Central to this goal is the quantification of the vulnerabilities of small states. As early as 1994, the Barbados Programme of Action[2] urged that vulnerability indices integrating ecological fragility and economic vulnerability be developed to ensure that small states can access supplementary resources[3]. The resurgence of global interest in the quantification of vulnerability indices follows the United Nations (UN) Third International Conference on Small Island Developing States (SIDS) in 2014. This conference called for a SIDS Accelerated Modalities of Action (SAMOA) Pathway to continued eligibility for concessional aid, given the vulnerability to climate change and natural disasters, and the gains made towards the increased recognition of the special needs of least developed countries in the 2015 UN Climate Change Conference.

Previous efforts were made by CDB to estimate the vulnerability of small states by Crowards (2000) and Hartman (2011). The focus was the estimation of an Economic Vulnerability Index (EVI) that was used to support evidence-based policy formulation, planning and decision-making, but also to guide CDB's development financing architecture and, particularly, for its concessional resources.

This research updates CDB's EVI and considers expanding the scope of the index beyond the typical economic measures to consider social vulnerability and susceptibility to natural hazards, and to include vulnerability to climate change. This provides a more holistic perspective on vulnerability while maintaining strong strategic alignment with the development priorities in

[1] A Policy Blueprint for Caribbean Economies.

[2] UN policy document in 1994 on sustainable development and vulnerability in SIDS.

[3] While lower-income small states are eligible for concessional funds to address vulnerability, upper-middle and middle-income small states—that equally require development finance to mitigate they vulnerability—they are not entitled to such resources. Multilateral development banks consider these countries to have less need for concessional finance because their higher per capita income level theoretically allows them to mobilise domestic and international capital.

countries of the Caribbean. This paper seeks to quantify and gain deeper understanding of the relative vulnerabilities of CDB's Borrowing Member Countries (BMCs) (see Appendix 1). It aims to answer the questions:

(a) How vulnerable are Caribbean small states?

(b) Where are the vulnerabilities concentrated?

(c) What can we do to build resilience in these economies?

The structure of the paper is as follows. Section 2 reviews vulnerability metrics; Section 3 highlights the methodology for estimating the Vulnerability Index; Section 4 discusses the results of the paper; and Section 5 concludes and provides some initial policy recommendations. It is anticipated that additional CDB research and policy papers on the topics of vulnerability and resilience will provide additional policy recommendations for Caribbean policymakers.

2. Review of Vulnerability Metrics

Definitions

The concept of vulnerability is complex but critical for development, and is highly policy-relevant. The term is multidimensional in nature, which contributes to the challenges in defining and measuring it. In 2011, the Economic Commission for Latin America and the Caribbean [ECLAC (2011)] noted that the concept of vulnerability has several dimensions[4]. These dimensions begin with vulnerability as an internal or intrinsic risk factor (which is universally accepted) and can be broadened to a multidimensional approach, which includes the physical, economic, social, environmental, and institutional characteristics of the grouping being assessed. It is defined in this paper as the exposure to sharp external shocks, either fiscal, trade or climate-related, and can be distinguished from the term fragility, which is a consequence of the tenuous institutional or societal mechanisms within a country to mediate internal pressures, causing it to either implode or face the stresses of conflict and economic collapse.

The term economic vulnerability refers to the inherent, permanent or quasi-permanent features of a country, which render that country exposed to economic forces outside its control. Deriving an index of economic vulnerability is regarded as a challenging, but worthwhile, exercise. The index attempts to combine what are perceived to be the root causes of economic vulnerability into an aggregate composite index.

In this paper, the focus of economic vulnerability is on the structural characteristics of small states that make them more vulnerable to external shocks than their larger country counterparts. These structural characteristics are independent of a country's political will or policy-induced factors and therefore do not result from recent policy choices of the government. The key building blocks of the economic vulnerability argument within small states are linked to structural factors that are associated with:

(a) remoteness from global markets;
(b) lack of diversification;
(c) dependence on external financing;
(d) susceptibility to natural disasters;
(e) small internal markets and lack of economies of scale; and
(f) dependence on non-renewable sources of energy.

It should be noted that susceptibility to natural disasters was assessed as an important component as it can exacerbate the downside effects of economic shocks.

4. Birkmann (2005) highlights the various dimensions of vulnerability, that begins with vulnerability as an internal risk factor (intrinsic vulnerability), which can gradually be widened to vulnerability as the likelihood to experience harm (human-centred). Vulnerability could also be conceived as a dualistic approach of susceptibility and coping capacity; it can be further widened as a multiple structure that considers susceptibility, coping capacity and exposure, adaptive capacity and, ultimately, vulnerability can be considered in a multidimensional context encompassing, physical, social, economic, environmental, and institutional features.

Measuring Vulnerability

Considerable work has been done on the estimation of economic vulnerability metrics. However, there remains tremendous scope to develop policy consensus on the choice of vulnerability metrics, the operationalisation of such metrics, and the agreement on weighting and aggregation. Much of the variation depends on the purpose and objectives of the index. This is a key component in guiding the design, as it distinguishes the selection of variables and estimation methods in one vulnerability index compared with another. Additional considerations include the availability of data and theoretical underpinnings. Several development agencies have also undertaken the design of vulnerability metrics including UN Committee for Development Policy (UNCDP); UN Office of the High Representative for Least Developed Countries, Landlocked Developed Countries and Small Island Developing States (UNOHRLLS); ECLAC; UN Development Programme (UNDP); UN Department of Economic and Social Affairs (UNDESA); the Commonwealth Secretariat; and CDB. The following paragraphs will briefly review these metrics and provide information pertaining to their indicators, methodology, strengths and limitations.

UNCDP flags three criteria to identify the least developed countries, benchmarks that are useful in measuring vulnerability in upper-middle and middle-income small states. The criteria include: (a) gross national income per capita; (b) the Human Assets Index, with four health and education indicators; and (c) EVI, which computes the structural vulnerability to economic and environmental shocks and incorporates two sub-indexes. Firstly, the exposure index factors in population, remoteness, merchandise export concentration, share of agriculture, forestry and fishing in gross domestic product (GDP), and the share of population in low-elevated coastal zones. Secondly, the shock index quantifies the instability of goods and services, victims of natural disasters, and instability of agricultural production. However, concerns about data availability weaken the applicability of the metrics and the rationale for the relative weights is unclear.

UNOHRLLS adapts EVI to create a weighted index to capture the interactions and interdependence between the selected indicators. The steps in the construction of the index include a normalisation methodology to the data. The composite index is estimated as the simple arithmetic average of the exposure and shock indices. The strengths of this approach include: the choice of indicators facilitates comparability (128 countries); it is relatively simple; it advocates the use of EVI with other indicators; and includes an approximation procedure for missing data. The limitations of the approach are as follows: vulnerability is confined mainly to economic factors; the rationale for the weights are unclear; it excludes service exports; and resilience is not explicitly covered by EVI.

ECLAC prepared a study on the vulnerability and resilience of Caribbean SIDS in 2011. The study highlights various indicators and indices of vulnerability and resilience and data requirements, methodological issues and disadvantages in deriving the economic vulnerability, environmental vulnerability, and social vulnerability indices. Notably, the study highlighted that the development of appropriate vulnerability indices for the Caribbean will be severely compromised unless the data paucity challenge is addressed in a holistic manner. The study highlights that strategies for building resilience, particularly to natural environmental impacts across the Caribbean Region, are not homogenous although there are crossing-cutting issues, such as gender equity, that would have universal application. Additionally, economies of scale can be realised through a regional effort to mainstream vulnerability reduction and resilience building into development planning.

The Commonwealth Secretariat started its work in the area of vulnerability and resilience in 2004. The methodology involved in estimating EVI is based on the seminal work of Briguglio (1992). The basic criteria adopted to construct the Briguglio Vulnerability Index and that underlies the selection of the indicators in the current study are:

- simplicity: the index should not be too complicated to construct;
- ease of comprehension: the overall composite index must have an intuitive meaning; and
- suitability of international comparison: the index should lend itself to international comparisons.

The Commonwealth's EVI has four equally-weighted components of: (a) Trade Dependence Index; (b) Export Concentration Index; (c) Dependence on Strategic Imports Index; and (d) Disaster Proneness Index. These components are complemented with a proposed resilience index that is grouped into three equally-weighted components of the Macroeconomic Stability Index; the Market Flexibility Index; and Political, Social and Enviro-Governance Index. For both the vulnerability and resilience indices, the total score is the simple average of the different components; and vulnerability is the risk of being hurt by an external economic shock minus resilience. This approach provides an aggregate score upon which aid can purportedly be apportioned. The main limitations of the approach relate to determining the appropriate proxy indicators and the lack of timely, reliable and consistent data on small states; and considering the effects of climate change in the disaster reduction index. The Commonwealth Secretariat has gone a step further in exploring the development of a vulnerability and resilience framework that is country focused.

UNDESA has been implementing a project to strengthen the capacity of SIDS to mitigate risks and reduce vulnerability. The project promotes the Vulnerability and Resilience Country Profile (VRCP) developed by UNDESA as a tool for the self-assessment of progress on the SAMOA Pathway and the Sustainable Development Goals. VRCP consists of an assessment of a country's vulnerabilities and its capacity to cope with these vulnerabilities. The VRCP methodology is based on a systematic and participatory process that:

- builds on a baseline study that is prepared by national experts and assembles relevant disaggregated data on the thematic areas in the SAMOA Pathway;
- uses an inclusive process based on multi-stakeholder and multi-disciplinary consultations;
- provides a numerical score on a scale of 1 to 5, to assess the extent of vulnerabilities and resilience; and
- presents the scores graphically within a low-to-high range showing the vulnerability and associated resilience of each identified thematic area.

The VRCP methodology involves five steps:

Step 1: selecting priority themes and major issues for each theme;

Step 2: selecting criteria for determining vulnerability and resilience of each theme;

Step 3: selecting indicators for each criteria;

Step 4: assessing and rating; and

Step 5: justifying and mapping.

It provides SIDS with a pictorial presentation of the vulnerability resilience nexus using existing information and data that can aid decision-making and serve as a practical tool for policymakers. The methodology is guided by expert and inter-agency coordination, is country-focused, and brings together data from several sources. However, it is resource and time-intensive and must be country-driven.

CDB also estimates an EVI. The design and methodological approach was guided by the work of Briguglio (1992, 1997) and was initially computed by Crowards (2000). The CDB EVI consisted of the following 6 sub-indices[5] and 11 proxy indicators:

- peripherality and accessibility, measured by freight and insurance costs for imports as a percentage of total imports, and provides an indication of remoteness from major economic trading partners;
- dependence upon imported energy, measured by imports, net of exports of energy (largely in the form of oil), as a percentage of total energy consumption;
- export concentration, measured as the percentage of total export receipts and accounted for by the major export and the top three exports, includes both export of goods and services and is combined with information on the openness of the economy measures as total export earnings as a percentage of GDP;
- convergence of export destination, measured in terms of the percentage of total export receipts, accounted for by the single most-important destination and the top three most-important destinations. This includes the exports of goods and services and is combined with information on the openness of the economy, that is measured as total export earnings as a percentage of GDP;
- reliance upon external finance, measured by a combination of two variables, i.e. overseas development assistance as a proportion of annual gross fixed capital formation and foreign direct investment as a proportion of annual gross fixed capital formation; and

5. The Peripherality and Energy Import Dependence sub-indices were combined into a single sub-index. This partly reflects their focus on imports, but also serves to implicitly reduce the emphasis placed on each sub-index due to data limitations related to the proxy indicators used for the relative cost of importation.

- susceptibility to natural disasters, measured as the cumulative number of persons affected and deaths caused by natural disasters between 1950 and 1998, each as a proportion of the total population.

As mentioned earlier, the EVI has a role in the allocation of CDB's concessional financial resources. In CDB, the Special Development Fund (SDF) is the single largest source of concessionary resources. The distribution of these concessional resources is a two-stage process. Currently, access to SDF is based solely on per capita income. Only then, are concessional resources allocated using a number of metrics, including the vulnerability index score. As a result, the vulnerability index score is one of several criteria that is used to determine the size of the allocation of each country that has access to SDF. Therefore, revising and updating the Vulnerability Index is necessary as a component of CDB's financial resource allocation framework.

3. New Methodology

The CDB Vulnerability Index combines what are perceived to be the root causes of vulnerability into an aggregate composite index. It provides a static view of the vulnerability of a country at a point in time, relative to other Caribbean small states. It quantifies the extent of the exposure[6] of the country to exogenous shocks and is updated using data for the years 2016 and 2017. This paper updates and revises the CDB Vulnerability Index, previously estimated by Crowards (2000) and Hartman (2011), and widens the coverage of the vulnerability analysis to include social vulnerability and a climate change component that considers not only historic natural hazard events but also predicts how the environment is likely to cope with future events. The term Multidimensional Vulnerability Index (MVI) was considered a more appropriate title for the revised index rather than EVI. The rationale for introducing the social vulnerability and climate change components of the Vulnerability Index and the proxy indicators are further discussed below.

Modifications to the Vulnerability Index

Social vulnerability, like susceptibility to natural hazards, is not a cause of vulnerability but was assessed an important component of the Vulnerability Index because it exacerbates the downside risks of economic shocks. Social vulnerability can be defined as the inability of human units (individuals, households or families) to cope with, and recover from, stresses and shocks; to adopt and exploit changes in physical, social and economic environments; and to maintain and enhance future generations. Among the factors that may influence social vulnerability are: access to resources (knowledge, technology); political power and representation; physical disabilities; and beliefs and custom. The selection of the proxy indicators for the social vulnerability sub-index was guided by the social vulnerability index developed by St. Bernard (2007).

St. Bernard (2007) proposed social vulnerability indicators including: (a) education (proportion of population with tertiary education, adult literacy rate); (b) health (life expectancy at birth); (c) security, social order and governance (murders per 100,000 population); (d) resource allocation (proportion of children and working age persons belonging to the poorest quintiles); and (e) communications architecture (computer literacy rate). The strength of this approach is that it embraced criterion of simplicity in the choice of indicators, and adopted a pioneering and strong methodological and a theoretical framework. The limitations include the paucity of social data and that the results were not subject to empirical testing.

The rationale for including climate change in the susceptibility to natural hazards sub-index is because the factors contributing to environmental vulnerability are varied and, in some cases, interconnected. These include, but are not limited to:

- natural disasters: increased intensity and frequency;
- climate change: sea level rise, coastal erosion;
- oceans and seas: exploitation of marine resources;

[6] The Vulnerability Index focuses on a country's exposure to exogenous shocks, and not the probability or intensity of risk from those shocks.

- biodiversity: deforestation and desertification and invasion of alien species;
- water: over exploitation of surface ground and coastal water and saline intrusion; and
- waste: insufficient waste treatment.

For consistency with the definition of vulnerability outlined earlier, the paper considered appropriate exogenous variables to be included in the Index (such as climate change and natural disasters), rather than endogenous variables such as resource degradation (biodiversity and waste). Additional details related to the susceptibility to natural hazards sub-index are provided in Appendix 2.

Additional adjustments made to the methodology utilised in the previous CDB work of Crowards (2000) and Hartman (2011) include the:

- Peripherality and Energy Sub-Index, that was renamed the Strategic Imports Sub-Index (SISI), and the proxy indicator freight and insurance[7], that was removed due to concerns regarding the veracity of its data sources and its relevance given the narrowed focus of SISI. A new proxy indicator, food, was included in the SISI measured as food imports as a percentage of total merchandise imports. As a result, the two parameters in the SISI are energy and food (as a percentage of total merchandise imports). The energy proxy indicator, which previously represented mainly crude oil, was widened to include fuels, natural and manufactured gas and lubricants and related materials, to better reflect the country's dependence on energy and its by-products. Strategic imports refer to essential products, that tend to be price and income inelastic, therefore the demand for such products does not decrease enough to compensate for income decreases; and

- Official Development Assistance (ODA) proxy indicator that was replaced with Remittances in the External Finance Sub-Index. ODA was excluded because, while concessional flows have increased globally (including after the global economic crisis), Caribbean small states have become increasingly less successful in accessing international development assistance. Multilateral flows have approximately the same trend as bilateral flows. The BMCs received approximately 0.8% of global ODA in 2017 (of which 80% was directly to Haiti). Moreover, many Caribbean countries are classified as middle and upper-middle-income, so they do not qualify for aid, or are a low priority.

[7] The peripherality parameter was proxied by freight and insurance costs for imports as a percentage of total import costs. However, Crowards (2000) notes that the accuracy of the data and the conflicting data sets that are available cast some doubt on the legitimacy of deriving an index based on such figures (freight and insurance costs).

Sub-Indices, Proxy Indicators and Data Sources

The updated and revised Vulnerability Index comprises three dimensions of vulnerability (economic, social, and environmental) and six sub-indices (export concentration; concentration of export destination; dependence on strategic imports; reliance upon external finance; social vulnerability; and susceptibility to natural hazards and climate change). Within the 6 sub-indices there are 15 proxy indicators. The following paragraphs provide a summary on the sub-indices, proxy indicators, data sources and weighting used in the Vulnerability Index.

Export Concentration relates to the dependence of the country on a few major exports (goods and services). The rationale for including export concentration is intuitive, the greater the dependence on a few major exports (goods and services) the more vulnerable that economy will be to shocks in the demand and supply of those exports. The extent of export concentration is measured by two proxy indicators, the percentage of total exports represented by the top three export categories, including tourism, non-tourism services (other services) and a measure of economic openness taken as the total exports of goods and services as a percentage of GDP (see Figure 1). The main data sources for the export concentration sub-index were the UN Conference on Trade and Development (UNCTAD) for categories of merchandise exports, according to the Standard International Trade Classification (SITC) 2-digit codes, and total merchandise exports. The UNCTAD database was used to source the service exports data (see Appendix 3), with travel utilised as a proxy for tourism exports.

Concentration of Export Destination occurs when a large proportion of a country's exports are supplied to a limited number of trading partners. In this instance, the economy will be vulnerable to changing patterns of trade, economic performance and changing preferences in major trading partners. Two proxy indicators measure the extent of the concentration of export destination: (a) the proportion of total exports of goods and services converging on the top three export destinations; and (b) the proportion of total tourists from the top three source market countries. The main data sources for the concentration of export destination sub-index were the International Monetary Fund's (IMF) Direction of Trade Statistics, Yearbook 2016. Tourism arrivals data available from the Caribbean Tourism Organisation were used to estimate the direction of trade for tourism, in the absence of a breakdown of tourism expenditure by country of origin.

Dependence on Strategic Imports relates to the dependence of the country on critical imports, which can have direct and indirect effects on domestic production and consumption. The two proxy indicators used in this sub-index were the dependence on imported energy and food. The greater the dependence on imported energy the more susceptible the economy will be to fluctuations in international market prices of energy. Imports of energy are taken as net imports, since many fossil fuel producers will be involved in some importation, either for domestic use or for re-exports, and are expressed as a percentage of domestic energy consumption. Further, countries that are dependent on food imports are also vulnerable to the vagaries in price and supply of international markets for their food. Ideally, the dependence on food imports should compare with the level of domestic food consumption; however, given challenges with

estimating the latter, the measure of food imports as a percentage of total imports will proxy this dependence in this study. The main data sources for the dependence on strategic imports sub-index were the UN Energy Statistics Yearbook 2014[8] and UNCTAD for imports of goods and services and total imports.

Reliance Upon External Finance relates to the dependence on external financial flows to support existing levels of consumption and investment. Investment is productive capital and is an essential ingredient in achieving a level of income that is sustainable. However, allocating resources towards investment requires forgoing some current consumption for the sake of greater consumption in the future. This allocation often is not the case in small and open economies that have relatively low levels of savings and investment. Additionally, the small size of the economy might impede the development of financial markets. Where limited financial markets restrict opportunities for reallocating resources, as with small economies, funds may be derived from external sources. These external sources include foreign direct investment (FDI), borrowing from the international private sector, and remittances. The reliance upon the external finance sub-index is measured by two proxy indicators: (a) the ratio of annual flows of FDI to GDP; and (b) the ratio of annual remittances to GDP.

The main data sources for these proxy indicators were data on FDI (inward flows) extracted from the UNCTAD database and remittance receipts as a percent of GDP sourced from UNCTAD and the World Bank (WB).

Social Vulnerability, the extent of which is measured by three proxy indicators: (a) the number of murders per 100,000 population; (b) the rate of unemployed persons in the labour force; and (c) the rate of persons living in poverty. The main data sources for the social vulnerability sub-index were the United States of America Overseas Security Advisory Centre and UN Office on Drugs and Crime (murders per 100,000, and official country statistics for poverty and unemployment).

Natural Hazards and Climate Change assesses a country's vulnerability to environmental factors outside of its control. Natural disasters and climate change can have catastrophic impacts, which can encompass damage to infrastructure, loss of life, injury, ill health and environmental damage. Crowards (2000) utilises the number of people affected by disasters and the number of deaths attributable to disasters as the proxy indicators in the Vulnerability Index. Notably, there are concerns about the Emergency Events Database (EM-DAT), which is the primary source of information related to the number of persons affected by natural disasters. These concerns surround the missing data for the years 1950-1998, that in part is due to the classification criteria[9] for recording events in EM-DAT. Also, Crowards (2000) did not include a proxy indicator for the macroeconomic impacts of natural disasters. The rationale was mainly that the impacts on macroeconomic variables, such as income, trade and debt, are difficult to isolate from the plethora of non-disaster related influences on the macro-economy and that the time scale of available data is limited for some countries.

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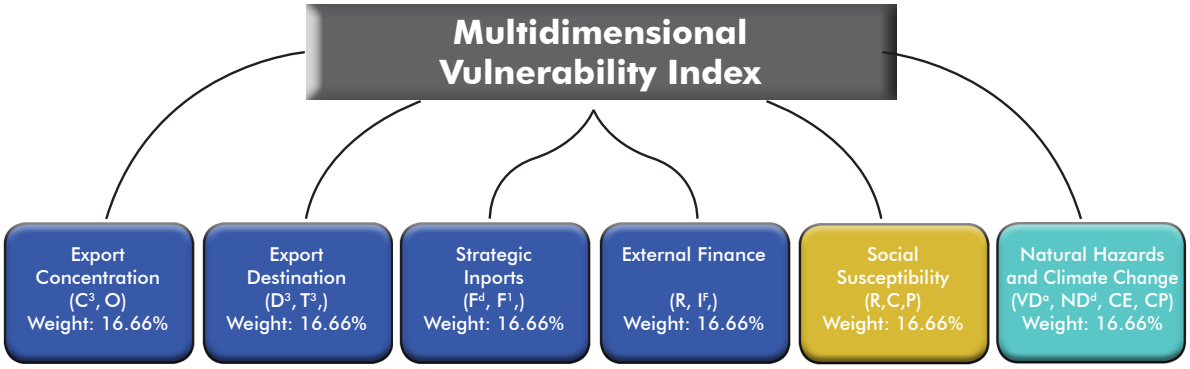
[8] EM-DAT includes information on natural disasters during the period 1900 to present, that satisfy the following criteria: (a) 10 or more dead; (b) 100 or more affected; (c) the declaration of a state of emergency; and (d) a call for international assistance.

[9] Includes tourism and financial services.

Following a review of the available climate vulnerability data sources, the Dara Climate Vulnerability Monitor (DCVM) was selected for use in the Vulnerability Index. DCVM was developed in 2010 and estimates the human and economic impacts of climate change and the carbon economy for 184 countries in 2010 and 2030, across 34 indicators in four impact areas (environmental disasters, habitat change, health impact, and industry stress). DCVM was updated in 2012. It uses current peer-reviewed scientific research, in-country field research, and critical input from two separate external advisory bodies. The main strength of DCVM is that it includes both the natural disaster and climate change aspects of environmental vulnerability—not only based on the past but also the near future.

Figure 1: Multidimensional Vulnerability Index



The proxy indicators in the Vulnerability Index are as follows:

Vulnerability = average (E^3, O); (D^3, T^3); (F^d, F^l); (R, I^f); (C, U, P); (ND^a, ND^d; CE, CP)

- C^3 = the proportion of total exports of goods and services represented by the top three export categories.
- O = total exports of goods and services[10] as a percentage of GDP.
- D^3 = the proportion of total exports of goods converging on the top three export destinations.
- T^3 = the proportion of total tourists from the top three source countries.
- F^d = Food imports as a percentage of total imports.
- F^l = Fuel imports as a percentage of total imports.
- R = the ratio of annual remittances to GDP.
- If = the ratio of the annual flow of FDI to GDP.
- C = the number of intentional homicides per 100,000 population.
- U = the rate of unemployed persons in the labour force.
- P = the rate of persons living in poverty.
- NDa = the number of persons affected by natural disasters, as a proportion of total population.
- ND^d = the number of deaths resulting from natural disasters, as a proportion of total population.
- CE = the economic losses or gains of climate change (Dara Climate Index).
- CP = the economic losses or gains of carbon (Dara Climate Index).

[10] Includes tourism and financial services.

Constructing and Aggregating

The Vulnerability Index is a composite index calculated from various sub-indices. The composite index is estimated as the simple arithmetic average of the sub-indices.

There are four steps in constructing the index:

Step 1: determining the causes of vulnerability;

Step 2: selecting and compiling proxy indicators;

Step 3: applying normalisation methodology to data; and

Step 4: computing sub-indices and aggregating the index.

The index is created for each country by averaging across the 6 sub-indices representing 15 proxy indicators. The grouping of proxy indicators within each of the sub-indices represents the structural characteristics that can reasonably be used as a proxy for the particular measure of vulnerability.

The aggregation of separate sub-indices into a single index introduces issues related to the direct comparability of these parameters, and the potential need for the scaling of the parameters to facilitate more direct comparison. Crowards (2000) examined five different methods of scaling[11] (see Appendix 4). The preferred method of scaling was to apply a fixed exponent of 0.3 to the entries in each series prior to normalisation. This is the degree of exponential scaling (i.e. raising each entry to the power of 0.3) that results in medians, that are, on average, midway between the series minimum and maximum. This produces series that are relatively evenly distributed, avoiding a situation where the majority of entries are bunched together at the lower end of the scale, making the difference between them almost indiscernible. The trade-off in any such transformation is the loss of information regarding the degree to which the more extreme values exceed the rest of the values in each series. The loss of information is considered justified given that:

- a country should not be considered highly vulnerable based primarily on an extreme value in a single series, as could be the case when employing untransformed data; and
- transforming the data into relatively evenly-distributed series enables differences between the majority of countries to be reflected in the final index, which is not the case for some of the other methods of scaling.

[11] Crowards (2000) examined the following methods for scaling: (a) normalisation; (b) condensed-decile normalisation; (c) the Borda Rule; (d) fixed exponential scaling; and (e) variable exponential scaling.

Weighting

After scaling the variables and applying a normalisation transformation, equal weights were applied to each of the sub-indices. A number of studies have recommended and embraced the assignment of equal weighting [Briguglio (1995); Crowards and Coulter (1998); Commonwealth Secretariat (2014); and Bernard (2007)]. The Human Development Index also assigns equal weights to all three of its dimension indices (long and healthy life, knowledge and a decent standard of living).

Sensitivity Analysis

The study conducted a sensitivity analysis on the proxy indicators in the Vulnerability Index to gauge the robustness of the results. A correlation matrix was prepared and used to assess the extent of the relationship between these proxy indicators. In instances where there was evidence of correlation, the proxy indicator was either deleted from the index or combined with another proxy indicator.

Further, the selection of weights for proxy indicators is another important consideration in the quantification[12] of the Vulnerability Index. As a result, alternative weighting scenarios were evaluated to assess how the results of the study are affected.

Limitations

Critics argue that the vulnerability index has too much subjectivity; access to high-quality data is a challenge; justification for weighting should be strengthened; and none of the variables can be tested for their relationship with economic vulnerability.

The research paper aimed to address these limitations in several ways. With respect to the subjectivity in the selection of proxy indicators[13], there is a growing body of literature on this topic. Some of this literature was identified in Section 2 (Review of Vulnerability Metrics) and is aligned with the work of Crowards (2000). More broadly, the selection of proxy indicators was guided by criteria identified by Briguglio (1997), including relevance, simplicity, transparency and reproducibility. Further, the paper conducted sensitivity analysis of the proxy indicators. Care was taken to use proxy indicators with a wide coverage of countries in the event that the study needed to be expanded. All of the data utilised in the study was sourced from well-established international, regional and country sources, such as the central banks.

The MVI in this paper focused specifically on the BMCs to better understand the inherent characteristics that make them vulnerable, and how this has evolved over time. However, there

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[12] EVI is a composite index, i.e. a weighted mean of multiple proxy indicators. The process of weighting variables based on perceived importance introduces subjectivity to the analysis, therefore, these weights were the focus of initial sensitivity testing.

[13] Principal Component Analysis (PCA) is a frequently utilised technique in the selection of proxy indicators. However, it is a requirement of the PCA method that the constituent variables be positively correlated, so that variations in each series contribute to the cumulative variation in the overall index. Given that a correlation matrix was utilised in the range of approaches to guide the selection of proxy indicators, it significantly reduced the extent of correlation in the remaining proxy indicators and, as such, the utility of the PCA method.

is scope for expanding this study, particularly in the coverage of countries to facilitate more direct comparison with earlier CDB studies[14]. It should be noted, that it is well established in the literature that vulnerability scores tend to be higher for smaller countries than larger countries. For example, Cordina (2008) revealed that seven out of the eight vulnerability indices reviewed had statistically-significant positive correlation coefficients between country size and vulnerability scores, implying that, in general, the indices tend to agree that small countries are more economically vulnerable than larger ones. Also, Crowards (2000), indicated that SIDS are more vulnerable than other larger country groupings due to their inherent dependence on energy imports, high level of export concentration, and exposure to environmental hazards such as climate change, among other reasons.

Notwithstanding, the Commonwealth Secretariat (2018) noted that there remains a need to build international consensus on defining and measuring economic vulnerability. In this regard, they have proposed the development of a new universal economic vulnerability index to focus on the economic, environmental, and socio-political causes of vulnerability.

An obvious challenge of widening the sphere of the Vulnerability Index (to include the social and natural hazard and climate change dimensions) is that it introduces further complexity in the construction of the index. This complexity is related to the selection of appropriate proxy indicators given the paucity of social and climate change data. Indicators are selected based on availability and reliability, as well as suitability. For example, it is difficult to source appropriate proxy indicators to track susceptibility to natural disasters and climate change, and social vulnerability. Crowards (2000) noted that there are significant hurdles to deriving a suitable measure to natural disasters. The main difficulty being that assessing the vulnerability to natural disaster and climate change requires predicting the likelihood of events occurring in the near future and their degree of impact, which may not be done correctly through analysing historic frequencies of events and the estimates of their magnitudes. Relatedly, it can be argued that while social factors[15] influence economic vulnerability, identifying suitable proxy indicators is challenging given the data limitations and that some of these social factors may also be policy induced.

The Turks and Caicos Islands and the Virgin Islands were excluded from the computation of the index. The Virgin Islands does not compile trade data and, therefore, no data was available for the Export Destination and Export Concentration sub-indices. Trade data by SITC classification and disaggregated by main trading partner was not available for the Turks and Caicos Islands, therefore no data was available to compile the Export Destination and Export Concentration sub-indices. Data gaps in other Caribbean states were overcome in other instances by extrapolating trends from historic data, and in others by leveraging existing data from similar countries to create estimates.

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[14] Crowards (2000) included 136 countries in the study, however, sufficient data was available for 95 countries for the calculation of EVI.

[15] Cutter, Boruff and Shirley's (2003) identified the following factors that influence social vulnerability: lack of access to resources (including knowledge and technology); limited access to political power and representation; social capital (including social networks and connections); beliefs and customs; building stock and age; frail and physically-limited individuals; and type and density of infrastructure and lifelines.

The Vulnerability Index provides a static view of vulnerability at a point in time. As a result, the relative ranking would be sensitive to the year the Index was calculated. Concerns have been raised about the potential for wide variations in the index scores, particularly in years where there are economic or natural disaster shocks. Whilst the utility of measuring vulnerability in a country at a point in time is clear, the possibility of large changes in the Index can be problematic for some policy applications. As a result, a dual approach for calculating the Index is proposed that involves a point-in-time measure and a moving average (at least three years) measure. The moving average will reduce the potential for large changes in the index and can be particularly useful to smooth the effects on the data when there are outlier years that may be beneficial in some policy applications of the Index. While the moving average approach was not calculated in this paper, it will be included in subsequent revisions of the Index.

4. Results

The study provides estimates of the MVI for BMCs (with the exception of the Turks and Caicos Islands and Virgin Islands) for the years 2016 and 2017.

The results show that the vulnerability of BMCs is concentrated in the areas of:

- the extent of trade openness with other countries;
- dependence on a few major exports and trading partners;
- dependence on the imports of energy and related products;
- social challenges such as crime; and
- exposure to natural hazards and climate change (number of persons affected) (see Appendix 5).

The results of the estimation also support the view that, in spite of the high human development status of BMCs, most are within the medium-high classification of vulnerability to external shocks. To determine this, the study utilised the Common Vulnerability Scoring System[16] (CVSS) as a classification criterion for the Vulnerability Index for each country. This classification criteria was adjusted to align the lower threshold for vulnerability scores (0.332) with that utilised by the Commonwealth Secretariat[17]. The vulnerability scoring system utilised in the study is: 0 to 0.33 as low vulnerability; 0.34 to 0.49 as medium-low vulnerability; 0.50 to 0.69 medium-high vulnerability; and 0.70 to 1.00 as high vulnerability.

Based on the number of countries that had scores in the medium vulnerability category, two tiers were added to the classification system: (a) medium (low) vulnerability comprising index scores of 0.34 to 0.49; and (b) medium (high) vulnerability comprising index scores of 0.50 to 0.69. The classification of BMCs in the vulnerability scoring system is illustrated in Table 1. Tourism-based economies appear to be more vulnerable than commodity-based economies (see Table 1). In part, the low vulnerability classification of commodity-based economies is linked to them being net exporters[18] of crude oil (e.g. Trinidad and Tobago and Suriname) and their geographic location that, in the past, resulted in the lower likelihood of being impacted by the Region's more severe natural disasters (particularly hurricanes).

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[16] CVSS provides a way to capture the principal characteristics of a vulnerability and produce a numerical score reflecting its severity. The numerical score can then be translated into a qualitative representation (such as low, medium, high, and critical) to help organisations properly assess and prioritise their vulnerability management processes.

[17] Commonwealth Secretariat (2014) noted that the threshold between high and low vulnerability scores was set at 0.332. Crowards (2000) identified vulnerability as high when the index score exceeded 0.54 (the 60th percentile).

[18] Suriname recently improved its crude oil refining capacity.

Table 1: Multidimensional Vulnerability Index Scoring System

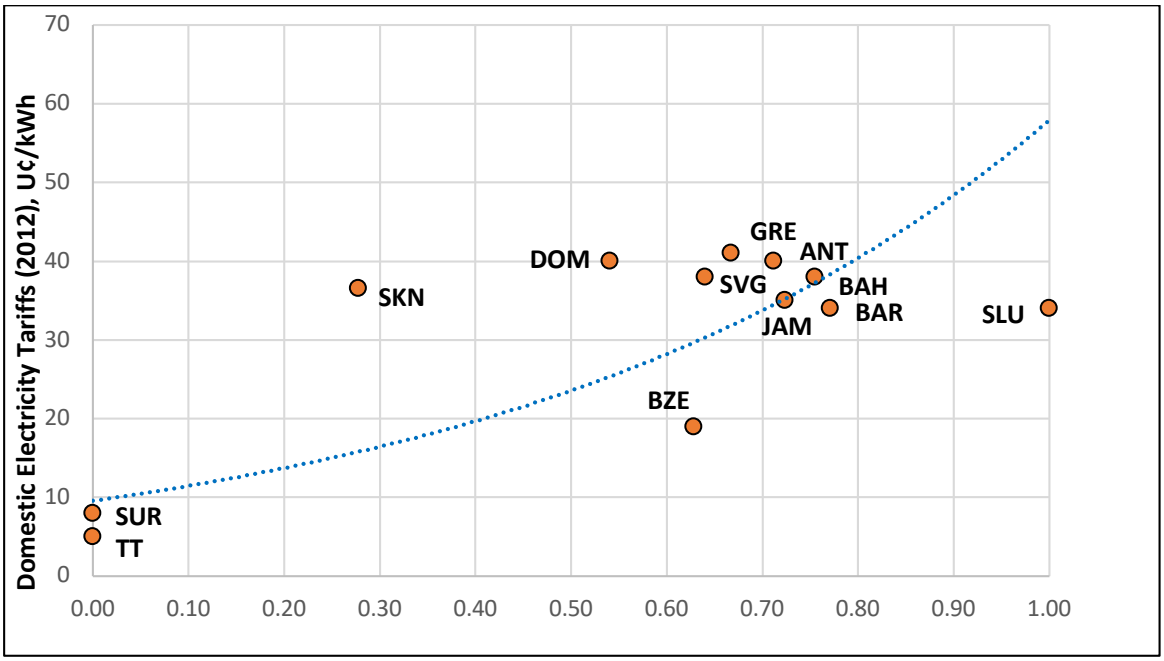
	2017				2016			
Country[19]	High Vulnerability (0.70 - 1.00)	Medium-high Vulnerability (0.50 - 0.69)	Medium-low Vulnerability (0.34 - 0.49)	Low Vulnerability (0 - 0.33)	High Vulnerability (0.70 - 1.00)	Medium-high Vulnerability (0.50 - 0.69)	Medium-low Vulnerability (0.34 - 0.49)	Low Vulnerability (0 - 0.33)
ANG		0.54				0.52		
ANT		0.54				0.50		
BAH		0.57				0.52		
BAR			0.48				0.47	
BZE		0.60				0.59		
CAY			0.48				0.49	
DOM		0.54					0.48	
GRE		0.58				0.52		
GUY		0.56				0.58		
HAI	0.71					0.69		
JAM		0.61				0.60		
MON			0.42				0.43	
SKN		0.55				0.52		
SLU		0.63				0.63		
SVG		0.52				0.54		
SUR			0.47				0.43	
TT			0.34					0.31

Source: author's calculations.

Dependence on the imports of crude oil and refined crude oil products is a major source of vulnerability in BMCs. The dependence of BMCs on strategic imports, and particularly energy, is clearly visible in the following scatter plot (Figure 2) that illustrates on a Cartesian plane the cost of domestic electricity tariffs per kilowatt hour with the vulnerability of the country to the strategic imports index, and particularly of energy and its by-products. With the exception of Trinidad and Tobago, Suriname and Belize to a lesser extent, all of the other BMCs have very high energy costs due to their dependence on imported fuels

[19] Cf. Appendix 1

Figure 2: Energy Imports Sub-Index and Domestic Electricity Costs



Source: author's calculations.

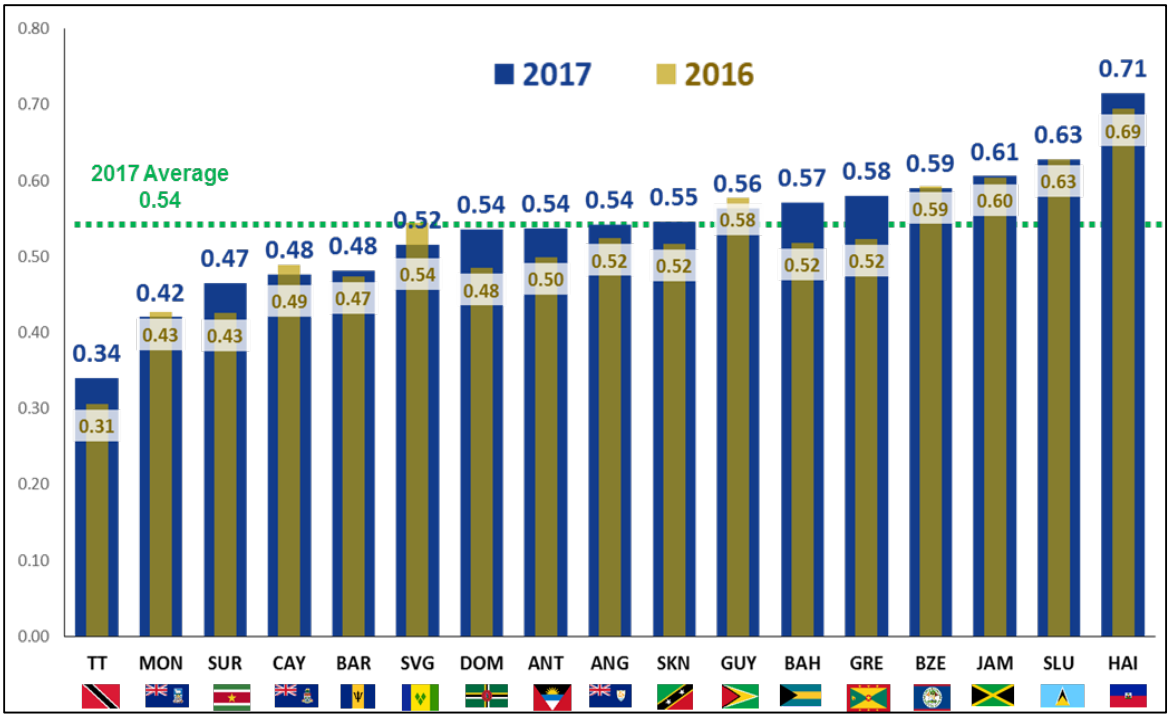
Being rich in natural resources has allowed some countries to accumulate large financial assets abroad, and enabled them to invest in schools, hospitals, and roads to promote growth and diversification. However, resource-based economies have challenges. The reality is that these resources will eventually be depleted and, in the absence of a more diversified economic base, the country would have to implement painful corrective measures to fiscal and monetary policies to achieve macroeconomic stability and growth. Resource-based economies also tend to be associated with higher levels of inequality. Research by Berry (2006), Buccellato and Mickiewicz (2008), El-Katiri et al. (2011), and Freije (2006), supports this point. In part, this may be due to the nature of resource-based economies and particularly the petroleum industry that is capital intensive and employs a very small, but highly paid, proportion of the labour force, which tends to increase income inequality within the society.

The average vulnerability index score of BMCs was 0.54 in 2017, and 0.52 in 2016 (medium-high vulnerability, see Figure 3).

The evolution of the vulnerability score over time can provide important signals about the changing productive and export structure of a country, its competitiveness in international markets, the level of diversification in its energy mix, the extent of the connect with its diaspora, challenges related to social cohesion, and susceptibility to the impacts of natural disasters and climate change. Among the factors that contributed to the increase in vulnerability score in 2017 are the rise in the number of murders; increased dependence on energy-related imports; the impact of natural hazards, particularly hurricanes on the number of persons affected in countries; higher remittances (related in part to countries affected by Hurricanes Irma and Maria); and also economic shocks and higher FDI, that may also be related to natural hazard and economic factors in BMCs.

The Vulnerability Index in this paper focused specifically on BMCs to better understand the inherent characteristics that make them vulnerable, and how this has evolved over time. The Vulnerability Index can be expanded to include other classifications of countries (such as small states, non-small states and large states).

Figure 3: Multidimensional Vulnerability Index—BMCs 2016 and 2017



Source: author's calculations.

A detailed review of the MVI sub-indices provides insights into what were the factors that contributed to the changes in the index score in each country between 2016 and 2017. For example, in Haiti the increase in the index score from 0.68 in 2016, to 0.71 in 2017, was mainly due to higher inflows of FDI that increased to 4.4% of GDP in 2017, compared with 1.4% of GDP in 2016, and the increased prevalence of crime (murders per 100,000). In Dominica, the MVI index score rose from 0.49 in 2016, to 0.54 in 2017. The increase can be attributed to the country's susceptibility to natural hazards and, in particular, the devastating impact of Hurricane Maria in 2017; the increased prevalence of criminal activity; and increased dependence on remittances. The increases in these sub-indices in Dominica were able to more than offset declines in other sub-indices such as export concentration. In Trinidad and Tobago, the MVI index score increased from 0.30 in 2016, to 0.34 in 2017. The increased prevalence of crime (murders per 100,000), and higher dependence on remittances and FDI contributed to the rise in the Index and more than offset a slight decline in the dependence on food imports.

Sensitivity Analysis

A correlation matrix (see Table 2) was utilised to assess the extent of relationship between the proxy indicators that were included in the Vulnerability Index. In instances where there was evidence of correlation, the proxy indicator was either deleted from the Index or combined with another proxy indicator, as outlined below:

- The Export Concentration parameter: C1 (exports of goods and services—top category) and C3 (exports of goods and services—top three categories) variables were correlated, and the C1 proxy indicator was removed.

- The Export Destination parameter: the proportion of total exports of goods converging on the top one export destination (D1) was correlated with the proportion of goods converging on the top three export destinations (D3), therefore the D1 proxy indicator was removed. Similarly, the variables capturing the proportion of tourists from the top source location (T1) and the top three source locations (T3) were correlated, therefore the T1 indicator was removed. Table 2 highlights the results of the correlation matrix after the adjustments highlighted.

The selection of weights for proxy indicators is an important consideration in the quantification of the Vulnerability Index. As a result, alternative weighting scenarios were evaluated to assess how they affect the results of the study. For simplicity, the paper utilised three weighting scenarios (see Table 3). The first weighting scenario (which represents the results presented in the paper) and is the same in principle as that utilised by Crowards (2000), is equal weighting by sub-index. It assumes that each of the six broad dimensions of vulnerability are equal influencers of a country's overall vulnerability. Therefore, in forming the composite EVI, each parameter was given an equal weight of 16.66%.

The second weighting scenario (equal weights by proxy indicator) is similar to the first in that it also utilises the concept of equal weighting, but the unit of emphasis changes to the proxy indicator as compared to the broad dimension of vulnerability. In this weighting scenario, the broad dimension of vulnerability with more proxy indicators (such as natural hazards and climate change and social vulnerability) would receive a larger overall weight than sub-indices with a lower number of proxy indicators. This resulted in the natural hazards and climate change and social vulnerability dimensions of vulnerability receiving weights of 26.7 and 20, respectively, with the other dimensions of vulnerability (export concentration, export destination, strategic imports, and external finance) receiving weights of 13.3, respectively.

Table 2: Correlation Matrix (2017)

	C³	O	D³	T³	Fd	Fl	F(F)	F(R)	C	U	P	NDᵅ	NDᵈ	CE	CP
C³	1.00	-0.02	0.21	0.43	0.06	0.18	-0.26	0.14	-0.19	0.54	0.11	0.12	0.21	-0.03	-0.24
O		1.00	-0.12	0.02	-0.38	-0.17	0.11	-0.52	-0.23	-0.19	-0.16	-0.48	-0.13	0.20	0.13
D³			1.00	0.38	0.01	-0.04	0.29	0.00	-0.31	-0.01	-0.18	0.40	0.33	0.06	-0.33
T³				1.00	-0.13	0.06	0.28	-0.12	-0.11	-0.15	-0.36	0.04	-0.12	-0.14	-0.37
Fd					1.00	-0.04	-0.60	0.69	0.15	0.41	0.78	0.66	0.13	-0.05	0.12
Fl						1.00	0.16	0.35	0.00	0.50	-0.10	0.02	0.41	-0.14	0.13
F(F)							1.00	-0.44	-0.39	-0.30	-0.69	-0.06	0.24	-0.38	0.09
F(R)								1.00	0.24	0.46	0.54	0.60	0.33	-0.06	-0.09
C									1.00	-0.22	0.06	-0.32	-0.38	-0.24	-0.25
U										1.00	0.42	0.31	0.57	-0.12	0.35
P											1.00	0.39	0.00	0.44	-0.05
NDᵅ											0.11	1.00	0.55	-0.13	0.16
NDᵈ													1.00	0.09	0.46
CE														1.00	0.06
CP															1.00

Source: author's calculations.

The third weighting scenario also assumes equal weighting but eliminates the social vulnerability dimension. This enables the research to assess how the removal of this sub-index would affect the overall index score. As a result, the weight for the five remaining dimensions changed to 20, respectively.

The weight assigned to each proxy indicator and the six dimensions of vulnerability in the three weighting scenarios are displayed in Table 3. While in each of the scenarios the economic dimension of the Index is weighted the most, the weight ranges from 53.2% to 80%, the weight of the social dimension ranges from 17% to 20%, and the weight of the environmental dimension ranges from 17% to 26.8%.

Table 3: Alternative Weighting Scenarios

(Scenario 1) Base Scenario—equal weights by sub-index															
Category	**Economic (66%)**								**Social (17%)**			**Environmental (17%)**			
Parameter	Export Concentration		Export Destination		Strategic Imports		External Finance		Social Vulnerability			Climate and Natural Hazards			
	16.67%		16.67%		16.67%		16.67%		16.67%			16.67%			
Variable	C^3	O	D^3	T^3	F^d	F^I	R	I^f	C	U	P	ND^a	ND^d	CE	CP
	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	5.6%	5.6%	5.6%	4.2%	4.2%	4.2%	4.2%
(Scenario 2) Alternative Scenario—equal weights by proxy indicator															
Category	Economic (53.2%)								Social (20%)			Environmental (26.8%)			
Parameter	Export Concentration		Export Destination		Strategic Imports		External Finance		Social Vulnerability			Climate and Natural Hazards			
	13.3%		13.3%		13.3%		13.3%		20.0%			26.7%			
Variable	C^3	O	D^3	T^3	F^d	F^I	R	I^f	C	U	P	ND^a	ND^d	CE	CP
	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
(Scenario 3) Eliminate Social Vulnerability sub-index															
Category	Economic (80%)								Social (0%)			Environmental (20%)			
Parameter	Export Concentration		Export Destination		Strategic Imports		External Finance		Social Vulnerability			Climate and Natural Hazards			
	20%		20%		20%		20%		0%			20%			
Variable	C^3	O	D^3	T^3	F^d	F^I	R	I^f	C	U	P	ND^a	ND^d	CE	CP
	10%	10%	10%	10%	10%	10%	10%	10%	0%	0%	0%	5%	5%	5%	5%

Source: author's calculations.

The results of the weighting sensitivity test generally validated the results of the Vulnerability Index (see Table 4). Notably, there were not significant changes in the Vulnerability Index score in the alternative weighting scenarios in BMCs. Haiti and Saint Lucia remained the first and second ranked countries in terms of vulnerability, whilst Trinidad and Tobago remained the least-vulnerable country across all three weighting scenarios. Small differences in the index score are likely due to the variances in weights across scenarios and data limitations with the climate and natural hazards metrics. This provides further validation for the Scenario 1 methodology, as it enables better smoothing across missing data.

Table 4: Illustration of Alternative Weighting Scenarios on the Multidimensional Vulnerability Index (2017)

	Weighting Scenario 1		Weighting Scenario 2		Weighting Scenario 3	
	Index Score	Rank	Index Score	Rank	Index Score	Rank
ANG	0.54	9	0.53	10	0.57	5
ANT	0.54	10	0.53	11	0.53	11
BAH	0.57	6	0.53	9	0.58	4
BAR	0.48	13	0.43	16	0.49	13
BZE	0.59	4	0.55	8	0.57	6
CAY	0.48	14	0.45	15	0.56	7
DOM	0.54	11	0.56	5	0.52	12
GRE	0.58	5	0.56	4	0.56	8
GUY	0.56	7	0.57	3	0.55	9
HAI	0.71	1	0.69	1	0.73	1
JAM	0.61	3	0.56	6	0.59	3
MON	0.42	16	0.45	14	0.40	16
SKN	0.55	8	0.55	7	0.53	10
SLU	0.63	2	0.59	2	0.62	2
SVG	0.52	12	0.51	12	0.46	14
SUR	0.47	15	0.46	13	0.45	15
TT	0.34	17	0.31	17	0.31	17
AVERAGE	**0.54**		**0.52**		**0.53**	

Source: author's calculations.

Vulnerability by Category

Table 5 gives a snapshot of economic social and environmental vulnerabilities of each BMC. These disaggregated tables provide a baseline and highlights the resilience building priorities for each BMC.

For example, building resilience in Anguilla should place the highest priority on reducing economic vulnerability. Meanwhile, in Saint Vincent and the Grenadines and Grenada, the highest priority should be on building social and environmental resilience, respectively. These disaggregated tables offer a useful guide for policy discussion in country about how to build resilience at the national level and how to allocate scarce development resources taking into account vulnerabilities.

Table 5: Economic, Social and Environmental Vulnerability Sub-Indices

	Economic				Social				Environmental			
	2016		2017		2016		2017		2016		2017	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Anguilla	0.55	9	0.58	9	0.42	16	0.39	16			0.55	4
Antigua and Barbuda	0.52	12	0.55	10	0.50	13	0.60	11	0.41	7	0.42	6
Bahamas, The	0.57	7	0.65	5	0.51	12	0.52	13	0.32	11	0.30	13
Barbados	0.58	6	0.58	8	0.43	15	0.45	15	0.11	14	0.10	17
Belize	0.63	3	0.65	4	0.71	3	0.71	2	0.32	10	0.30	14
Cayman Islands	0.61	5	0.60	7	0.05	17	0.07	17	0.45	5	0.40	7
Dominica	0.45	15	0.48	14	0.54	11	0.62	8	0.56	3	0.66	1
Grenada	0.51	13	0.60	6	0.69	5	0.69	3	0.41	6	0.39	8
Guyana	0.56	8	0.55	11	0.64	6	0.61	10	0.59	2	0.56	3
Haiti	0.73	1	0.77	1	0.64	7	0.64	6	0.60	1	0.59	2
Jamaica	0.67	2	0.69	2	0.70	4	0.68	4	0.22	13	0.20	16
Montserrat	0.42	16	0.41	16	0.62	8	0.62	7	0.26	12	0.24	15
Saint Kitts and Nevis	0.49	14	0.53	12	0.61	9	0.61	9		15	0.42	5
Saint Lucia	0.63	4	0.69	3	0.79	1	0.68	5	0.46	4	0.34	11
Saint Vincent and the Grenadines	0.53	11	0.50	13	0.73	2	0.78	1	0.41	8	0.33	12
Suriname	0.39	17	0.47	15	0.60	10	0.56	12	0.39	9	0.35	10
Trinidad and Tobago	0.34	18	0.38	17	0.46	14	0.51	14	0.00	15	0.00	18
AVERAGE	**0.54**		**0.57**		**0.57**		**0.57**		**0.32**		**0.36**	

Source: author's calculations.

*Key	High Vulnerability	Medium-high Vulnerability	Medium-low Vulnerability	Low Vulnerability

Discussion and Conclusion

This Paper updates and revises CDB's Vulnerability Index previously estimated by Cowards (2000) and Hartman (2011), and widens the scope to include social vulnerability and climate change. The Vulnerability Index is important as it is a component of CDB's financial resource allocation framework and has the potential to assist in the more effective allocation of scarce concessional resources. The Vulnerability Index also provides a solid basis to develop more effective strategies to build resilience and foster the economic growth that is needed. This work is also timely, as it contributes to the international and regional dialogue about increased access to development finance for small states to help them address their vulnerabilities.

The paper seeks to quantify and gain deeper understanding of the relative vulnerabilities of BMCs and proposes a framework to inform the preparation of a resilience index. The paper also seeks to:

(a) answer the question of how vulnerable BMCs are;

(b) identifies where these vulnerabilities are concentrated; and

(c) what can be done to build resilience in these economies.

Among the main findings are that BMCs, on average, can be considered middle-to-high vulnerability countries with an average vulnerability index score of 0.54 for 2017, slightly above the score of 0.51 for 2016. The vulnerabilities are concentrated in the areas of dependence on a few major export products and trading partners, dependence on the imports of energy and related products, social challenges such as crime, and exposure to natural hazards and climate change. These results are not surprising since there is a need within the Region to improve competitiveness and strengthen small and micro enterprises to increase non-traditional exports. Further, fossil fuels account for 95% of the Region's energy needs. Significant volatility in energy prices has contributed, in large part, to the competitiveness challenges that many Caribbean industries face, and one of the major development challenges now threatening the development agenda within the Caribbean Region is the thorny issue of increasing crime and violence. In the natural environment, 2017 was one of the most destructive hurricane seasons for the Region with two major hurricanes—Irma and Maria—causing over USD100 billion in damage and loss across several Caribbean countries. These were a stark reminder that the Region, ranked as the second highest in terms of climate vulnerability, faces a future characterised by more intense and destructive meteorological systems and, possibly, more frequent and intense natural hazards.

These findings give credence to the emphasis of CDB on the greater use of renewable energy and energy efficiency, disaster risk management, and resilience building. The findings corroborate with Crowards (2000), and the identified areas of vulnerability align with those identified by the IMF study on strengthening growth and boosting resilience prepared by Alleyne, et al. (2017).

Although resource-rich countries had lower vulnerability scores, the paper notes that these economies have unique challenges related to sharp boom and bust cycles and higher levels of inequality, among others.

The paper, therefore, makes the following policy recommendations:

- There is need for sustained and deeper effort to reduce the dependence of Caribbean economies on hydrocarbons and intensify the utilisation of more sustainable fuel sources. This can involve a deeper investigation into the impact on government revenues, private sector interest and the social outcomes of higher dependence on renewable energy sources compared with hydrocarbon resources, and strategies for transitioning to renewable energy sources.

- There may be the need for a regional approach to address vulnerability and, in particular, to close the financing gap caused by natural disasters given the increased intensity and the insufficient amount of finances that is currently available. The regional approach can include a disaster contingency fund, which will seek to provide immediate liquidity to the affected countries and will complement other ex-post financing, including domestic and external credit, budget reallocation, donor assistance and relief, and parametric insurance.

- Regional sovereigns can also explore the potential of state contingent debt instruments, e.g. GDP-linked bonds or disaster-linked bonds. These instruments can assist in building resilience in the face of shocks by providing an option for a moratorium[20] on the payment of interest and principal in the event of a natural hazard of a predetermined magnitude. Sovereigns in the Caribbean may need capacity building to design and negotiate these instruments as they are new to the Region.

- There is the potential for the MVI to be used by BMC's to assist in determining and or justifying their development priorities within an evidence-based framework. For CDB, the MVI can play a greater role in its policy advisory and financing frameworks. The possibilities include providing information on the relative vulnerability profile of BMCs over time, serving as a gauge or assessing the effectiveness of the policies implemented by countries. Additionally, this information can be utilised to design new and innovative financial instruments, and source targeted funding (economic, social, and environmental) to assist with building resilience.

- The MVI shows that although many of the BMC's are classified as middle-income countries, economic security of these countries is highly vulnerable due to small size, economic and social structures, the high annual probability of many individuals being affected by natural disasters and, to a lesser extent, individuals losing their lives as a result of natural disasters. The individual country vulnerability scores for 2016 and 2017 (the change from year-to-year), show that when an event occurs vulnerability can change significantly from one period to the next, highlighting the economic insecurity of the Region. This analysis shows that ex-ante resilience building should be an urgent requirement in all BMCs.

[20] The trigger for the moratorium option usually is linked to indicators such as GDP, the magnitude of the natural hazard, and commodity prices.

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APPENDIX 1

CARIBBEAN DEVELOPMENT BANK BORROWING MEMBER COUNTRIES

	Country	Acronym in Tables
1.	Anguilla	ANG
2.	Antigua and Barbuda	ANT
3.	Bahamas, The	BAH
4.	Barbados	BAR
5.	Belize	BZE
6.	Cayman Islands	CAY
7.	Dominica	DOM
8.	Grenada	GRE
9.	Guyana	GUY
10.	Haiti	HAI
11.	Jamaica	JAM
12.	Montserrat	MON
13.	Saint Kitts and Nevis	SKN
14.	Saint Lucia	SLU
15.	Saint Vincent and the Grenadines	SVG
16.	Suriname	SUR
17.	Trinidad and Tobago	TT
18.	Turks and Caicos Islands*	TCI
19.	Virgin Islands*	VI

(*Excluded from the computation of the Index).

APPENDIX 1

SUSCEPTIBILITY TO NATURAL HAZARDS (SUB-INDEX)

This research widened the scope of the susceptibility to natural hazards sub-index beyond natural disasters to include climate change[21]. Higher frequency and intensity of weather events, including floods, storms, landslides, hurricanes, droughts (13 per year since 1990, EM-DAT) are linked to a changing climate in the Caribbean and negative future scenarios [The Intergovernmental Panel on Climate Change (2014)]. These weather events are also leading to depressed economic growth and increased costs for public budgets. The events of the last two hurricane seasons certainly support this view. Sea level rise is the main threat, as most Caribbean communities and infrastructures are located in the coastal areas and coastal infrastructures are not resilient.

Acevedo (2016) noted that between 1950 and 2014, hurricanes in the Caribbean resulted in an average annual cost of 1.6% of GDP and, based on reported damage, the cost increases to 2.5% of GDP when missing data on damage was included, and to 5.7% of GDP utilising all available information on hurricanes in the Caribbean. The cost of disaster damage in the Caribbean (2.5% of GDP) is six times larger than the average country in the world (0.4% of GDP). These disasters have reversed years of gains made in infrastructure, economic and social advancement. Building resilience against these disasters is imperative for the continued success of the Region.

Several climate change indicators and databases were reviewed and a criteria utilised to guide the selection of an appropriate indicator for the study. Included in the criteria was the selection of an indicator that fulfilled the conditions identified earlier of simplicity, ease of comprehension, and suitability for international comparison. In addition, the climate indicator should quantify the vulnerability of BMCs with respect to the effects of climate change and human pressures on the quality of the environment and susceptibility to disasters. The indicator should also predict how the environment is likely to cope with future events.

DCVM was selected for use in the Vulnerability Index, among the other climate vulnerability data sources. The other climate vulnerability data sources considered included the Global Climate Risk Index. This index is produced annually by the think tank Germanwatch and analyses the extent to which countries have been affected by the impacts of weather-related loss events, such as storms, flood, heat waves, etc. The index has an extensive database spanning the period 1997 to 2016, with coverage of more than 180 countries. The variables used in the estimation of the index are fatalities (annual average), fatalities per 100,000 inhabitants (annual average), losses in millions of United States dollars (purchasing power parity), and losses per unit of GDP

[21] Climate change impacts on the natural environment can be seen as chains of causation with first, second and third-order effects. The first order effects of climate change indicate rising temperatures and shifting precipitation patterns. The second order effects include rising sea levels and increasing temperatures. These rising sea levels can lead to flooding, erosion damage and altered ecosystem distribution, which we may refer to as the third order effect of climate change. Climate change impacts increase the intensity and frequency of the occurrence of natural hazards on the environment.

in percentage. The main weakness of this index is that it does not include a climate change component nor take into account important aspects of environmental vulnerability, such as sea level rise and warmer seas. Moreover, the data only reflects the direct impacts (direct losses and fatalities) of extreme weather events, whereas the indirect impacts (e.g. droughts and food security) are not considered.

The main drawback of the Secretariat of the Applied Geoscience Commission methodology is that it is highly data-intensive, deriving information from 50 indicators covering areas related to weather and climate, geology, geography, resources and services and human populations. Other climate risk data sources include the Notre Dame Global Adaptation Index developed by the Climate Change Adaptation Programme out of the University of Notre Dame's Environmental Change Initiative. The index summarises a country's vulnerability to climate change and other global challenges, in combination with its readiness to improve resilience. The index utilises two decades of data across 45 indicators (36 vulnerability indicators; 9 readiness indicators) to rank 181 countries annually based upon their vulnerability and readiness to adapt.

APPENDIX 3

DATA SOURCES FOR THE VULNERABILITY INDEX

Strategic Imports: UNCTAD Statistics Data Centre.

Export Concentration: UNCTAD Statistics Data Centre.
Available online at http://unctadstat.unctad.org/EN/.

Export Destination: IMF Direction of Trade Statistics, Yearbook 2017; Caribbean Tourism Organisation, Tourism Statistical Tables, 2017 (tourism arrivals).

External Finance: WB Development Indicators (FDI); UNCTAD Statistics Data Centre (Remittances).

Natural Disasters and Climate Change: EM-DAT: The OFDA/CRED International Disaster Database www.emdat.be, Université Catholique de Louvain, Brussels, Belgium; DCVM (economic gains or losses from climate change and carbon.

Social Vulnerability: United States Overseas Security Advisory Centre; UNODC (murders per 100,000); Official country statistics for poverty and unemployment rates.

APPENDIX 4

CONVERTING VARIABLES TO A COMMON SCALE

The Crowards (2000) study considered five different methods of scaling and combining the data. These are:

- **Normalisation**: each variable is converted to a scale between zero (applied to the lowest value of the series) and one (applied to the highest value in the series) and the minimum value for a series is subtracted from each of its entries in turn; the result of which is divided by the difference between the maximum and the minimum of the series. This is a standard transformation procedure, maintaining relative proportions within the series, but suffers from the influence of singularly high (or low) values causing the rest of the series to be bunched at the lower (or upper) end of the series.

- **Decile-condensed Normalisation**: in order to reduce the impact of extreme values, normalisations are carried out, but with the top decile of entries in a series attributed a value of one, and the bottom decile attributed a value of zero. This reduces the bunching effect of extreme values, but leads to a loss of information about differences between entries within the top and bottom deciles.

- **Borda Rule:** a ranking of countries is determined for each component variable and an aggregate score calculated for each country as the sum of its ranks, rather than normalised values across variables. This ranking removes the influence of extreme values, but ignores the extent of differences between the entries in each series.

- **Fixed Exponential Scaling:** prior to normalising, each series is transformed by applying a fixed exponent. In the present study, each entry is raised to the power of 0.3. This reduces, but does not remove, the impact of extreme values in positively skewed distributions, which is appropriate in this study.

- **Variable Exponential Scaling**: before normalising, each series is transformed by applying an exponent that meets a prior objective, such as minimising the skewness of the series or achieving median value that is midway between the minimum and maximum of the series. This has the advantage of producing relatively evenly distributed series, but involves treating each of the series differently and applying radical transformations to some of the series.

Other transformation methods, such as applying logarithms or inverting the data, were proposed but rejected since they served to increase the skewness in some variables.

MULTI-DIMENSIONAL VULNERABILITY INDEX (PROXY INDICATORS 2017)

	Overall VI	Export Concentration		Export Destination		Strategic Imports		External Finance		Social Vulnerability			Climate and Natural Hazards			
	Weight	17%		17%		17%		17%		17%			17%			
		C[3]	O	D[3]	T[3]	F[d]	F[I]	R	I[f]	C	U	P	ND[a]	ND[d]	CE	CP
	Sub-Weight	8.33%	8.33%	8.33%	8.33%	8.33%	8.33%	8.33%	8.33%	5.56%	5.56%	5.56%	4.17%	4.17%	4.17%	4.17%
Anguilla	0.54	0.61	0.94	0.63	0.72	0.29	0.63	0.31	0.51	0.54	0.40	0.21	0.22	0.88		
Antigua and Barbuda	0.54	0.92	0.93	0.00	0.83	0.41	0.71	0.19	0.43	0.57	0.67	0.54	0.04	0.58	0.19	0.85
Bahamas, The	0.57	0.76	0.72	0.93	0.99	0.48	0.76	0.24	0.33	0.72	0.52	0.33	0.16	0.37	0.22	0.45
Barbados	0.48	0.50	0.92	0.50	0.75	0.60	0.72	0.22	0.47	0.33	0.47	0.55	0.03	0.13	0.03	0.19
Belize	0.59	0.65	1.00	0.77	0.78	0.59	0.63	0.20	0.59	0.81	0.46	0.84	0.08	0.28	0.46	0.10
Cayman Islands	0.48	0.37	0.92	1.00	0.97	0.00	0.52	1.00	0.00	0.00	0.20	0.00	0.08			
Dominica	0.54	0.21	0.88	0.77	0.00	0.68	0.54	0.19	0.61	0.48	0.68	0.70	0.39	0.72	0.23	1.00
Grenada	0.58	0.70	0.85	0.56	0.61	0.64	0.67	0.23	0.53	0.26	1.00	0.81	0.25	1.00	0.20	0.42
Guyana	0.56	0.64	0.79	0.59	0.27	0.46	0.77	0.22	0.67	0.43	0.60	0.79	0.10	0.71	1.00	0.35
Haiti	0.71	0.84	0.68	0.99	0.92	1.00	0.49	0.20	1.00	0.23	0.69	1.00	1.00	0.81	0.18	0.25
Jamaica	0.61	0.62	0.73	0.78	1.00	0.51	0.77	0.22	0.86	0.99	0.59	0.46	0.07	0.92	0.14	0.03
Montserrat	0.42	0.00	0.78	0.10	0.34	0.52	0.76	0.25	0.57	0.82	0.26	0.79		0.24		
Saint Kitts and Nevis	0.55	0.35	0.86	0.65	0.72	0.71	0.28	0.28	0.38	1.00	0.22	0.63				
Saint Lucia	0.63	1.00	0.87	0.90	0.60	0.43	1.00	0.22	0.47	0.45	0.89	0.70	0.16	0.95	0.09	0.17
Saint Vincent and the Grenadines	0.52	0.56	0.77	0.25	0.25	0.65	0.64	0.26	0.60	0.78	0.84	0.72	0.15	0.67	0.09	0.40
Suriname	0.47	0.67	0.95	0.64	0.71	0.57	0.00	0.00	0.23	0.32	0.46	0.90	0.04	0.29	0.77	0.29
Trinidad and Tobago	0.34	0.59	0.82	0.53	0.38	0.32	0.00	0.12	0.32	0.79	0.19	0.54	0.00	0.00	0.00	0.00
AVERAGE	**0.54**	**0.59**	**0.85**	**0.62**	**0.64**	**0.52**	**0.58**	**0.26**	**0.50**	**0.56**	**0.54**	**0.62**	**0.18**	**0.57**	**0.28**	**0.35**

A score close to 1 indicates high vulnerability with respect to that variable.

MULTI-DIMENSIONAL VULNERABILITY INDEX AND RANK 2017

	Rank	Index	Export Concentration	Export Destination	Strategic Imports	External Finance	Social Susceptibility	Natural Hazards and Climate Change
Anguilla	9	0.54	0.78	0.68	0.46	0.41	0.39	0.55
Antigua and Barbuda	10	0.54	0.93	0.42	0.56	0.31	0.60	0.42
Bahamas, The	6	0.57	0.74	0.96	0.62	0.28	0.52	0.30
Barbados	13	0.48	0.71	0.62	0.66	0.34	0.45	0.10
Belize	4	0.59	0.82	0.77	0.61	0.39	0.71	0.23
Cayman Islands	14	0.48	0.65	0.98	0.26	0.50	0.07	0.40
Dominica	11	0.54	0.54	0.38	0.61	0.40	0.62	0.66
Grenada	5	0.58	0.78	0.58	0.65	0.38	0.69	0.39
Guyana	7	0.56	0.72	0.43	0.61	0.44	0.61	0.56
Haiti	1	0.71	0.76	0.96	0.74	0.60	0.64	0.59
Jamaica	3	0.61	0.68	0.89	0.64	0.54	0.68	0.20
Montserrat	16	0.42	0.39	0.22	0.64	0.41	0.62	0.24
Saint Kitts and Nevis	8	0.55	0.60	0.69	0.49	0.33	0.61	0.42
Saint Lucia	2	0.63	0.93	0.75	0.72	0.35	0.68	0.34
Saint Vincent and the Grenadines	12	0.52	0.66	0.25	0.64	0.43	0.78	0.33
Suriname	15	0.47	0.81	0.68	0.28	0.11	0.56	0.35
Trinidad and Tobago	17	0.34	0.71	0.45	0.16	0.22	0.51	0.00
AVERAGE		**0.54**	**0.72**	**0.63**	**0.55**	**0.38**	**0.57**	**0.36**

MULTI-DIMENSIONAL VULNERABILITY RANK 2017

	Overall Vulnerability Rank	Export Concentration	Export Destination	Strategic Imports	External Finance	Social Vulnerability	Natural Hazards and Climate Change
Anguilla	9	6	9	14	7	16	4
Antigua and Barbuda	10	2	14	12	14	11	6
Bahamas, The	6	8	2	8	15	13	12
Barbados	13	10	10	3	12	15	16
Belize	4	3	5	11	9	2	14
Cayman Islands	14	14	1	16	3	17	7
Dominica	11	16	15	10	8	8	1
Grenada	5	5	11	4	10	3	8
Guyana	7	9	13	9	4	10	3
Haiti	1	7	3	1	1	6	2
Jamaica	3	12	4	6	2	4	15
Montserrat	16	17	17	7	6	7	13
Saint Kitts and Nevis	8	15	7	13	13	9	5
Saint Lucia	2	1	6	2	11	5	10
Saint Vincent and the Grenadines	12	13	16	5	5	1	11
Suriname	15	4	8	15	17	12	9
Trinidad and Tobago	17	11	12	17	16	14	17

MULTI-DIMENSIONAL VULNERABILITY INDEX (PROXY INDICATORS 2016)

	Overall VI	Export Concentration		Export Destination		Strategic Imports		External Finance		Social Vulnerability			Climate and Natural Hazards			
	Weight	17%		17%		17%		17%		17%			17%			
		C[3]	O	D[3]	T[3]	F[d]	F[I]	R	I[f]	C	U	P	ND[α]	ND[d]	CE	CP
	Sub-Weight	8.33%	8.33%	8.33%	8.33%	8.33%	8.33%	8.33%	8.33%	5.56%	5.56%	5.56%	4.17%	4.17%	4.17%	4.17%
Anguilla	0.52	0.98	0.92	0.28	0.74	0.30	0.62	0.35	0.20	0.66	0.39	0.21				
Antigua and Barbuda	0.50	1.00	0.96	0.00	0.84	0.41	0.64	0.24	0.09	0.26	0.69	0.54	0.00	0.60	0.19	0.85
Bahamas, The	0.52	0.77	0.73	0.60	0.97	0.46	0.78	0.13	0.12	0.68	0.51	0.33	0.21	0.38	0.22	0.45
Barbados	0.47	0.52	0.94	0.63	0.76	0.63	0.70	0.31	0.11	0.23	0.52	0.55	0.07	0.14	0.03	0.19
Belize	0.59	0.69	1.00	0.79	0.78	0.59	0.66	0.48	0.06	0.80	0.48	0.84	0.14	0.57	0.46	0.10
Cayman Islands	0.49	0.38	0.95	0.94	0.93	0.00	0.43	0.25	1.00	0.00	0.14	0.00	0.14			
Dominica	0.48	0.54	0.86	0.34	0.00	0.69	0.65	0.42	0.12	0.24	0.68	0.70	0.31	0.76	0.23	1.00
Grenada	0.52	0.55	0.89	0.48	0.34	0.64	0.68	0.35	0.16	0.26	1.00	0.81	0.29	0.72	0.20	0.42
Guyana	0.58	0.75	0.82	0.75	0.30	0.48	0.76	0.56	0.05	0.52	0.62	0.79	0.16	0.75	1.00	0.35
Haiti	0.69	0.73	0.66	1.00	0.93	1.00	0.49	1.00	0.04	0.28	0.65	1.00	1.00	0.84	0.18	0.25
Jamaica	0.60	0.65	0.75	0.74	1.00	0.57	0.75	0.80	0.13	0.91	0.64	0.57	0.12	0.97	0.14	0.03
Montserrat	0.43	0.00	0.76	0.59	0.37	0.43	0.66	0.43	0.14	0.82	0.25	0.79		0.59		
Saint Kitts and Nevis	0.52	0.31	0.88	0.68	0.73	0.70	0.28	0.19	0.16	1.00	0.21	0.63		0.26		
Saint Lucia	0.63	0.86	0.90	0.62	0.75	0.47	1.00	0.30	0.13	0.78	0.89	0.70	1.00	0.60	0.09	0.17
Saint Vincent and the Grenadines	0.54	0.67	0.79	0.30	0.51	0.66	0.66	0.48	0.18	0.63	0.85	0.72	0.70	0.45	0.09	0.40
Suriname	0.43	0.61	0.87	0.41	0.05	0.56	0.49	0.00	0.13	0.32	0.60	0.90	0.30	0.20	0.77	0.29
Trinidad and Tobago	0.31	0.47	0.80	0.47	0.53	0.36	0.00	0.11	0.00	0.76	0.15	0.48	0.00	0.00	0.00	0.00
AVERAGE	**0.52**	**0.62**	**0.85**	**0.57**	**0.62**	**0.53**	**0.60**	**0.38**	**0.17**	**0.54**	**0.54**	**0.62**	**0.32**	**0.52**	**0.28**	**0.35**

MULTI-DIMENSIONAL VULNERABILITY RANK 2016

	Overall Vulnerability Rank	Export Concentration	Export Destination	Strategic Imports	External Finance	Social Vulnerability	Natural Hazards and Climate Change
Anguilla	7	2	10	15	7	16	
Antigua and Barbuda	11	1	13	12	14	13	7
Bahamas, The	9	6	5	9	15	12	11
Barbados	14	8	7	4	12	15	14
Belize	4	4	4	8	8	3	10
Cayman Islands	12	14	2	16	1	17	5
Dominica	13	12	17	3	9	11	3
Grenada	8	10	14	6	10	5	6
Guyana	5	5	9	10	5	6	2
Haiti	1	13	1	1	2	7	1
Jamaica	3	11	3	7	3	4	13
Montserrat	15	17	12	11	6	8	12
Saint Kitts and Nevis	10	16	6	14	13	9	
Saint Lucia	2	3	8	2	11	1	4
Saint Vincent and the Grenadines	6	9	15	5	4	2	8
Suriname	16	7	16	13	16	10	
Trinidad and Tobago	17	15	11	17	17	14	15