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The Decade of Action and Small Island Developing States: Measuring and addressing SIDS' vulnerabilities to accelerate SDG progress

Jeffrey Sachs[1], Isabella Massa[2], Simona Marinescu[3], Guillaume Lafortune[4]

[1] President, Sustainable Development Solutions Network (SDSN), United States
[2] Senior Economist, Sustainable Development Solutions Network (SDSN), France
[3] UN Resident Coordinator, Samoa, Cook Islands, Niue, Tokelau
[4] Director, Sustainable Development Solutions Network (SDSN), France

Abstract

Small Island Developing States (SIDS) face a unique set of vulnerabilities which impede their ability to achieve sustainable development. Structural factors, including their size, remoteness, limited resource base, market size, exposure to climate risks and natural disasters impact socio economic outcomes and their ability to achieve the SDGs. The COVID-19 pandemic amplified those vulnerabilities with many SIDS countries being particularly affected by the drop in international tourism and travels and international remittances. To support the UN effort to develop a sound and robust Multidimensional Vulnerability Index (MVI), this Working Paper presents a new pilot framework and MVI for tracking SIDS structural vulnerabilities by distinguishing across different SIDS categories. Based on this pilot framework and indicators retained, our preliminary results underline that SIDS tend to be particularly vulnerable compared with other world regions. At the same time, the type of vulnerability faced by Atlantic/Indian SIDS, Caribbean SIDS, and Pacific SIDS tends to vary and may require different types of financing mechanisms and development pathways to support resilience, emergency responses and sustainable development. The initial results also emphasize the strong negative correlation between high structural vulnerabilities and poor SDG outcomes, including extreme poverty, life expectancy and subjective well-being. This Working Paper aims to provide an initial basis for further discussions on measuring multidimensional vulnerabilities and on the relationship between vulnerabilities and SDG achievement and financing mechanisms. We welcome comments and feedback on these preliminary results.

Comments and feedback on this Working Paper can be sent to Dr. Isabella Massa (isabella.massa@unsdsn.org). These will help inform the future work of this group. Ideally, comments would be received by 23 July 2021.

About the SDSN

The UN Sustainable Development Solutions Network (SDSN) mobilizes scientific and technical expertise from academia, civil society, and the private sector to support practical problem solving for sustainable development at local, national, and global scales. The SDSN has been operating since 2012 under the auspices of the UN Secretary-General. The SDSN is building national and regional networks of knowledge institutions, solution-focused thematic networks, and the SDG Academy, an online university for sustainable development.

Acknowledgement

This analysis is the result of the partnership between the United Nations Resident Coordinators for the Small Island Developing States (SIDS) and the Sustainable Development Solutions Network under the coordination of Prof. Jeffrey Sachs for the purpose to develop a multidimensional vulnerability index (MVI) for the SIDS in line with Art. 8.a. of General Assembly Resolution A/RES/75/215. The initiative aligns with the vision of the SAMOA Pathway as adopted in Samoa in 2014.

The UN Resident Coordinators in Barbados & OECS, Belize Multi-Country Office (MCO), Cabo Verde, Comoros, Cuba, Dominican Republic, Fiji MCO, Guyana, Jamaica (MCO), Maldives, Mauritius (MCO), Papua New Guinea, Samoa (MCO), Sao Tome & Principe, Timor-Leste, Trinidad & Tobago (MCO) and their teams as well as the Representatives of UNDP in the MCO Samoa and of UNESCO and FAO in the Pacific and their staff are thankful to Prof. Jeffrey Sachs, SDG Index Manager Guillaume LaFortune and Senior Economist Isabella Massa for the joint work that made possible the development of the MVI and the continued collaboration for the sustainable future of SIDS that we remain committed to.

This work would not have come to light without the passionate contribution of senior economists and strategic planners in the Resident Coordinator Offices including Stuart Davies, Oleksiy Ivaschenko, Sebastien Vauzelle, Klem Ryan, William Evans, Olaf Jan De Groot, Pierre Fallavier, Raymond Prasad, Constance Vigilance, Yaima Doimeadios Reyes, Jeremie Delage, Yanki Ukyab, Wakhile Mkhonza, Manuel Ortiz, Kanako Mabuchi, Abdou Katibou, Osmar Ferro, Rasmiyya Aliyeva, Narmina Guliyeva and Jan Nemecek.

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The SIDS UN Resident Coordinators are grateful to Mr. Sai Navoti and Ms. Anya Ihsan Thomas in UNDESA and Ms. Heidi Schroderus-Fox and Ms. Tishka Hope Francis at OHRLLS for their guidance throughout this process and to Mr. Riad Meddeb at UNDP for a great partnership for SIDS.

The collaboration with the Alliance of Small Island States (AOSIS) has helped us to deepen knowledge of the growing challenges that SIDS are facing on their journey to sustainable development.

At the time the development of the MVI is in progress, our humanity is still battling the COVID-19 pandemic that affected SDG progress everywhere and, most particularly, in vulnerable contexts. It is therefore our common belief that, in order to expedite sustainable development including reversing global warming within planetary means and boundaries, understanding and addressing vulnerabilities is the only way forward.

Simona Marinescu, Ph.D.

UN Resident Coordinator for Samoa, Cook Islands, Niue and Tokelau on behalf of SIDS UN Resident Coordinators

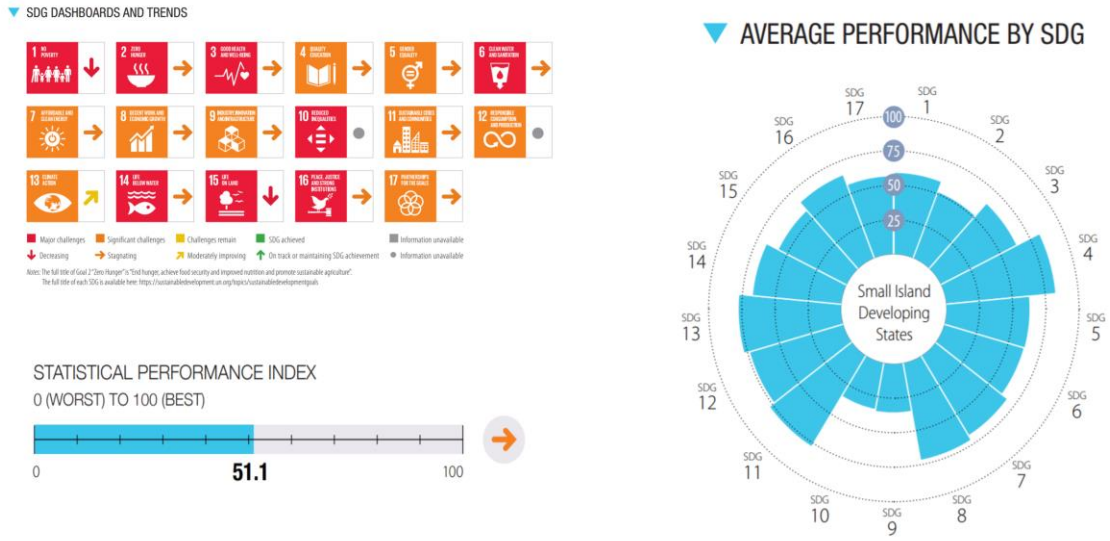
Executive Summary

The COVID-19 pandemic is a major setback for sustainable development everywhere, particularly in vulnerable and poor countries. This is emphasized in the latest Sustainable Development Report (SDR21) published in June (Sachs et al., 2021). The sharp drop in international tourism and remittances led to severe economic recessions and job losses in Small Island Developing States (SIDS) which are heavily dependent on the tourism sector and remittance flows[5]. According to the IMF (2021), in the Pacific Islands GDP is estimated to be about 3 percent below trend in 2023, of which 0.4 percentage point is estimated to be due to the shock in the tourism sector. The OECD (2021) reports that in SIDS a drop in remittances of approximately USD 1.1 billion is expected over 2020, assuming that the average fall in remittances applies to SIDS as well. Globally, given the severe economic setbacks caused by the pandemic – and the two-year delay in implementing SDG investments – the IMF estimates that incremental spending needs are now roughly 14 percent of World GDP for each year to 2030: roughly 21 percent more than was estimated in 2019 (Benedek et al., 2021).

The COVID-19 pandemic amplifies SDG-related challenges facing SIDS, which were already present before the pandemic. According to the latest SDR21, on average, SIDS face significant challenges in all SDGs, especially on addressing extreme poverty, access to and quality of key services and infrastructure, biodiversity goals and strong institutions. On average, progress on the SDGs since their adoption has been too slow in SIDS. The average performance of SIDS hides major differences across country performance with Cuba ranking in the top 50 countries on the SDGs Index and Haiti or Papua New Guinea ranking 151 and 150 respectively. Due to data gaps many SIDS are not included in the SDG Index.

[5] For two out of three SIDS tourism accounts for 20% of GDP or more, compared to 4.2% for OECD countries (OECD 2018). In 2019 remittances as a share of GDP averaged 8.3% across SIDS, with Tonga and Haiti receiving remittances worth almost 40% of GDP (OECD 2021).

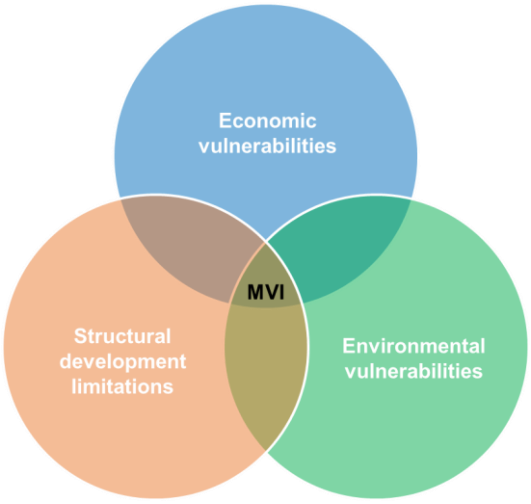
Average performance of Small Island Developing States (SIDS) in the 2021 Sustainable Development Report



Source: Sachs et al, 2021

SIDS face a unique set of vulnerabilities, which need to be better measured and considered in the context of the Decade of Action for the SDGs and to build "forward" better. Structural vulnerabilities of SIDS include their size, remoteness, limited resource base, market size, exposure to climate risks and other disasters. In August 2020, the UN Secretary-General committed the United Nations to advocate for SIDS on the issue of access to concessional finance, and in November 2020 called for the development and coordination of work within the UN on a Multidimensional Vulnerability Index (MVI), including its finalization and use. We propose a three-pillared framework covering economic vulnerabilities, structural development vulnerabilities and exposure to climate risks and natural disasters.

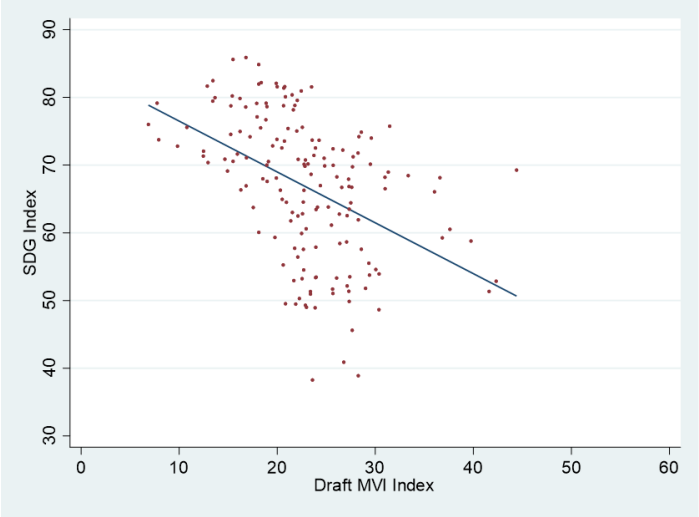
Draft framework for the Multidimensional Vulnerability Index (MVI)



Source: Authors.

The structural vulnerabilities of SIDS affect their ability to achieve the SDGs. Based on a new pilot MVI framework and database, this note presents new preliminary evidence on the link between structural vulnerabilities faced by SIDS and SDG outcomes[6]. Overall, countries with high structural vulnerabilities tend to perform worse on the SDG Index prepared annually by the Sustainable Development Solutions Network (SDSN) and other SDG outcomes, including extreme poverty, life expectancy and subjective well-being. Yet, there are important variations across groups of SIDS on how structural vulnerabilities affect their SDG outcomes.

MVI vs SDG Index: preliminary results



Source: Authors.

Coordinated international actions are needed to address SIDS' vulnerabilities, including dedicated international financing mechanisms. High economic concentration, structural and geographic barriers to development and exposure to climate risks and other disasters require tailored financing mechanisms and policies. This note focuses on the various types of vulnerabilities faced by SIDS in the Atlantic/Indian, Caribbean, and Pacific. Traditional as well as innovative financing mechanisms and solutions, insurance and guarantee mechanisms, Official development Assistance (ODA), debt relief and compensation schemes (among others) can be leveraged to address different types of vulnerabilities. International financing institutions, including the IMF and Multilateral Development Banks can play a key role in supporting SDG investments and infrastructure in SIDS. Government capacities, long-term development pathways, universal access to digital technologies and sound management of the global commons, including oceans, are key for long-term sustainable development of SIDS.

Enhancing statistical capacity and leveraging new sources of the data are key for strengthening the monitoring of vulnerabilities and the SDG progress of SIDS. As emphasized by many international organizations, statistical capacities and data gaps remain major challenges for SIDS. This is an important limitation for measuring multidimensional

[6] Structural vulnerability is defined as any structural limitation which impedes to achieve sustainable development.

vulnerabilities and SDG outcomes. International efforts to build domestic statistical capacities of SIDS should be maintained alongside efforts to identify new sources of data, satellite, big data, crowdsourcing, etc. that can fill gaps.

Disclaimer

The initial results presented in this WP, should really be seen as an initial attempt made by SDSN and the UN Resident Coordinators in the SIDS to conceptualize and measure multidimensional vulnerability. These are preliminary results that will be further refined with the aim of finalizing the MVI after having received feedback from the Member States at the 76th UNGA.

We welcome comments and feedback on our approach. In particular, we aim to:

a) Conduct further consultations with experts and stakeholders;

b) Refine the indicator selection and imputation methods;

c) Develop a special SDG Baseline Assessment for SIDS and assess SDG financing gap in SIDS;

d) Connect the MVI to broader issues such as volatility of GDP and exports, SDG outcomes, resilience, public governance, statistical capacities, development pathways and international financing;

e) Strengthen communication and outreach including to policymakers and international financing institutions.

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1. Introduction

The path to building sustainable development and achieving the SDGs in Small Island Developing States (SIDS) is impeded by their unique set of vulnerabilities. Structural factors, including their size, remoteness, limited resource base, market size, exposure to climate risks and other disasters impact socio-economic outcomes and their ability to achieve the SDGs. The COVID-19 pandemic has amplified these vulnerabilities with many SIDS countries being particularly affected by the drop in international tourism and travels and international remittances. In August 2020, in a letter to the Alliance of Small Island States, the UN Secretary-General committed the United Nations to advocating for SIDS on the issue of access to concessional finance and to undertaking work for the development of a Multidimensional Vulnerability Index (MVI). The letter acknowledged ongoing work by the UN Resident Coordinators and their teams in developing the Index and defining its potential use. In December 2020, the UN General Assembly (UNGA), through resolution A/RES/75/215, mandated the United Nations to produce an MVI for SIDS and present options for its use and requested the UN Secretary-General to report back on the matter at the 76th UNGA.

This short note prepared by the SDSN aims to support the broad UN efforts, including the efforts led by the SIDS UN Resident Coordinators, to develop a sound and robust MVI. Building on the literature and earlier work conducted internationally, it presents a new draft framework and pilot MVI for tracking SIDS structural vulnerabilities[7]. This note also tentatively explores the correlation between this pilot MVI and SDG outcomes, using SDSN's SDG Index and Dashboards results. Finally, the paper discusses the implications for international financing mechanisms and identifies next steps towards developing a sound and robust MVI. Detailed data tables are provided in the Appendix.

2. The draft Multidimensional Vulnerability Index (MVI)

2.1. Index Objectives

Small Island Developing States (SIDS) are a distinct group of 58 countries characterized by certain common inherent characteristics[8]. They are small, undiversified, highly open, in most cases far away from main world markets, and with challenging natural environments (e.g. minimal elevation above sea level, limited access to freshwater resources, etc.). Because of these features, they are exposed to vulnerabilities that hinder their development progress. They are highly exposed to international trade shocks, financial volatility and economic

[7] See, for example, Briguglio (1995); Atkins *et al.* (2000); Guillaumont (2009); Scandurra *et al.* (2018).

[8] The list of SIDS is the one reported by the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN- OHRLLS) and is available at https://www.un.org/ohrlls/content/list-sids

downturns, as well as to natural disasters (e.g. storms, floods, droughts, landslides, etc.) and adverse impacts of climate change (e.g. sea level rise).

Despite the above commonalities, SIDS are also a rather heterogeneous group of countries. They differ by income level, population size, and land area. Most SIDS are middle income countries, with a few high-income economies. All SIDS are characterized by small territories, but while some of them have a land area of less than 50 square kilometers (e.g. Nauru), others can reach up to 450,000 square kilometers (e.g. Papua New Guinea). Some SIDS are very small with just 5,000 inhabitants (e.g. Montserrat) but others have more than 10 million inhabitants (e.g. Dominican Republic, and Haiti). SIDS countries also differ with respect to their geographical location, and the structure of their economies. They are located across different geographic regions – the Caribbean, the Pacific, and the Atlantic, Indian Ocean, Mediterranean and South China Sea (AIMS), and while islands in the Pacific, Atlantic, and Indian Ocean tend to be quite remote, those in the Caribbean Sea are closer to the continent and major markets. Moreover, some SIDS rely more on services (e.g. the Bahamas, and Barbados), while others are more natural resource based (e.g. Papua New Guinea, and Trinidad & Tobago).

To take into account the above aspects, the MVI aims at measuring structural vulnerability by distinguishing across different categories of SIDS. This is important for three main reasons:

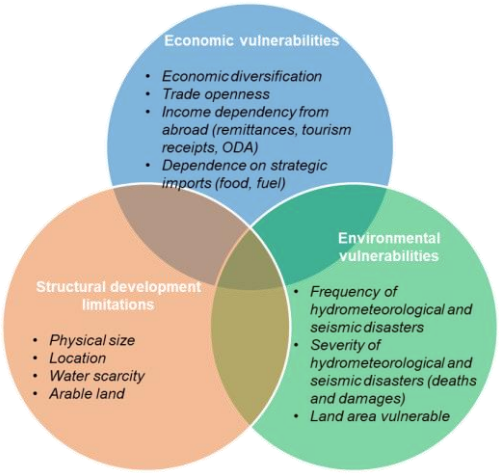
(i) To measure the degree of structural vulnerability and to identify the key sources of vulnerability for each category of SIDS;
(ii) To understand the relationship between structural vulnerability and the achievement of the Sustainable Development Goals (SDGs) across the SIDS categories;
(iii) To shed light on the specific financial mechanisms and development pathways that could be considered taking into account the particular vulnerabilities of each category of SIDS.

Structural vulnerability is defined as any structural limitation which impedes to achieve sustainable development. We focus here specifically on vulnerabilities faced by SIDS. Other factors might affect countries' vulnerability (e.g. being landlocked). Three different dimensions of structural vulnerability are considered: economic vulnerabilities, structural development limitations, and environmental vulnerabilities. Economic vulnerability is the probability that a country is affected by economic and financial external shocks. Structural development limitations refer to those geophysical constraints such as smallness and remoteness which hinder the development progress of a country. Environmental vulnerability is the exposure of a country to the impacts of climate change and natural disasters. Given that a large degree of differentiation exists among SIDS, we distinguish across three different regional clusters: the Atlantic/Indian SIDS, the Caribbean SIDS, and the Pacific SIDS.

2.2. Index Components

The draft Multidimensional Vulnerability Index (MVI) is made up of 18 indicators across three categories, reflecting the three broad dimensions of structural vulnerability discussed in Section 2.1: economic vulnerabilities; structural development limitations; and environmental vulnerabilities (Figure 1).

Figure 1. Framework for the Multidimensional Vulnerability Index (MVI)



Source: Authors.

The category of economic vulnerabilities considers seven indicators measuring a country's degree of exposure to unforeseen exogenous shocks, arising out of economic openness as well as dependency on a narrow range of exports and strategic imports such as food and fuel. To account for a country's exposure to drops in economic resources from abroad, the dependency on remittances, tourism receipts and overseas development assistance (ODA) are included[9].

In the dimension of structural development limitations, five proxies for geophysical vulnerability are used. The size of population is included as a measure for the physical size of a country. To consider the remoteness of an economy, we also look at maritime connectivity, as well as at transport costs. It is assumed that the more remote is a country and the less connected it is to global shipping networks, then the higher are the transport costs it is likely to incur. In addition to this, a measure of the percentage of arable land and a measure of total internal renewable freshwater resources per capita are included.

The environmental dimension includes six factors related to a country's vulnerability to natural hazards and climate change. Both the frequency and severity of natural disasters are considered. We distinguish between hydrometeorological disasters (e.g. drought, flood, storm, and extreme temperature, among others) and seismic disasters (e.g. earthquakes and

[9] Dependence on FDI was included in a previous version of the MVI. However, it was not statistically significant for the economic vulnerability of SIDS regions. Therefore, we decided to withdraw this variable from the Index.

volcanic activity). As a proxy of vulnerability to sea-level rise the percentage of land areas where elevation is below 5 meters is included.

Definitions, data sources and descriptive statistics of the variables included in the MVI are reported in Table A1 in the Appendix.

2.3. Country Coverage

To shed light on how SIDS are placed compared to the rest of the world for the indicators selected to measure SIDS vulnerabilities, each indicator in the MVI is extended to cover 195 countries, including both developed and developing economies. Country coverage is constrained by data availability.

Among the countries included in the MVI, 45 are SIDS: 37 UN-Members, and eight Non-UN Members[10]. In terms of their regional distribution, 18 of covered SIDS are in the Pacific Ocean, while 9 are in the Atlantic and Indian Ocean, and 18 are in the Caribbean Sea (Table A2).

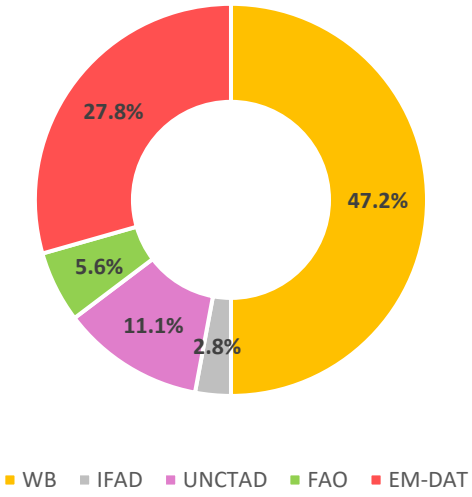
2.4. Data

The MVI uses a mix of official data sources and non-governmental data sources. Official data are sourced from international organizations' databases. More than half of the official data used come from the World Bank (Figure 2).

All the data related to variables under the economic dimension are official and sourced from the World Bank's World Development Indicators (WDI), except for remittances for which the World Bank's data are integrated with those reported in the IFAD's RemitSCOPE. UNCTADstat is used for gathering data on the Product Concentration Index of exports and the Liner Shipping Connectivity Index. Data on the ratio between the cost insurance freight (CIF) and the freight on board (FOB) stem from the IMF's Direction of Trade Statistics (DOTS), while data on total internal renewable water resources per capita are sourced from the FAO's Aquastat.

[10] The list of SIDS is the one reported by the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN- OHRLLS) and is available at https://www.un.org/ohrlls/content/list-sids

Figure 2. Official data sources used in the MVI



Source: Authors.

Non-governmental data sources are used for most of the variables under the environmental dimension. Indeed, data used to measure countries' vulnerability to natural disasters and climate change come from the Emergency Events Database (EM-DAT) of the Centre for Research on the Epidemiology of Disasters (CRED) within the Université Catholique de Louvain.

2.5. Construction and Technical Aspects

In this section, the methodology used to construct the index and the approaches adopted to deal with technical issues such as missing data are discussed. It builds on the OECD and JRC Handbook on constructing composite indicators (2008)[11].

2.5.1. Computing the MVI

The draft MVI is a composite index, that is a weighted aggregation of the 18 selected indicators described in Section 2.2. Although these variables are certainly not exhaustive to measure a country's structural vulnerability, some of them were used previously in other vulnerability indices and they satisfy the criteria of relevance, simplicity, transparency, and reproducibility[12].

[11] OECD and JRC (2008).

[12] For example, similar indicators are used in the UN Committee for Development Policy Economic Vulnerability Index (EVI), Commonwealth Vulnerability Index, and the Caribbean Development Bank's Multidimensional Vulnerability Index for the Caribbean, among others.

To compute the MVI and to reduce the volatility of some of the indicators, the five-year average of the latest available data is used – in most cases the period covered is 2015-19[13]. When this is not possible due to data constraints, data for the latest available year are used. In the case of the indicators related to the frequency and severity of natural disasters, the 2009-19 average of the latest available data is used.

The procedure for calculating the MVI comprises three main steps:

(i) Dealing with outliers at the top and bottom of the distribution: remove extreme values from the distribution of each indicator;

(ii) Normalization: rescale the data to ensure comparability across indicators;

(iii) Constructing the MVI: aggregate the indicators into the three dimensions (economic vulnerability, structural development limitations, and environmental vulnerability), and estimate the final MVI Index.

To control for outliers, we fix the extreme values from the distribution of each indicator as follows. If a specific indicator has an ascending relationship with vulnerability (e.g. the more a country is dependent on remittances, the more vulnerable it is), we fix the bottom bound at the 2.5th percentile and the upper bound at the average of the top 5 values. All values exceeding the upper bound score 100, and values below the lower bound score 0. The opposite (average of the lowest 5 values – 97.5th percentile) applies to indicators with a descending relationship with vulnerability (e.g. the more freshwater resources per capita are available, the less vulnerable a country is). Table A1 in the Appendix reports the relationship between each indicator and vulnerability.

After establishing the upper and lower bounds, all indicators are transformed linearly to a scale between 0 and 100 to ensure that data are comparable. In the case of the population and freshwater resources per capita indicators, we rescale using the natural logarithm before normalization.

Each indicator is normalized from 0 to 100, using the Min/Max formula:

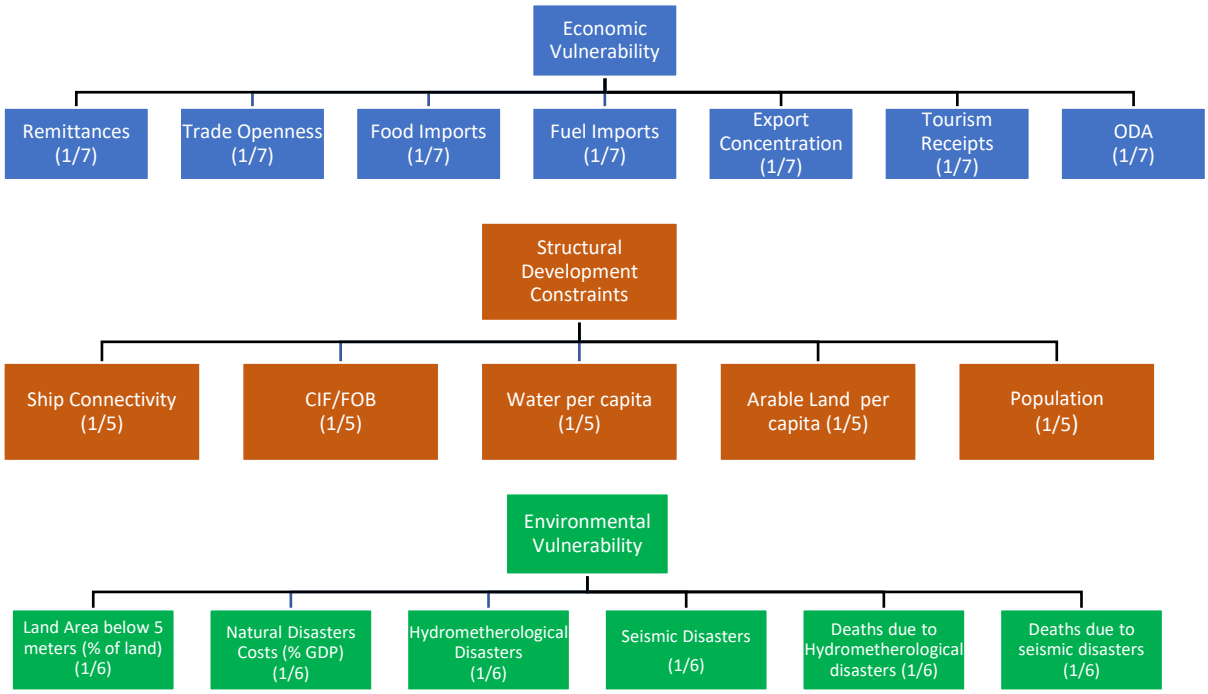
$$x' = \frac{x - \min(x)}{\max(x) - \min(x)}$$

where *x* is the raw data value; *max*/*min* denote the bounds for the highest and lowest value; and *x'* is the normalized value after rescaling.

Once all variables are normalized, we proceed to create the three dimensions of structural vulnerability by dividing the 18 selected indicators into three groups as shown in Figure 3. Seven indicators are allocated to the economic dimension, five to the structural development limitations dimension, and six to the environmental dimension. In each dimension, the normalized indicators are aggregated using equal weights.

[13] Note that pre-2020 data are used. So, the impact of the current COVID-19 pandemic crisis is not captured in the MVI values.

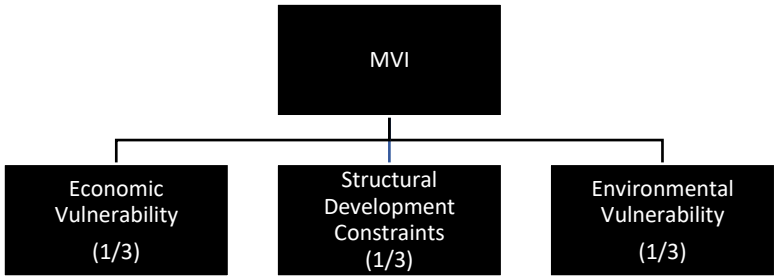
Figure 3. The three dimensions of the MVI



Source: Authors.

To compute the MVI score for each country, we then aggregate the three dimensions using equal weights (Figure 4).

Figure 4. The MVI



Source: Authors.

2.5.2. Missing Data

Only countries having data for at least 70% of the variables included in the MVI are included to calculate the MVI scores. Table A3 in the Appendix provides the list of countries that do not meet the cut-off.

In order to retain as many SIDS as possible in the data sample, the regional average value is imputed for those countries that have a missing value for one or several indicators[14]. Table A4 in the Appendix indicates for which countries and across which variables we use imputation to deal with missing data.

In the case of remittances for Asian and Pacific countries, missing values are imputed using data reported in the IFAD's RemitSCOPE[15].

When dealing with ODA, we allocate a value equal to zero to those countries that reported no data and/or are classified as developed economies.

The issue of missing data when constructing the MVI sheds light on the need of better data especially for developing countries and SIDS. Table A4 gives an idea of which data would be needed to refine the draft MVI.

2.6. Results

As mentioned above, the MVI – focusing on 18 vulnerability indicators relevant to SIDS – is calculated for 195 developing and developed countries, of which 45 are SIDS.

Tables 1-3 report the 30 most vulnerable countries in the three dimensions of the MVI[16]. SIDS clearly represent the biggest share of most vulnerable countries across the world in all dimensions. In the economic dimension, 80% of the top-30 most vulnerable countries are SIDS, 83% in the structural development dimension, and 77% in the environmental dimension.

[14] The regional average is the average of the remaining countries in the sample that are in the same region.

[15] In the case of Tuvalu, we impute a value of 11.9% in 2016. In the case of American Samoa, Brunei Darussalam, Korea Dem., Guam, and Northern Mariana Islands, we impute a value equal to 0 since these countries are registered as non-receiving countries.

[16] MVI values by pillar for all countries are reported in Tables A10-A12.

Table 1. Top-30 most vulnerable countries in the MVI economic dimension

Country	*Draft MVI Economic Dimension*	*Regions*
Antigua and Barbuda	40.98	SIDS_Caribbean
Aruba	36.91	SIDS_Caribbean
Cabo Verde	42.49	SIDS_AtlanticIndian
Comoros (the)	37.77	SIDS_AtlanticIndian
Dominica	36.56	SIDS_Caribbean
Gambia (the)	41.57	SSA
Guinea-Bissau	38.95	SIDS_AtlanticIndian
Jamaica	41.33	SIDS_Caribbean
Kiribati	48.54	SIDS_Pacific
Kyrgyzstan	38.97	CentralAsia
Liberia	44.03	SSA
Maldives	42.42	SIDS_AtlanticIndian
Mali	35.94	SSA
Malta	35.09	Europe
Marshall Islands (the)	49.02	SIDS_Pacific
Micronesia (Federated States of)	53.64	SIDS_Pacific
Nauru	46.56	SIDS_Pacific
New Caledonia	35.53	SIDS_Pacific
Palau	48.95	SIDS_Pacific
Saint Lucia	36.48	SIDS_Caribbean
Saint Vincent and the Grenadines	37.38	SIDS_Caribbean
Samoa	44.58	SIDS_Pacific
Sao Tome and Principe	43.76	SIDS_AtlanticIndian
Seychelles	39.46	SIDS_AtlanticIndian
Solomon Islands	36.29	SIDS_Pacific
Timor-Leste	37.50	SIDS_Pacific
Tonga	50.64	SIDS_Pacific
Tuvalu	50.43	SIDS_Pacific
Vanuatu	43.74	SIDS_Pacific
Yemen	49.28	MENA

Source: Authors. *Notes*: Countries are reported in alphabetic order. The global average value is 24.22.

Table 2. Top-30 most vulnerable countries in the MVI structural development dimension

Country	*Draft MVI Structural Development Dimension*	*Regions*
American Samoa	61.57	SIDS_Pacific
Antigua and Barbuda	67.67	SIDS_Caribbean
Aruba	69.44	SIDS_Caribbean
Bahrain	66.54	SIDS_AtlanticIndian
Barbados	67.09	SIDS_Caribbean
Bermuda	77.71	SIDS_Caribbean
Cabo Verde	65.23	SIDS_AtlanticIndian
Cayman Islands (the)	67.87	SIDS_Caribbean
Dominica	65.72	SIDS_Caribbean
Gambia (the)	62.86	SSA
Greenland	65.20	Europe
Grenada	68.90	SIDS_Caribbean
Guam	61.46	SIDS_Pacific
Kiribati	62.04	SIDS_Pacific
Maldives	75.78	SIDS_AtlanticIndian
Marshall Islands (the)	68.11	SIDS_Pacific
Micronesia (Federated States of)	62.30	SIDS_Pacific
Montenegro	61.97	Europe
Nauru	69.31	SIDS_Pacific
Northern Mariana Islands (the)	64.70	SIDS_Pacific
Palau	78.45	SIDS_Pacific
Qatar	63.93	MENA
Saint Kitts and Nevis	70.04	SIDS_Caribbean
Saint Lucia	65.37	SIDS_Caribbean
Saint Vincent and the Grenadines	67.24	SIDS_Caribbean
Sao Tome and Principe	75.22	SIDS_AtlanticIndian
Seychelles	67.92	SIDS_AtlanticIndian
Timor-Leste	63.67	SIDS_Pacific
Tuvalu	73.40	SIDS_Pacific
Yemen	77.28	MENA

Source: Authors. *Notes*: Countries are reported in alphabetic order. The global average value is 48.37.

Table 3. Top-30 most vulnerable countries in the MVI environmental dimension

Country	*Draft MVI Environmental Dimension*	*Regions*
American Samoa	34.51	SIDS_Pacific
Antigua and Barbuda	10.60	SIDS_Caribbean
Bahamas (the)	26.83	SIDS_Caribbean
Bahrain	11.22	SIDS_AtlanticIndian
Barbados	5.28	SIDS_Caribbean
Comoros (the)	7.51	SIDS_AtlanticIndian
Congo (the)	4.78	SSA
Denmark	4.83	Europe
Dominica	33.71	SIDS_Caribbean
Fiji	4.10	SIDS_Pacific
French Polynesia	7.02	SIDS_Pacific
Gambia (the)	6.08	SSA
Haiti	37.93	SIDS_Caribbean
Hong Kong	6.76	EastAsiaPacific
Kiribati	18.43	SIDS_Pacific
Maldives	15.02	SIDS_AtlanticIndian
Marshall Islands (the)	26.38	SIDS_Pacific
Micronesia (Federated States of)	5.46	SIDS_Pacific
Nepal	7.04	SouthAsia
Netherlands (the)	16.98	Europe
Northern Mariana Islands (the)	4.69	SIDS_Pacific
Saint Kitts and Nevis	4.32	SIDS_Caribbean
Saint Lucia	7.54	SIDS_Caribbean
Saint Vincent and the Grenadines	13.12	SIDS_Caribbean
Samoa	9.94	SIDS_Pacific
Seychelles	8.53	SIDS_AtlanticIndian
Tonga	25.19	SIDS_Pacific
Tuvalu	27.45	SIDS_Pacific
Vanuatu	13.56	SIDS_Pacific
Viet Nam	5.63	EastAsiaPacific

Source: Authors. *Notes*: Countries are reported in alphabetic order. The global average value is 2.85.

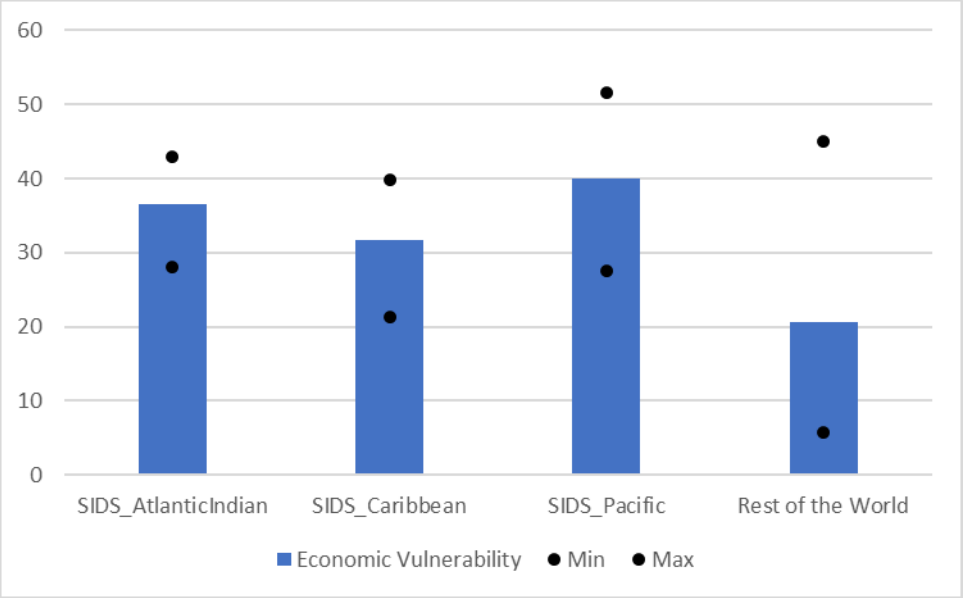
The results of the regression of the MVI against the world regional dummy variables, including those for the three SIDS regional clusters, show that *all* SIDS regions are much more vulnerable than any other region in the world (Table A5). Indeed, the coefficients of the SIDS regional dummy variables are positive, significant, with a magnitude considerably higher than that of the coefficients of any other regional dummy. Notably, the SIDS Pacific region has the highest coefficients, followed by the SIDS Atlantic/Indian region, and the SIDS Caribbean region.

Although all the three SIDS regions are highly vulnerable compared to the rest of the world, there are important differences across them. As shown in Tables A6-A8, when regressing each of the MVI dimensions – economic vulnerability, structural development constraints, environmental vulnerability – against the world regional dummy variables, all the SIDS regions result to be vulnerable across all the three dimensions. But SIDS in both the Pacific Ocean and Atlantic/Indian Ocean are particularly vulnerable economically, while

Atlantic/Indian SIDS seem to face slightly more development constraints compared to their peers. From an environmental perspective, the Pacific and Caribbean SIDS result to be the most exposed to environmental shocks.

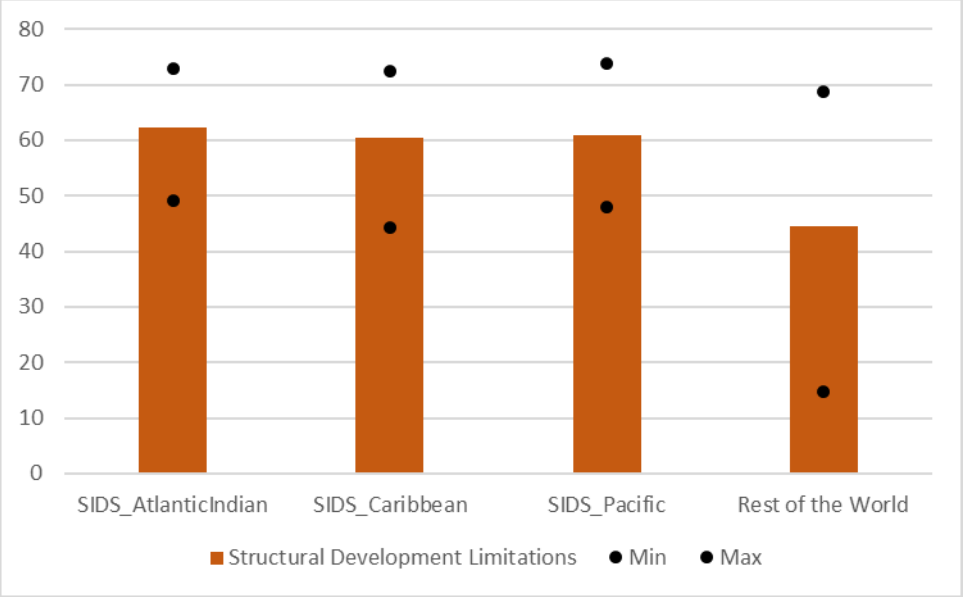
Figures 5-7 summarize the described results and point out to the fact that within each region there is a certain degree of heterogeneity across countries in all dimensions. Notably, there is a big heterogeneity across countries in the Caribbean and Pacific regions under the environmental dimension.

Figure 5. MVI economic dimension: Average vulnerability, by regions



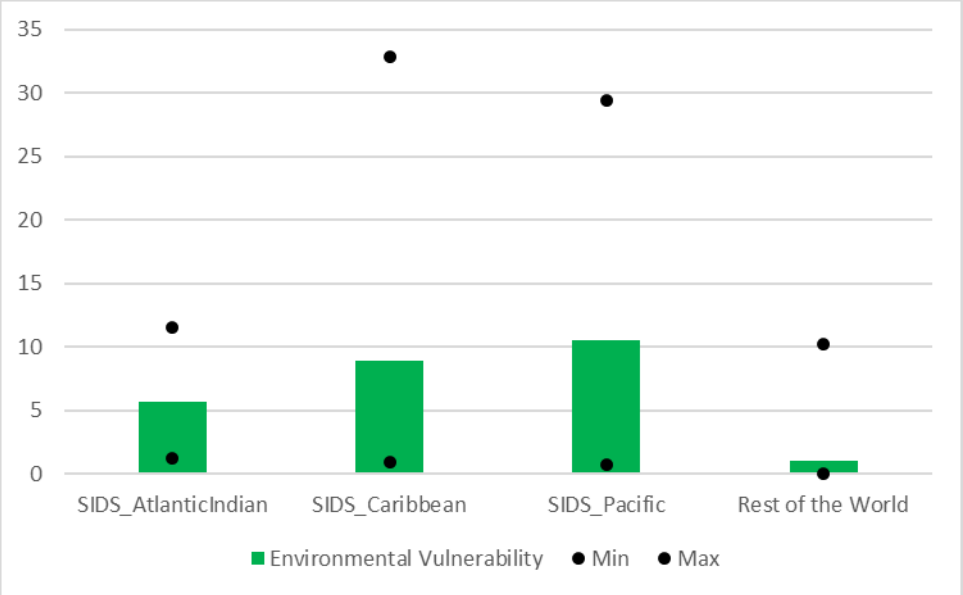
Source: Authors.

Figure 6. MVI structural development dimension: Average vulnerability, by regions



Source: Authors.

Figure 7. MVI environmental dimension: Average vulnerability, by regions



Source: Authors.

When checking which variables may explain the high vulnerability of SIDS regions across the three MVI dimensions, we find that food imports, export concentration, tourism dependence, small population, the limited size of arable land, and vulnerability to sea-level rise have strong explanatory power. Nevertheless, there are differences across SIDS regions as shown in Figures A1-A3 in the Appendix.

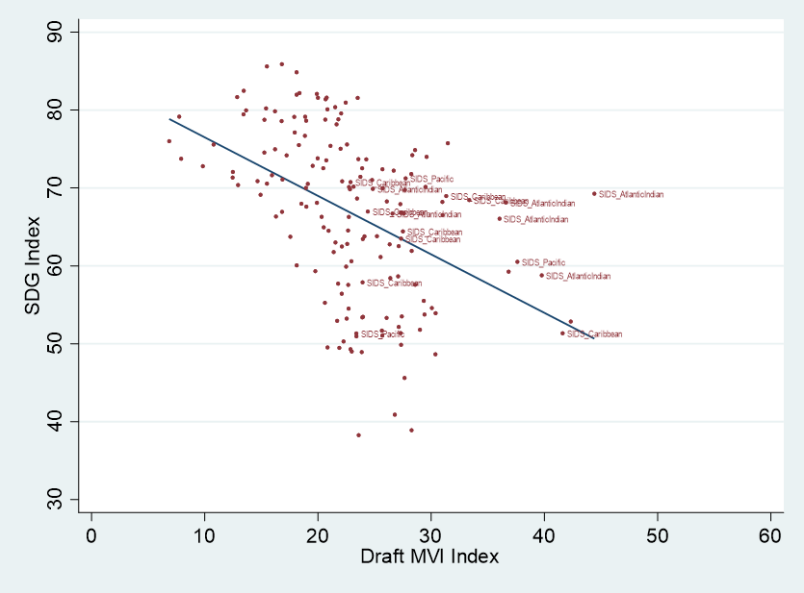
3. Vulnerability and other outcomes

As discussed in the above Sections, SIDS are characterized by a very high degree of structural vulnerability which has been exacerbated by the impact of the COVID-19 pandemic. Such vulnerability is likely to have a significant impact on socio-economic outcomes and SIDS' ability to achieve the Sustainable Development Goals (SDGs). Therefore, in this section, we investigate the relationship between the MVI, SDSN's SDG Index, and a number of headline SDG indicators including extreme poverty, life expectancy, and subjective well-being.

3.1. Vulnerability vs SDG Index

In order to study whether structural vulnerability affect the progress towards achieving the SDGs, we first regress the SDG Index against the pilot MVI. The SDG Index measures how much of the distance to the Sustainable Development Goals a country has already covered; therefore, the higher the Index the closer a country is in achieving its SDG targets. The results of the regression are reported in Table A9. Figure 8 shows that there exists a negative relationship between the MVI and the SDG Index. So, a higher degree of structural vulnerability is associated with a lower SDG Index performance. This implies that highly vulnerable countries face more difficulties to reach the SDG targets.

Figure 8. MVI vs SDG Index

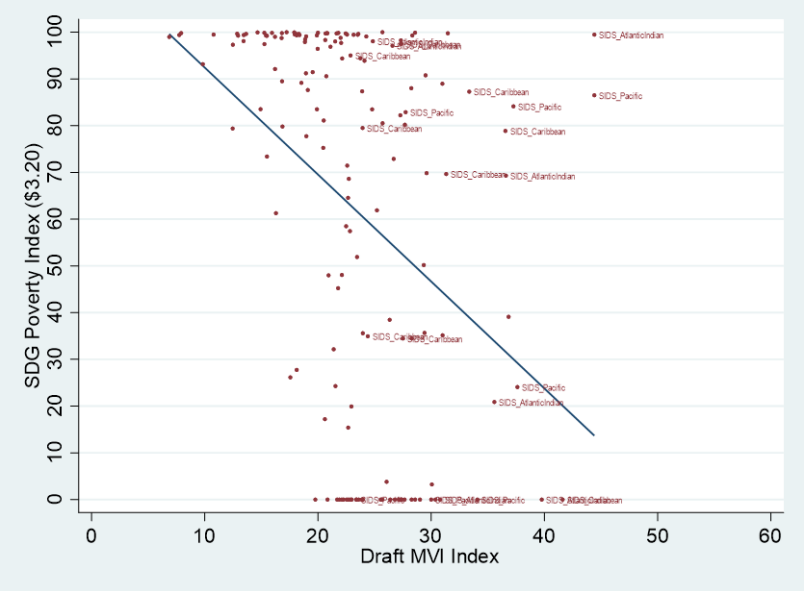


Source: Authors.

3.2. Vulnerability vs Key SDG Indicators

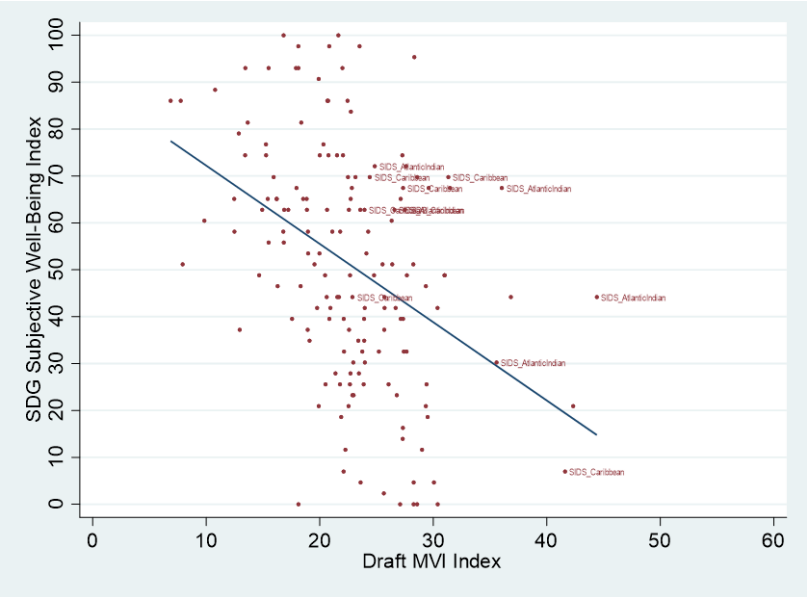
A few regressions are also conducted to study the relationship between structural vulnerability and other socio-economic outcomes. We test the impact of vulnerability as measured by the MVI on three SDG outcomes: poverty, subjective well-being, and life expectancy (Table A9). As shown by Figures 9-11, there is a clear negative relationship between the MVI and these outcomes, thus suggesting that countries with a higher degree of vulnerability are likely to experience bigger SDG gaps in poverty, health, and subjective well-being.

Figure 9. MVI vs Poverty



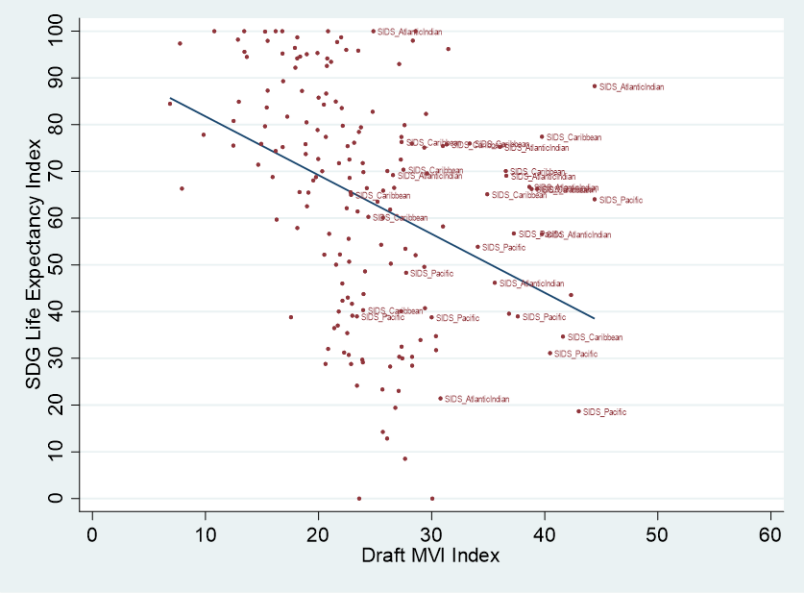
Source: Authors.

Figure 10. MVI vs Subjective Well-Being



Source: Authors.

Figure 11. MVI vs Life Expectancy



Source: Authors.

The negative relationship between the MVI and the SDG indicators above still holds when reducing the sample of analysis to SIDS only, although given the small number of countries the relationship is not significant anymore.

Figures 9-11 highlights that there are important variations across groups of SIDS on how structural vulnerabilities affect their SDG outcomes. Countries with the same level of vulnerability can have very different SDG outcomes. These variations might be due to various factors such as institutional and state capacities, partnerships and investment flows, as well as social and development policies, and other factors.

4. Conclusions and Next Steps

The initial results presented suggest that SIDS are more vulnerable than other world regions. At the same time, the type of vulnerability faced by Atlantic/Indian SIDS, Caribbean SIDS, and Pacific SIDS tends to vary and may require different types of financing mechanisms and development pathways to support resilience, emergency responses and sustainable development. These initial results also emphasize the strong negative correlation between high structural vulnerabilities and poor SDG outcomes, including extreme poverty, life expectancy and subjective well-being.

The initial results presented in this WP, should really be seen as an initial attempt made by SDSN and the UN Resident Coordinators in the SIDS to conceptualize and measure multidimensional vulnerability. These are preliminary results that will be further refined with the aim of finalizing the MVI after having received feedback from the Member States at the 76th UNGA.

We welcome comments and feedback on our approach. In particular, we aim to:

a) Conduct further consultations with experts and stakeholders;
b) Refine the indicator selection and imputation methods;
c) Develop a special SDG Baseline Assessment for SIDS and assess SDG financing gap in SIDS;
d) Connect the MVI to broader issues such as volatility of GDP and exports, SDG outcomes, resilience, public governance, statistical capacities, development pathways and international financing;
e) Strengthen communication and outreach including to policymakers and international financing institutions.

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among others.

Supplementary information

Table A1. Definitions, data sources and descriptive statistics of the MVI indicators

Variable	Description	Source	Obs	Mean	Std. Dev.	Min	Max	Impact on Vulnerability
Economic Vulnerabilities								
Remittances	Personal remittances, received (% of GDP)	WB WDI & IFAD REMITSCOPE	185	4.65	6.26	0.00	33.74	ascending
ODA	ODA (% of GDP)	WB WDI	195	3.46	6.50	-0.01	53.94	ascending
Trade Openness	Exports and imports of goods and services (% of GDP)	WB WDI	180	91.38	55.38	19.58	393.54	ascending
Food Imports	Food imports (% of merchandise imports)	WB WDI	169	15.14	7.68	3.84	46.26	ascending
Fuel Imports	Fuel imports (% of merchandise imports)	WB WDI	169	13.36	6.64	0.56	30.09	ascending
Export Concentration	Product concentration index for exports	UNCTAD	195	0.35	0.21	0.05	0.98	ascending
Tourism Receipts	Tourism receipts (% of GDP)	WB WDI	169	7.53	11.31	0.03	59.58	ascending
Structural Development Limitations								
Population	Population (log)	WB WDI	195	38000000.00	143000000.00	11369.60	1390000000.00	descending
Ship Connectivity	Liner Ship Connectivity Index	UNCTAD	156	18.06	17.81	0.49	100.00	descending
CIF/FOB	Ratio of Cost Insurance Freight (CIF)/Freight on Board (FOB) factors	IM DOTS	192	374.61	787.50	23.64	8557.43	ascending
Water per capita	Total internal renewable water resources per capita (log)	FAO AQUASTAT	176	15903.74	48834.46	0.00	508383.80	descending
Arable Land per capita	Arable land (hectares per capita)	WB WDI	192	0.20	0.23	0.00	1.66	descending
Environmental Vulnerabilities								
Land Area below 5m	Land area where elevation is below 5 meters (% of total land area)	WB WDI	195	3.76	8.95	0.00	55.56	ascending
Natural disasters Costs	Natural disasters costs (% of GDP)	EM-DAT	195	0.62	5.39	0.00	73.88	ascending
Hydrometeorological Disasters	Number of hydrometherological disasters (drought, flood, storm, extreme temperature, landslide, wildfire), adjusted by land area (sq. km)	EM-DAT	195	0.01	0.05	0.00	0.61	ascending
Seismic Disasters	Number of seismic disasters (earthquake, volcanic activity), adjusted by land area (sq. km)	EM-DAT	195	0.00	0.00	0.00	0.05	ascending
Deaths due to Hydrometeorological Disasters	Total deaths due to hydrometherological natural disasters (drought, flood, storm, extreme temperature, landslide, wildfire) (% of population)	EM-DAT	195	0.00	0.01	0.00	0.19	ascending
Deaths due to Seismic Disasters	Total deaths due to seismic natural disasters (earthquake, volcanic activity) (% of population)	EM-DAT	195	0.00	0.01	0.00	0.18	ascending

Source: Authors' calculations using several different data sources.

Table A2. SIDS covered by the MVI (UN Members and Non-UN Members), by geographical regions

Pacific SIDS		Caribbean SIDS		Atlantic / Indian SIDS	
UN Members	***Non-UN Members***	***UN Members***	***Non-UN Members***	***UN Members***	***Non-UN Members***
Tuvalu	American Samoa	Dominica	Bermuda	Baharain	
Fiji	French Polynesia	Haiti	Aruba	Cabo Verde	
Kiribati	Guam	Antigua and Barbuda	Cayman Islands (the)	Comoros (the)	
Marshall Islands (the)	New Caledonia	Saint Vincent and the Grenadines		Guinea-Bissau	
Micronesia (Federated States of)	Northern Mariana Islands (the)	Bahamas (the)		Maldives	
Nauru		Saint Lucia		Mauritius	
Palau		Grenada		São Tomé and Príncipe	
Papua New Guinea		Barbados		Seychelles	
Samoa		Saint Kitts and Nevis		Singapore	
Solomon Islands		Jamaica			
Timor-Leste		Belize			
Tonga		Trinidad and Tobago			
Vanuatu		Suriname			
		Guyana			
		Dominican Republic (the)			

Source: Authors. *Note*: SIDS not included in the MVI are: Anguilla, Cook Islands, Cuba, Curaçao, Guadeloupe, Martinique, Montserrat, Niue, Sint Maarten, Puerto Rico, Turks and Caicos Islands, British Virgin Islands, U.S. Virgin Islands.

Table A3. List of countries deleted for having more than 30% missing variables

Country	Number of Missing Indicators	% of Missing Data
Anguilla	9	50
Cook Islands (the)	10	56
Curaçao	6	33
Eritrea	6	33
Guadeloupe	11	61
Martinique	11	61
Montserrat	9	50
Niue	11	61
Sint Maarten (Dutch part)	6	33
Turks and Caicos Islands (the)	6	33
Virgin Islands (British)	7	39
Virgin Islands (U.S.)	6	33

Source: Authors.

Table A4. Imputation by variable and by country

Country	Food Imports	Fuel Imports	Tourism Receipts	Remittances	CIF/FOB ratio	Trade Openness	Water per capita	Arable Land per capita
Afghanistan						x		
American Samoa	x	x					x	
Aruba							x	
Bahamas (the)				x				
Bahrain				x				
Belize			x					
Bermuda							x	
Bhutan	x	x						
Burundi			x					
Cayman Islands (the)					x	x	x	
Central African Republic (the)			x	x				
Chad	x	x	x	x				
China			x					
Congo (the Democratic Republic of the)	x	x						
Djibouti	x	x						
Dominica	x	x						
Equatorial Guinea	x	x	x	x				
French Polynesia			x	x		x	x	
Gabon	x	x						
Greenland			x	x			x	
Grenada	x	x						
Guam	x	x	x				x	
Guinea-Bissau	x	x						
Guyana			x			x		
Haiti	x	x						
Hong Kong							x	
Iceland			x					
Iraq	x	x						
Jamaica			x					
Kiribati							x	
Kuwait							x	
Latvia			x					
Lesotho			x					
Liberia	x	x	x					
Libya			x	x				
Lithuania			x					
Malta			x					
Marshall Islands (the)	x	x					x	
Micronesia (Federated States of)							x	
Montenegro							x	
Nauru	x	x						x
New Caledonia			x	x		x	x	
Nicaragua			x					
Northern Mariana Islands (the)	x	x	x		x		x	
Palau							x	
Papua New Guinea	x	x				x		
Republic of North Macedonia					x			
Saint Kitts and Nevis						x		
Saint Lucia						x		
Saint Vincent and the Grenadines						x		
Samoa							x	
Sao Tome and Principe						x		
Serbia	x	x						
Seychelles							x	
Somalia	x	x	x					
South Sudan	x	x						x
Spain			x					
Sudan (the)	x	x						
Suriname						x		
Sweden			x					
Tajikistan	x	x						
Tonga	x	x					x	
Trinidad and Tobago	x					x		
Turkmenistan		x	x					
Tuvalu						x	x	x
United Arab Emirates (the)				x				
United Kingdom of Great Britain and Northern Ireland (the)			x					
Vanuatu	x	x				x		
Yemen						x		

Source: Authors.

Table A5. Regression results: MVI vs SIDS regions and other world regions

Variable	MVI									
SIDS-Caribbean	9.45***	10.91***	11.62***	10.90***	10.11***	10.54***	12.95***	13.93***	12.05***	13.49***
SIDS-Pacific		14.34***	15.06***	14.34***	13.55***	13.98***	16.39***	17.37***	15.49***	16.93***
SIDS-AtlanticIndian			12.70***	11.97***	11.19***	11.62***	14.02***	15.00***	13.12***	14.57***
Europe				-2.60***	-3.38***	-2.95***	-0.54	0.43	-1.44	
LatinAmerica					-4.98***	-4.54***	-2.14	-1.16	-3.04	-1.59
MENA						2.31	4.72***	5.69***	3.82	5.26***
SSA							4.34***	5.32***	3.44	4.89***
SouthAsia								4.61**	2.73	4.18**
EastAsiaPacific									-3.05	-1.61
CentralAsia										5.04***
NorthAmerica										-12.93***
Constant	24.28***	22.82***	22.10***	22.83***	23.61***	23.18***	20.78***	19.80***	21.68***	20.23***
Observations	195	195	195	195	195	195	195	195	195	195
R_2	0.11	0.38	0.48	0.5	0.53	0.53	0.56	0.57	0.57	0.61
Adj R_2	0.11	0.37	0.48	0.49	0.51	0.52	0.54	0.55	0.55	0.59

Source: Authors' own calculations.

Notes: The regression we run is:

$$MVI_i = \beta_0 + \delta_0 d_{CaribbeanSIDS} + \delta_1 d_{PacificSIDS} + \delta_2 d_{AtlanticIndianSIDS} + \delta_3 d_{EuropeSIDS} + \cdots + \varepsilon_i$$

where: MVI_i is the MVI score for country *i*, *d* are regional dummies, and ε_i is the error term.
* p<.1; ** p<.05; *** p<.01

Table A6. Regression results: Economic vulnerability vs SIDS regions and other world regions

Variable	Economic Vulnerability									
SIDS-Caribbean	8.43***	10.31***	11.21***	9.65***	8.48***	8.26***	11.86***	12.90***	10.23***	15.22***
SIDS-Pacific		18.48***	19.38***	17.82***	16.65***	16.43***	20.03***	21.07***	18.40***	23.39***
SIDS-AtlanticIndian			15.89***	14.33***	13.16***	12.94***	16.54***	17.57***	14.91***	19.90***
Europe				-5.57***	-6.74***	-6.96***	-3.36*	-2.33	-4.99	
LatinAmerica					-7.44***	-7.66***	-4.06*	-3.03	-5.70	-0.70
MENA						-1.18	2.42	3.46	0.79	5.78**
SSA							6.50***	7.53***	4.86	9.86***
SouthAsia								4.88*	2.22	7.21***
EastAsiaPacific									-4.34	0.66
CentralAsia										8.87***
NorthAmerica										-10.52***
Constant	23.46***	21.58***	20.68***	22.24***	23.41***	23.63***	20.03***	19.00***	21.66***	16.67***
Observations	195	195	195	195	195	195	195	195	195	195
R_2	0.05	0.31	0.41	0.45	0.49	0.49	0.53	0.53	0.54	0.57
Adj R_2	0.05	0.3	0.4	0.44	0.48	0.47	0.51	0.51	0.51	0.54

Source: Authors' own calculations.

Notes: The regression we run is:

$$EcV_i = \beta_0 + \delta_0 d_{CaribbeanSIDS} + \delta_1 d_{PacificSIDS} + \delta_2 d_{AtlanticIndianSIDS} + \delta_3 d_{EuropeSIDS} + \cdots + \varepsilon_i$$

where: EcV_i is the score for the MVI economic vulnerability dimension for country *i*, *d* are regional dummies, and ε_i is the error term.
* p<.1; ** p<.05; *** p<.01

Table A7. Regression results: Structural development vs SIDS regions and other world regions

Variable	Structural Development Limitations									
SIDS-Caribbean	13.27***	14.83***	15.83***	15.11***	13.95***	15.50***	19.56***	21.22***	17.39***	17.68***
SIDS-Pacific		15.37***	16.36***	15.64***	14.48***	16.03***	20.09***	21.75***	17.92***	18.22***
SIDS-AtlanticIndian			17.59***	16.87***	15.71***	17.26***	21.32***	22.98***	19.15***	19.44***
Europe				-2.58	-3.73*	-2.19	1.87	3.53	-0.29	
LatinAmerica					-7.34***	-5.80***	-1.74	-0.08	-3.90	-3.61
MENA						8.27***	12.33***	13.99***	10.17*	10.46***
SSA							7.33***	8.99***	5.16	5.45***
SouthAsia								7.83**	4.01	4.30
EastAsiaPacific									-6.21	-5.92**
CentralAsia										7.28**
NorthAmerica										-27.66***
Constant	47.15***	45.58***	44.59***	45.31***	46.47***	44.92***	40.86***	39.20***	43.02***	42.73***
Observations	195	195	195	195	195	195	195	195	195	195
R_2	0.1	0.23	0.32	0.33	0.36	0.39	0.42	0.43	0.44	0.51
Adj R_2	0.09	0.22	0.31	0.32	0.34	0.37	0.4	0.41	0.42	0.48

Source: Authors' own calculations.

Notes: The regression we run is:

$$Dev_i = \beta_0 + \delta_0 d_{CaribbeanSIDS} + \delta_1 d_{PacificSIDS} + \delta_2 d_{AtlanticIndianSIDS} + \delta_3 d_{EuropeSIDS} + \cdots + \varepsilon_i$$

where: Dev_i is the score for the MVI structural development dimension for country *i*, *d* are regional dummies, and ε_i is the error term.

* p<.1; ** p<.05; *** p<.01

Table A8. Regression results: Environmental vulnerability vs SIDS regions and other world regions

Variable	Environmental Vulnerability									
SIDS-Caribbean	6.63**	7.57***	7.83***	7.93***	7.90***	7.87***	7.43***	7.67***	8.53***	7.58***
SIDS-Pacific		9.19***	9.45***	9.55***	9.52***	9.49***	9.05***	9.29***	10.15***	9.20***
SIDS-AtlanticIndian			4.61***	4.70***	4.68***	4.65***	4.21**	4.45***	5.31***	4.36**
Europe				0.35	0.33	0.30	-0.15	0.09	0.95**	
LatinAmerica					-0.14	-0.17	-0.61*	-0.38	0.49***	-0.47
MENA						-0.16	-0.60	-0.37	0.49*	-0.46
SSA							-0.80**	-0.56	0.30	-0.65
SouthAsia								1.11	1.97**	1.02
EastAsiaPacific									1.40***	0.45
CentralAsia										-1.04**
NorthAmerica										-0.61
Constant	2.24***	1.30***	1.04***	0.95***	0.97***	1.00***	1.44***	1.20***	0.34***	1.29***
Observations	195	195	195	195	195	195	195	195	195	195
R_2	0.1	0.28	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Adj R_2	0.09	0.28	0.3	0.29	0.29	0.29	0.28	0.28	0.28	0.27

Source: Authors' own calculations.

Notes: The regression we run is:

$$Env_i = \beta_0 + \delta_0 d_{CaribbeanSIDS} + \delta_1 d_{PacificSIDS} + \delta_2 d_{AtlanticIndianSIDS} + \delta_3 d_{EuropeSIDS} + \cdots + \varepsilon_i$$

where: Env_i is the score for the MVI environmental vulnerability dimension for country *i*, *d* are regional dummies, and ε_i is the error term.

* p<.1; ** p<.05; *** p<.01

Table A9. MVI vs SDG Index and other SDG outcomes

	MVI vs SDGs			
Variable	**SDG Index**	**Poverty ($3.20)**	**Life Expectancy**	**Subjective Well-Being**
Pilot MVI	-0.75***	-2.59***	-1.51***	-1.68***
Constant	84.01***	121.79***	99.76***	89.08***
N	163	154	163	156
R2	0.20	0.16	0.15	0.16
Adj R2	0.20	0.15	0.15	0.16

Source: Authors' own calculations.

Notes: The regression we run is:

$$Y_i = \beta_0 + \beta_1 MVI_i + \varepsilon_i$$

where: Y_i represents the score of the SDG Index, SDG Poverty Index, SDG Life Expectancy Index, and SDG Subjective Well-Being Index respectively for country *i*, and ε_i is the error term.
* p<.1; ** p<.05; *** p<.01

Table A10. MVI Economic dimension

Country	*Economic Pillar*	*Regions*
Afghanistan	34.04	SouthAsia
Albania	21.68	Europe
Algeria	16.18	MENA
American Samoa	29.02	SIDS_Pacific
Angola	25.23	SSA
Antigua and Barbuda	40.98	SIDS_Caribbean
Argentina	6.51	LatinAmerica
Armenia	29.67	CentralAsia
Aruba	36.91	SIDS_Caribbean
Australia	10.82	EastAsiaPacific
Austria	9.78	Europe
Azerbaijan	24.10	CentralAsia
Bahamas (the)	31.51	SIDS_Caribbean
Bahrain	30.35	SIDS_AtlanticIndian
Bangladesh	19.50	SouthAsia
Barbados	27.71	SIDS_Caribbean
Belarus	25.01	Europe
Belgium	15.59	Europe
Belize	29.95	SIDS_Caribbean
Benin	32.69	SSA
Bermuda	32.21	SIDS_Caribbean
Bhutan	25.34	SouthAsia
Bolivia (Plurinational State of)	16.32	LatinAmerica
Bosnia and Herzegovina	23.01	Europe
Botswana	27.09	SSA
Brazil	8.25	LatinAmerica
Brunei Darussalam	22.51	EastAsiaPacific
Bulgaria	17.22	Europe
Burkina Faso	32.42	SSA
Burundi	29.97	SSA
Cabo Verde	42.49	SIDS_AtlanticIndian
Cambodia	22.73	EastAsiaPacific
Cameroon	21.43	SSA
Canada	7.56	NorthAmerica
Cayman Islands (the)	26.22	SIDS_Caribbean
Central African Republic (the)	26.88	SSA
Chad	32.33	SSA
Chile	14.90	LatinAmerica
China	9.81	EastAsiaPacific
Colombia	12.83	LatinAmerica
Comoros (the)	37.77	SIDS_AtlanticIndian

Country	*Economic Pillar*	*Regions*
Congo (the Democratic Republic of the)	25.73	SSA
Congo (the)	18.22	SSA
Costa Rica	14.36	LatinAmerica
Côte d'Ivoire	23.12	SSA
Croatia	20.64	Europe
Cyprus	27.37	Europe
Czechia	10.82	Europe
Denmark	10.91	Europe
Djibouti	27.56	MENA
Dominica	36.56	SIDS_Caribbean
Dominican Republic (the)	21.21	SIDS_Caribbean
Ecuador	19.08	LatinAmerica
Egypt	20.54	MENA
El Salvador	27.67	LatinAmerica
Equatorial Guinea	28.73	SSA
Estonia	16.86	Europe
Eswatini	21.56	SSA
Ethiopia	16.26	SSA
Fiji	30.15	SIDS_Pacific
Finland	11.41	Europe
France	9.54	Europe
French Polynesia	33.62	SIDS_Pacific
Gabon	23.41	SSA
Gambia (the)	41.57	SSA
Georgia	28.32	CentralAsia
Germany	8.65	Europe
Ghana	19.87	SSA
Greece	23.91	Europe
Greenland	26.10	Europe
Grenada	33.13	SIDS_Caribbean
Guam	27.87	SIDS_Pacific
Guatemala	20.01	LatinAmerica
Guinea	27.99	SSA
Guinea-Bissau	38.95	SIDS_AtlanticIndian
Guyana	32.54	SIDS_Caribbean
Haiti	34.25	SIDS_Caribbean
Honduras	30.46	LatinAmerica
Hong Kong	21.15	EastAsiaPacific

Country	*Economic Pillar*	*Regions*
Hungary	13.80	Europe
Iceland	19.13	Europe
India	17.51	SouthAsia
Indonesia	12.43	EastAsiaPacific
Iran (Islamic Republic of)	15.19	MENA
Iraq	27.39	MENA
Ireland	18.16	Europe
Israel	11.47	MENA
Italy	10.22	Europe
Jamaica	41.33	SIDS_Caribbean
Japan	13.82	EastAsiaPacific
Jordan	30.89	MENA
Kazakhstan	14.88	CentralAsia
Kenya	18.41	SSA
Kiribati	48.54	SIDS_Pacific
Korea (the Republic of)	16.61	EastAsiaPacific
Kuwait	17.57	MENA
Kyrgyzstan	38.97	CentralAsia
Lao People's Democratic Republic (the)	18.92	EastAsiaPacific
Latvia	17.10	Europe
Lebanon	29.58	MENA
Lesotho	34.77	SSA
Liberia	44.03	SSA
Libya	33.67	MENA
Lithuania	21.10	Europe
Luxembourg	24.66	Europe
Madagascar	23.71	SSA
Malawi	28.31	SSA
Malaysia	15.99	EastAsiaPacific
Maldives	42.42	SIDS_AtlanticIndian
Mali	35.94	SSA
Malta	35.09	Europe
Marshall Islands (the)	49.02	SIDS_Pacific
Mauritania	26.83	SSA
Mauritius	25.72	SIDS_AtlanticIndian
Mexico	8.87	LatinAmerica
Micronesia (Federated States of)	53.64	SIDS_Pacific
Moldova (the Republic of)	24.36	Europe
Mongolia	28.10	EastAsiaPacific
Montenegro	30.76	Europe
Morocco	20.33	MENA

Country	*Economic Pillar*	*Regions*
Mozambique	28.82	SSA
Myanmar	19.96	EastAsiaPacific
Namibia	16.74	SSA
Nauru	46.56	SIDS_Pacific
Nepal	31.15	SouthAsia
Netherlands (the)	16.78	Europe
New Caledonia	35.53	SIDS_Pacific
New Zealand	11.64	EastAsiaPacific
Nicaragua	22.89	LatinAmerica
Niger (the)	21.49	SSA
Nigeria	30.15	SSA
Northern Mariana Islands (the)	29.59	SIDS_Pacific
Norway	10.61	Europe
Oman	17.49	MENA
Pakistan	21.16	SouthAsia
Palau	48.95	SIDS_Pacific
Panama	9.40	LatinAmerica
Papua New Guinea	25.44	SIDS_Pacific
Paraguay	15.01	LatinAmerica
Peru	14.57	LatinAmerica
Philippines (the)	18.61	EastAsiaPacific
Poland	9.63	Europe
Portugal	14.51	Europe
Qatar	14.80	MENA
Republic of North Macedonia	16.67	Europe
Romania	9.72	Europe
Russian Federation (the)	8.42	Europe
Rwanda	28.80	SSA
Saint Kitts and Nevis	24.79	SIDS_Caribbean
Saint Lucia	36.48	SIDS_Caribbean
Saint Vincent and the Grenadines	37.38	SIDS_Caribbean
Samoa	44.58	SIDS_Pacific
Sao Tome and Principe	43.76	SIDS_AtlanticIndian
Saudi Arabia	15.28	MENA
Senegal	30.85	SSA
Serbia	17.67	Europe
Seychelles	39.46	SIDS_AtlanticIndian
Sierra Leone	27.63	SSA
Singapore	28.24	SIDS_AtlanticIndian
Slovakia	15.20	Europe
Slovenia	15.24	Europe

Country	*Economic Pillar*	*Regions*
Solomon Islands	36.29	SIDS_Pacific
Somalia	26.11	SSA
South Africa	11.99	SSA
South Sudan	35.08	SSA
Spain	12.58	Europe
Sri Lanka	18.48	SouthAsia
Sudan (the)	20.44	SSA
Suriname	23.04	SIDS_Caribbean
Sweden	11.77	Europe
Switzerland	9.37	Europe
Tajikistan	30.39	CentralAsia
Tanzania, United Republic of	22.16	SSA
Thailand	15.90	EastAsiaPacific
Timor-Leste	37.50	SIDS_Pacific
Togo	25.03	SSA
Tonga	50.64	SIDS_Pacific
Trinidad and Tobago	24.99	SIDS_Caribbean
Tunisia	18.11	MENA
Turkey	5.96	Europe
Turkmenistan	23.22	CentralAsia
Tuvalu	50.43	SIDS_Pacific
Uganda	20.85	SSA
Ukraine	24.15	Europe
United Arab Emirates (the)	16.39	MENA
United Kingdom of Great Britain and Northern Ireland (the)	9.04	Europe
United States of America (the)	4.74	NorthAmerica
Uruguay	13.80	LatinAmerica
Uzbekistan	14.82	CentralAsia
Vanuatu	43.74	SIDS_Pacific
Venezuela (Bolivarian Republic of)	16.54	LatinAmerica
Viet Nam	18.26	EastAsiaPacific
Yemen	49.28	MENA
Zambia	24.51	SSA
Zimbabwe	30.52	SSA

Source: Authors. *Notes*: Countries are reported in alphabetic order. The global average value is 24.22.

Table A11. MVI Structural Development dimension

Country	*Development Pillar*	*Regions*
Afghanistan	56.63	SouthAsia
Albania	49.51	Europe
Algeria	50.19	MENA
American Samoa	61.57	SIDS_Pacific
Angola	41.42	SSA
Antigua and Barbuda	67.67	SIDS_Caribbean
Argentina	22.51	LatinAmerica
Armenia	54.98	CentralAsia
Aruba	69.44	SIDS_Caribbean
Australia	21.11	EastAsiaPacific
Austria	49.83	Europe
Azerbaijan	52.67	CentralAsia
Bahamas (the)	58.17	SIDS_Caribbean
Bahrain	66.54	SIDS_AtlanticIndian
Bangladesh	48.62	SouthAsia
Barbados	67.09	SIDS_Caribbean
Belarus	40.33	Europe
Belgium	36.33	Europe
Belize	50.09	SIDS_Caribbean
Benin	48.90	SSA
Bermuda	77.71	SIDS_Caribbean
Bhutan	50.18	SouthAsia
Bolivia (Plurinational State of)	40.24	LatinAmerica
Bosnia and Herzegovina	47.42	Europe
Botswana	57.64	SSA
Brazil	28.91	LatinAmerica
Brunei Darussalam	55.60	EastAsiaPacific
Bulgaria	42.34	Europe
Burkina Faso	49.44	SSA
Burundi	56.62	SSA
Cabo Verde	65.23	SIDS_AtlanticIndian
Cambodia	44.19	EastAsiaPacific
Cameroon	40.27	SSA
Canada	15.04	NorthAmerica
Cayman Islands (the)	67.87	SIDS_Caribbean
Central African Republic (the)	43.86	SSA
Chad	47.81	SSA
Chile	38.10	LatinAmerica
China	26.95	EastAsiaPacific
Colombia	33.30	LatinAmerica
Comoros (the)	61.45	SIDS_AtlanticIndian

Country	Development Pillar	Regions
Congo (the Democratic Republic of the)	42.64	SSA
Congo (the)	42.08	SSA
Costa Rica	46.74	LatinAmerica
Côte d'Ivoire	44.78	SSA
Croatia	43.37	Europe
Cyprus	57.80	Europe
Czechia	51.05	Europe
Denmark	38.59	Europe
Djibouti	60.17	MENA
Dominica	65.72	SIDS_Caribbean
Dominican Republic (the)	46.38	SIDS_Caribbean
Ecuador	40.90	LatinAmerica
Egypt	49.23	MENA
El Salvador	52.27	LatinAmerica
Equatorial Guinea	50.17	SSA
Estonia	42.40	Europe
Eswatini	56.42	SSA
Ethiopia	51.82	SSA
Fiji	48.98	SIDS_Pacific
Finland	38.85	Europe
France	28.15	Europe
French Polynesia	61.42	SIDS_Pacific
Gabon	44.21	SSA
Gambia (the)	62.86	SSA
Georgia	50.97	CentralAsia
Germany	30.14	Europe
Ghana	46.19	SSA
Greece	37.91	Europe
Greenland	65.20	Europe
Grenada	68.90	SIDS_Caribbean
Guam	61.46	SIDS_Pacific
Guatemala	45.91	LatinAmerica
Guinea	41.84	SSA
Guinea-Bissau	51.14	SIDS_AtlanticIndian
Guyana	37.84	SIDS_Caribbean
Haiti	52.64	SIDS_Caribbean
Honduras	47.56	LatinAmerica
Hong Kong	33.15	EastAsiaPacific
Hungary	47.94	Europe
Iceland	44.93	Europe

Country	Development Pillar	Regions
Namibia	46.84	SSA
Nauru	69.31	SIDS_Pacific
Nepal	54.83	SouthAsia
Netherlands (the)	36.74	Europe
New Caledonia	56.38	SIDS_Pacific
New Zealand	40.98	EastAsiaPacific
Nicaragua	44.02	LatinAmerica
Niger (the)	40.87	SSA
Nigeria	41.17	SSA
Northern Mariana Islands (the)	64.70	SIDS_Pacific
Norway	43.07	Europe
Oman	50.34	MENA
Pakistan	43.36	SouthAsia
Palau	78.45	SIDS_Pacific
Panama	45.46	LatinAmerica
Papua New Guinea	44.09	SIDS_Pacific
Paraguay	35.39	LatinAmerica
Peru	35.32	LatinAmerica
Philippines (the)	41.27	EastAsiaPacific
Poland	36.13	Europe
Portugal	41.61	Europe
Qatar	63.93	MENA
Republic of North Macedonia	54.02	Europe
Romania	38.02	Europe
Russian Federation (the)	13.81	Europe
Rwanda	56.38	SSA
Saint Kitts and Nevis	70.04	SIDS_Caribbean
Saint Lucia	65.37	SIDS_Caribbean
Saint Vincent and the Grenadines	67.24	SIDS_Caribbean
Samoa	57.26	SIDS_Pacific
Sao Tome and Principe	75.22	SIDS_AtlanticIndian
Saudi Arabia	45.50	MENA
Senegal	47.09	SSA
Serbia	49.63	Europe
Seychelles	67.92	SIDS_AtlanticIndian
Sierra Leone	47.39	SSA
Singapore	43.59	SIDS_AtlanticIndian
Slovakia	50.84	Europe
Slovenia	46.89	Europe
Solomon Islands	51.03	SIDS_Pacific
Somalia	56.55	SSA

Country	*Development Pillar*	*Regions*
South Africa	40.55	SSA
South Sudan	49.61	SSA
Spain	27.33	Europe
Sri Lanka	39.54	SouthAsia
Sudan (the)	45.10	SSA
Suriname	49.01	SIDS_Caribbean
Sweden	34.35	Europe
Switzerland	52.94	Europe
Tajikistan	52.05	CentralAsia
Tanzania, United Republic of	43.90	SSA
Thailand	34.64	EastAsiaPacific
Timor-Leste	63.67	SIDS_Pacific
Togo	42.29	SSA
Tonga	57.39	SIDS_Pacific
Trinidad and Tobago	55.61	SIDS_Caribbean
Tunisia	52.41	MENA
Turkey	32.52	Europe
Turkmenistan	53.37	CentralAsia
Tuvalu	73.40	SIDS_Pacific
Uganda	50.88	SSA
Ukraine	30.33	Europe
United Arab Emirates (the)	51.44	MENA
United Kingdom of Great Britain and Northern Ireland (the)	30.40	Europe
United States of America (the)	15.11	NorthAmerica
Uruguay	31.28	LatinAmerica
Uzbekistan	53.62	CentralAsia
Vanuatu	55.53	SIDS_Pacific
Venezuela (Bolivarian Republic of)	42.25	LatinAmerica
Viet Nam	34.71	EastAsiaPacific
Yemen	77.28	MENA
Zambia	47.22	SSA
Zimbabwe	50.29	SSA

Source: Authors. *Notes*: Countries are reported in alphabetic order. The global average value is 48.37.

Table A12. MVI Environmental dimension

Country	*Environmental Pillar*	*Regions*
Afghanistan	0.49	SouthAsia
Albania	3.15	Europe
Algeria	0.03	MENA
American Samoa	34.51	SIDS_Pacific
Angola	0.12	SSA
Antigua and Barbuda	10.60	SIDS_Caribbean
Argentina	0.47	LatinAmerica
Armenia	0.08	CentralAsia
Aruba	2.34	SIDS_Caribbean
Australia	0.41	EastAsiaPacific
Austria	0.10	Europe
Azerbaijan	0.31	CentralAsia
Bahamas (the)	26.83	SIDS_Caribbean
Bahrain	11.22	SIDS_AtlanticIndian
Bangladesh	3.75	SouthAsia
Barbados	5.28	SIDS_Caribbean
Belarus	0.05	Europe
Belgium	3.18	Europe
Belize	2.09	SIDS_Caribbean
Benin	0.42	SSA
Bermuda	3.92	SIDS_Caribbean
Bhutan	1.60	SouthAsia
Bolivia (Plurinational State of)	0.36	LatinAmerica
Bosnia and Herzegovina	0.27	Europe
Botswana	0.09	SSA
Brazil	0.23	LatinAmerica
Brunei Darussalam	0.13	EastAsiaPacific
Bulgaria	0.34	Europe
Burkina Faso	0.34	SSA
Burundi	0.43	SSA
Cabo Verde	2.07	SIDS_AtlanticIndian
Cambodia	1.04	EastAsiaPacific
Cameroon	0.13	SSA
Canada	0.64	NorthAmerica
Cayman Islands (the)	3.88	SIDS_Caribbean
Central African Republic (the)	0.03	SSA
Chad	0.21	SSA
Chile	0.84	LatinAmerica
China	0.68	EastAsiaPacific
Colombia	0.35	LatinAmerica

Country	*Environmental Pillar*	*Regions*
Comoros (the)	7.51	SIDS_AtlanticIndian
Congo (the Democratic Republic of the)	0.25	SSA
Congo (the)	4.78	SSA
Costa Rica	1.10	LatinAmerica
Côte d'Ivoire	0.10	SSA
Croatia	0.54	Europe
Cyprus	0.55	Europe
Czechia	0.15	Europe
Denmark	4.83	Europe
Djibouti	0.49	MENA
Dominica	33.71	SIDS_Caribbean
Dominican Republic (the)	1.03	SIDS_Caribbean
Ecuador	1.42	LatinAmerica
Egypt	0.57	MENA
El Salvador	1.88	LatinAmerica
Equatorial Guinea	0.08	SSA
Estonia	0.73	Europe
Eswatini	0.20	SSA
Ethiopia	0.02	SSA
Fiji	4.10	SIDS_Pacific
Finland	0.18	Europe
France	0.89	Europe
French Polynesia	7.02	SIDS_Pacific
Gabon	0.12	SSA
Gambia (the)	6.08	SSA
Georgia	0.76	CentralAsia
Germany	1.53	Europe
Ghana	0.27	SSA
Greece	1.48	Europe
Greenland	3.35	Europe
Grenada	2.71	SIDS_Caribbean
Guam	0.52	SIDS_Pacific
Guatemala	1.53	LatinAmerica
Guinea	0.34	SSA
Guinea-Bissau	2.25	SIDS_AtlanticIndian
Guyana	0.80	SIDS_Caribbean
Haiti	37.93	SIDS_Caribbean
Honduras	0.97	LatinAmerica
Hong Kong	6.76	EastAsiaPacific
Hungary	0.19	Europe

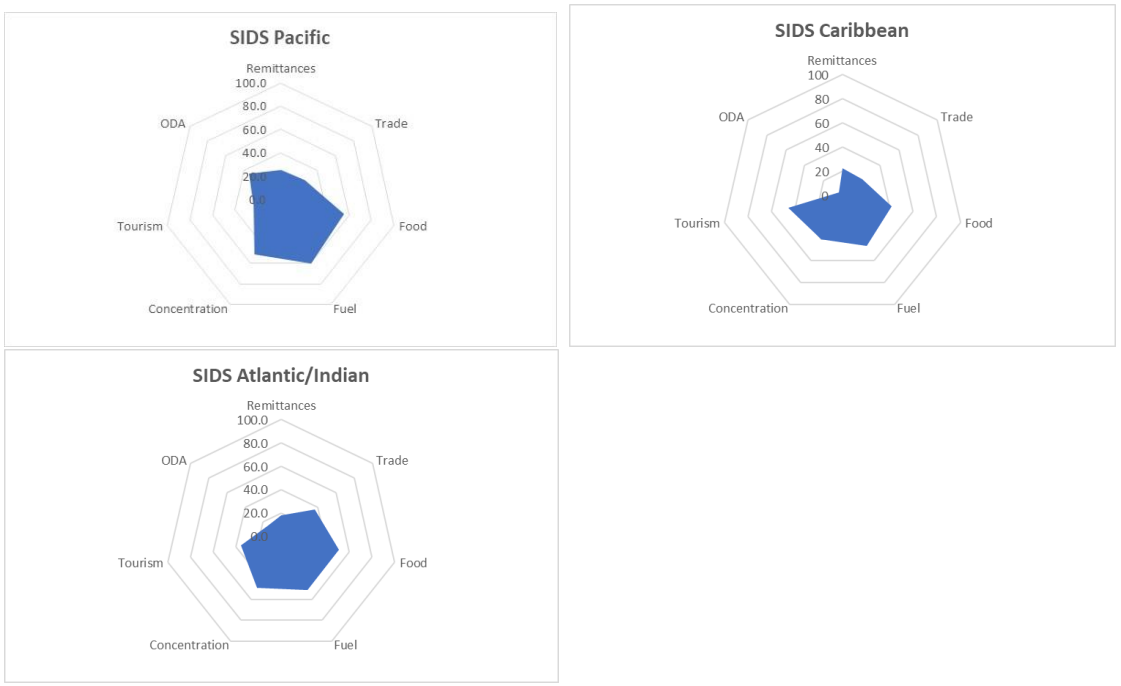
Country	*Environmental Pillar*	*Regions*
Iceland	0.85	Europe
India	0.79	SouthAsia
Indonesia	1.44	EastAsiaPacific
Iran (Islamic Republic of)	0.58	MENA
Iraq	1.10	MENA
Ireland	0.75	Europe
Israel	0.41	MENA
Italy	1.87	Europe
Jamaica	1.55	SIDS_Caribbean
Japan	2.86	EastAsiaPacific
Jordan	0.13	MENA
Kazakhstan	0.02	CentralAsia
Kenya	0.25	SSA
Kiribati	18.43	SIDS_Pacific
Korea (the Republic of)	1.32	EastAsiaPacific
Kuwait	2.75	MENA
Kyrgyzstan	0.27	CentralAsia
Lao People's Democratic Republic (the)	0.43	EastAsiaPacific
Latvia	0.74	Europe
Lebanon	0.46	MENA
Lesotho	0.20	SSA
Liberia	0.13	SSA
Libya	0.23	MENA
Lithuania	0.64	Europe
Luxembourg	0.29	Europe
Madagascar	0.50	SSA
Malawi	1.41	SSA
Malaysia	0.52	EastAsiaPacific
Maldives	15.02	SIDS_AtlanticIndian
Mali	0.04	SSA
Malta	0.90	Europe
Marshall Islands (the)	26.38	SIDS_Pacific
Mauritania	0.40	SSA
Mauritius	1.28	SIDS_AtlanticIndian
Mexico	0.98	LatinAmerica
Micronesia (Federated States of)	5.46	SIDS_Pacific
Moldova (the Republic of)	0.44	Europe
Mongolia	0.14	EastAsiaPacific
Montenegro	0.23	Europe
Morocco	0.11	MENA
Mozambique	3.03	SSA

Country	*Environmental Pillar*	*Regions*
Myanmar	1.38	EastAsiaPacific
Namibia	0.57	SSA
Nauru	2.52	SIDS_Pacific
Nepal	7.04	SouthAsia
Netherlands (the)	16.98	Europe
New Caledonia	0.96	SIDS_Pacific
New Zealand	1.08	EastAsiaPacific
Nicaragua	1.26	LatinAmerica
Niger (the)	0.17	SSA
Nigeria	0.27	SSA
Northern Mariana Islands (the)	4.69	SIDS_Pacific
Norway	0.67	Europe
Oman	0.39	MENA
Pakistan	0.82	SouthAsia
Palau	3.76	SIDS_Pacific
Panama	0.74	LatinAmerica
Papua New Guinea	0.62	SIDS_Pacific
Paraguay	0.08	LatinAmerica
Peru	0.70	LatinAmerica
Philippines (the)	2.92	EastAsiaPacific
Poland	0.48	Europe
Portugal	0.73	Europe
Qatar	4.07	MENA
Republic of North Macedonia	1.02	Europe
Romania	0.88	Europe
Russian Federation (the)	1.51	Europe
Rwanda	0.55	SSA
Saint Kitts and Nevis	4.32	SIDS_Caribbean
Saint Lucia	7.54	SIDS_Caribbean
Saint Vincent and the Grenadines	13.12	SIDS_Caribbean
Samoa	9.94	SIDS_Pacific
Sao Tome and Principe	0.30	SIDS_AtlanticIndian
Saudi Arabia	0.18	MENA
Senegal	1.21	SSA
Serbia	0.39	Europe
Seychelles	8.53	SIDS_AtlanticIndian
Sierra Leone	1.91	SSA
Singapore	2.70	SIDS_AtlanticIndian
Slovakia	0.09	Europe
Slovenia	0.17	Europe
Solomon Islands	2.67	SIDS_Pacific

Country	*Environmental Pillar*	*Regions*
Somalia	0.27	SSA
South Africa	0.14	SSA
South Sudan	0.10	SSA
Spain	0.36	Europe
Sri Lanka	1.71	SouthAsia
Sudan (the)	0.12	SSA
Suriname	0.89	SIDS_Caribbean
Sweden	0.34	Europe
Switzerland	0.19	Europe
Tajikistan	0.58	CentralAsia
Tanzania, United Republic of	0.23	SSA
Thailand	1.14	EastAsiaPacific
Timor-Leste	1.06	SIDS_Pacific
Togo	0.28	SSA
Tonga	25.19	SIDS_Pacific
Trinidad and Tobago	1.16	SIDS_Caribbean
Tunisia	0.70	MENA
Turkey	0.35	Europe
Turkmenistan	0.00	CentralAsia
Tuvalu	27.45	SIDS_Pacific
Uganda	0.19	SSA
Ukraine	0.45	Europe
United Arab Emirates (the)	1.60	MENA
United Kingdom of Great Britain and Northern Ireland (the)	1.52	Europe
United States of America (the)	0.73	NorthAmerica
Uruguay	0.69	LatinAmerica
Uzbekistan	0.04	CentralAsia
Vanuatu	13.56	SIDS_Pacific
Venezuela (Bolivarian Republic of)	0.50	LatinAmerica
Viet Nam	5.63	EastAsiaPacific
Yemen	0.41	MENA
Zambia	0.02	SSA
Zimbabwe	0.41	SSA

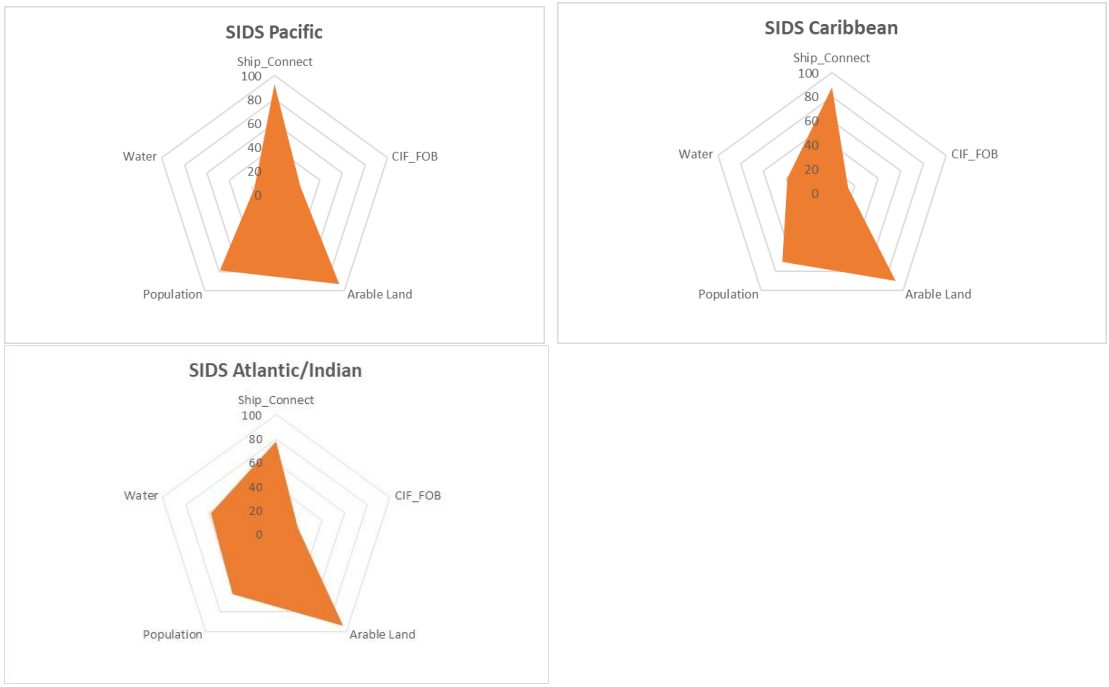
Source: Authors. *Notes*: Countries are reported in alphabetic order. The global average value is 2.85.

Figure A1. SIDS Economic Vulnerability, by indicator and by region



Source: Authors.

Figure A2. SIDS Structural Development Limitations, by indicator and by region



Source: Authors.

Figure A3. SIDS Environmental Vulnerability, by indicator and by region

Source: Authors.