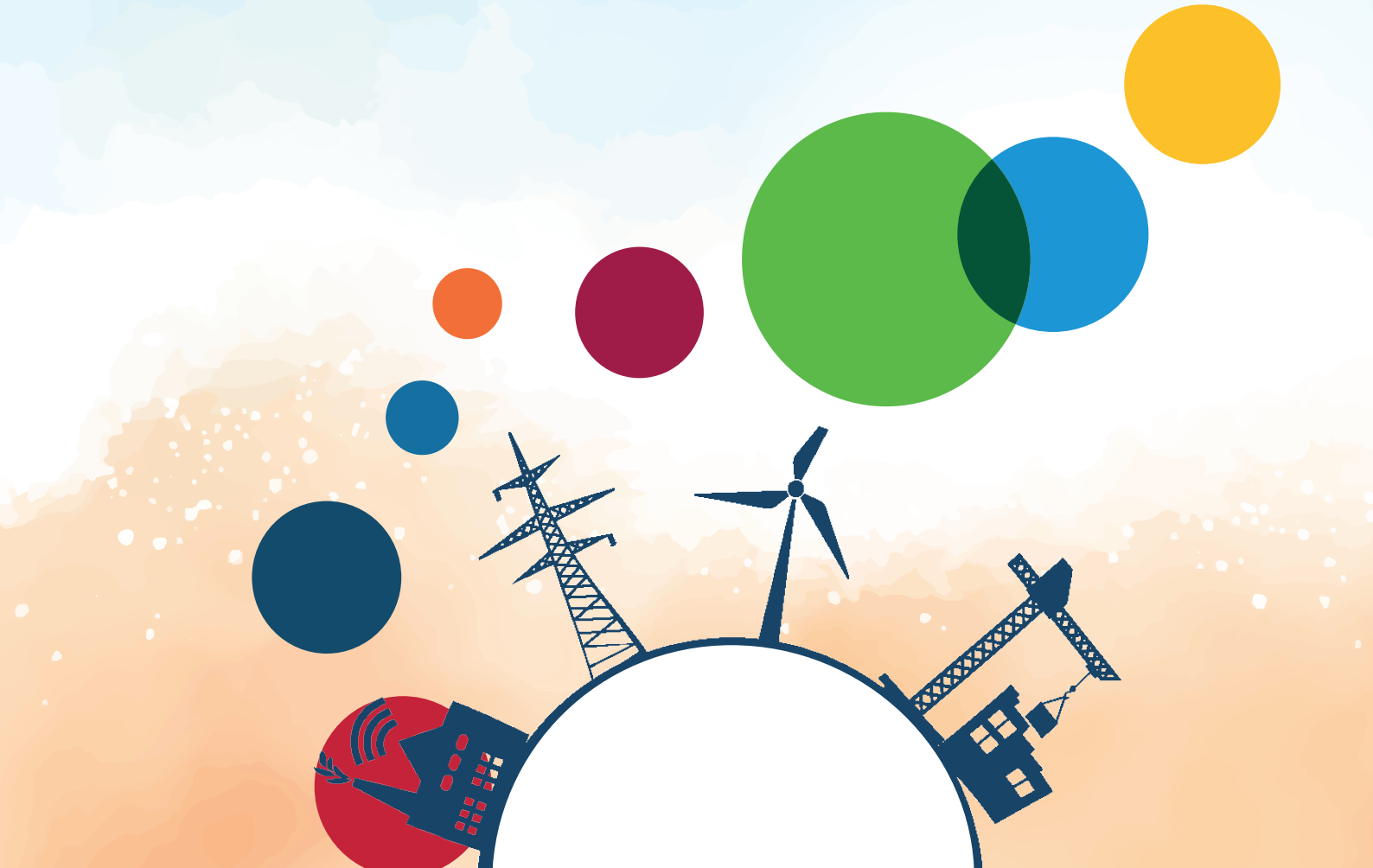
UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

UNCTAD

Building resilience in small island developing States

A compendium of research prepared by the

UNCTAD Division for Africa, Least Developed Countries and Special Programmes



UNCTAD/ALDC/INF/2022/2

CONTENTS

ACKNOWLEDGEMENTS

The work was completed under the overall supervision of Paul Akiwumi, Director, Division for Africa, Least Developed Countries and Special Programmes at UNCTAD.

Kris Terauds and Collin Zhuawu authored Chapter 1 on “Identifying alternative development strategies.”

Giovanni Valensisi and David Vanzetti authored Chapter 2 on “Tourism: intersectoral linkages.”

Anja Slany authored Chapter 3 on “Multiple disasters and debt sustainability.”

Darell Bloch and Kris Terauds authored Chapter 4 on “Aligning economic development and water policies .”

Lisa Borgatti, Sonia Bouali, Mussie Delelegn and Stefanie Garry provided substantive inputs and valuable comments on drafts of the compendium.

John Steinhardt edited the text. The cover design was prepared by Stefanie Garry. Sonia Bouali and Stefanie Garry designed the infographics. Evelyn Benitez provided administrative support. Rostand Ngadjie Siani was responsible for the layout and desktop publishing.

ABBREVIATIONS

CBI	Citizenship-By-Investment
CCRT	Catastrophe Containment and Relief Trust
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CGE	Computable General Equilibrium (model)
ECOSOC	United Nations Economic and Social Council
EM-DAT	Emergency Events Database
EVI	Economic Vulnerability Index
FDI	Foreign Direct Investment
GMSL	Global Mean Sea Level
GTAP	Global Trade Analysis Project
HDI	Human Development Index
HIPC	Heavily Indebted Poor Countries
ICT	Information and Communication Technology
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resource Management
LDCs	Least Developed Countries
LDC5	Fifth United Nations Conference on the Least Developed Countries
LLDCs	Landlocked Developing Countries
MDRI	Multilateral Debt Relief Initiative
PCI	Productive Capacities Index
PICCIF	Pacific Islands Climate Change Insurance Facility
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PPG	Public and Publicly Guaranteed
R&D	Research and Development
RCF	Rapid Credit Facility
RFI	Rapid Financing Instrument
SAMOA	Pathway SIDS Accelerated Modalities of Action (Pathway)
SCM	Synthetic Control Method
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
SPC	Segregated Portfolio Company
SVEs	Small and Vulnerable Economies
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UN-OHRLLS	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States
UNWTO	United Nations World Tourism Organization
WTO	World Trade Organization

A NOTE FROM THE DIRECTOR

The structural vulnerabilities that Small Island Developing States (SIDS) face have been further compounded by new and emerging challenges. Recently, heavy external shocks such as the COVID-19 pandemic, fluctuating global commodity prices, and waning support for multilateralism have exacerbated the long-term risks posed by climate change and unequal participation in global production networks. The need for urgent action has been brought into sharp focus.

In this respect, building the economic resilience of developing countries, and SIDS in particular, remains a daunting challenge. However, the key policy lessons that can be drawn from the pandemic are clear. Above all, "business as usual" is no longer a viable option for the most vulnerable countries. A reprise of time-worn actions will not usher in the new development outcomes desired.

The upcoming fifteenth session of the United Nations Conference on Trade and Development (UNCTAD 15) in October 2021 and the Fifth United Nations Conference on the Least Developed Countries (LDC5), which will be held in January 2022, provide the international community with an unprecedented opportunity to take stock and reimagine a stronger, more inclusive, and more sustainable future, particularly for the most vulnerable. By leveraging the transformative power of productive capacities, SIDS and other vulnerable developing countries can be better equipped to face the next generation of trade and development challenges, equipped with more options for growth, and stronger partnerships for the future.

On the road to UNCTAD 15 and LDC5, this publication aims to provide a range of analysis and policy guidance on issues of pressing concern for SIDS. For this special group of countries, growth and development must be examined through a unique policy-oriented lens. This compendium tackles trade and development challenges related to SIDS' current productive capacities and structural transformation to date; possible alternative development strategies; tourism and sectoral linkages; and debt sustainability. It draws on the extensive research and policy analysis work carried out by UNCTAD's Division for Africa, LDCs and Special Programmes, as well as lessons learned from our technical support to the most vulnerable countries in developing key aspects of their trade and productive structures.

UNCTAD's Productive Capacities Index (PCI) makes an important contribution to these efforts. It is the first comprehensive attempt to measure productive capacities in all economies and construct a multidimensional, global index that can provide country-specific insights and diagnostics of productive capacity development of relevance for SIDS.

The upcoming UNCTAD 15 Conference and LDC5 should be key moments in the international conversation on how to put these transformative productive capacities at the centre of efforts to ensure a better recovery from the pandemic, breaking the structural barriers of inequality and vulnerability, and working towards a more prosperous future for all.

The challenges are many for small islands to overcome existing trade and development barriers, yet this compendium confirms UNCTAD's role as a visionary partner to support the efforts of SIDS to address them. The compendium identifies pressing issues, and, importantly, bold and innovative strategies for building the necessary productive capacities to support structural transformation. I am confident it will be a helpful resource for government officials, policy makers and the wider international community to design effective and sustainable programmes to support SIDS in building a more sustainable and resilient future.

Mr. Paul Akiwumi
Director, Division for Africa, LDCs
and Special Programmes, UNCTAD

INTRODUCTION

Small Island Developing States (SIDS) are a heterogeneous group of countries, with diverse geographic, demographic, and economic characteristics. Despite their diversity, they face common physical characteristics such as their size and geographic isolation from neighbouring markets. With increasing regularity they are hit by severe weather and other external disasters, resulting in the loss of lives, livelihoods, and infrastructure, while in some cases placing additional burdens on already tenuous public finances. For small islands, the per capita cost of reconstruction following a disaster can be exorbitant. This simply exacerbates their unifying trait: extreme vulnerability to environmental and economic shocks.

The economies of SIDS are characterized by a high degree of openness and a strong dependence on global partners through trade, tourism, remittances, financial services, and concessional financing. However, their small economies tend to militate against diversification or economies of scale. Similarly, small and vulnerable economies face serious constraints when seeking to kickstart secondary activities (particularly manufacturing and agro-processing) as a foundation for productive transformation, sustained and inclusive economic growth, and development. Most SIDS are also heavily dependent on the export of a limited number of agricultural commodities and fisheries to a small number of markets. Their commodity-dependence and overreliance on a few export destinations render them increasing vulnerability to global price- shocks and weak demand for their products.

While from a public health perspective, SIDS have largely been spared a heavy loss of life, the spillover effects of the COVID-19 pandemic have taken an important toll on their socio-economic development. Measures to limit spread of the virus have resulted in a sharp drop in international demand. They have also taken a heavy toll on the tourism sector, which contributes nearly one third of GDP, on average, for SIDS, according to data from the World Travel and Tourism Council[1]. In 2020, due to the negative impact of the pandemic, SIDS were forecast by the International Monetary Fund to experience a contraction of -9.8 percent in their gross domestic product (GDP), compared to a -2.2 percent fall in other developing countries. Despite widespread uncertainty, GDP growth is expected to recover in 2021 and 2022[2].

The United Nations Conference on Trade and Development has a long history of support and advocacy in favor of SIDS. Indeed, UNCTAD is mandated to help SIDS address the persistent trade, investment, and development challenges they face, in line with the targets of the SAMOA Pathway. As envisioned in the 2016 Nairobi Maafikiano, UNCTAD aims to assist SIDS in building, maintaining, and using their productive capacities to structurally transform their economies. In practice, this takes the form of intergovernmental coordination and consensus building on SIDS-related trade and development themes, coordinated technical and advisory services for capacity building and institutional strengthening, and undertaking necessary analytical research to guide appropriate policy interventions.

In addressing their multifaceted vulnerabilities, the paramount development goal for SIDS is building resilience to external shocks. In this regard, SIDS and their development partners should take comprehensive action to address short-term issues, as well as implement long-term strategies to address systemic vulnerabilities. This includes building resilience to the economic and environmental impacts of climate change, as well taking action to build the necessary productive capacities to support a process of structural transformation, leading to sustainable

1.Coke-Hamilton, P. (2020). "Impact of COVID-19 on tourism in small island developing states." https://unctad.org/news/impact-covid-19-tourism-small-island-developing-states. Accessed April 2021.
2.he estimates refer to the projected IMF Economic Outlook as of April 2021.

development. Most SIDS also need external financial or technical support in their resilience-building efforts, and UNCTAD has advocated for dedicated international support measures to address their unique trade and development challenges.

The economies of SIDS suffer from limited economic and export diversification, disproportionate impacts from climate change and disasters, and are fiscally exposed to public debt distress. As UNCTAD has recently argued, clear plans are needed to resolve the debt crisis in the short term and achieve debt sustainability over the longer term[3]. Recent UNCTAD analysis finds that overall, SIDS have higher levels of debt distress than other developing countries, but there is a high degree of heterogeneity among them. Barbados (which restructured its public debt for the first time in 2018 and 2019), Cabo Verde, Jamaica, Antigua and Barbuda, Dominica, São Tomé and Príncipe, Saint Vincent and the Grenadines, Maldives, Grenada and Bahamas all have particularly high levels of debt distress. In contrast, Saint Kitts and Nevis, Trinidad and Tobago and Timor-Leste are under comparatively less pressure in this respect.

Against this background, the present publication contains a range of analysis and policy guidance on issues of pressing concern for SIDS. As a special group of countries, with their own unique trade and development challenges, as well as opportunities, the growth and development strategies of small islands must be assessed and considered through a unique policy-oriented lens. The present publication attempts to provide that guidance by tackling what UNCTAD considers to be of particular relevance for SIDS in 2021: current productive capacities, extent of structural transformation to date, possible alternative development strategies, tourism and sectoral linkages, and debt sustainability.

The compendium is set out as follows. It begins with a series of infographics to illustrate how SIDS perform on the UNCTAD Productive Capacities Index (PCI) (UNCTAD, 2021b; UNCTAD 2020b). This index captures eight dimensions of productive capacities. Its overall aim is to support the formulation in developing countries of holistic, coherent, and evidence-based policies, as well as to facilitate their subsequent implementation and monitoring. The PCI seeks to improve the quality of trade and development policies by placing efforts to foster productive capacities and structural economic transformation at the centre. It particularly helps to identify any economy-wide gaps and limitations that hinder these efforts. It also serves to illuminate the potential impact of the pandemic on the building of new productive capacities in small islands as well as the maintenance and use of existing ones.

Chapter 1 provides an overview of potential alternative development strategies for SIDS. It argues that diverse economic development strategies provide a blueprint for governments – and incentives for the private sector – to invest in new industries and infrastructure, ideally spurring a cycle of economic growth and structural transformation, towards a resilient economy and sustainable long-term development.

Chapter 2 uses a CGE model to assess the intersectoral linkages (and leakages) of the tourism sector within the economies of SIDS. It assesses the intersectoral impacts of a sudden decrease in demand for tourism services in SIDS. It also explores the likely impact of an increase in the cost of transport, initiated, for example, by a tax on fuel. The chapter finds that loss of international tourists has a negative and multiplicative effect on economic development in SIDS because of the backward linkages in the supply chain.

Chapter 3 assesses the impact of multiple disasters on debt sustainability and sheds light on determinants of debt sustainability, such as macroeconomic conditions, price fluctuations and trade openness.

3.Bouhia, R. and E. Wilkinson (2021). "Small island developing states need urgent support to avoid debt defaults". https://unctad.org/news/small-island-developing-states-need-urgent-support-avoid-debt-defaults. Accessed April 2021.

The chapter discuses different dimensions of natural disasters and their financial implications. A standard panel-data approach and a synthetic control method are applied to provide a broad assessment of debt sustainability. Both methods allow the identification of short- and long-run dimensions of debt in relation to severe natural disasters to provide policy makers with a better understanding of the options and the complexity of the relationship between disaster response and debt.

Chapter 4 explores how SIDS can better align their economic development and water management policies to support the productive transformation of their economies, by incorporating water security and water productivity into their economic plans. The chapter elaborates on the fundamental and multifaceted relationship between water and economic development, as well as the use of water as an input in productive economic activities in SIDS – including agriculture, industry, and electricity generation. It also identifies policy gaps that SIDS must fill to better incorporate water security and productivity into their economic plans.

A set of consolidated references is included at the end of the compendium.

PRODUCTIVE CAPACITY BUILDING IN SIDS[4]

4.The infographics in this section are based on UNCTAD's analysis of the performance of small island developing states on the Productive Capacities Index (PCI). For further information on the methodology of the index and to access the full PCI dataset please see https://pci.unctad.org.

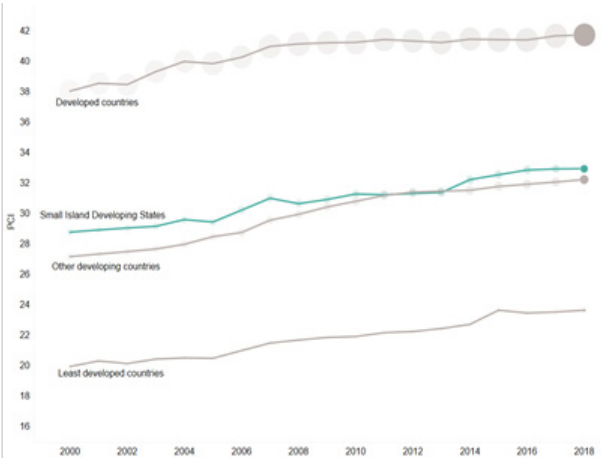
SIDS have benefitted from **shifts in their economic structure** towards the services sector.

Financial intermediation

Tourism

Other intangible services

SIDS have **performed better** on the PCI Productive Capacities Index than most **other developing countries.**



Productive capacities are the

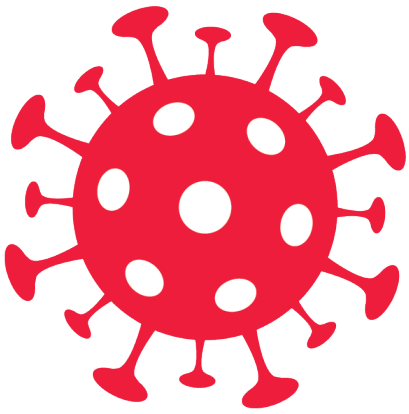
Productive resources

Entrepreneurial capabilities

Production linkages

whose **dynamic development** results in the **structural transformation** of the economy.

SIDS with **more developed productive capacities**

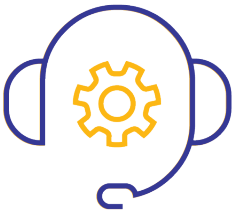


are better equipped to **handle external shocks.**

SIDS with stronger **productive capacities** have a higher **Export Diversification Index** score

Export diversification – developing new and value-added products and entering new markets – can help SIDS improve their productive capacities. This is a virtuous cycle.

ICT services and digital trade hold strong potential for SIDS' **economic development** and **diversification**. Investment in **technology**, **infrastructure**, **training** and **skills development**



are needed to **boost ICT performance**.

Chapter 1: Identifying alternative economic development strategies[5]

1. 1. INTRODUCTION

Small Island Developing States (SIDS) face severe structural challenges to their sustainable development. The United Nations recognizes 38 SIDS[6], which include some of the poorest and most isolated countries in the world, with relatively small populations and narrow endowments of land and natural resources.

The size and geographic isolation of SIDS underpin their unifying trait: extreme vulnerability to environmental and economic shocks. For example, SIDS were hit hard by the 2008-2009 global financial crisis, from which they had not fully recovered by the time the COVID-19 pandemic plunged the global economy into recession. Compounding these economic shocks, SIDS are at the front line of climate change, reaping the mounting consequences of an anthropogenic environmental crisis for which they bear extremely little responsibility.

The need to reduce vulnerability and build resilience to external shocks has guided collective efforts by SIDS and the international community. As part of the 2030 Agenda for Sustainable Development, the United Nations devoted an intergovernmental process to assisting SIDS, from which the most recent outcome document is the wide-ranging 2014 SIDS Accelerated Modalities of Action (SAMOA) Pathway, intended to guide international action towards sustainable development in SIDS.

Using a simple evaluation framework, we seek to complement the general vision contained in the Pathway, offering more detailed analysis and guidance on alternative economic development strategies for SIDS, in the context of global value chains and the Fourth Industrial Revolution. On the basis of our analysis, we outline alternative strategies for different types of SIDS, including examples of new sectors, activities and technologies for development. To support these strategies, we recommend policies necessary for SIDS to build their competitiveness in new industries.

This chapter does not presume to prescribe short-term fixes to the unique challenges facing SIDS. Instead, the analysis and recommendations are intended to reinforce an ongoing strategic planning process in SIDS, towards long-term, sustainable economic development.

1.2. VULNERABILITY AND THE NEED TO BUILD RESILIENCE

Vulnerability is the defining characteristic of SIDS. In this section, we review some of the main forms of environmental and economic vulnerability that constrain their sustainable development. We echo the call for collective action, contained in the SAMOA Pathway, to build the resilience of SIDS to external shocks.

1.2.1. Climate change

Anthropogenic climate change is a persistent and growing threat to SIDS. Mainly comprising islands with low-lying coasts, SIDS already suffer disproportionately from changes to oceans and coastal ecosystems.

In many SIDS, extreme weather events are a huge, unceasing threat not only to economic development, but to life and limb. Indeed, the 2020 World Risk Report ranked eight SIDS among the 10 countries at greatest risk of natural disasters, principally extreme weather events (Behlert, et al., 2020).

The scale of damage caused by recurrent natural disasters can be economically crippling in SIDS. In 2017, for example, in addition to the deplorable loss of life, displacement and everyday privations it inflicted, Hurricane Maria caused physical damage in Dominica estimated at 225 per cent of its gross domestic product (GDP). Meanwhile, in Vanuatu, there was a relatively short period between category-5 Tropical Cyclones Pam (2015) and Harold (2020), each of which caused damage equivalent to 70 per cent of the country's GDP (Government of Vanuatu, 2015; Government of Vanuatu, 2020).

5. For further reference, please see the article by Terauds and Zhauwu (2021, forthcoming) on "Identifying alternative economic development strategies for diverse SIDS".
6. United Nations Members classified as SIDS by the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS). Please see Table A.1. (Annex A) for the full list.

Looking forward, the Intergovernmental Panel on Climate Change predicts more frequent and severe extreme weather events in ocean regions (IPCC, 2019). Predicted increases in sea surface temperatures, for example, imply that the threshold level for the formation of hurricanes or cyclones – around 26°C – will be reached more often (while any greater temperature rise will be associated with increased storm intensity accordingly).

Sea level rise is another major climate change threat to SIDS. For example, 80 per cent of the Maldives lies just one meter or less above sea level, meaning that, even under the IPCC's best-case projection – of an average sea level rise of 0.43m by 2100 – 77 per cent of the country's land area is at risk of being submerged by the end of the century. Other SIDS in a comparable predicament are Kiribati (average 1.8m above sea level), the Marshall Islands and Tuvalu (both two meters).

Through these observed and predicted effects, climate change threatens SIDS with the degradation of coastal ecosystems, and a loss of habitat and biodiversity. Threats to human life include the loss of ecosystem services, such as fisheries or the supply of freshwater, shocks to food production and employment, as well as damage to housing stock and coastal infrastructure.

1.2.2. COVID-19

The pandemic hit SIDS particularly hard. As well as the consequent loss of life and the burden on health systems, the crisis demonstrated the severe vulnerability of SIDS to economic shocks. The United Nations World Tourism Organization (UNWTO) estimates that pandemic travel restrictions caused year-on-year international tourist arrivals to fall worldwide by 70 per cent from January to August 2020, representing losses of US$730 billion – eight times the losses the tourism sector incurred during the 2008-2009 global economic crisis – and putting well over 100 million jobs at risk[7].

In parallel, the World Trade Organization (WTO) estimated in October 2020 that total merchandise trade volume would decline by 9.2 per cent in 2020 because of the pandemic[8]. The trend in services trade is more severe, with an estimated year-on-year decline of 23 per cent (overshadowing the nine per cent decline suffered during the 2008-2009 global financial crisis)[9]. The decline in service trade was exacerbated by restrictions on travel, with a catastrophic effect on international tourism. SIDS keenly felt these pandemic-related contractions, which impacted tourism and trade, undermining their main sources of foreign exchange, staples and employment, and pitching large numbers of people into precarity and food insecurity[10].

1.2.3. Debt

Spending requirements for responses to the acute COVID-19 crisis, piled on top of the chronic needs in SIDS for climate change adaptation, have exacerbated a debt overhang in many countries, threatening an outright debt disaster. Prior to the pandemic, many SIDS already had high debt service costs, leaving them with little fiscal space to respond and plunging some countries into liquidity crises by mid-2020.

Without short-term injections of liquidity and debt relief (through the year 2021, at least), many SIDS governments feared their liquidity problems could escalate into insolvency (United Nations, 2020b). Over the medium to long term, SIDS require debt restructuring and a new arrangement to access concessionary finance and aid, which has customarily been conditional upon income-based criteria, without regard for vulnerability or debt distress. Without a new arrangement on debt, SIDS face a series of impossible choices, as they allocate inadequate segments of insufficient resources to COVID-19 response, disaster recovery, climate change adaptation and sustainable development objectives under the 2030 Agenda for Sustainable Development (Slany, 2020).

7. United Nations World Tourism Organization (UNWTO). 2020. International tourism down 70% as travel restrictions impact all regions. Blog entry. 27 October. Available at:www.unwto.org/news/international-tourism-down-70-as-travel-restrictions-impact-all-regions. Retrieved 24 November 2020.

8.World Trade Organization (WTO). 2020. Trade shows signs of rebound from COVID-19, recovery still uncertain. Press release 862, 6 October. Available at: www.wto.org/english/news_e/pres20_e/pr862_e.htm. Retrieved 27 October 2020

9. Ibid..

10. Food and Agriculture Organization of the United Nations (FAO). 2020. Small Island Developing States Response to COVID-19. Policy brief. 7 May. Available at: www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1275322/. Retrieved 20 August 2020.

1.2.4. Economic vulnerability

A key factor in the economic vulnerability of SIDS is their dependence on capital inflows and trade. For example, in most SIDS, foreign aid and remittances represent a larger share of GDP than the average in other developing countries and Least Developed Countries (LDCs). Reliance on foreign direct investment (FDI) flows is more heterogeneous, with SIDS in the Pacific attracting little FDI, relative to those in Africa and the Caribbean (McGillivray, Naudé, & Santos-Paulino, 2010).

Similarly, SIDS are among the most trade-dependent economies in the world. Among the 37 SIDS profiled in this chapter, the average trade-to-GDP ratio in 2018 was 97 per cent[11], while 12 SIDS had ratios above 100 per cent. Over the past 15 years, the combination of these high ratios and commodity export dependence meant all but five of the 37 SIDS incurred persistent trade deficits[12].

SIDS have tried to integrate into global value chains, as well as to increase and upgrade domestic value, but these efforts have largely foundered on the lack of competitiveness that stems from high transaction costs, low productivity and low-quality goods and services (Lanz & Werner, 2016).

As a result, among the 145 countries included in the 2018 Economic Vulnerability Index (EVI) – calculated as one of the three criteria for the identification of LDCs – 25 of the 40 most vulnerable countries were SIDS, including eight of the 10 most vulnerable. Even relatively wealthy SIDS, such as Bahrain (62nd most vulnerable) and Singapore (87th), were far from the ranks of the least vulnerable, such as the Republic of Korea (144th) or Turkey (145th)[13].

1.2.5. Building resilience

The consensus view (among SIDS and the international community) is that these chronically vulnerable countries can only achieve sustainable development if they build their resilience to environmental and economic shocks. The mounting severity of these shocks in recent years has served to amplify the urgency of their calls for action.

A robust intergovernmental process in the United Nations system has generated consensus and calls to action on building resilience and fostering sustainable development in SIDS. The resulting programme of action is contained in the SIDS Accelerated Modalities of Action (SAMOA) Pathway of 2014. The Pathway is appropriately ambitious, acknowledging SIDS' vulnerabilities and proposing a wide-ranging programme of action on their economic, environmental and social priorities. This includes alternative economic development strategies – "taking into account… individual country circumstances and legislation"[14]– to achieve the level of economic growth and job creation necessary to underpin the proposed programme.

This chapter seeks to identify these new economic development strategies for SIDS as part of the resilience-building effort envisioned in the SAMOA Pathway. Economic development strategies provide a blueprint for governments and incentives for the private sector to invest in new industries and infrastructure, ideally spurring a self-reinforcing cycle of economic growth, increased productivity and wages, followed by upgrading and diversification into new industries. This cycle equates to the structural transformation of an economy sufficiently resilient to sustain development in the long run.

1.3. IDENTIFYING ALTERNATIVE ECONOMIC DEVELOPMENT STRATEGIES FOR SIDS

This section begins by outlining the methodology and results from the simple evaluation framework we used for our study. The latter subsections analyse the results with a view to identifying alternative development strategies for SIDS.

11.Source: World Bank and OECD national accounts data.
12.Source: International Monetary Fund, Balance of Payments Statistics Yearbook
13.Secretariat of the Committee on Development Policy. LDC Data. Available at: www.un.org/development/desa/dpad/least-developed-country-category/ldc-data-retrieval.html. Retrieved 20 August 2020.
United Nations General Assembly. 2014. Resolution 69/15: Small Island Developing States Accelerated Modalities of Action (SAMOA) Pathway. Available at: https://sustainabledevelopment.un.org/sids2014/samoapathway. Retrieved 27 August 2020.

14.United Nations General Assembly. 2014. Resolution 69/15: Small Island Developing States Accelerated Modalities of Action (SAMOA) Pathway. Available at: https://sustainabledevelopment.un.org/sids2014/samoapathway. Retrieved 27 August 2020.

1.3.1. Methodology

For our analysis, we constructed a simple evaluation framework, involving three screens, described below. The first two look at the current situation in SIDS, while Screen 3 captures the chapter's research objective, namely identifying alternative development strategies for SIDS.

1.3.1.1. Screens

Screen 1 framed endowment structures around three of the main economic development strategies pursued by countries in the post-war period, namely: 1) manufacturing-led industrialization; 2) natural resource-led industrialization; and 3) service-led development. For each strategy, we identified its prerequisite endowments, each illustrated by a proxy indicator. The list of indicators and sources is available in Table A.2 (please see Annex A below).

In Screen 2, we profiled the existing structure of the economy, as an input for the following screen, which looks at how SIDS are positioned to pursue future opportunities. We looked at three elements of economic structure: a) distribution of inputs by sector; b) distribution of outputs by sector; and c) the importance of trade. Table 1.1 shows the indicators used for each element.

Table 1.1 – Indicators for Screen 2

Element	Proxy indicator	Source
Sectoral distribution of inputs	Employment by sector, % of total	International Labour Organization (ILO)
Sectoral distribution of outputs	Value added by sector, % of total	United Nations
Participation in trade	Trade-to-GDP ratio	World Bank

With Screen 3, we aimed to evaluate the positioning of SIDS for future opportunities, in the context of global value chains and the Fourth Industrial Revolution. In this context, new opportunities rely on some of the same conditions and prerequisites as previous generations of manufacturing or service industries. Nevertheless, these new opportunities differ by placing a premium on the ability of an economy or firm to innovate and adapt to a rapid pace of technological change (UNCTAD, 2017; WEF, 2018).

In this context, we constructed Screen 3 with drivers related to innovation, change and adaptation, as elements of a country's positioning to capitalize on future opportunities. Table 1.2 lists the eight indicators for the drivers of future opportunities.

Table 1.2 – Indicators for Screen 3

Driver	Proxy indicator	Source
Investment capital	Gross savings rate	World Bank
	Net FDI inflows	International Monetary Fund (IMF)
Information and Communications Technology (ICT) capabilities	Proportion of population using internet	International Telecommunications Union (ITU)
Research and development (R&D)	Research and development expenditures	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Human capital	Government expenditure on education	UNESCO
	Tertiary enrolment rate	UNESCO
Innovation	Total patent applications	World Intellectual Property Organization (WIPO)
Institutional quality	Regulatory quality index	World Bank, Worldwide Governance Indicators (WGI)

1.3.1.2. Sample

We applied our three-screen evaluation framework to a sample of 37 SIDS, that is, the 38 United Nations Member States classified as SIDS by UN-OHRLLS (see Table A.1), minus Singapore. We arrived at the sample after conducting a sensitivity analysis, concluding that excluding Singapore corrected skewness in the results, while preserving the regional representativeness of the group.

1.3.1.3. Thresholds

As thresholds, we evaluated the sample of SIDS against four threshold country groupings, representing the economic development strategies that framed our evaluation. Table 1.3 summarizes the four threshold groups, while Table A.3 provides the full list of countries in each group.

Table 1.3 – Country groupings for evaluation thresholds

Representative group of countries			
Economic development strategy	Name (source)	Code	Countries
Manufacturing-led industrialization	Selected exporters of manufactured goods (UNCTAD)	MAN	16
Natural resource-led industrialization			
Agriculture variant	Selected exporters of agricultural products (UNCTAD)	APE	25
Extractive variant	Selected exporters of minerals and metals (UNCTAD)	MME	16
Service-led development	Selected exporters of services (authors' list)	SER	17

1.3.2. Results

1.3.2.1. Screen 1 – Endowment structure

For the indicators representing factors of production – that is, stocks of land, labour and capital – no SIDS approached the average values for the threshold groups. These results underline that SIDS' smallness precludes them adopting large-scale economic development strategies based on abundant factors of production.

In 2018, five SIDS – Timor-Leste, Suriname, Papua New Guinea, Solomon Islands and Guyana – relied on natural resources for approximately 20-34 per cent of their GDP, more than the MME group average of 15 per cent (for group abbreviations please refer to the four codes in Table 1.3 above). For a further three SIDS – Trinidad and Tobago (11 per cent), Guinea-Bissau (nine per cent) and Bahrain (four per cent) – the share of natural resource rents in GDP[15] was greater than the averages for both the APE and MAN groups.

Using 2018 values for GDP per capita as our indicator for domestic market size, we found that eight SIDS had higher GDP per capita[16] values than the MAN group average of approximately $14,300. A further 14 SIDS had higher GDP per capita values than the APE group average of $4,500 and 17 than the MME average of $3,600. These figures suggest that a cross-section of SIDS of different sizes and economic structures have a minimum purchasing power to support local consumption.

As an indicator of access to basic infrastructure, 24 SIDS in the sample had a greater proportion of their population with access to electricity[17] in 2018 than the MAN group average of 96 per cent, with 20 SIDS reporting 100 per cent access. Further study could establish whether residents of these countries have comparable access to other forms of basic infrastructure, for example, internal transport and trade infrastructure. For the purposes of this chapter, this indicator suggests that access to basic infrastructure is a comparative advantage for many SIDS, relative to other developing countries.

15. Total natural resources rents (% of GDP), 2018. Source: World Bank.
16. GDP per capita, 2018. Source: UNCTADStat.
17. Share of population with access to electricity, 2018. Source: Sustainable Energy for All (SE4ALL) database.

Table 1.4 summarizes the results for the seven indicators, as described above.

Table 1.4 – Summary of Screen 1 proxy indicators

Indicator	Endowment or stock	Proxy indicator	Unit	SIDS (n= 37)	Threshold group averages				Number of SIDS exceeding MAN average
					SER	APE	MME	MAN	
1.1	Labour force	Total labour force	Persons, thousands	26	1,008	8,573	5,955	108,778	0
1.2	Capital stock	Gross capital formation	US$ millions (current)	37	11,464	9,695	9,894	528,207	0
1.3	Agricultural land	Agricultural land area	1,000 ha	37	207	17,111	23,043	62,166	0
1.4	Ocean area and coastal distance	Capture fisheries production	MT	37	40,248	135,352	438,473	2,523,579	0
1.5	Reserves of natural resources	Total natural resources rents (% of GDP)	% of GDP	30	0	4	15	2	9
1.6	Domestic market size	GDP per capita	US$ (constant 2015)	37	18,743	4,483	3,628	14,314	8
1.7	Access to basic infrastructure	Share of population with access to electricity	% of population	37	95	77	65	96	24

1.3.2.2. Screen 2 – Existing economic structure

To evaluate the existing economic structure in SIDS, we began by comparing the allocation of inputs and outputs among the primary, secondary and tertiary sectors in SIDS with the averages for the four threshold groups. We used employment as the proxy indicator for inputs, and value added for outputs.

Table 1.55 shows the group averages for the two indicators, sorted by the respective shares in the tertiary sector (with the highest share in each sector marked in bold italics). Overall, the highest shares of both inputs and outputs by sector correspond to the economic development strategy around which each group is compiled, that is: SER in the tertiary sector, MAN in the secondary and MME in the primary.

In general, SIDS had a lower proportion of jobs in the primary and secondary sectors, with more in the tertiary sector, albeit less than the SER group average.

Looking closely at the 26 SIDS with value for employment by sector, 19 had less employment in the primary sector than the APE and MME group averages and only three (Bahrain, Mauritius and Tonga) had more employment in the secondary sector than the MAN group average.

Table 1.5 – Average economic structure of SIDS and threshold groups

Indicator	Flow	Proxy indicator	Unit	Group average	Primary	Secondary	Tertiary
2.8	Inputs	Employment by sector	%	SER	18.0	14.2	67.8
				SIDS	25.5	15.5	59.0
				MAN	22.5	23.1	54.4
				APE	37.5	14.1	48.5
				MME	40.3	12.4	47.3
2.9	Outputs	Value added by sector	%	SER	13.4	12.3	74.3
				SIDS	23.2	14.2	62.6
				APE	32.2	15.9	51.8
				MAN	28.2	21.4	50.4
				MME	36.8	16.4	46.8

Source: International Labour Organization (ILO) (employment), United Nations, National Accounts Estimates of Main Aggregates (value added)

Among the 37 SIDS with values for value added by sector, the comparison with the threshold groups was similar to the employment figures, with 30 SIDS generating less value added in the primary sector than the APE and MME group averages. All but four SIDS (Dominican Republic, Haiti, Saint Kitts and Nevis and Suriname) had a lower share of value added in the secondary sector than the MAN group average. For most SIDS, employment and value added were therefore concentrated in the tertiary sector.

A high dependence on trade is another defining characteristic of many SIDS economies. As shown in Table , relative to the threshold groups, the average trade-to-GDP ratio in 2018 in SIDS (97.3) was below that of SER (165.9) and MAN (122) groups, but above the MME and APE groups. This order remained intact for both the export and import channels.

Table 1.6 – Average trade-to-GDP ratio in SIDS and Middle Income Countries (2018)

Indicator	Flow	Proxy indicator	Unit	Group average	Exports	Imports	Total trade
2.10	Trade	Trade-to-GDP ratio	%	SER	81.9	84.0	165.9
				MAN	61.2	60.8	122.0
				SIDS	38.0	59.4	97.3
				MME	34.0	44.1	78.1
				APE	29.6	37.1	66.7

Source:World Bank and OECD national accounts data
Only five SIDS (Bahrain, Maldives, Marshall Islands, Palau and Seychelles) reported a higher total ratio than the MAN group average, and only Seychelles had a higher ratio than the SER group average. Eleven (11) SIDS reported a higher imports-to-GDP ratio than the MAN group average, while only three (Bahrain, Maldives and Seychelles) did on the export side.

1.3.2.3. Screen 3 – Drivers for future opportunities

In Screen 3, we evaluated the 37 SIDS according to eight forward-looking attributes that could position them for future opportunities. The chosen proxy indicators include six flows that yield future benefits – such as investments, patent applications and government expenditures in key areas – and two indicators for use of ICT and institutional quality.

We included in our evaluation two proxy indicators for available investment capital – gross savings rate and net FDI inflows. Only two SIDS – Cabo Verde and Kiribati – had higher annual gross savings rates[18] than the SER and MAN group averages over the 2014-18 period. Another eight SIDS had savings rates above the MME and APE group averages. During the same 2014-18 period, five SIDS – Grenada, Guyana, Palau, Saint Kitts and Nevis and Saint Vincent and the Grenadines – had higher annual net FDI inflows[19] than the SER group average, while a total of 12 had higher values than the MAN group average.

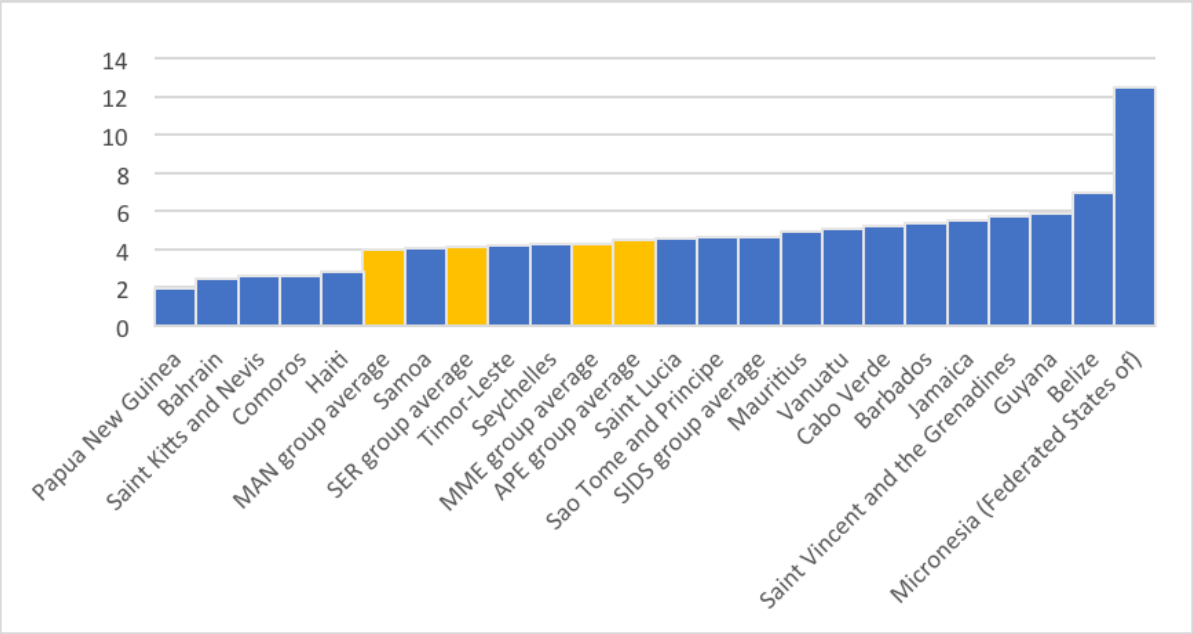
As a proxy indicator for use of ICT, five SIDS in the sample – Bahamas, Bahrain, Barbados, Dominican Republic and Saint Kitts and Nevis – had a higher proportion of population using the internet[20] in 2017 than the SER and MAN group averages, with the bulk of the remaining SIDS falling somewhere between the SER/MAN and APE/MME averages.

Research and development (R&D) is an important driver of future opportunities. We therefore included average government expenditure on R&D[21], as a percentage of GDP from 2014 to 2018, despite values for only six SIDS for this indicator. None of the SIDS in the sample spent more than 0.4 per cent of GDP on R&D during the period, considerably less than the averages for the SER (0.8 per cent) and MAN (1.1 per cent) groups.

18. Average annual gross savings rate (% of GDP), 2014-18. Source: World Bank.
19. Average annual FDI net inflows, % of GDP, 2014-18. Source: IMF.
20. Proportion of population using internet, 2017. Source: ITU-ICT Indicators Database.
21. Average annual research and development expenditure (% of GDP), 2014-18. Source: UNESCO Institute for Statistics.

We included two proxy indicators for an important driver – human capital – namely government expenditure on education and tertiary enrolment rates. Figure 1.1 shows average government expenditure on education[22], as a percentage of GDP, over the 2014-18 period, for 22 SIDS and the group averages. Half of the SIDS in the sample (11) reported higher relative spending on education than the nearest threshold group average (APE). Of these, the average spending of 10 fell within the band of 4.5-7 per cent of GDP, whereas the Federated States of Micronesia reported an average of 12.5 per cent.

Figure 1.1: Government expenditure on education, % of GDP, five-year average (2014-18)



Source: UNESCO Institute for Statistics

Turning to tertiary enrolment rates[23], as a percentage of gross enrolment, for the 2014-18 period, only three SIDS – Dominican Republic, Grenada and Saint Kitts and Nevis – had tertiary enrolment rates above the SER and MAN group averages over the period. The remainder of the SIDS values were clustered on either side of the APE and MME group averages.

On innovation, illustrated by annual total patent applications per 100,000 inhabitants[24] from 2014-18, the SER (67.5) and MAN (63.6) groups far outpaced the nearest SIDS, Samoa, with an average of 27. The remaining SIDS values were all below 20 annual patent applications per 100,000 inhabitants, highlighting that here the entire group lags considerably behind the benchmarks for manufacturing- and service-led strategies.

As a proxy indicator for institutional quality, the Worldwide Governance Indicators (WGI) regulatory quality subindex scores countries along a scale from -2.5 for weak governance, to +2.5 for strong governance. With a few exceptions, SIDS generally scored below zero on the subindex[25], with only five SIDS – Antigua and Barbuda, Barbados, Bahrain, Mauritius and Saint Kitts and Nevis – ranked higher on regulatory quality than the SER and MAN group averages.

22. Average annual government expenditure on education (% of GDP), 2014-18. Source: UNESCO Institute for Statistics.
23. Average annual tertiary enrolment rate (% of gross enrolment), 2014-18. Source: UNESCO Institute for Statistics.
24. Average annual total patent applications, residents and non-residents, per 100,000 people, 2014-18. Source: World Intellectual Property Organization (WIPO) (patent applications), World Bank (population).
25. Regulatory quality subindex, 2018. Source: World Bank, Worldwide Governance Indicators, 2019 update.

In summary, for seven of the eight indicators used in Screen 3, the SIDS group trailed the averages for the SER and MAN groups, but outperformed the natural resource-led groups, APE and MME. The SIDS group had a higher average value than all four threshold groups only for government expenditures on education. If SIDS want to be competitive in attracting opportunities in the context of the Fourth Industrial Revolution, these results offer some benchmarks for improvement.

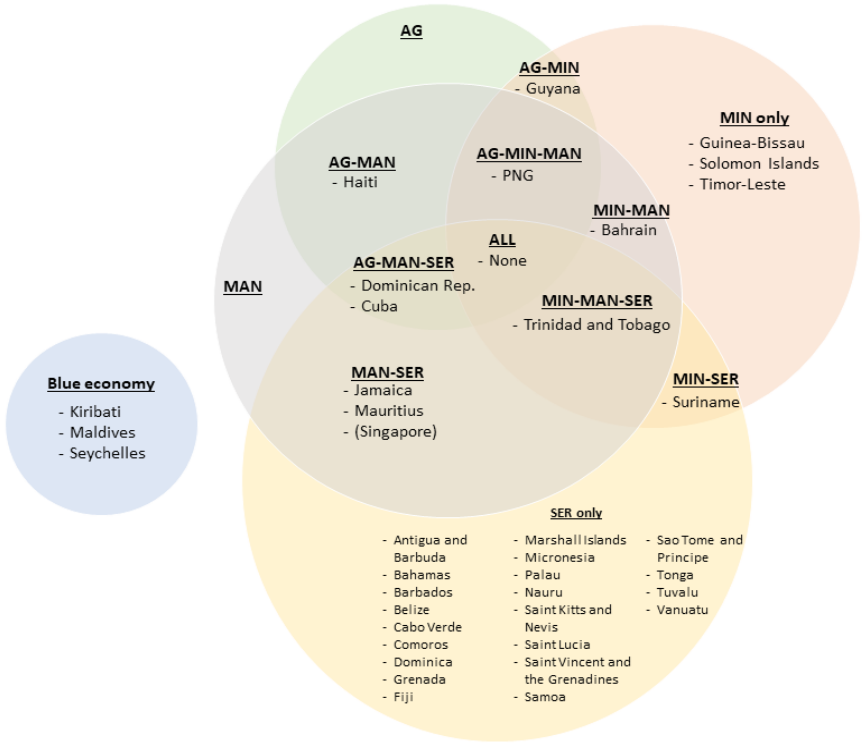
1.3.3. Analysis

1.3.3.1. Mixed strategies

In Screen 2, we observed that for most SIDS economic structure follows endowment structure. Nevertheless, there were nuances. For example, seven SIDS had higher shares of inputs or outputs in the secondary sector than the MAN threshold group. While this does not suggest a comparative advantage in large-scale manufacturing, it does indicate that these countries are suited to mixed strategies, with small-scale, targeted manufacturing industries complementing their comparative advantage in, for example, extractives or services.

Figure 1.2 is a Venn diagram of the potential strategies for the individual SIDS in our sample, among the four economic development strategies profiled in this chapter: manufacturing-led, service-led, and the agriculture and extractive variants of natural resource-led strategy. The Venn diagram illustrates both the countries with a single, most suitable strategy (e.g., services) as well as the handful of countries best served by a mix of two or three strategies. Although we omitted Singapore from the sample for our evaluation framework, we included it in the diagram for illustration.

Figure 1.2: Venn diagram of suitable SIDS strategies



AG: Natural resource-led strategy, agriculture variant
MIN: Natural resource-led strategy, minerals variant
MAN: Manufacturing-led industrialization
SER: Service-led development

We included a fifth bubble for blue economy strategies, mostly for illustration. Our indicator for blue economy strategies – capture fisheries production – proved less effective than other indicators. More importantly, we did not sufficiently elaborate a holistic concept of the blue economy, to situate it in relation to the other strategies in the Venn diagram. We therefore depicted the blue economy bubble apart from the others and populated it with countries with higher capture fisheries production – countries that would otherwise appear in the services bubble.

As Figure 1.2 illustrates, our evaluation framework identified natural resource-led strategies, based on the extractive (mineral) variant, as the single most suitable strategy for three SIDS: Guinea-Bissau, Solomon Islands and Timor Leste. Meanwhile, we did not identify large-scale manufacturing- or agriculture-led strategies as suitable for any of the 37 SIDS in our sample.

Furthermore, we identified 21 SIDS as suited to pure service-led development strategies. This is largely a "default" finding for these countries, since, through our evaluation, we found: a) that they lacked the prerequisites for the other strategies we used in our simple framework and b) that the tertiary sector was already predominant in their economic structure. For these countries, this finding may reinforce some of their existing service-led strategies and policies.

Nevertheless, this finding falls short of providing ideas for new strategies or industries through which these countries could diversify their economies or build productive capacity, towards greater economic resilience. More analytical work is therefore required to look more closely at these 21 SIDS, to help them identify new opportunities or variants on their existing strategies.

For the remaining 13 SIDS in the sample, we identified suitable "mixed" strategies. These typically involve: a) a dominant sector, in which they may enjoy a comparative advantage, relative to the threshold groups included in our framework, plus b) one or two other strategies in which we found them to be competitive, even if their endowments and current structures did not indicate an outright comparative advantage in our framework.

Among these 13 SIDS, the Dominican Republic and Cuba emerge as the economies with the greatest prospects for diversification, with opportunities to pursue mixed strategies based on agriculture, manufacturing and services. Although they are currently somewhat less diversified, Papua New Guinea (agriculture-extractives-manufacturing) and Trinidad and Tobago (extractives-manufacturing-services) also seem to have the prerequisites to pursue a mix of three strategies.

Singapore and Mauritius appear in Figure 1.2 under mixed manufacturing-services strategies and, indeed, both countries are already strong examples. Based on its endowments and structure, Jamaica also appears on this list, with the potential to follow a similar mixed strategy.

1.3.3.2. Future opportunities

With Screen 3, we aimed to evaluate the positioning of SIDS relative to future opportunities, in the context of, for example, global value chains and the Fourth

Industrial Revolution. For seven of the eight proxy indicators included in Screen 3, the SIDS group was generally better positioned than the threshold groups representing natural resource-led strategies (APE and MME), but trailed the manufacturing- and service-led threshold groups (MAN and SER). For the eighth indicator – government spending on education as a share of GDP – the SIDS group average was higher than those of the threshold groups.

Although they do not appear to have an outright comparative advantage in most of these forward-looking indicators, compared to the MAN and SER groups of countries, SIDS are nonetheless better placed than many other developing countries, as represented by the APE and MME groups. For example, there is a subset of SIDS with higher gross savings, FDI inflow and internet penetration rates than the APE and MME groups. From this perspective, SIDS can leverage these advantages to expand the remaining forward-looking drivers that require improvement, such as R&D, human capital development, innovation and governance.

In practice, for example, a human capital development strategy could leverage existing education programmes and infrastructure, coupled with wide internet penetration, to train a critical mass of, first, instructors and researchers to mount targeted technical training programmes and, second, engineers and other graduates to run targeted new industries in remote services, such as financial technology, outsourced business functions and design.

Developing these drivers of production takes time. As a result, SIDS should adopt a long-term approach to capitalizing on new opportunities. In parallel to building the human capital and infrastructure necessary to compete for these opportunities, SIDS can pursue complementary incremental steps by implementing innovative new technologies in their traditional sectors, or as part of the mixed strategies identified in the previous subsection.

Indeed, upgrading and diversification strategies inevitably involve a degree of path dependence, both at the sectoral and firm levels, especially in countries with relatively low levels of investments in, for example, R&D and capital equipment. In these cases, new, more productive industries evolve from the capabilities developed during earlier phases (Thrane, Blaabjerg, & Moller, 2010; Isaksen, 2015; Delgado, Porter, & Stern, 2014; Martin & Sunley, 2006).

For example, SIDS with important agricultural sectors could invest in entry-level precision agriculture technologies, with the accompanying extension and information services for farmers. Implementing these technologies on a targeted, small-scale basis can contribute to immediate policy priorities – increasing agricultural productivity, improving overall food security and nutrition, and reducing food import dependency, for example – as well as building knowledge of new technologies among local entrepreneurs, engineers and technicians, as part of a long-term strategy for capitalizing on future opportunities.

Similarly, SIDS governments can work with large-scale commercial energy consumers, such as tourist resorts, mines or factories, to implement renewable energy technologies that supply a portion of their energy consumption. This serves immediate energy

transition priorities in many SIDS, as well as aligning with industry energy-transition initiatives, for example in mining. These partnerships also provide opportunities to build skills with forward-looking technologies for local firms and engineers.

SIDS with established financial services sectors can pursue niche opportunities in financial technology (fintech), meaning the platforms, software and services that automate banking and financial services. Given the size of SIDS, they are unlikely to compete with leading overseas brands of mobile payment services, for example. However, many SIDS already specialize in providing niche services to the traditional offshore financial sector, a model that is potentially applicable to: mobile and online-only payment platforms; and backend, intermediary and data processing services for mobile and online platforms. Looking forward, SIDS can assess how their traditional offshore financial services could be augmented to compete in the cryptocurrency and blockchain sectors.

Pursuing future opportunities in SIDS requires a long-term plan to build the required drivers, which are often different from those required by traditional primary, manufacturing and service industries. According to the preliminary analysis in this chapter, SIDS have an advantage relative to other developing countries in drivers such as education spending, gross savings and internet penetration rates, but need a concerted effort to extend these advantages into better R&D, human capital development, innovation and governance.

1.4. CONCLUSION

Achieving sustainable development in SIDS requires building their resilience to the environmental and economic vulnerabilities that typically define them. As part of this effort, SIDS require economic development strategies that deliver economic growth, diversification and structural transformation.

In this chapter, we proposed a simple evaluation framework to identify alternative economic development strategies for SIDS. We began by looking at what exists, in terms of SIDS' endowments (Screen 1) and economic structures (Screen 2). These screens underlined, for example, that: a) SIDS' economic structures largely follow their endowment base; b) SIDS' endowments do not support large-scale manufacturing strategies and only a handful of SIDS are endowed for natural resource-based strategies; and c) as a result, most SIDS rely on services, mainly tourism.

Thus far, these findings recapitulate what SIDS already know about their dependence on the tertiary sector. But for 15 of the SIDS in the sample, the analysis also identified the potential for mixed strategies in one or two other sectors, for example developing targeted, small-scale manufacturing activities that complement the country's predominant sector, typically services or extractives.

In Screen 3, we looked at SIDS' positioning to capitalize on future opportunities, in the context of global value chains and the Fourth Industrial Revolution. Although traditional factors of production are still required to compete for these opportunities – particularly skilled workers – success depends more on dynamic drivers that allow firms and workers to innovate and adapt to the rapid pace of technological change and shifting global value chains.

For the eight proxy indicators used in Screen 3, SIDS' values were lacklustre compared to the threshold groups, especially the manufacturing- and service-

based groups of economies. SIDS had higher average government spending on education than all threshold groups. But for the remaining seven indicators, they rated below the manufacturing- and service-based economies, and were on either side of the averages for the agriculture- and extractive-based economies.

On this basis, SIDS can leverage their comparative advantage in education spending, as well as their above-average performance in, for example, income per capita, gross savings and internet penetration rates, to boost their performance in the lagging drivers, such as R&D, human capital development, innovation and governance. This effort can form the basis of a long-term strategy to compete for future opportunities in, for example, financial technology, outsourced business functions and design.

Intermediate steps to this long-term strategy could include investing in new technologies in SIDS' established sectors, including in the mixed strategies identified. These could include, for example, precision agriculture or public-private partnerships with the main energy consumers to build renewable energy generation capacity.

1.5. Policy recommendations

For SIDS wishing to pursue future opportunities in global value chains or the Fourth Industrial Revolution, as part of their overall economic development strategy, we recommend the following policies.

Extractive sector:

• Prioritize revenues over other strategic objectives, such as value addition. This requires an efficient taxation regime, with a balance of production, export and income taxes, and using modelling to maximize revenues over a project's anticipated life cycle;

• Earmark a portion of extractive revenues and rents to provide a predictable stream of investments and spending in: a) other productive sectors with long-term potential for diversification and structural transformation of the economy; and b) drivers supporting these new opportunities, including R&D, human capital development, innovation and governance; and

• Employ sound macroeconomic management to prevent export earnings from the extractive sector inflating the local currency, which can erode the net benefit from exploiting natural resources, undermine other export sectors and complicate efforts to diversify into new industries.

Agricultural sector:

• Create incentives – for the few SIDS with important agricultural sectors or competitive advantages in agriculture – to invest in smart agriculture technologies, including precision and vertical agriculture, on a targeted and small-scale basis, to reinforce food security and nutrition, as well as providing opportunities for technology transfer and human capital development; and

• Identify and pursue niche opportunities for value addition, including for by-products, to build productive capacity.

Future opportunities:

• Identify and prioritize high-value activities that do not rely on economies of scale or a geographic proximity to markets, such as niche opportunities in fintech, outsourced business functions or design;

• Support priority opportunities with public investments and spending in infrastructure, R&D, human capital development and innovation;

• Expand and ensure access to relevant enabling infrastructure, such as the internet, energy and transport;

• Engage the private sector in developing R&D programmes in priority industries;

• Maintain an ongoing dialogue among government, employers and trade unions to inform human capital development programmes, manage employment expectations and preserve social cohesion through periods of economic structural transformation;

• Create incentives to mobilize domestic savings and FDI inflows into investments in productive capital – including both new technologies to upgrade existing sectors, as well as drivers and activities in pursuit of future opportunities;

• Expand service offerings in the tourism and financial sectors, with an emphasis on those involving new technologies;

• Engage – where possible – in public-private partnerships with large energy consumers, such as tourism resorts, mines and factories, to construct renewable energy sources, with an emphasis on technology transfer and human capital development for local firms and workers;

• Expand internet penetration through public investments in infrastructure and the adoption of ICT in public education;

• Leverage relatively high education spending into other drivers for future opportunities. Examples could include: training a critical mass of researchers and instructors and mounting tertiary and vocational training programmes oriented towards priority industries;

• Reinforce science, technology, engineering and mathematics (STEM) in the public education curriculum and support apprenticeships for graduates to acquire practical experience;

• Include explicit language in all policies and programmes that ensures equal access to new opportunities for women, minorities and youth; and

• Improve governance through policy, regulatory and institutional reforms that strengthen, for example, property rights, the rule of law and competition, with a view to fostering innovation, entrepreneurship and investment.

ANNEX A

TABLE A.1 – UN-OHRLLS LIST OF SIDS

United Nations Member States (38)	Non-UN Members/Associate Members of the Regional Commissions (20)
1. Antigua and Barbuda	1. American Samoa
2. Bahamas	2. Anguilla
3. Bahrain	3. Aruba
4. Barbados	4. Bermuda
5. Belize	5. British Virgin Islands
6. Cabo Verde	6. Cayman Islands
7. Comoros	7. Commonwealth of Northern Marianas
8. Cuba	8. Cook Islands
9. Dominica	9. Curaçao
10. Dominican Republic	10. French Polynesia
11. Fiji	11. Guadeloupe
12. Grenada	12. Guam
13. Guinea-Bissau	13. Martinique
14. Guyana	14. Montserrat
15. Haiti	15. New Caledonia
16. Jamaica	16. Niue
17. Kiribati	17. Puerto Rico
18. Maldives	18. Sint Maarten
19. Marshall Islands	19. Turks and Caicos Islands
20. Federated States of Micronesia	20. U.S. Virgin Islands
21. Mauritius	
22. Nauru	
23. Palau	
24. Papua New Guinea	
25. Saint Kitts and Nevis	
26. Saint Lucia	
27. Saint Vincent and the Grenadines	
28. Samoa	
29. São Tomé and Príncipe	
30. Singapore	
31. Seychelles	
32. Solomon Islands	
33. Suriname	
34. Timor-Leste	
35. Tonga	
36. Trinidad and Tobago	
37. Tuvalu	
38. Vanuatu	

TABLE A.2 – LIST OF INDICATORS AND SOURCES

No.	Indicator, short name	Year / range	Data points	Publisher	Source
Screen 1: Endowment structure					
1	Total labour force	2018	26	ILO-STAT	ILO-STAT
2	Gross capital formation	2018	37	UNCTAD	UNCTADStat
3	Agricultural land area	2017	37	FAO	FAOSTAT
4	Capture fisheries production	2016	37	World Bank	FAO
5	Total natural resources rents (% of GDP)	2018	30	World Bank	World Bank
6	GDP per capita	2018	37	UNCTAD	UNCTADStat
7	Share of population with access to electricity	2018	37	World Bank	Sustainable Energy for All (SE4ALL) database
Screen 2: Existing economic structure					
8	Employment by sector	2018	26	ILO-STAT	ILO-STAT
9	Value added by sector	2018	37	UN Data	National Accounts Estimates of Main Aggregates
10	Trade-to-GDP ratio	2018	26	World Bank	World Bank national accounts data, and OECD National Accounts data files
Screen 3: Positioning for future opportunities					
11	Average annual gross savings rate (% of GDP)	2014-18	19	World Bank	World Bank national accounts data, and OECD National Accounts data files
12	Average annual FDI net inflows, % of GDP	2014-18	34	World Bank	International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, International Debt Statistics, and World Bank and OECD GDP estimates
13	Proportion of population using internet	2017	34	World Bank	ITU-ICT Indicators Database
14	Average annual research and development expenditure (% of GDP)	2014-18	6	World Bank	UNESCO Institute for Statistics
15	Average annual government expenditure on education (% of GDP)	2014-18	21	World Bank	UNESCO Institute for Statistics
16	Average annual tertiary enrolment rate (% of gross enrolment)	2014-18	15	World Bank	UNESCO Institute for Statistics
17	Average annual total patent applications, residents and non-residents, per 100,000 people	2014-18	14	World Bank	WIPO (patent applications), World Bank (population)
18	Regulatory quality	2018	36	World Bank	Worldwide Governance Indicators, 2019 update

TABLE A.3 – LIST OF COUNTRY GROUPINGS FOR EVALUATION THRESHOLDS

Selected exporters of manufactured goods (MAN) Source: UNCTAD	Selected exporters of agricultural products (APE) Source: UNCTAD	Selected exporters of minerals and metals (MME) Source: UNCTAD	Selected exporters of services (SER) Source: authors
1. Bangladesh 2. Belarus 3. China 4. Hong Kong, China 5. Taiwan, China 6. India 7. Korea, Republic of 8. Malaysia 9. Mexico 10. Morocco 11. Pakistan 12. Philippines 13. Singapore 14. Thailand 15. Turkey 16. Viet Nam	1. Afghanistan 2. Argentina 3. Belize 4. Benin 5. Cameroon 6. Côte d'Ivoire 7. Cuba 8. Ecuador 9. Ethiopia 10. Falkland Islands (Malvinas) 11. Fiji 12. Guatemala 13. Guinea-Bissau 14. Honduras 15. Kenya 16. Malawi 17. Maldives 18. Nicaragua 19. Paraguay 20. Seychelles 21. Solomon Islands 22. Somalia 23. Syrian Arab Republic 24. Uganda 25. Uruguay	1. Botswana 2. Burkina Faso 3. Chile 4. Congo, Democratic Republic of the 5. Eritrea 6. Guinea 7. Guyana 8. Kyrgyzstan 9. Mali 10. Mongolia 11. Namibia 12. Peru 13. Sierra Leone 14. Suriname 15. Tajikistan 16. Zambia	1. Antigua and Barbuda 2. Barbados 3. Belize 4. Cabo Verde 5. Djibouti 6. Dominica 7. Fiji 8. Grenada 9. Hong Kong, China 10. Lebanon 11. Macao, China 12. Maldives 13. Saint Kitts and Nevis 14. Saint Lucia 15. Seychelles 16. Singapore 17. Vanuatu

Chapter 2: Tourism: Intersectoral linkages[26]

The tourist industry is in trouble, as are the Small Island Developing States (SIDS) that are typically among the countries most heavily dependent on tourism receipts. However, there is only a limited understanding of how tourism is linked to other sectors of the economy, such as transport, accommodation and other services. How much of the tourist dollar stays in the country? This study investigates the potential development impact of the tourism sector in SIDS, to inform evidence-based policymaking in these countries.

We use a CGE model to assess intersectoral linkages (and leakages) in tourism in SIDS economies. First, we assess the intersectoral impacts of a sudden decrease in demand for tourism services in SIDS, driven by changing tastes in the tourists' home countries, or a temporary shutdown. Second, we examine the likely impact of an increase in the cost of transport, triggered by a tax on fuel, for example. Most SIDS are in favour of carbon taxes or similar measures to mitigate carbon emissions because of concerns about rising sea levels, but such taxes inhibit one of their main industries.

We quantify the likely intersectoral, trade and welfare effects. A loss of international tourists has a multiplicative negative effect because of the backward linkages in the supply chain. There is limited scope to replace international visitors with domestic tourists. The effects of a five per cent increase in fuel costs are generally manageable, in spite of the importance of transport to the tourist industry. The government has a role in training the tourist sector workforce, promotion and maintaining personal security and sanitation.

2.1. Introduction

Small Island Developing States (SIDS) are typically among the most heavily dependent on tourism receipts and yet the extent of this dependence and its interplay with their peculiar economic structure and multifaceted vulnerabilities have rarely been examined in the existing literature[27]. At present, two key issues facing tourism-dependent countries are the long-term impact of the pandemic and the progressive effect of climate change and related policy responses. A difficulty in analysing these developments is the complexity of global and regional tourism value chains and their multifaceted links with the rest of the economy. Developing countries are generally advised to stimulate intersectoral links (thereby maximizing tourism multiplier effects) while reducing the scale of leakages. To date, however, there is a limited understanding of the complex and context-specific links between the tourism sector and the rest of the economy, as well as of how the different patterns of tourism affect those relationships.

The multiple shocks triggered by COVID-19 have brought renewed attention to these issues and to the role of the tourism industry in the post-pandemic recovery, or even more fundamentally in a world hit by the growing impact of climate change and environmental degradation. The near-paralysis of the travel industry in 2020 – at least at an international level – warrants a rethinking of the role of tourism in SIDS development strategies, as well as of its anchoring in the local economy. In this context, and while acknowledging the constraints posed by data limitations, this chapter attempts to shed some light on the special role of tourism within SIDS economies and its implications for the post-pandemic recovery. More specifically, the chapter examines two questions: (i) how changes in tourist demand are spread through the different sectors of the SIDS economy; and (ii) how a rise in transport costs, due for example to a carbon tax aimed at limiting carbon emissions, might impact their economies.

The chapter is structured as follows. Section 2 introduces the discussion, analysing some key trends in the tourism sector and highlighting the specificities of SIDS in that respect. Section 3 carries out a CGE simulation to assess the impact of two policy scenarios, related to an anaemic recovery of the tourism industry, as well as to the potential impacts of changes in transport costs related to climate change mitigation policies. Finally, Section 4 summarizes and concludes.

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26. David Vanzetti and Giovanni Valensisi, The University of Western Australia and UNCTAD, respectively. Last update: August 2021. Contact: david.vanzetti@uwa.edu.au.

27. Throughout the chapter the category of SIDS refers to countries falling within the analytical classification developed by UNCTAD (MacFeely et al., 2021).

2.2. Tourism and SIDS specificities

The relevance of the tourism industry for SIDS economies has long been acknowledged, but was brought to the fore once again, in a dramatic way, in the context of COVID-19. Various studies have highlighted the disastrous impact of the pandemic on global tourism flows in the course of 2020 and the related disproportionate impact on tourism dependent countries (UNWTO, 2020a, 2020b; United Nations, 2020a; Mooney and Zegarra, 2020). UNCTAD, in turn, has estimated that globally the losses from a year-long standstill of international tourism could amount to US$3.3 trillion ($2.4 trillion in 2021), with most tourism-dependent countries losing up to 10 per cent of GDP (UNCTAD, 2020a, 2021a). Beyond the immediate adverse challenges triggered by COVID-19, more fundamentally the pandemic exposed the need to "transform tourism" – to quote the title of a recent UN Policy Brief – "with a focus on leveraging its impact on destinations visited and building more resilient communities and businesses" (United Nations 2020a). This requires an in-depth understanding of tourism's complex role for the local economy, as well as a rethinking of its role for destination countries' development, as well as for local communities and the broader ecosystem.

These areas of analysis are intrinsically complex; but an additional constraint, in the case of many SIDS, is posed by the lack of adequate data, from tourism satellite accounts to reliable and sufficiently disaggregated input-output tables. The lack of systematic data is particularly pronounced in relation to the money spent by tourists within the local economy, or rather leaking away through importation of foreign products and services, or through payments to non-residents. Similarly, little data is available to account for the potential impacts of climate change, and of related mitigation measures like carbon taxes, on international tourism demand, via higher transport costs. While acknowledging these data limitations from the outset, the rest of this section makes use of a broad array of data sources to tease out key facets of the dependence of SIDS on the tourism industry.

Prior to the outbreak of the pandemic, tourism was one of the fastest growing economic sectors and as such was widely regarded as an important driver of economic growth and sustainable development. In 2018 there were 1,407 million international tourist arrivals worldwide, a six per cent rise on the previous year[28]. Export revenues from international tourism amounted to $1,644 billion in 2018; correspondingly, tourism receipts amounted to $1,462 billion, some $1,040 per arrival. Accordingly, the sector accounts for seven per cent of global trade in goods and services; moreover, because of its labour-intensive nature tourism represents a significant source of employment, both directly and through a range of satellite activities. The sector generates both relatively low-skilled jobs (such as waiters and cleaners), and more qualified positions like clerks, hotel managers and the like. As such, it is widely regarded as a potential driver of inclusivity in many developing countries, including through significant employment creation among women and youth.

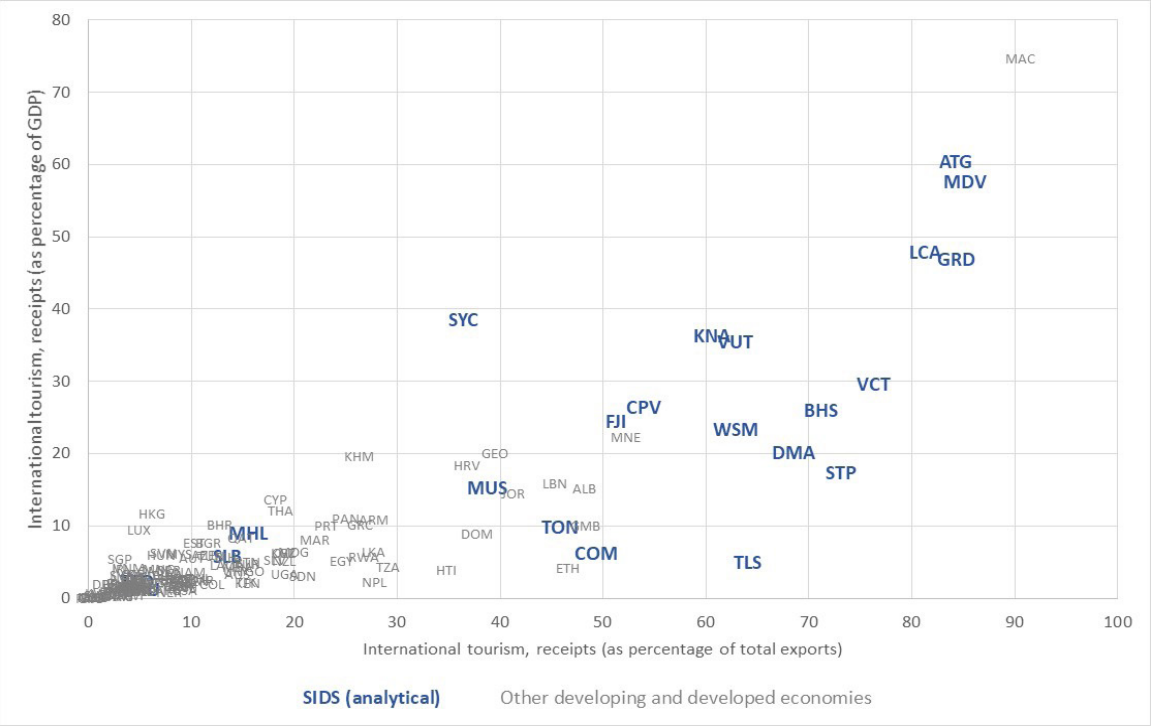
SIDS attracted 21 million inbound visitors in 2018. The most popular destinations were Bahamas (6.6 million) and Jamaica (4.3 million), but other popular destinations include Antigua and Barbuda, Barbados, Fiji, Mauritius, Saint Kitts and Nevis and Saint Lucia. In view of their small economic size, SIDS – and many overseas territories alike – tend to display a particularly high dependence on tourism by international standards (Figure 2.1). With few exceptions, this dependence on tourism is even more pronounced in relation to their circumscribed export capacities, underpinning the sector's prominence in terms of foreign exchange

28. Unless otherwise stated, data in this section is drawn from UN World Tourism Organization (UNWTO) Compendium of Tourism Statistics, Data 2014-2018, 2020 Edition. World Tourism Organization. Madrid (2020c).

earnings. The dependence is often exacerbated by the prevailing limited economic diversification and high import dependence of many SIDS, all of which limits the scope for harnessing intersectoral linkages and exploiting tourism expenditures to boost the local economy.

In spite of the obvious benefits, the remarkable expansion of the tourism industry has not been free from criticism. Large numbers of tourists can be accompanied by adverse environmental, social and economic outcomes, such as congestion, pollution and rental price inflation, with little of the industry's revenues trickling down to the residents (Kottasová, 2017; Hunt, 2017; Weeden, 2016). Similarly, some observers have claimed that large cruise tourism projects often fail to provide benefits for local populations, especially where taxation and regulation frameworks are weak or poorly enforced (MacNeill and Wozniak, 2018). Again, some ship owners have been found guilty of illegally dumping waste at sea, jeopardizing the sustainability of the very ecosystem which constitutes the appeal of tourist destinations (Ryan et al., 2019). Similar issues are extremely relevant for SIDS, where the arrival of non-resident visitors can significantly increase pressure on existing infrastructures and ecosystems, stretching their so-called "carrying capacity" (UNWTO, 2012a). Equally, the distinct contribution of SIDS to global biodiversity implies that particular attention should be paid to the environmental impact of tourism and its repercussions on their green and blue economy. In light of this, developments in the cruise sector have a critical bearing on the sustainability of tourism in SIDS (ibid.)[29].

Figure 2.1: Tourism dependence for SIDS and other developing and developed economies and territories (2018)



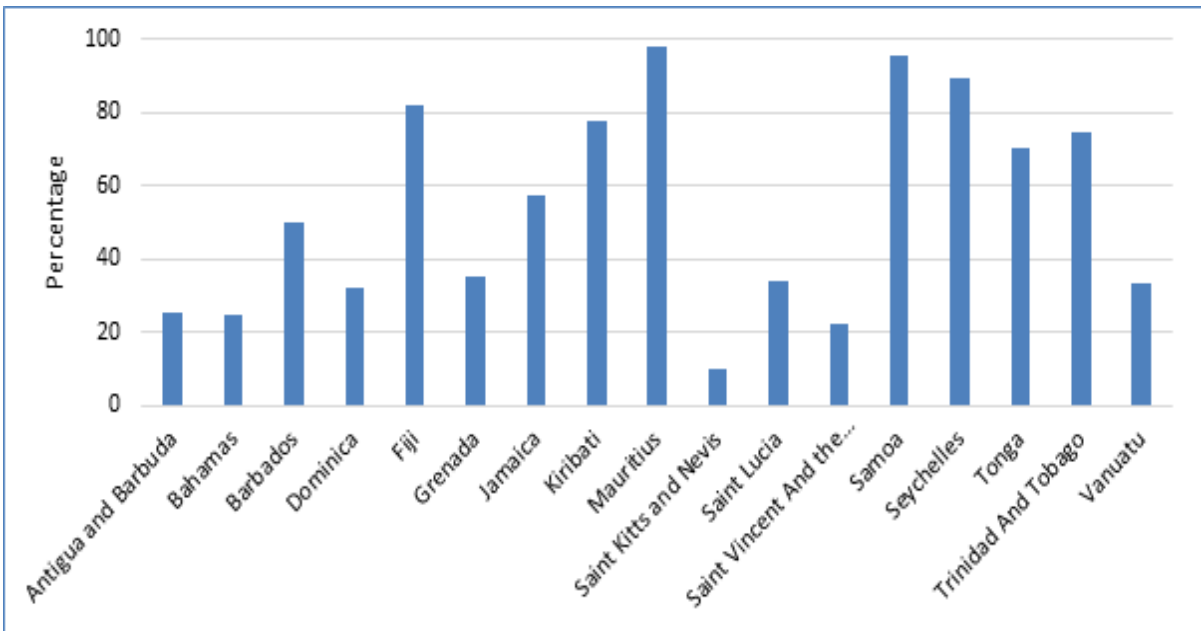
Source: UNCTAD Secretariat calculation based on World Development Indicators
Note: Country labels are based on ISO codes.

29. The cruise industry has expanded rapidly in recent years, but it remains dominated by few companies. With reference to the Caribbean SIDS, companies such as Carnival, Royal Caribbean and Norwegian (all headquartered in Florida) control three quarters of the market. Cruise ships typically travel under flags of convenience and are subject to the laws of these countries. This institutional context may entail delicate challenges in terms of enforcing social, safety and environmental regulations, or ensuring that shipping companies do not adopt aggressive tax avoidance strategies, or flout minimum wage regulations (Brida and Zapata, 2010).

The structural specificities of SIDS impinge not only on their degree of dependence on tourism, but also the pattern of tourism they are able to attract and the related mode of transport. In view of their size, the contribution of domestic tourism in SIDS tends to be minimal: according to World Travel and Tourism Council (WTTC) 2019 data, the latter accounts on average for barely one per cent of the contribution of international tourists[30]. Geographical characteristics imply that the cost of transport is typically a significant determinant of demand for tourism in SIDS, with visitors arriving either by air or sea. The overwhelming majority of sea passengers arrive on cruise ships and do not stay on land overnight, although the ship may dock in port for several days. This has an important bearing on the local economy, as overnight visitors tend to spend more in the destination country than same-day visitors. On the other hand, one advantage of same-day visitors is that since no accommodation is provided locally, the investment needed to cater for them (with associated running costs) is lower.

In 2018, of the 21 million visitors to SIDS, roughly half stayed overnight, and half were same-day visitors, mostly from cruise ships. Figure 2.2 shows that there is a considerable dispersion among islands in this respect, ranging from almost no overnight visitors (Saint Kitts and Nevis) to almost 100 per cent of them (Mauritius). Besides, in addition to the mode of transport, the length of stay is also influenced by the specific "value proposition" of a given destination, in turn partly related to the size of the country and the

Figure 2.2: Share of overnight visitors in total arrivals to selected SIDS (2018)



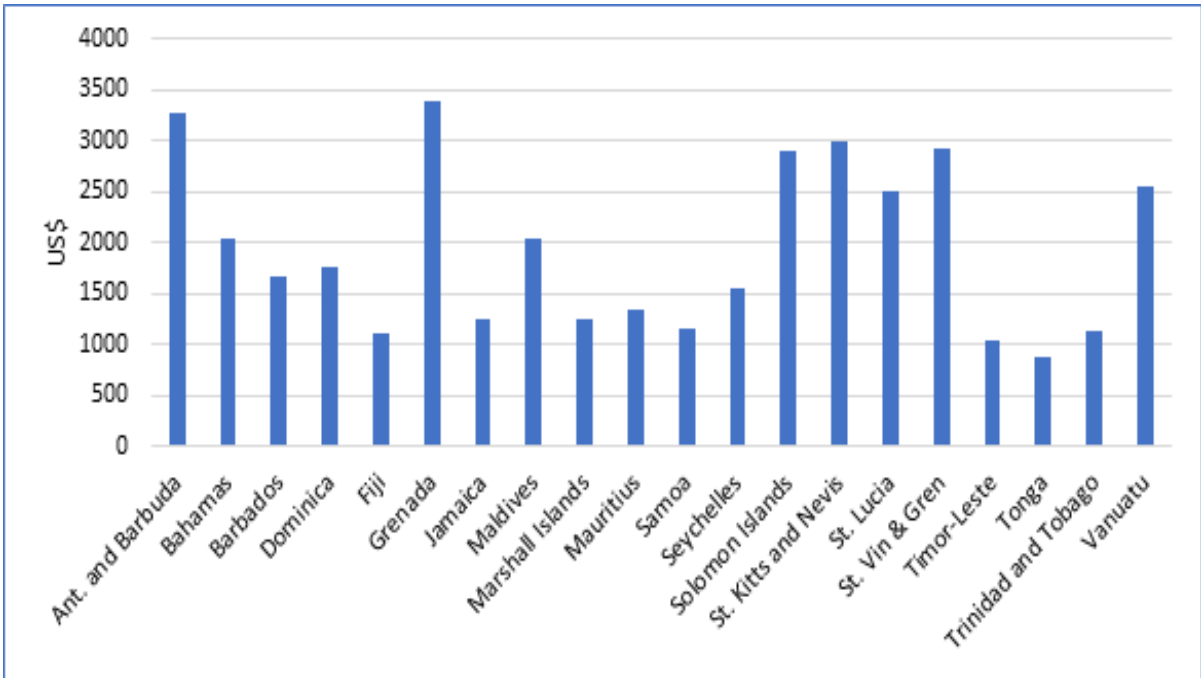
Source: UNCTAD Secretariat calculation based on UNWTO(2020c)

30. The UN World Tourism Organization (UNWTO) collects data on domestic tourist trips, length of stay and expenditure; however, no such data is available for SIDS.

range of attractions and activities available for tourists. Although an increasing number of tourists are travelling to SIDS, receipts per arrival have not increased much over the past ten years according to UNWTO data. Expenditure per person varies a great deal by country (Figure 2.3) and depends, among other things, on the type and duration of the trip, as well as on individual characteristics of the prevailing visitors. However, expenditure per visit is also affected by disparities in transport costs and cost of living, with the result that it cannot always be simply predicted on the basis of the pattern of tourism. For instance, UNWTO data on receipts per arrival suggest that Antigua & Barbuda and Grenada – both countries with a low share of overnight visitors – are locations where tourists spend more than $3,000 per visit. Conversely, Mauritius hosts overnight visitors – almost exclusively– but the average spend is only $1,350. This belies the stereotype of the day tripper who spends very little money.

More fundamentally, not all tourist expenditure flows to or stays in the destination country. Transport costs – a sizeable component of SIDS tourism exports – are usually paid in the country of origin; a significant share of tourism final demand is catered for through the import of related goods and services; finally, accommodation and other services may be provided by international companies that repatriate the corresponding profits. This begs the question of how and to what extent tourism contributes to stimulating the local economy and boosting foreign exchange revenues once these factors are taken into account. Ideally, the analysis of the origin of value added in tourism final demand could provide a direct answer to some of these questions. Unfortunately, though, the lack of reliable data for SIDS in highly disaggregated multi-region input-output tables makes it impossible to give a full account of the underlying pattern of intersectoral linkages. Despite this, it is nonetheless useful to contextualize the following discussion by looking first at world trends in terms of intersectoral linkages in tourism. According to data from OECD's Trade in Value Added database, the average share of domestic value added in worldwide tourism final demand reached 65 per cent in 2015 (the latest data available), with large variations across countries. This figure is higher than the corresponding share in manufactures (41 per cent), where the use of intermediate inputs underpinning the rise in global value chains is far more prominent, but less than the average share of domestic value-added content in total services final demand (80 per cent). Although the database does not cover any country in the analytical list of SIDS, it is worth noting that smaller economies – especially islands countries like Malta, Cyprus or Singapore – appear to be more dependent on imported value added, suggesting shallower intersectoral demand linkages and greater demand leakages. This is particularly the case for sectors such as agriculture and manufacturing, which could constitute the backbone of an economic diversification strategy.

Figure 2.5: Tourism receipts per arrival in selected SIDS, 2018



Source: UNCTAD Secretariat calculation based on UNWTO (2020).

2.3. A general equilibrium analysis

Computable general equilibrium (CGE) models, such as the Global Trade Analysis Project (GTAP) used here, capture macroeconomic behavioural and intersectoral relationships, as specified in input-output tables and social accounting matrices, as well as in bilateral trade linkages. In order to gauge how the model accounts for multifaceted linkages between tourism and the rest of the economy, it is useful to outline here the main assumptions of the GTAP modelling framework. GTAP is a multi-country and multi-sectoral CGE model, fully documented in Hertel and Tsigas (1997). For each country or region, there are multi-stage production processes which combine primary factors of land, labour, capital and natural resources with intermediate inputs. The latter, which account for the lion's share of inputs demanded by the tourism sector, may be domestically produced or imported. Returns to factors, i.e., income, are taxed by the government, saved or spent by the single representative household. While there is no substitution between intermediate inputs and primary factors or among the intermediate inputs, there is substitution between different sources of intermediate inputs, namely domestic products and imports from each region. The regions are linked together by imports and exports of commodities. Similar commodities, which are produced by different countries, are assumed to be imperfect substitutes for one another, with the degree of substitution being determined by the Armington elasticities. For simplicity, the original 65 sectors are aggregated into 32 as per Table B.2 (please see Annex B below).

In this application, the standard GTAP closure is used with the exception that a semi-flexible labour market for services, clerical and unskilled labour is assumed, implying that a change in the demand for labour leads to some change in both wages and employment[31]. Skilled (managerial and technical) labour is assumed to be mobile between sectors in each country but in a fixed supply, with no surplus labour. That is, all the adjustment occurs in wages, not employment.

31. The assumptions embodied in this closure are different from the one adopted in UNCTAD (2020).

In terms of geographical coverage, the GTAP database includes four individual SIDS according to UNCTAD classification: three in the Caribbean, namely Jamaica, Trinidad and Tobago and Puerto Rico, and one in Africa, Mauritius[32]. There are also two residual regional groups that are relevant to SIDS, namely the "Rest of Caribbean" and "Rest of Oceania", whose composition includes both SIDS (according to the analytical classification) and a few larger island economies[33].

One last methodological caveat is in order before discussing the scenarios and related simulation results. The current version of the GTAP database (V10) includes "Accommodation, food and services", and "Recreation and other services", sectors that cover most tourist expenditure. Travellers' expenditure is allocated across sectors, as described in the GTAP documentation:

"Travelers' expenditures" includes spending abroad by tourists, people working overseas for short periods, and the like. The balance of payments statistics treat these expenditures as a single services commodity. But to fit in with the I-O [Input-Output] accounting framework in the GTAP Data Base, we need to resolve them into the standard GTAP commodities; so if a traveler abroad buys a T-shirt or a train ticket, we treat the expenditure as trade in apparel or in "other transport", not in "travelers' expenditures."(McDougall and Hagemejer, 2006: 2).

In SIDS, most of the travellers are international tourists, and most of the expenditure is in two sectors "Accommodation, food and services" and "Recreation and other services". However, a serious limitation is that in GTAP, national income is defined as revenue produced within the borders of the national territory, as noted by Berrittella et al. (2004). Therefore, the additional expenditure generated by tourism activities is not accounted for as exports, but as additional domestic consumption, while foreign income spent inside the country amounts to an income transfer. Changes in the flow of tourists can be modelled as changes in final consumption plus changes in the international income transfers. Changes in tourism demand are modelled as an appropriate shock to consumption of GTAP sectors "Accommodation, food and services" and "Recreation and other services", according to the UNWTO estimates of inbound tourist expenditure.

Table 2.5 shows tourism expenditure in the GTAP framework (summing "Accommodation, food & services" plus "Recreation and other services"), and the inbound tourist expenditure from UNWTO. The UNWTO estimate is considered more indicative in this case, because the GTAP figures include domestic tourism and other expenses. Therefore, the GTAP estimate should be greater than the UNWTO estimate[34].

Table 2.5 – Tourism expenditure in selected SIDS, 2014 (millions of US dollars)[35]

Code	Region	GTAP	UNWTO
mus	Mauritius	1,720	1,719
jam	Jamaica	3,017	2,405
pri	Puerto Rico	11,840	3,439
tto	Trinidad and Tobago	1,681	875
xcb	Rest of Caribbean	13,574	20,260
xoc	Rest of Oceania	6,022	3,061

Source: UNCTAD Secretariat calculation based on UNWTO (2020) and GTAP database.

32. Other SIDS in the African region are grouped together with much larger continental economies hence cannot be analysed separately.

33. The region "Rest of Caribbean" includes the following countries and territories: Aruba, Anguilla, Netherlands Antilles, Antigua & Barbuda, Bahamas, Barbados, Cuba, Cayman Islands, Dominica, Dominican Republic, Guadeloupe, Grenada, Haiti, St Kitts & Nevis, Saint Lucia, Montserrat, Martinique, Turks & Caicos, St Vincent and the Grenadines, UK Virgin Islands, and US Virgin Islands. Conversely, the aggregation "Rest of Oceania" encompasses: American Samoa, Cook Islands, Fiji, Federated States of Micronesia, Guam, Kiribati, Marshall Islands, North Marianas, New Caledonia, Norfolk Island, Niue, Nauru, Palau, Papua New Guinea, French Polynesia, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis & Futuna, and Samoa.

34. The Puerto Rico estimate for WTO may be artificially low because tourists from the United States are treated as domestic, given that Puerto Rico is an unincorporated state of the United States.

35. The GTAP figure for Mauritius was adjusted in the database because the initial figure appeared to be too low, even in comparison to national sources.

2.3.1. Scenarios

The rest of the chapter examines three scenarios:

(1) A 25 per cent decrease in demand for tourism services in SIDS (at the level of individual country and/or regional aggregate);

(2) A 50 per cent decrease in cruise ships arrivals; and

(3) A five per cent increase in fuel costs due to restrictions on fuel use as part of international efforts to curb CO2 emissions.

Scenarios 1 and 2 reflect an external demand shock: the first involving both air travel and shipping; the second focusing on cruise shipping (which suffered the most in the wake of COVID-19). These shocks are significantly lower than the global collapse in international arrivals suffered in the course of 2020 and lingering also for 2021 (UNWTO, 2020a; UNCTAD, 2020a, 2021a), but they are designed to reflect a subdued recovery in tourism flows over the medium-term. Scenario 3 reflects instead a policy change such as a hypothetical tax on fuel adopted as part of international efforts to curb CO2 emissions, and collected by producing countries.

Table 2.6.2 shows the demand shock simulated in Scenarios 1 and 2. In each case, the relevant percentage change in inbound tourist expenditure has been first transformed into an absolute reduction (using the figures in the second column of Table 2.5)[36], which is then applied to the output of the tourism sectors (as reported in the first column of Table 2.5). Note that in Scenario 2 the percentage reduction in tourism expenditure varies widely across countries, with the pattern of arrivals by mode of transport. Accordingly, for example, the shock to Mauritius is small because Mauritius receives almost all its tourists by air; conversely, the shock to the Rest of Caribbean is significantly larger since a high proportion of arrivals are accounted for by cruise ships.

The GTAP database accounts for transport costs – whether by air, water or overland transport – of the international movement of goods, though not of services. Overall, in the case of SIDS, transport costs amount to roughly four to five per cent of the landed value of the goods; however, for some sectors, such as forestry, minerals and mineral products, the costs can be 10 to 20 per cent of the value of the landed goods (Figure 2.6). Generally speaking, SIDS tend to be disproportionately affected by transport costs, not only due to their remoteness and size (hence

Table 2.6 – Demand shocks to tourist sectors (percentage)

Region	Scenario 1 25% fall in demand	Scenario 2 50% fall in cruise ship arrivals
Mauritius	-25.0	-1.5
Jamaica	-19.9	-17.1
Puerto Rico	-7.3	-3.9
Trinidad and Tobago	-13.0	-6.5
Rest of Caribbean	-37.3	-51.5
Rest of Oceania	-12.7	-6.4

Source: UNCTAD Secretariat calculation based on UNWTO (2020) and GTAP database.

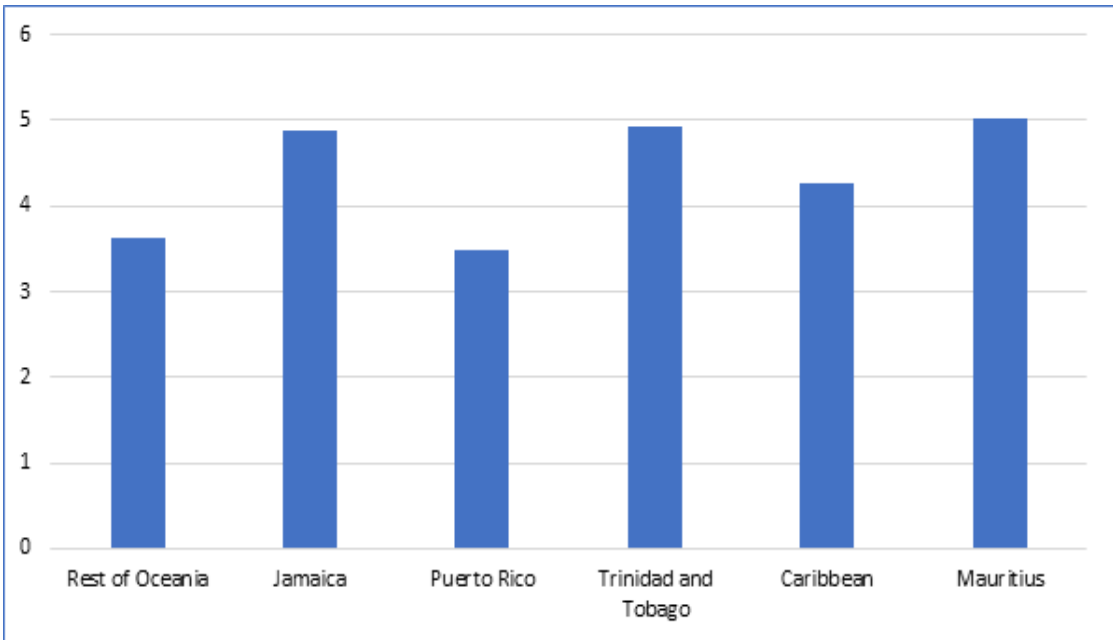
35. For example, in the case of Jamaica a 25 per cent reduction in inbound tourist expenditure is equivalent to $601 million ($2,405 million x 0.25); hence the shock modelled in the GTAP framework

diseconomies of scale), but also trade imbalances – situations where ships arrive full but return mostly empty. Therefore, further increases to the costs of international transport might have a detrimental impact, especially on sectors where transport costs are more significant.

To investigate this issue, Scenario 3 involves the impact of an increase in transport costs, such as following a carbon tax or similar restrictions to limit greenhouse gas emissions. The simulation in Scenario 3 involves a worldwide five per cent output tax on petroleum and coal products. The tax revenue accrues to the country imposing the tax, but the effects are felt on fuel-intensive industries worldwide, including transport. Moreover, an island's remoteness and dependence on sensitive imports suggest that it might be disproportionately affected in terms of a higher cost of imports, compared to most locations.

A limitation of current circumstances, however, is that the effects of international transport costs on services are not captured in the GTAP framework and database. Hence, in Scenario 3 the fossil fuels tax has no bearing on tourism, even though presumably the remote nature of SIDS should imply that tourism-related transport costs increase more than to other destinations. UNWTO (2012a) suggest a one per cent increase in transport costs leads to a 0.6 per cent decrease in international tourist arrivals, but because of their remoteness, the effects of transport costs on SIDS arrivals is likely to be much greater than this. Total arrivals are more sensitive to growth in GDP than transport costs, but higher transport cost would encourage tourists to substitute locations, travelling to alternative destinations closer to their home country, for example within Europe rather than to the Caribbean.

Figure 2.6: Transport costs on imported goods (percentage)



Source: GTAP database.

2.3.2. Results: Welfare, GDP and trade impacts

An exogenous fall in demand for tourist arrivals is estimated to have substantial effects on the Caribbean SIDS, but a comparatively lower impact on other SIDS considered. Not being as highly reliant on tourism, Puerto Rico, Trinidad and Tobago and Rest of Oceania are also negatively affected but not as badly. Table 2.3 shows the absolute changes in welfare (measure of consumption) while real GDP (Figure 2.7) give a better indication of the relative effects.

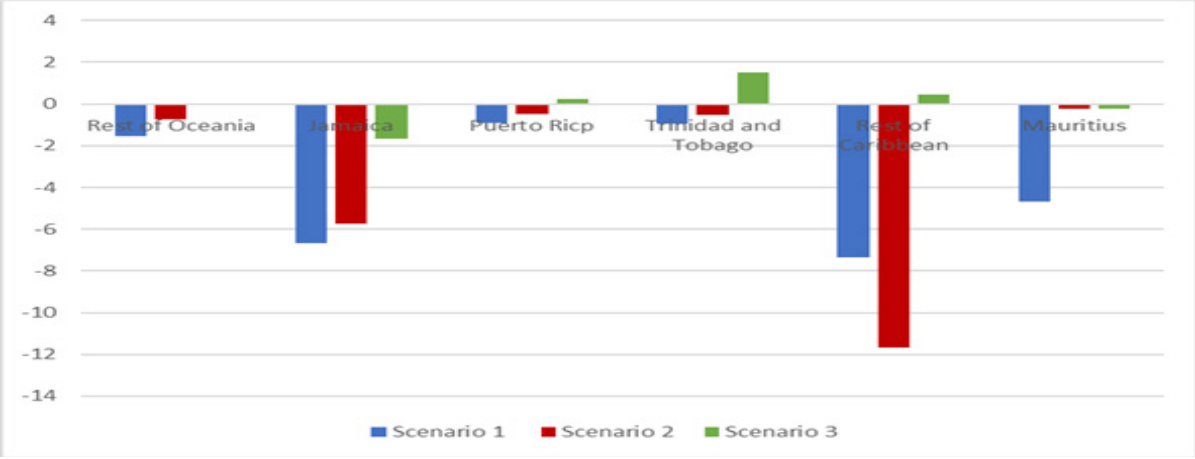
Equally troubling for most Caribbean countries, apart from Puerto Rico and Trinidad and Tobago, is their reliance on cruise shipping, whose full recovery will likely take several years. This is reflected by a 12 percent decline in real GDP in Rest of Caribbean in Scenario 2. Islands heavily affected are Antigua & Barbuda, Bahamas, Barbados, Dominica, Grenada and St Lucia, as these countries have a high proportion of same-day visitors. Conversely, Mauritius is hardly affected by a fall in demand for cruises because most of its tourist arrivals travel by air (which may even benefit somewhat from the substitution between modes of transport). The 50 per cent drop in cruises to SIDS results in a minor impact to the Mauritian economy, just $57 million as opposed to $1 billion in Scenario 1. It should be noted, however, that these estimates are based solely on the number of arrivals, and do not consider that certain tourists may spend less than others (for instance, same-day visitors presumably spend less than people staying overnight).

Table 2.7 – Welfare effects (millions of US dollars)

Region	Scenario 1 25% fall in demand	Scenario 2 50% fall in cruise ship arrivals	Scenario 3 5% increase in fuel costs
Rest of Oceania	-2,330	-1,139	-231
Jamaica	-1,574	-1,359	-211
Puerto Rico	-2,816	-1,516	-319
Trinidad and Tobago	-611	-300	223
Rest of Caribbean	-16,821	-25,365	-71
Mauritius	-1,026	-57	-90
World	-27,044	-26,524	-98,015

Source: GTAP simulations.

Figure 2.7: Real GDP effects (percent compared to the baseline)



Source: GTAP simulations.

Scenario 3, involving increased transport costs following a tax increase, results in global welfare losses of $98 billion but the impacts on SIDS are relatively contained, compared with the loss of tourism, at any rate. These losses amount to one to two per cent of GDP at most, but some countries experience an increase in GDP (bear in mind that GDP is a measure of national output, not consumption). On this basis, the SIDS are no worse off than many other countries, especially those characterized by energy intensive industries such as iron and steel. Pivotal to this outcome, however, are also the implicit redistributive assumptions made regarding the revenues of the tax collected by producing countries, with additional costs being at least partly passed through along the value chain[37].

A fall in demand for tourism in SIDS (Scenarios 1 and 2) only appears to have a modest effect on trade of other goods, with imports falling 1-2 per cent and exports up to 5 per cent. These effects work through adjustments in intermediate inputs and reallocation of factors. On the import side, a contraction of tourism reduces the demand for imported intermediate inputs such as food and drink. On the export side, labour and capital can move out of tourism into other sectors, such as agriculture and textiles, and other services, such as transport and communications.

In Scenario 3, the five per cent fuel tax tends to increase the value of trade (reflecting higher costs) but not the quantity. Demand for fuel being inelastic, the effect of price increases outweighs the quantity effect, thus, trade increases. However, the effect is small, less than one per cent for most SIDS.

2.3.3. Intersectoral effects and labour market

Demand multipliers and intersectoral linkages tend to spread and compound the impact of a decline in tourism demand in Scenarios 1 and 2, due to the indirect shock induced to the various suppliers of the food, hospitality and recreational industry. Accordingly, second-round contractions are experienced in retail and wholesale trade and other services, compounding the overall impact of the demand shock. However, consistent with the model's closure, some of the production inputs no longer needed in these industries are employed in other sectors, such as manufacturing and agriculture, which in some cases experience slight increases in output, only partly offsetting the above-mentioned reductions.

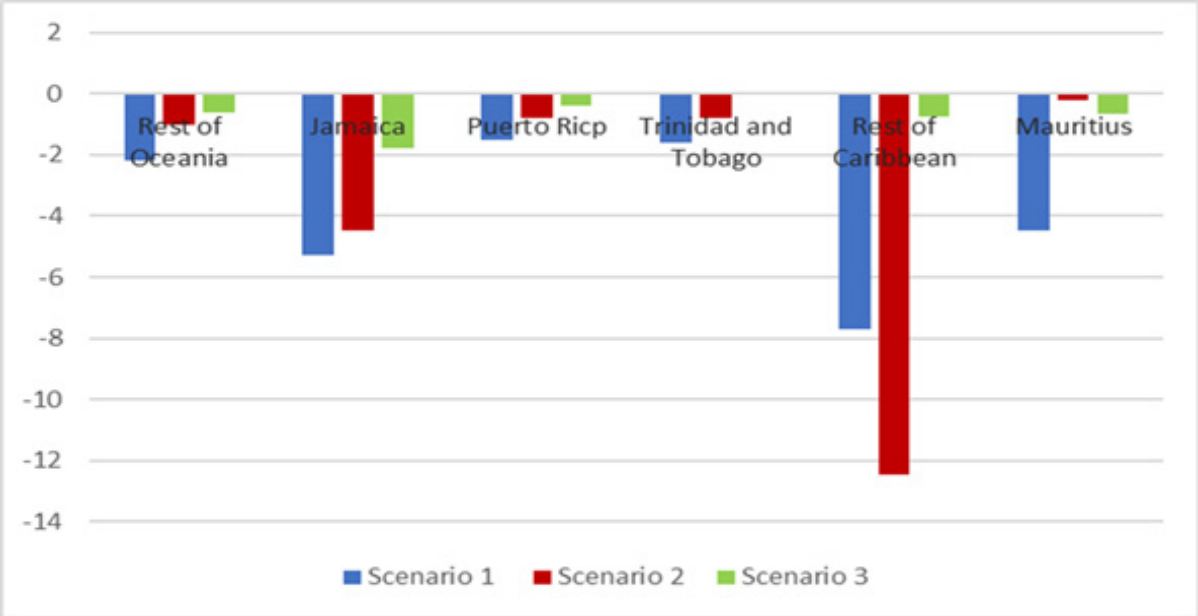
Detailed percentage changes in output for all SIDS under Scenario 1 are provided in Table B.2. It suffices here to underscore that while the negative effects from the tourism demand shock manifest themselves visibly across all SIDS, only a few of them ¬– Mauritius and, to a lesser extent the "rest of the Caribbean" – experience the modest expansionary impacts due to the kind of reallocation of factors discussed above. Two important considerations should however be borne in mind when interpreting the model's results. First, the reallocation of under-utilized production factors to other sectors depends on the flexibility of factor markets, and – on the other hand – on whether their characteristics match the needs of the other sectors (especially in connection with the skill set of the newly unemployed workers). Second, unlike the demand shock, which is felt almost immediately, the reallocation of production factors is expected to take some time. This points to the importance of countercyclical policy action to cushion the negative impact of the downturn and foster a readjustment with proactive policies, notably in terms of upskilling.

Moreover, in the closure adopted here, part of the adjustment in the labour market occurs through changes in employment, and part through

37.This explains, notably, the positive impact of the tax on Trinidad and Tobago, a fossil fuel exporter.

adjustments in real wages (Figure 2.8). Simulations of the different scenarios show, once again, that the tourism demand shocks (Scenarios 1 and 2) have a visibly larger adverse effect than the introduction of a fossil fuels tax (Scenario 3). The 25 per cent drop in inbound tourism simulated in Scenario 1 would trigger a significant reduction of real wages in Jamaica, in the "rest of the Caribbean" and in Mauritius, with smaller decreases in other SIDS, reflecting mainly their lower reliance on international tourism. If the fall in demand were confined to cruise shipping (Scenario 2), the effects would differ somewhat depending on the proportion of tourists coming by ship as opposed to air. Accordingly, Caribbean SIDS would be the worst affected, in contrast to the Pacific and Mauritius, where a high proportion of inbound tourists come by air and stay overnight. Finally, in Scenario 3, the 5 per cent increase in transport costs due to the carbon tax

Figure 2.6: Real wage effects (percentage points compared to the baseline)



Source: GTAP simulations. Average of all labour types.

would trigger some modest reductions in real wages across SIDS, except for Jamaica, where the decline would be more significant (almost two percent).

2.4. Conclusion and policy implications

The dependence of SIDS on international tourism has long been recognized, and the disruptions caused by the pandemic have dramatically exposed the attendant risks. International tourist arrivals plummeted in 2020, a decline of roughly 74 per cent, with no meaningful rebound yet in sight (UNCTAD, 2021a). In many SIDS, the impact of the ensuing fall in foreign exchange earnings has been compounded by high existing levels of external debt. Moreover, income levels in most SIDS are too high for them to qualify for debt relief under the G20 Debt Service Suspension Initiative (DSSI) and the Common Framework for Debt Treatments, although some may be able to obtain concessional loans under the Catastrophe Containment and Relief Trust (CCRT).

In this context, the previous discussion and model

simulations highlight several key issues in rethinking the role of tourism. First, the tourism sector is strongly anchored to the local economy chiefly because of its direct and indirect employment creation for both skilled and semi-skilled workers. On the negative side, this implies that a demand shock such as the present one is propagated to the local economy and compounded by the indirect employment effects; on the positive side, however, the fact that demand multipliers work in both directions also highlights the scope for a stronger and inclusive recovery as soon as international arrivals rebound. In this context, initiatives to promote soft skills and language training, intensify digital offers and marketing efforts could assist the development of the industry, while possibly increasing indirect job creation. More broadly, upskilling could make the labour market more flexible and accelerate labour reallocation (especially towards other services).

Second, beyond employment effects, our analysis suggests the presence of some intersectoral linkages in SIDS, particularly in relation to other services demanded by tourism (from trade and transport to financial services). The lack of reliable data on SIDS at a sufficient level of disaggregation hampers a comprehensive analysis of this aspect. Nonetheless, the available evidence suggests that, in view of their narrow production basis, very few SIDS have been able to significantly leverage intersectoral linkages to manufacturing and agriculture, with the result that much of the related demand is catered for through importation. Considering the size of (inbound) tourist expenditure, this suggests a missed opportunity to spur economic diversification and thereby broaden gains beyond the touristic areas.

Third, the type of tourism "target market" and mode of transport are critical to an understanding of the sector with a view to diversification. Our simulations show, for instance, that if the recovery of cruise shipping is delayed, this can be expected to exert a far more damaging effect in the Caribbean islands than it would in other SIDS (assuming that a demand shock will affect SIDS in a rather similar way, and after having accounted for degree of dependence on the industry). Half of international tourists to the Caribbean arrive by sea and do not stay overnight. Although the data is too patchy to draw a definitive conclusion on this point, it could be argued that same-day visitors are less likely to have the multiplier effects of overnight tourists, and hence the domestic economy gains little from each visit. However, cruise tourism reduces the need to provide capital-intensive infrastructure (mainly accommodation), somewhat lowering pressure on the island ecosystem.

Fourth, shocks to international tourist demand fall particularly heavily on SIDS in the sense that, unlike elsewhere, there is very limited scope for domestic tourists to replace the drop in international arrivals. With closed borders, or if pandemic-related travel restrictions continue to apply, some potential outbound tourists from SIDS might travel domestically, or perhaps within the region. However, they would be relatively few, and their consumption and spending patterns would probably differ from those of international tourists[38]. If improving access to vaccines remains a priority in the short run, especially in developing countries, a sensible long-run policy option to diversify economic risk would be to actively encourage visitors from a range of sources, consolidating existing markets while striving to build new ones. One option is to offer a broad range of services that caters for different budgets and tastes, ages, lifestyles, interests, and activities. In recent years, tourists have sought activity-based holidays,

38. According to World Travel And Tourism Council (WTTC) data (2019), domestic tourist expenditure is a tiny fraction of foreign visitor expenditure in Aruba, Barbados, Bahamas, and Jamaica. For example, in Jamaica outbound tourism is 3.2 per cent of GDP, whereas inbound tourism is 20 per cent. In Antigua & Barbuda, the corresponding numbers are 7 and 60 per cent; in Saint Lucia, 4.5 and 53 per cent. An exception is Puerto Rico, but this is likely due to its special status within the United States, as tourists from the mainland are treated as domestic for statistical purposes.

adventure travel and participatory experiences rather than just rest and relaxation, as in previous decades, and this could offer a potential avenue to broaden indirect linkages to the local economy. A related issue is the seasonality of tourist arrivals. Here again, diversification of activities and of visitors' origin might provide some benefits, although the margin for action is relatively limited.

Fifth, a major constraint to a deeper evidence-based understanding of the peculiarities of tourism in SIDS is the lack of reliable data pertaining to various tourism-related dimensions. Notably, the GTAP model does not have bilateral service trade data for tourism, and there is no explicit export data. Bilateral tourism data is collected by the UNWTO, but this has not been incorporated into the GTAP database. Similarly, the absence of reliable value-added data and expenditure surveys limits the capacity to track how much distinct typologies of tourists spend, and how their expenditure contributes to the local communities. Another area where hard data and research are scarce is in linking transport modes and related costs to tourism demand. Given the huge difference in emissions intensity between air and sea transport, any attempt to fully evaluate the implications of climate change for tourism-dependent countries is impossible without a complete view of the implication of transport costs.

ANNEX B

Table B.1 – Inbound tourism expenditure, 2018

	Total (Million dollars)	Expenditure as percentage of GDP	Expenditure as percentage of merchandise exports
Antigua and Barbuda	..	60	2,552
Bahamas	..	..	527
Barbados	..	..	..
Cabo Verde	492	26	192
Comoros	76	6	176
Dominica			
Fiji	969	25	135
Grenada	..	45	1,272
Jamaica	..	20	157
Kiribati	..	..	..
Maldives	..	58	900
Marshall Islands	9	10	23
Mauritius	1,891	15	91
Micronesia, Federated States of	..	..	..
Nauru	..	1	13
Palau	..	..	..
Saint Kitts and Nevis	..	35	1,096
Saint Lucia	..	53	707
Saint Vincent And the Grenadines	..	30	598
Samoa	..	22	453
São Tomé and Príncipe	72	17	449
Seychelles	559	38	109
Solomon Islands	..	6	4
Timor-Leste	81	7	17
Tonga	78	3	317
Trinidad And Tobago	48	11	336
Tuvalu	429	2	5
Vanuatu	..	..	..

Source: UNWTO.

Table B.2 – Changes in output following 25 per cent fall in demand

	Rest of Oceania	Jamaica	Puerto Rico	Trinidad and Tobago	Rest of Caribbean	Mauritius
	%	%	%	%	%	%
Cereals	-0.29	2.02	-0.35	0.22	-0.14	0.01
Other crops	0.18	2.60	-0.19	-0.70	0.31	1.61
Forestry & fishing	-0.30	-3.28	-1.27	-0.31	-1.78	-1.81
Coal	-0.40	-3.14	-2.35	-0.31	1.99	-1.93
Oil	-0.17	-2.49	-2.19	-0.30	2.19	-2.06
Gas	-0.10	-2.53	-1.94	-0.20	2.15	-1.23
Petroleum, coal products	-1.55	-1.24	-1.00	-1.35	-2.19	-1.41
Minerals n.e.c.	-0.31	0.74	-1.53	-0.26	-1.43	-3.20
Livestock products	-0.82	-2.13	-0.74	-0.94	-2.47	-1.05
Food products n.e.c.	-0.54	-1.25	-0.93	-1.12	-2.56	1.49
Beverages & tobacco	-0.50	-2.78	-0.81	-1.24	-2.42	-2.92
Textiles & apparel	-1.62	2.75	-0.84	-1.52	-0.95	6.32
Electronics	-1.80	3.80	-0.35	-1.44	-1.52	7.30
Motor vehicles and parts	-1.73	-2.14	-0.26	-1.36	-7.97	0.66
Transport equipment n.e.c.	-0.12	4.12	0.04	-1.37	1.75	3.79
Wood products	-1.29	-1.74	-0.92	-1.78	-2.87	4.24
Paper products, publishing	-1.55	-0.12	-0.75	-2.03	-4.36	-1.77
Chemical, rubber & plastics	-1.48	2.46	-0.91	0.15	-3.70	3.27
Machinery and equipment n.e.c.	-1.80	0.83	-0.50	-1.03	-3.84	5.72
Mineral products n.e.c.	-1.60	-1.13	-0.96	-2.60	-5.07	-0.77
Ferrous metals	-0.57	5.12	-0.33	-1.02	-1.39	1.91
Manufactures	-0.84	8.36	-0.51	-1.24	0.30	0.98
Utilities	-1.51	-4.77	-1.00	-1.11	-6.85	-4.60
Accommodation, food & services	-12.71	-19.93	-7.26	-13.01	-37.31	-24.99
Other transport	-1.30	-0.35	-1.22	-3.37	-3.69	-10.93
Water transport	-1.16	1.05	-1.74	-3.17	-1.36	-0.55
Air transport	-1.16	-2.31	-3.19	-14.61	-9.29	-9.26
Communication	-1.72	-1.07	-1.19	-1.34	-6.10	-7.28
Trade	-2.26	-4.93	-1.31	-1.32	-6.99	-30.82
Retail & wholesale trade	-1.53	-0.99	-1.47	-3.56	-6.28	-9.44
Recreational and other service	-12.71	-19.93	-7.26	-13.01	-37.31	-24.99
Business services n.e.c.	-1.55	-2.57	-1.39	-1.45	-5.06	-5.47
Other services	-1.90	-5.88	-1.23	-1.19	-7.02	-5.38

Source: Authors' calculations based on GTAP database.

Chapter 3: Multiple disasters and debt sustainability[39]

3.1. Introduction

Small Island Developing States (SIDS) are the most disaster-prone countries in the world. They are regularly – and increasingly – hit by severe storms and other disasters, causing damage amounting on average to 2.1 percent of GDP every year. In the aftermath, reconstruction efforts require massive financial resources, often covered through external borrowing. Small countries are also highly exposed to economic shocks, resulting in a massive fall in GDP and exports during global crises such as the pandemic. In order to provide policy makers with tools to maintain debt sustainability, it would be useful to gain a better understanding of the options that emerge from the complex interrelationship between disaster response and debt.

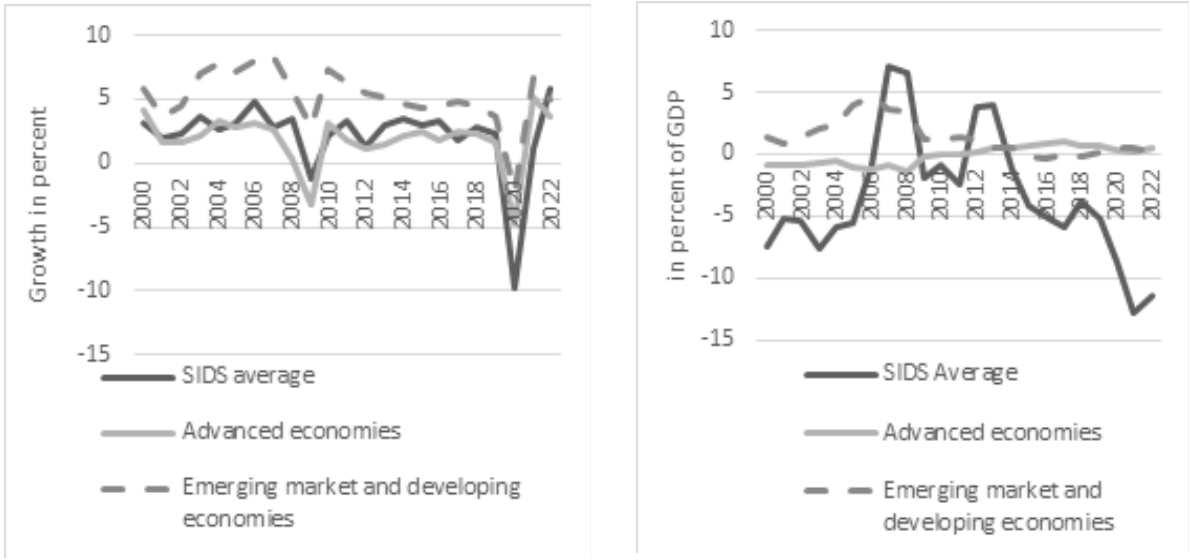
SIDS are characterized by a high degree of openness and a strong dependence on the global economy through tourism, remittances, financial services, and concessional financing. In 2020, due to the negative impact of the pandemic, SIDS are expected to experience a 9.8 percent fall in GDP, compared to a drop of 2.2 percent in other developing countries. Despite significant unpredictable factors, GDP growth is expected to recover in 2021 and 2022[40]. The negative impact on the current account balance presents a less reassuring prospect (Figure 3.1). The immense drop in external receipts is likely to entail a debt repayment crisis for many countries. The combined effect of declining macroeconomic output, fighting a pandemic with a weakened health care system, and the threat of impending natural disaster due to seasonal storms would be devastating for any country.

This chapter aims to assess the prospects of debt in the aftermath of a disaster and sheds light on determinants of debt sustainability, such as macroeconomic conditions, price fluctuations and trade openness. The chapter discusses different dimensions of natural disasters and their financial implications. A standard panel-data approach and a Synthetic Control Method are applied to provide a broad assessment of debt sustainability. Both methods allow the identification of short- and long-run dimensions of debt in relation to severe natural disasters.

This chapter employs a novel approach to empirically assesses the link between natural disasters and debt development for the group of SIDS. While recent literature has looked at Caribbean or Pacific Islands countries it has largely focused on climate-related natural disasters, whereas other types (earthquakes and biological disasters) are equally important. This chapter assesses the impact that the full spectrum of natural disasters has exerted on external debt held by SIDS. The chapter seeks to contribute significantly to the literature by looking at SIDS as a group and considering various types of natural disaster.

39. This chapter is an excerpt from the UNCTAD Research Paper No. 55 "Multiple disasters and debt sustainability in Small Island Developing States" (UNCTAD/SER.RP/2020/14) prepared by Anja Slany, Associate Expert in the Africa Section, UNCTAD. The full paper is available at https://unctad.org/webflyer/multiple-disasters-and-debt-sustainability-small-island-developing-states.
40. The estimates refer to the projected IMF Economic Outlook as of April 2021. The numbers have been revised downwards compared to earlier projections in 2020.

Figure 3.1: Real GDP growth rates (left) and current account balance (right) 2000 - 2022, Simple average by respective country group



Source: Author's graph based on IMF World Economic Outlook (April 2021 estimates), 2020, 2021 and 2022 projected growth rates.

The chapter is structured as follows: Section 3.2 provides stylized facts of SIDS' exposure to different types of disasters and discusses financial instruments to recover from such severe external shocks. The econometric analysis and related results are discussed in Section 3.3; Section 3.4 provides conclusions and policy recommendations.

3.2. Vulnerability of SIDS to natural disasters

SIDS are especially vulnerable to natural disasters due to a strong exposure to meteorological hazards and rising sea levels[41], their size, the high density and concentration of population, and high per capita costs of roads, ports and airport infrastructure. For small countries, the per capita costs of post-disaster reconstruction can be exorbitant. In combination with limitations to diversification and building resilience against external shocks, external debt grows, and debt servicing capacity weakens when exports drop dramatically, such as during the current COVID-19 crisis.

The Emergency Events Database (EM-DAT), launched by the Centre for Research on the Epidemiology of Disasters (CRED)[42], is the most comprehensive database on the global occurrence of natural disasters. The classification of natural disasters applied in this chapter is based on the EM-DAT database:

i) Climate-related disasters: Meteorological[43], hydrological[44] and climatological[45] disasters;

ii) Earth-related disasters: Geophysical and extraterrestrial disaster[47];

iii) Biological disasters (i.e., epidemics): A hazard caused by the exposure to living organisms and their toxic substances (e.g., venom, mould) or vector-borne diseases that they may carry[48].

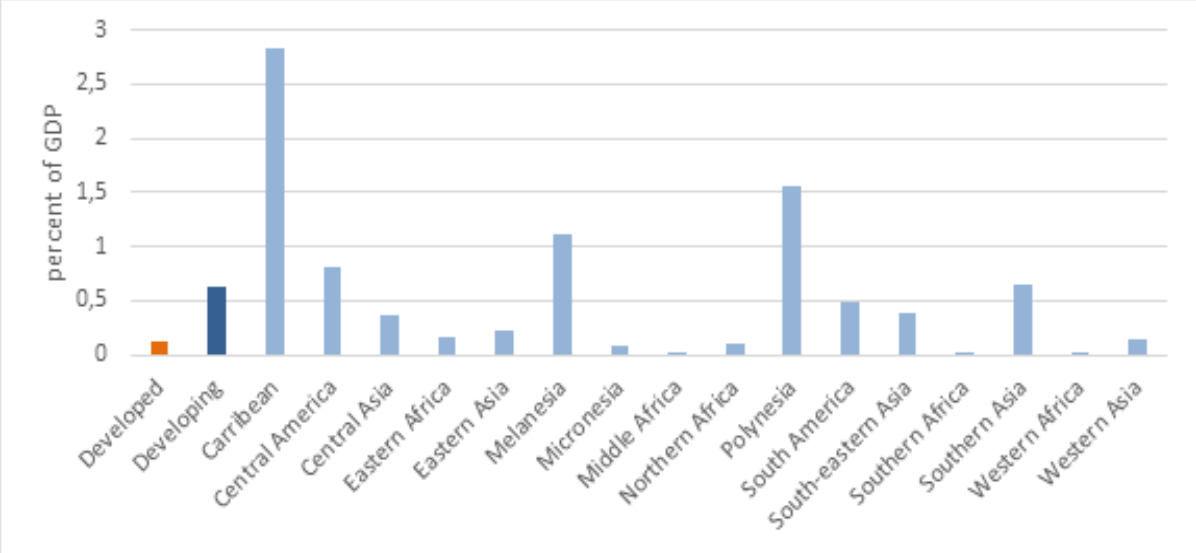
According to the available data, natural disasters and their costs have steadily increased over the past 40 years. Among developing regions, Eastern Asia, the Caribbean, Southern Asia and South-Eastern Asia have been hit the most in terms of absolute costs

41. Rising sea levels are another major threat to infrastructure, but this chapter focuses on the fiscal impact of sudden natural disasters.

42. The database differentiates between natural and technological disasters. https://www.emdat.be
43. A hazard caused by short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days (e.g., extreme temperature, fog, storm).
44. A hazard caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater (flood, landslide, wave action).
45. A hazard caused by long-lived, meso- to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability (drought, glacial lake outburst, wildfire).
46. This term is used interchangeably with the term geological hazard (earthquake, mass movement, volcanic activity).
47. A hazard caused by asteroids, meteoroids, and comets as they pass near earth, enter the atmosphere, or strike the earth, and by changes in interplanetary conditions that affect space weather (affect the magnetosphere, ionosphere, and thermosphere).

and occurrences between 1980 and 2019. In smaller countries, natural disasters present a systemic risk (Cebotari and Youssef, 2020). For instance, the small states in the Caribbean experience the highest damage (Figure 3.2). Between 1970 and 2018 natural disasters there caused on average annual damage equivalent to 2.8 percent of GDP.

Figure 3.2: Annual (1970-2018 average) damage costs of disasters, average by region (including only developing countries), as percent of GDP



Source: Author's calculation based on EMDAT data; figure includes all types of natural disasters; country classification as reported in the database (www.emdat.be/)

Monetary damage indicators are only available for a few natural disasters. Some natural disasters have a smaller impact on physical capital but more strongly affect health and well-being. For instance, a drought may not cause physical damage to infrastructure, but it directly affects people through food insecurity, malnutrition, lower productivity, loss of income, and rising poverty.

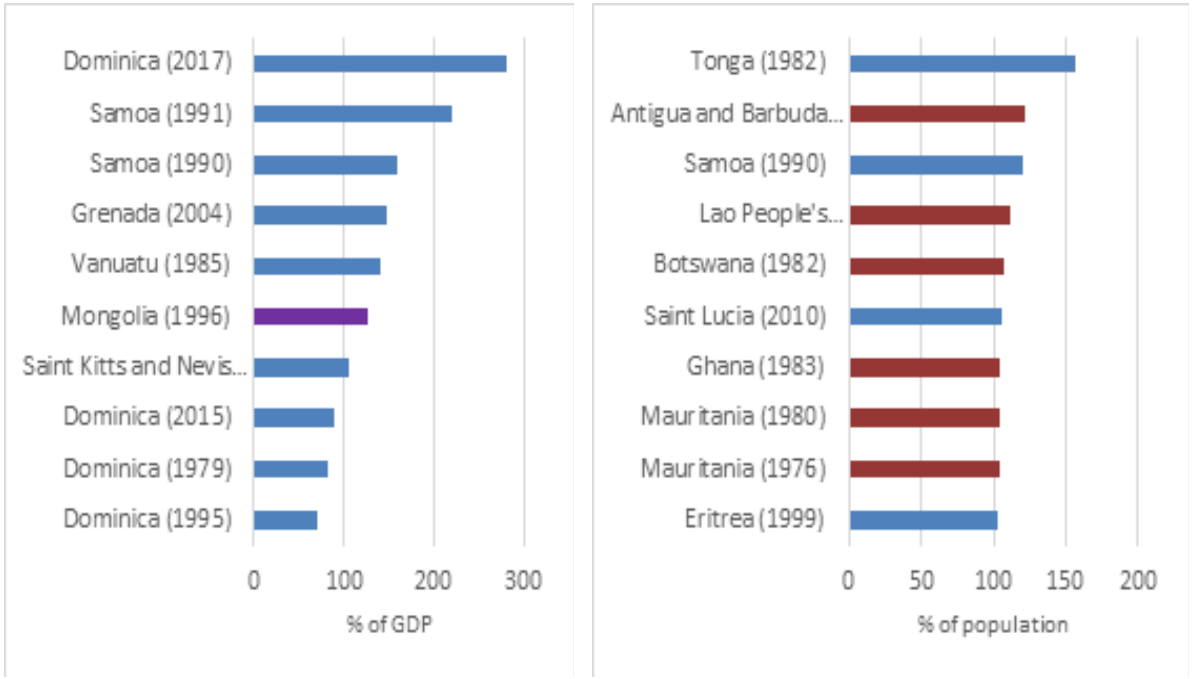
The three types of natural disaster can be differentiated.

3.2.1. Climate-related natural disasters

The worst natural disasters, measured by damage relative to GDP, have almost exclusively occurred in SIDS (except Mongolia), and are mainly in the form of storms. Figure 3.3 lists the 10 globally most severe natural disasters over the period 1970 to 2018, in terms of damage-to-GDP (left) and of the affected population per year (right). The three worst hit countries since 1970 are SIDS (Tonga, Antigua & Barbuda, Samoa).

48. Examples are venomous wildlife and insects, poisonous plants, and mosquitoes carrying disease-causing agents such as parasites, bacteria, or viruses (e.g., malaria, COVID-19). Although some biological disasters might be anthropogenic, they are classified as natural disasters in the EMDAT database. This chapter defines disasters in the same way as the database.

Figure 3.3: Most severe climate-related disaster years, by damage (in % of GDP) (left) and affected people (in % of population) (right), Global, 1970 - 2018

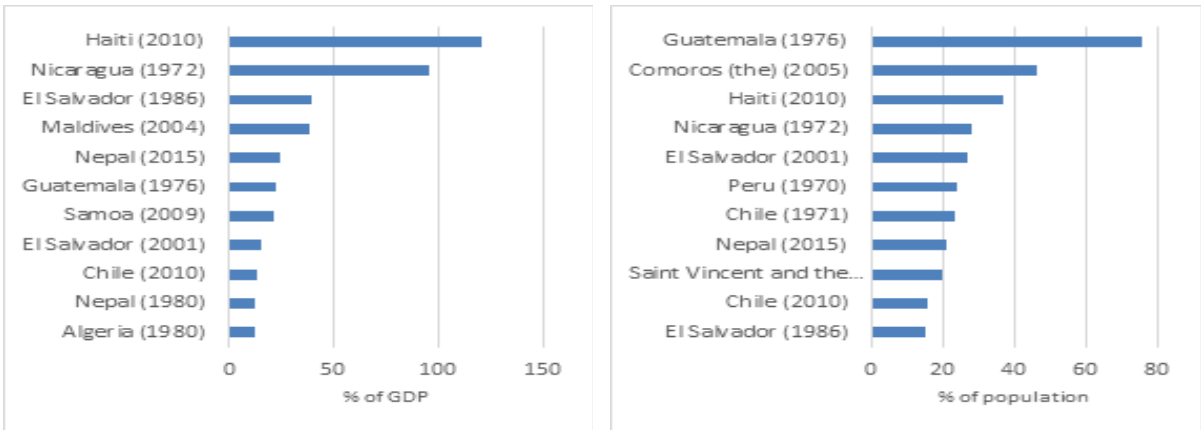


Source: Author's calculation based on EMDAT data.
Note: Climate-related disasters are the sum of meteorological, climatological and hydrological disasters (droughts in brown; storms in blue; wildfire in purple).

3.2.2. Earth-related natural disasters

In 2010, Haiti suffered an earthquake of horrific proportions, possibly the world's most destructive in several generations: 200,000 people lost their lives, and 300,000 were injured. The disaster directly affected 40 percent of the population, causing economic damage of roughly 120 percent of GDP. Similarly, disastrous earthquakes affected Nicaragua in 1972, Guatemala in 1976, the Comoros in 2005 and the Maldives in 2004 (Figure 3.4).

Figure 3.4: Most severe earth-related natural disasters globally, by damage (% of GDP, left) and affected people (% of population, right), 1970 to 2018

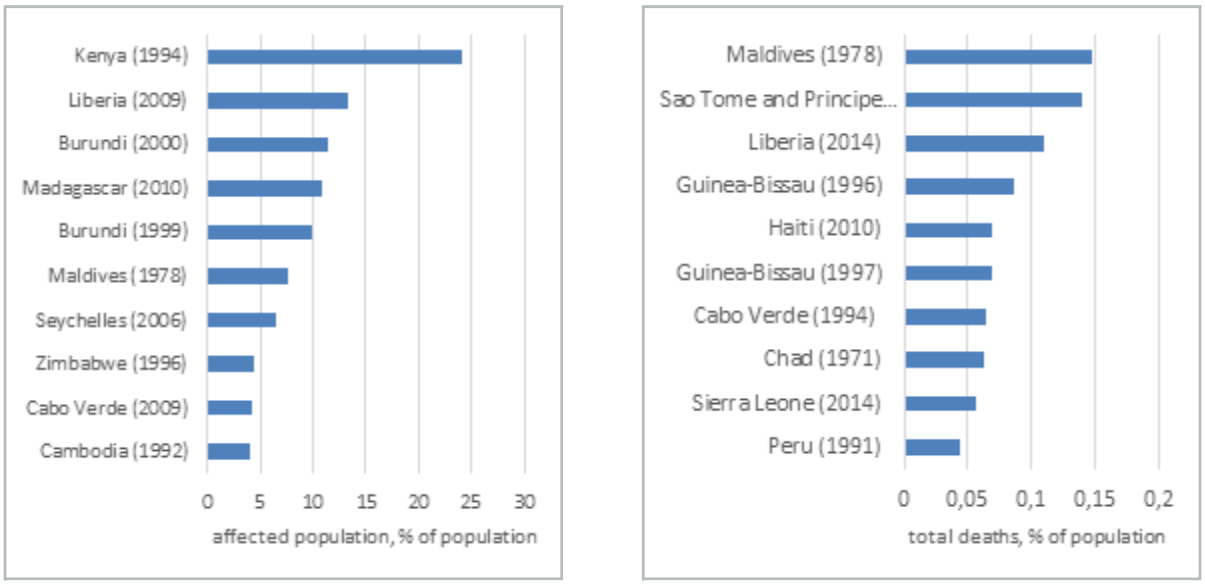


Source: Author's calculation based on EMDAT data.

3.2.3. Biological disasters

Relative to their population, SIDS are extremely vulnerable to health-related disasters (Figure 3.5)[49]. Proportionally, the deadliest biological disaster was in 1978 in the Maldives, where 0.14 percent of the population died, and 1986 in São Tomé and Príncipe (0.13 percent). Of the world's 10 deadliest biological disasters, five have affected SIDS (Maldives, São Tomé & Príncipe, Guinea-Bissau, Haiti and Cabo Verde).

Figure 3.5: Most severe biological disasters globally: affected people (% of population, left) and total deaths (% of population, right) 1970 to 2018



Source: Author's calculation based on EMDAT.

3.3. Financing Natural Disasters

A natural disaster is associated with an immediate destruction of human and physical capital. Direct instruments to manage the financial risks from these costs include: i) self-insurance; ii) risk-transfer to the insurance market (such as catastrophe bonds); iii) pre-arranged loans from financial institutions and central banks; and iv) fiscal spending and borrowing. In reality, post-disaster financing needs are largely covered through grants and official borrowing. Due to the rising costs of multiple disasters, donor countries struggle to provide enough to facilitate investments to build resilience. Financing the costs of natural disasters is a matter not only of a swift response after the event, but also prior arrangements to accelerate investment in resilience.

3.3.1. Self-insurance

The management of a sovereign wealth fund can play a crucial role for disaster financing[50]. Individual countries have established their own fiscal buffers, whereby surpluses during good years are invested in a stabilization fund (or natural disaster fund)[51]. However,

49. It should be noted that many biological disasters are in fact man-made disasters. Nevertheless, the way countries are affected by these disasters can be treated as an exogenous shock for a country, at least in a short-term perspective.

50. A sovereign insurance would simply mean that the national government is the buyer of the risk.

51. For resource-abundant countries, such a fund could be funded from resource revenues (Nakatani, 2019).

this is rarely on a scale sufficient to cover the costs of an exceptionally severe natural disaster. Losses from natural disasters burden those households and small businesses that all too often lack sufficient insurance coverage. In Grenada, for example, traditional insurance of physical assets covered only 4.5 percent of the total damage of recent large natural disasters (Cebotari and Youssef, 2020). For small and vulnerable countries, traditional insurance markets rarely offer a solution because of the huge premiums demanded.

While micro-insurance systems are often insufficient to cover the costs of large disasters, an insurance pool proved to be an important instrument. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) was set up in 2007 and restructured into a segregated portfolio company (SPC) in 2014. This instrument offers governments insurance policies for cyclones, earthquakes, excess rainfall and damage in the fisheries sector. In 2017, in the aftermath of Hurricanes Irma and Maria, the risk pool provided rapid assistance to affected countries. Between June 2007 and October 2019, a total of $106.4 million has been paid out for tropical cyclones, $9.2 million for earthquakes and $36.4 million for excess rainfall; with the current pay-out limited to $100 million per hazard per year (CCRIF SPC, 2019). Similarly, the Pacific Islands Climate Change Insurance Facility (PICCIF) and the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), established in 2013, are important financial instruments. The diversified portfolio helps countries to pool the risk, while the pay-out limit functions as an incentive for countries to invest in risk reduction.

3.3.2. Risk-transfer to the insurance market

Catastrophe bonds are an innovative instrument, with a high-risk rating and maturity of up to three years, issued by insurance and re-insurance companies to transfer the risk to investors. As described in Munevar (2018), such bonds can be attractive to investors because of higher returns compared to other investments in times of low interest rates.

3.3.3. Pre-arranged instruments from financial institutions and central banks

The IMF provides support through the Rapid Credit Facility (RCF) and Rapid Financing Instrument (RFI) at a zero percent interest rate. The RCF is offered on a case-by-case basis after consideration of balance of payments, strength of macroeconomic policies, capacity to repay the fund, amount of outstanding fund credit, the member's record of past use of the facility, and the size of the shock.

The Catastrophe Containment and Relief (CCRT) Trust was designed to provide post-catastrophe relief assistance to 38 low-income countries eligible for concessional borrowing. However, due to the increased frequency of natural disasters, the criteria defining a single occurrence may no longer be adequate[52]. Furthermore, the eligibility criteria – that the disaster must affect at least one third of the population, and more than a quarter of the country's productive capacity, or cause damage exceeding 100 percent of GDP – are problematic not least because of the assumption that under such circumstances sufficient administrative capacity will remain in place to measure and promptly report the impact.

52. Initial relief has been made available to 25 countries (see Introduction).

Another pre-arranged instrument to increase resilience to natural disasters are the so-called "debt-for-nature" swaps which have been used to reduce some of the countries' debt in exchange for environmental project support. The main constraints to successful adaptation are access to financial resources, as well as lack of technical know-how and equipment.

Central banks and regulators should play a complementary role to support economic activity. Central banks in Fiji, Papua New Guinea, and Vanuatu have reduced policy rates and/or reserve requirements. Other central banks in the region have provided liquidity assistance in various forms during the pandemic[53].

The negative impact of the current pandemic on growth and the fiscal account balance is mostly transmitted through the external economic shock: the severe drop in tourism and lower demand for exports. According to UNCTAD estimates, a 25 percent decline in tourism will reduce GDP by 7.3 percent in SIDS. In addition to falling tourism revenues, remittances will decline. Although SIDS have faced and overcome liquidity threats in the past, this pandemic has triggered a solvency crisis, because net interest payments may exceed current account inflows.

3.3.4. Fiscal spending and borrowing

In the event of a severe disaster, a country needs to mobilize domestic resources by increasing taxes, using foreign exchange reserves, or borrowing money (domestically and abroad). For instance, Hurricane Maria, which hit Dominica in 2017, caused estimated damage of $1.45 billion, or 280 percent of GDP. The country received a total of $3.1 million in bilateral donations and US$7.7 million in donations from multilateral donors (of which $7.1 million from the World Bank); the islands received a pay-out of $20.6 million from the CCRIF; and the government had deposits of 24 percent of GDP mainly from its Citizenship-By-Investment (CBI) scheme. These financial resources fell short of what was needed to rebuild infrastructure. The resulting current account deficit was financed mainly through external borrowing (official and bilateral loans). In the aftermath of the hurricane, the World Bank has approved $115 million over three years of International Development Association credits and grants from the Caribbean Development Bank (IMF, 2018a).

Low-income countries barely access non-concessional funding, despite the high returns the reconstruction projects could generate. Consequently, the role of non-concessional external financing mediated by multilateral institutions tends to play a larger role, especially for infrastructure projects, but the hurdles (due to limited creditworthiness) remain high. Intensified public-private partnership is required to overcome these before higher flows of non-concessional finance become accessible.

3.4. Debt vulnerability to multiple disasters

The SAMOA Pathway, adopted at the Third International Conference on Small Island Developing States held in Apia, Samoa, in 2014, is a dedicated 10-year programme of action to promote international assistance to address the unique set of challenges these islands face. In view of the increased funding needed to achieve the sustainable development goals

53. https://www.imf.org/en/News/Articles/2020/05/27/na-05272020-pacific-islands-threatened-by-covid-19

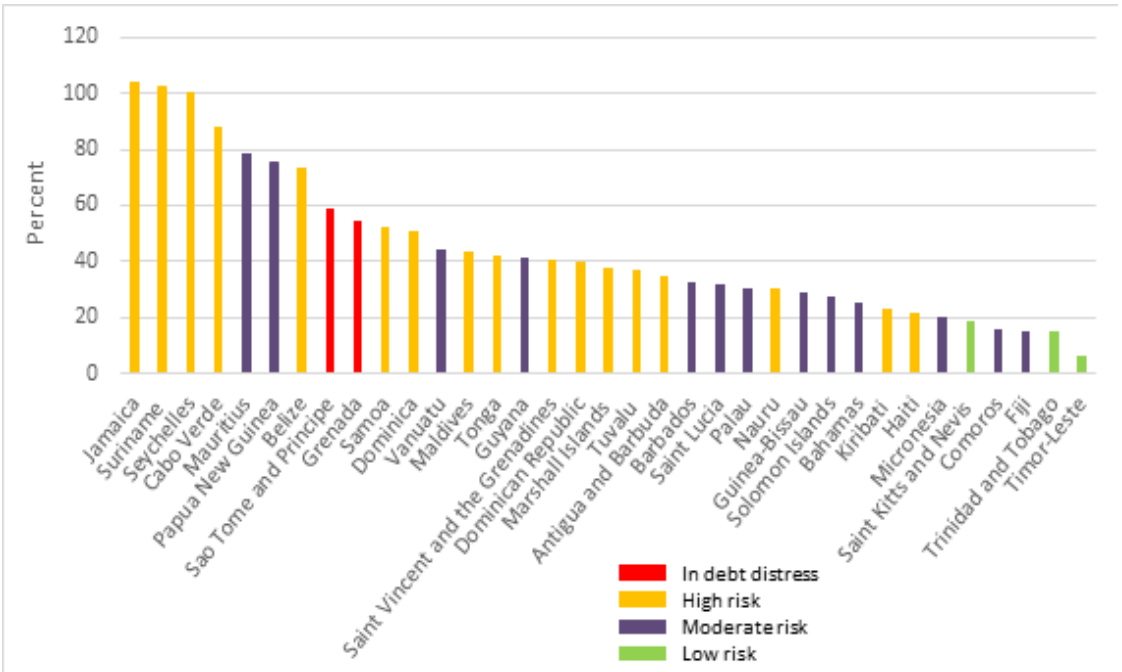
(SDGs) and to finance climate change adaptation and mitigation, debt is already a problem in many developing countries. “Debt justice” initiatives have provided debt relief and debt restructuring programmes (Box 3.1).

According to the IMF debt sustainability analysis, many SIDS are close to being in “debt distress” (unable to pay external debts). As of August 2020, Grenada and São Tomé and Príncipe are already in that category, despite debt restructuring efforts, while 17 SIDS are classed as being at high risk of debt distress, 13 at moderate risk, and three at low risk (see Figure 3.6, below, and Table C.1 in Annex C below).

Of the total external debt in SIDS, long-term debt accounts on average for more than 80 percent (see Table C.1). Long-term debt can be further broken down into public and publicly guaranteed debt (PPG), and external debt held by private borrowers. Public debt is the main component of external debt in most SIDS, except for Mauritius and the Solomon Islands, where 77 percent and 70 percent, respectively, of the reported long-term external debt is owed by private borrowers.

Among SIDS, there is wide variation in the structure of long-term, and PPG debt. Traditionally, lower-middle income economies[54] (Cabo Verde, Comoros, São Tomé and Príncipe, the Solomon Islands, Timor-Leste, Vanuatu) depend relatively heavily on official multilateral and bilateral creditors. The role of private debt (relief) is only important in a few countries, such as Jamaica and St. Lucia where 62 percent and 51 percent, respectively, of the public debt is to private creditors. Given the large share of the public debt and the importance of the public sector in SIDS, due to small market size, the public sector is particularly vulnerable to multiple shocks.

Figure 3.6: External debt stocks, total (% of current GDP), 2018, SIDS



Source: Author’s graph based on World Bank International Debt Statistics; IMF Country Reports; projected estimate of external debt for 2017 for Barbados, Saint Kitts & Nevis, Kiribati, Marshall Islands; external debt stock comprises PPG long-term external debt, private non-guaranteed long-term external debt, and short-term external debt including interest arrears on long-term debt.

54. Lower-middle income economies have a per capita income level between US$ 1,026 and US$ 3,995.

Box 3.1. Heavily Indebted Poor Countries Initiative and Multilateral Debt Relief Initiative

The joint IMF-World Bank Heavily Indebted Poor Countries (HIPC) initiative, launched in 1996, aims to ensure that no poor country faces a debt that it cannot manage. Debt relief under the HIPC and Multilateral Debt Relief Initiative (MDRI) initiatives substantially alleviated debt burdens and enabled recipient countries to increase their poverty-reducing expenditures. In 2005, the HIPC was supplemented by the MDRI to allow for 100 percent debt relief for countries completing the HIPC process. In order to grant access to the HIPC and MDRI, countries have to meet certain criteria and demonstrate a good track record. Once a country meets the criteria and reaches the decision point, it begins to receive relief on its debt service. In a second step, in order to receive a full reduction in debt, a country must further demonstrate good performance in implementing key reforms and adopting the Poverty Reduction Strategy Paper. After this, a country reaches completion point, with full debt relief committed at the decision point. The largest creditors are the World Bank, the African Development Bank, the IMF, the Inter-American Development Bank, and all Paris Club creditors (IMF, 2020); 39 countries have been covered.

Comoros completed the process of HIPC assistance in December 2012. Debt servicing was cut from US$ 9.2 million to US$ 2.1 million, which equates to 2.0 percent of exports instead of 10.4 percent (OECD, 2018).

Sao Tome and Principe had experienced a massive debt service of 155 percent of exports (17.9 percent of GDP) in 2006. After the finalized debt relief in March 2007, debt servicing, as a percentage of exports, decreased to 10.9 percent in 2008, and to 3.1 percent in 2017 (OECD, 2018).

Haiti's debt cut was completed in June 2009 from a high of 12.7 percent of exports in 2007 to 1.6 percent in 2010. Between 2015 and 2017, debt servicing again increased from 1.7 to 7.5 percent of exports. The 2010 earthquake was the worst natural disaster to hit Haiti. Then in 2016, Hurricane Matthew, the strongest storm since 1964, caused damage valued at US$ 1.9 billion. Long-run negative impacts are still being felt, as the country struggles with soil productivity, poverty, and lack of education (OECD, 2018).

For Guinea-Bissau, the initiative was completed in December 2010, debt services were cut from 7.2 percent of exports, to 3.0 percent in 2010, to 1.2 percent in 2011. In 2017, debt services increased from 1.9 to 14.7 percent of exports. According to the IMF, in 2017, Guinea-Bissau's government contracted loans totaling some US$ 112 million to boost electricity supply and road construction and diversify agriculture.

Guyana reached the completion point in December 2003. Debt service to GDP declined from nine percent in 2003 to 2.1 in 2007, or from 5.0 percent of GDP to 1.1 percent of GDP. Debt services have remained significantly lower despite a small increase to 3.8 percent of exports in 2017.
Source: Various sources

3.5. Econometric analysis and results

A panel-data model is estimated where the natural disaster event enters with a lag of one (baseline regressions) or more years (t-k). The model specification in equation (1) is guided by the literature (e.g., Lee, Zhang and Nguyen, 2018):

$$\Delta y\_it = \beta_0 + \beta_1 \text{ Intense ND dummy}_{it-k} + \beta_2 \text{ yit-1} + \beta_3 \text{ ln real per capita GDP}_{it-1} + \beta_4 \text{ ln Population}_{it-1} + \beta_5 \text{ Inflation}_{it-1} + \beta\_6 \text{ Terms of Trade}_{it-1} + \beta 7 \text{ Trade openness}_{it-1} + \beta\_8 \text{ Debt restructuring dummy}_{it-1} + \beta 9 \text{ Xit-1} + \alpha_i + \gamma_t + \mu_{it}$$

where y_it denotes country i's external debt-to-GDP ratio or the debt service-to-exports ratio in period t. k refers to the lag of years. Δ indicates annual change and ln denotes the natural logarithm.

Theoretically, a severe natural disaster forces the government to look for external sources of finance to cover the costs of recovery. Access to these sources, however, may well depend on initial levels of debt, hence the need to estimate a dynamic model and introduce the past t-1 value of debt stock (y_(it-1))[55].

The sample consists of 16 SIDS[56] for which we have data on debt from 1980 to 2018. The ineligibility for analysis of the other SIDS – simply for lack of data – might suggest the risk of selection bias, though this is only a slight concern in the sense that the 16 include those countries that experienced the most severe disasters. Nevertheless, results obtained from a seemingly selective small sample must be tested for robustness compared to a control group. The control group includes the group of Small and Vulnerable Economies (SVEs)[57] and LDCs. Equation (1) is estimated using a fixed-effects (FE) panel estimator to be able to account for marginal effects of types of natural disasters on dynamic changes in external debt.

3.5.1. Baseline fixed-effects regressions

The results obtained from the standard fixed-effects regression for the sample of SIDS are provided in Table 3.1, for the change in total external debt (columns 1-7) and for debt service (columns 8-14). The regressions separately include the dummies for the most severe natural disasters (at the 95th, 85th and 75th percentiles) and the control variables X_(it-1).

The empirical analysis assesses the impact of a severe natural disaster on two main indicators of debt sustainability: the annual change in external-debt-to-GDP ratio, and the change in the external debt service-to-exports ratio. The severity of a single natural disaster for a small country is expected to determine the costs of rebuilding and consequently the change in external debt in the aftermath of a disaster. The econometric approach takes into account different levels of severity, measured by the damage (in per cent of GDP) and the ratio of affected people to whole population.

In order to establish a causal link, the econometric analysis allows for a delay of one to five years between the occurrence of a disaster and its effect on debt, and it controls for a range of country-specific characteristics – as well as debt management – that could influence debt sustainability. The results reveal that SIDS that have been eligible for debt restructuring experienced an immediate fall in the debt-to-GDP ratio by on average roughly 13 percent. However,

55. For further information on the construction of variables and descriptions of other control variables please see the full methodological description in UNCTAD Research Paper No. 55 "Multiple disasters and debt sustainability in Small Island Developing States" (UNCTAD/SER.RP/2020/14) prepared by Anja Slany, Associate Expert in the Africa Section, UNCTAD. The full paper is available at https://unctad.org/webflyer/multiple-disasters-and-debt-sustainability-small-island-developing-states.

56. Comoros, Cape Verde, Dominica, Fiji, Grenada, Jamaica, St. Lucia, Maldives, Mauritius, Solomon Islands, São Tomé and Príncipe, Timor-Leste, Tonga, Saint Vincent and the Grenadines, Vanuatu, Samoa.
57. SVEs are WTO members that account for only a small fraction of world trade, being particularly vulnerable to economic uncertainties and external shocks (https://www.wto.org/english/thewto_e/minist_e/min11_e/brief_svc_e.htm). For a full list of countries in the SVE and LDC categories please see UNCTAD Research Paper No. 55, by Anja Slany.

most restructuring and debt relief programmes failed to significantly reduce the burden of annual debt repayment costs.

More importantly, the results suggest that it is the macroeconomic environment of a country that determines debt sustainability through higher GDP levels and export revenues.

Higher lag-order (k=2, … ,5) and higher frequency of disasters

As implied above, debt might not increase immediately after a disaster, and two or more years might elapse before it does. Indeed, reconstruction costs may evolve over the several years most probably required for recovery from a natural disaster. The Intense ND dummy$_{-(it-k)}$ enters separately with k=2, k=3, k=5 in the regressions. Compared to the results reported in Table 3.1, the natural disaster dummies become positive but remain insignificant, with one exception: for earth-related natural disasters, a significantly positive association can be found between the event and the increase in debt servicing (as a percentage of exports) with a lag of two years.

In EMDAT, all reported natural disasters are defined as severe for the economy and have caused an emergency status. Instead of a dummy for a natural disaster at the highest percentile, equation (1) is estimated including: i) a cumulative sum of the occurrence of natural disasters over time, and ii) each natural disaster as reported in EMDAT. The results are strongly in line with those reported in Table 3.1, showing no significant association between debt and natural disasters, irrespective of the type of disaster.

The results suggest that, on average, controlling for past values of debt, macroeconomic conditions and trade performance, a natural disaster in a given SIDS does not seem to be linked to changes in its external debt.

Table 3.1 – Fixed effects regression results for different dummies, SIDS only, 1980 - 2018

	(1)	(2)	(3)	(4)	(5)
			External debt-to-GDP change		
L. (log) External debt, % of GDP	-0.133***	-0.138***	-0.133***	-0.136***	-0.138***
	(0.018)	(0.019)	(0.018)	(0.020)	(0.019)
L. Debt service, % of exports					
L.dummy_nat95_sids	-3.220	-3.208	-2.931	-3.208	-3.340
	(4.306)	(4.314)	(4.346)	(4.771)	(4.300)
L.dummy_nat85_sids					
L.dummy_nat75_sids					
L.(log) real per capita GDP	4.843	6.924	5.967	-5.018	3.889
	(3.798)	(4.497)	(4.201)	(9.313)	(3.852)
L.(log) population	2.906	3.607	2.519	5.225	5.169
	(8.793)	(8.836)	(8.914)	(14.12)	(8.924)
L. Inflation rate (CPI)	-0.119	-0.116	-0.109	-0.206	-0.104
	(0.116)	(0.116)	(0.118)	(0.168)	(0.116)
L. Terms-of-trade growth	-5.206	-4.998	-5.509	-5.443	-5.666
	(6.894)	(6.910)	(6.932)	(9.235)	(6.890)
L. Trade openness (% of GDP)	5.952	6.012	6.664	-0.135	2.967
	(5.265)	(5.277)	(5.412)	(7.011)	(5.669)
Debt restructuring dummy	-12.62***	-12.54***	-12.63***	-12.68***	-12.56***
	(3.085)	(3.091)	(3.094)	(3.246)	(3.080)
L.Net ODA (% of GNI)		0.0931			
		(0.108)			
L. Broad money (% of GDP)			-0.045		
			(0.081)		
L. Export diversification index				16.04	
				(18.01)	
L. (log) exchange rate					-2.815
					(2.004)
Observations	333	332	332	280	333
R-squared	0.351	0.353	0.352	0.340	0.355
Number of countries	16	16	16	16	16

Note: Standard errors in parentheses; Country- and year-fixed effects always included. *** p<0.01, ** p<0.05, * p<0

(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
External debt service-to-exports change								
-0.133***	-0.133***							
(0.018)	(0.018)							
		-0.503***	-0.542***	-0.537***	-0.584***	-0.504***	-0.504***	-0.504***
		(0.054)	(0.056)	(0.055)	(0.062)	(0.055)	(0.054)	(0.054)
		0.775	1.069	1.255	0.763	0.774		
		(2.749)	(2.733)	(2.746)	(3.055)	(2.755)		
-1.363							1.093	
(2.416)							(1.548)	
	-1.556							-0.507
	(2.007)							(1.284)
5.016	5.043	-2.272	-1.650	-2.882	-4.657	-2.284	-2.431	-2.199
(3.819)	(3.811)	(2.406)	(2.836)	(2.693)	(5.171)	(2.459)	(2.415)	(2.412)
3.310	3.132	-12.48**	-11.71**	-13.59**	-18.22**	-12.45**	-12.58**	-12.65**
(8.775)	(8.775)	(5.654)	(5.656)	(5.656)	(8.716)	(5.793)	(5.638)	(5.645)
-0.119	-0.118	0.0666	0.0648	0.0666	0.00147	0.0668	0.0648	0.0689
(0.116)	(0.116)	(0.0730)	(0.0736)	(0.0743)	(0.104)	(0.0734)	(0.0730)	(0.0730)
-4.413	-4.260	-4.378	-4.314	-3.708	-7.719	-4.380	-4.504	-4.611
(6.798)	(6.794)	(4.577)	(4.562)	(4.572)	(6.241)	(4.587)	(4.502)	(4.502)
5.618	5.643	-1.005	-3.759	-3.318	3.495	-1.039	-0.872	-1.008
(5.265)	(5.259)	(3.273)	(3.441)	(3.538)	(4.201)	(3.546)	(3.271)	(3.271)
-12.76***	-12.69***	-1.251	-1.385	-1.416	-1.366	-1.250	-1.265	-1.157
(3.075)	(3.077)	(1.902)	(1.942)	(1.940)	(1.999)	(1.906)	(1.895)	(1.898)
			0.079					
			(0.066)					
				-0.036				
				(0.051)				
					-16.68			
					(11.62)			
						-0.0319		
						(1.292)		
333	333	329	326	325	276	329	329	329
0.350	0.351	0.359	0.376	0.378	0.386	0.359	0.360	0.359
16	16	16	16	16	16	16	16	16

0.1. CPI = consumer price index. ODA = official development assistance.

3.5.2. Modified model specification

Synthetic Control Method (SCM)

Using the Synthetic Control Method, this section aims to test whether the occurrence of a severe climate-related, earth-related or biological disaster can cause debt to become unsustainable in the long run. The challenge of the SCM is to find a valid synthetic control group which must consist of non-disaster countries that show similar pre-disaster macroeconomic, geographic, and fiscal circumstances. A valid synthetic control group must be untouched by any similarly severe natural disaster occurring at any time at least 10 years before or after the treated event[58]. It is unlikely that an exact match between the synthetic control group and the disaster country is possible, but the SCM can apply country weights based on the best possible match. In contrast to equation (1), the list of control variables varies slightly due to data coverage and the need to find the best fit between the treated country and the control group.

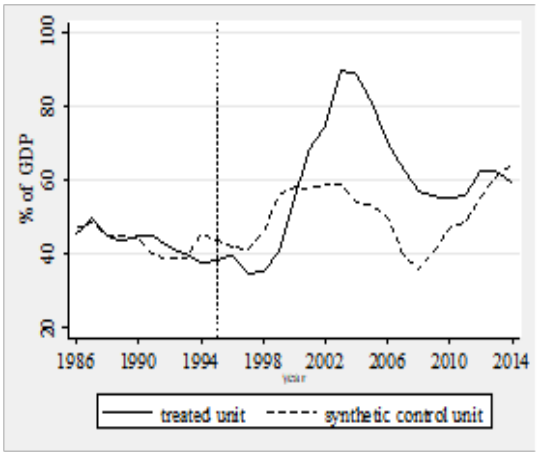
The comparative case studies discussed in this section cover the most severe climate-related, earth-related and biological disasters in SIDS. The selection of countries has been based on data availability.

3.5.2.1. Climate-related natural disaster: Dominica (1995)

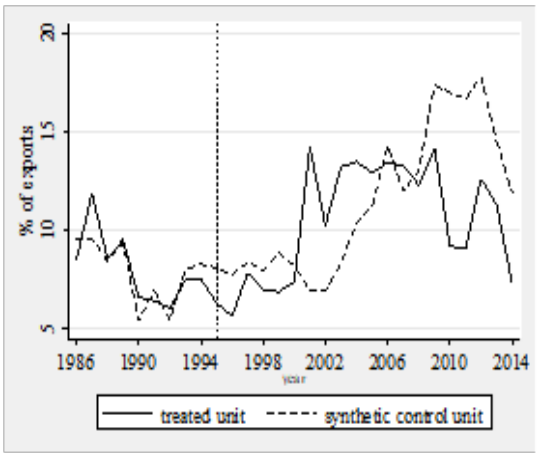
In 1995, Dominica was hit by Hurricane Luis, which affected seven percent of the population and caused damage equivalent to 71 percent of GDP. The SCM projects the potential path of debt in the absence of a similarly large disaster at least until 2005. Controlling for structural factors and the occurrence of other disasters in the period prior to the hurricane, the SCM results suggest that debt has increased by significantly more in Dominica than in the synthetic control group (Figure 3.7). In the aftermath of the disaster in 1995, debt increased to over 90 percent of GDP, while that of the control group only increased to 60 percent despite following a similar trend over that period. Total debt service has also continuously increased, from 5.6 percent of exports in 1996 to roughly 14 percent six years later. However, compared to the synthetic control group, no significant difference can be observed. After the restructuring programme in 2004, debt had been kept low in Dominica, in contrast to the control group which was not eligible for debt restructuring. This finding suggests that although external debt stock has significantly increased – with a delay of three years – the restructuring programme significantly helped to keep debt on an even keel and improve economic conditions.

Figure 3.7: Dominica 1995 – SCM results

a) External debt (% of GDP, left)



a) total debt service (% of exports, right)



Note: a) Control group Central African Republic, Cabo Verde, Mauritius; root mean square prediction error (RMSPE) = 4.72, b) Control group: Cabo Verde, Mauritius; RMSPE = 4.91

58. Only countries that have not been affected by a severe natural disaster (below 75-percentile threshold) over the assessed period can serve as a potential control group. All other countries must be deleted from the estimation as they would influence the estimates. Abadie et al. (2010) show that the synthetic control group does not need to comprise a large number of comparison units providing that they are valid (crucially, being unaffected by similar events). The potential control group includes SVEs and LDCs.

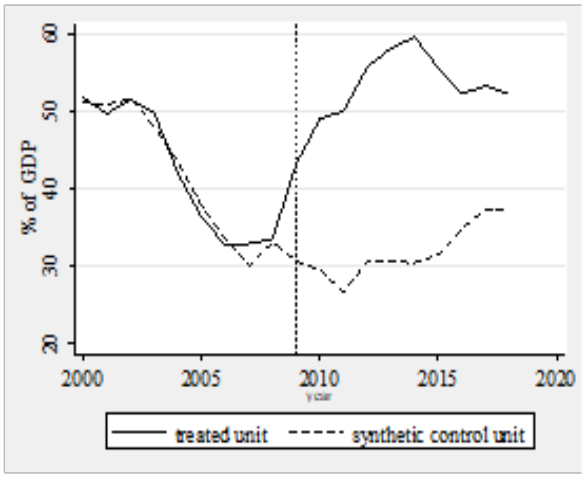
3.5.2.2. Earth-related natural disasters: Samoa (2009)

Samoa experienced one of the most severe earthquakes with a following tsunami in 2009. In the aftermath, debt steadily increased, from 33 percent in 2008 to 59 percent in 2014. The SCM results suggest that this rise would not have happened without the natural disaster (Figure 3.8). In the long run, debt remained at a higher level compared to the counterfactual. Similarly, annual debt servicing (as a percentage of exports) steadily rose from 4.1 percent in 2008 to 9.7 percent in 2018, while the counterfactual group experienced debt that rarely rose much above 4 percent.

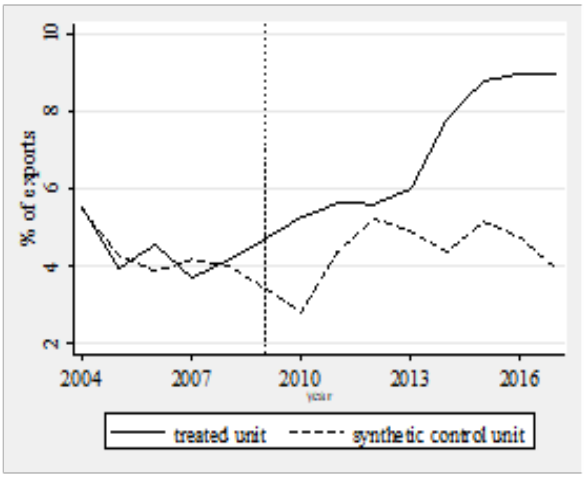
Allowing external debt to increase beyond the government's target of 50 percent was necessary to manage the massive financial reconstruction needs. This was however only possible due to low levels of debt in the pre-2009 period, which enabled the government to borrow money on reasonable terms. The expansion of debt to reconstruct helped to spur economic growth. Although Samoa remains at high risk of debt default, according to the IMF Debt Sustainability Analysis, debt remains sustainable. The country's economic success despite its vulnerability to natural disasters is underlined by the graduation from LDC status in 2014.

Figure 3.8: SCM Samoa 2009, SCM results, External debt (% of GDP, left) and total debt service (% of exports, right)

a) External debt, % of GDP



b) Total debt service, % of exports



Note: a) Control group: Burundi, Cambodia, St. Lucia, Lesotho, Yemen; RMSPE = 0.98; b) Control group: Burundi, Burkina Faso, Cambodia, St. Lucia; RMSPE=0.4.

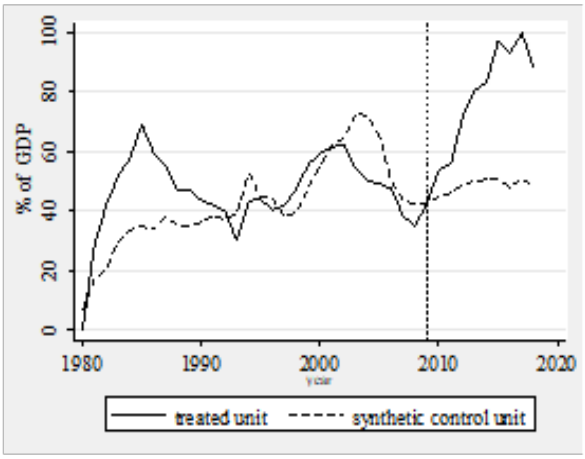
3.5.2.3. Biological disaster: Cabo Verde (2009)

In view of the availability of observations over a sufficient pre- and post-disaster time period, the SCM was applied to the dengue outbreak in Cabe Verde in 2009. The combination of the biological disaster and the drop in GDP due to the global financial crisis in 2009 caused the external debt-to-GDP ratio to rise dramatically (Figure 3.9). In contrast to the control group, debt had increased by 2017 to almost 100 percent of GDP. The negative impact of the financial crisis had been more severe for Cabo Verde than for the synthetic control group. Fiscal measures that failed to boost GDP growth were the main cause of the continuous and unsustainable rise in external debt. However, thanks to tourism, which accounts for more than 50 percent of total exports, annual debt service, as a percentage of exports, remains relatively

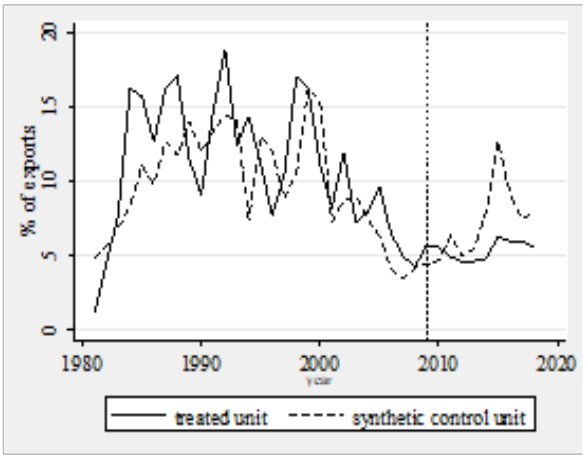
low at 6 percent. In addition, nearly 100 percent of the external debt is long-term debt with low interest rates: the average interest on new external debt (public and private) is 0.48 percent (2018). Under these conditions, Cabo Verde retains its capability to service its debt.

Figure 3.9: Cabo Verde 2009, SCM results, External debt (% of GDP, left) and total debt service (% of exports, right)

a) External debt, % of GDP



b) Total debt service, % of exports



Note: a) Control group: Fiji, Rwanda, St. Vincent and the Grenadines; RMSPE = 13.96; b) Control group: Fiji, Rwanda; RMSPE = 3.54

3.5.3. Robustness Checks

Several robustness checks were undertaken to support this chapter's findings. For a complete assessment, see Slany (2020).

An extension of the above analysis to other small and vulnerable economies and LDCs confirms that past values of debt stocks and debt servicing are significantly negatively associated with additional debt in the subsequent period. Furthermore, using a static log-linear model supports the statistically weak relationship between natural disasters and external debt and emphasizes the importance of trade and export earnings to reducing the annual debt payment.

3.6. Conclusions and policy recommendations

The chapter's empirical findings on the relationship between natural disasters and debt sustainability can be summarized as follows:

(1) SIDS are the most disaster-prone countries in the world, facing on average annual damage of 2.1 percent of GDP over the period 1970 to 2018.

(2) Due to their small domestic markets, SIDS are highly vulnerable to global economic shocks. During the COVID-19 crisis, SIDS can expect to see a drop in the current account balance from an average of -2.7 percent of GDP in 2019 to -13.1 percent of GDP in

2020, mainly due to the drop in tourism.

(3) According to the fixed effects regression results, on average, there is no significant relationship between a disaster and increases in external debt across SIDS. This finding is confirmed across different types of disasters. The small and insignificant effect on debt in the aftermath of severe disaster strongly relates to the restrictions on access to adequate funding imposed on already indebted countries.

(4) Using the Synthetic Control Method to calculate a counterfactual for selected countries for which suitable data was available, a strong association was found between an increase in external debt stock and the occurrence of a severe natural disaster. SIDS are highly heterogeneous in their exposure to natural disasters, depending on phase of development, eligibility for concessional financing, and institutional capacity to manage disaster response. Country case studies are necessary to reveal each country's vulnerability to debt increases.

(5) Much of the disaster response was conducted on a short-term emergency basis rather than within long-term development planning, especially in the case of biological disasters. Positive examples from Dominica and Samoa reveal that rebuilding efforts have made it possible to achieve economic growth and greater resilience. If sufficient resources are not available when they are needed, countries may end up in a trap whereby low economic activity and poor competitiveness make repayment of external debt problematic, further reducing eligibility to access loans in the future.

(6) Debt restructuring has provided important relief only to some disaster-prone countries.

(7) The chapter's findings reveal that the external debt-to-GDP and debt service-to-exports ratios are mainly driven by inherited pressures, by real GDP, terms-of-trade growth and export diversification. Stronger economic growth and diversified exports improve SIDS' capability to manage and repay debt.

The chapter gives rise to the following policy recommendations, which can be structured along three pillars.

3.6.1. Financial instruments and the role of multilateral institutions

The IPCC pointed out in 2012 that without investment in adaptation and resilience building measures, the increased frequency of natural disasters will negatively impact growth and poverty reduction in the future. Although it remains important to access a portfolio of post-disaster financing options, pre-disaster financing is crucial to reduce human and physical damage in the first place.

Risk reduction investments should be supported by international donors, and through access to Green Climate Funds. Stronger collaboration between traditional and emerging donors could help to reduce transaction costs (OECD, 2018). Moreover, agreements between debtor and creditors to reduce a developing

country's debt stock or debt servicing in exchange for a commitment to protect nature, so-called "debt-for-nature swaps", could be extended by including climate change resilience building. The international community could help to enhance domestic resource mobilization by supporting diaspora schemes to foster trade and investments; improving the efficiency of tax collection; supporting revenue generation in key domestic sectors (such as fisheries, and tourism), and using remittances to mitigate financial risks.

Given the extent of the damage caused by natural disasters every year, a mix of financing options is required. Countercyclical instruments – such as hurricane clauses in debt restructuring and contingent borrowing – could be generalized. To improve debt sustainability, however, it is strongly recommended that collective action clauses be introduced into bond contracts to further facilitate negotiations with external bond holders in times of severe shocks. Moreover, the pay-out criteria must be more flexible.

The transfer of risk through insurance and re-insurance (such as CCRIF and PCRAFI) has seen some success and can be further exploited. The international community could help countries to obtain insurance contracts against natural disaster from the private sector at reasonable premiums. The InsuResilience Global Partnership on Climate Risk Insurance could be an opportunity to strengthen public-private partnership on the transfer of risk. Moreover, green and blue bonds – created to fund projects that promise a positive environmental impact – should be used far more extensively.

Furthermore, access to financing at concessional terms should be extended to countries when they are exposed to external shocks such as natural disasters or a global economic downturn[59]. Existing resources must be used more efficiently and catalytically to attract private and public investments (OECD, 2018). In order to mobilize investment, especially at the beginning of the development path, and still be sustainable over the long term, debt ratios should be allowed to increase.

3.6.2. Investing in economic resilience

Trade resilience and preventing trade disruptions should be of central importance for researchers and policy makers. Attracting FDI is another important mechanism. After a natural disaster, a group of new firms is likely to emerge, and providing appropriate help to these firms could contribute to a stronger economy. If such assistance is provided, natural disasters could impact trade positively through demand, technology upgrading, and generating import demand[60].

Potential avenues to build greater resilience include a more sustainable use of the oceans, fostering biodiversity, and investing in green technology, to reduce energy and water consumption (OECD, 2018). The largely untapped potential of the blue economy involves offshore wind energy, fish processing and marine aquaculture. Marine organisms could also provide resources for the pharmaceutical sector (OECD, 2018). Furthermore, the development of nutritional supplements and other biologically derived products from marine resources could play a role in supporting economic diversification efforts in SIDS.

59. Countries with access to concessional loans have been able to maintain debt sustainability (see examples of Samoa in the 1990s and Vanuatu). In contrast, SIDS with higher per capita GDP have no access to concessional funding but are also strongly vulnerable to natural disasters and bear high costs of reconstruction.

60. For instance, a study by Brata, de Groot and Zant (2018) suggests that the 2006 earthquake in Indonesia had a "cleaning effect" on the manufacturing sector, forcing out unproductive firms and allowing in new firms.

Regional approaches already help to distribute the risks and costs of natural disaster, but they can be further strengthened through sharing best practices and regulating standards of regional response (such as the Caribbean Disaster Emergency Management Agency). Science, technology, and innovation play a key role in advance preparation for future risks of multiple shocks. As remote communication platforms continue to flourish, digital technologies can extend access to education and health services, connect communities, and enable early warning systems[61].

3.6.3. Improving data collection

It is probable that the costs of natural disasters will be underestimated, due to lack of comprehensive data. Data limitations cause uncertainties which lead to cautionary findings. All kinds of natural disaster need to be measured in a sophisticated and standardized manner. Moreover, policy makers should not rely on highly uncertain projections of long-term debt. Instead they should concentrate on the accumulation of domestic resources to maximize the revenue side by addressing financial leakages, supported by better data management. Data unavailability has prevented an analysis of the unequal impact of natural disasters on gender and income groups.

61.https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=2373.

ANNEX C

Table C.1 – Debt indicators, 2018, SIDS

Country	LDC Status	Debt restructu-ring	Real per capita GDP in US$	External debt, in % of current GDP	PV of external debt, in % of current GDP	External debt, in % of exports	Total in %
Antigua and Barbuda	No	2010 (2), 2008 (3)	15134	35.00		73.60	8.40
Bahamas	No		27261	25.50		74.10	9.10
Barbados	No	2018/19	16018	32.60		79.50	
Belize	No	2007 (4), 2013 (3), 2017	4248	73.75	69.33	126.98	10.14
Cabo Verde	Graduated 2007		3759	87.79	78.13	173.62	5.57
Comoros	Yes	HIPC; 2009 (2), 2010 (2)	1401	16.23	8.09	125.37	1.92
Dominica	No	2004 (3)	6694	50.67	47.42	161.81	16.54
Dominican Re-public	No	1985 (2), 1991 (2), 2004 (2), 2005 (2,3)	7697	39.63	29.03	163.85	15.07
Fiji	No		4795	15.38	12.42	31.29	1.95
Grenada	No	2006 (2), 2005 (3), 2013 (3) 2015 (3)	9096	54.38	41.09	97.44	8.44
Guinea-Bissau	Yes	1987 (2), 1989 (2), 1995 (2), 2001 (2),2010 (2), 2011 (2)	622	28.85	16.84	81.54	1.90
Guyana	No	HIPC, 1989 (2), 1990 (2), 1993 (2), 1996 (2),1999 (2), 2004 (2)	3992	41.48	29.51	99.72	4.97
Haiti	Yes	HIPC, 1995 (2), 2006 (2), 2009 (2)	730	22.91	15.74	119.70	1.16
Jamaica	No	1984 (2), 1985 (2), 1987 (2), 1988 (2), 1990 (2), 1991 (2), 1993 (2), 2010 (4), 2013 (4)	4855	103.77	88.52	268.22	20.44
Kiribati	Yes		1762	23.00	11.40		6.00
Maldives	Grad. (2011)		8033	43.78	22.18	63.03	9.23
Marshall Islands	No		3066	37.70	31.50	106.70	10.70
Mauritius	No		10578	78.81	10.05	81.06	23.25
Micronesia	No		2728	20.30	18.70		6.40
Nauru	No		10910	30.60		117.70	5.60
Palau	No		12260	30.80		64.40	5.80
Papua New Guinea	No		2416	75.40	9.26	166.45	26.11
Saint Kitts and Nevis	No	2012 (2,3)	16942	18.50		54.30	5.50
Saint Lucia	No		8485	32.04	28.58	49.12	3.90
Saint Vincent and the Grenadines	No	2007 (2)	6852	40.45	36.94	101.63	12.29
Samoa	Grad. 2014		3748	52.10	42.43	137.20	9.77
Sao Tome and Principe	Yes	HIPC; 2000 (2), 2005 (2), 2007 (2)	1297	59.11	52.04	242.87	4.52
Seychelles		2009 (2), 2015 (2), 2010 (3)	14385	100.10		97.80	
Solomon Islands	Yes	2010 (3)	1482	27.84	5.81	53.83	5.61
Suriname	No	2009 (2)	8040	102.3		153.8	
Timor-Leste	Yes		2759	6.12	4.02	15.68	0.32
Tonga			4054	41.90	34.72	122.51	7.23
Trinidad and Tobago		1989 (2), 1990 (2)	15161	15.00			
Tuvalu	Yes		3636	37.00	45.00	320.60	
Vanuatu	Grad. 2020		2875	43.99	44.20	96.20	8.00

debt service, % of exports	Risk of Debt distress (from IMF debt sustainability analysis)	Concessional debt, in % of ext. debt	Long-term debt, in % of total ext. debt	PPG, in % of total external debt	Private creditor bonds, % of total PPG debt	Average interest on new external debt, public and private (%)	Currency composition of PPG debt, U.S. dollars (%)
	High						
	Moderate						
	Moderate						
	High						
	High	44.29	99.18	99.19	0.00	0.48	25.74
	Moderate	85.29	87.71	87.70	0.00	1.00	45.00
	High	18.53	87.28	87.29	10.47	0.75	63.60
	High	1.25	92.9	69.3	69.4	6.6	93.92
	Moderate	0.13	83.81	83.78	28.03	3.05	67.91
	In debt distress	28.55	75.76	75.76	22.21	0.78	94.89
	Moderate						
	Moderate						
	High						
	High	0.51	81.19	59.91	62.06	3.41	97.84
	High						
	High	12.83	88.24	85.89	17.47	5.52	73.79
	High						
	Moderate	0.35	56.02	12.76	0.00	1.23	37.22
	High						
	High						
	Moderate						
	Moderate						
	Low						
	Moderate	16.58	81.17	81.16	51.41	1.83	95.97
	High	24.19	94.52	94.52	2.94	0.75	92.77
	High	61.47	94.32	94.32	0.00	0.00	26.56
	In debt distress	70.21	89.36	89.38	0.00	0.00	49.18
	High						
	Moderate	19.08	84.52	24.72	0.00	0.75	69.56
	High						
	Low	13.54	91.56	91.52	0.00	2.60	90.87
	High	36.92	95.15	95.12	0.00	0.00	25.47
	Low						
	High						
	Moderate	36.29	78.01	78.02	0.00	2.00	23.68

Chapter 4: Aligning economic development and water policies[62]

4.1. Introduction

Small Island Developing States (SIDS) are among the most water-scarce countries in the world, with seven in ten facing the risk of water shortages – including nine in ten of those classified as low-lying islands (UNESCO, UNEP, 2016). Water is a central element of life, and its scarcity undermines fundamental human and environmental priorities, such as the right to clean water and sanitation, or the conservation of biodiversity.

By extension, water scarcity constrains economic development in SIDS. A limited availability of freshwater impacts the feasibility of developing water-intensive industries that might otherwise eminently suit the local context in SIDS, such as fish processing, beverages, textiles, or smelting and refining metals, or of implementing more productive technologies, such as irrigated agriculture. Scarcity also imposes an uncomfortable zero-sum compromise on the allocation of water for the production of, on one hand, essentials such as food and energy and, on the other hand, commercial goods and services.

In many SIDS, water scarcity precludes investment in higher-value industries, or in other productive capacities, such as infrastructure, human capital or institutions, thus scarcity has hamstrung the productive transformation of the national economy, limiting long-term development and growth prospects.

Climate change is steadily exacerbating the strategic risk posed by water scarcity. SIDS are highly exposed to climate changes such as sea level rise, changing rainfall patterns and more frequent and severe weather events, all of which threaten to reduce the availability of freshwater resources (Nurse, et al., 2014; Oppenheimer, et al., 2019).

Despite this strategic threat, water security is only sporadically tackled in the economic development plans of SIDS. In fact, very few of these include measures to ensure access to clean water and sanitation, a human right embodied in Sustainable Development Goal 6 (SDG 6). Access is just one component – albeit a fundamental one – of the wider picture, which requires a broader approach to ensuring water security.

By contrast, many of their plans do already include policies to build resilience and mitigate other major risks to their sustainable development, such as climate change adaptation, disaster risk reduction and ensuring food security.

In this chapter, we analyse how SIDS could better align their economic development and water management policies to support the productive transformation of their economies, in particular by incorporating water security and water productivity into their economic plans.

4.2. Water and economic development in SIDS

Water is a unique resource, at once a human right and an input for economic production. Through its multiple uses, water has a broad societal value, including for its importance to economic development. Water is a classic economic input, for example, in growing cash crops or in industrial applications. Its societal value broadens as an input in the production of essential goods and services, such as food and electricity. Many cultural traditions and recreational activities are associated with water. Water is also a municipal utility with wide-ranging applications in businesses and public spaces.

At the apex of its societal value, water is an element of life, essential for the conservation of habitat and biodiversity, and for human needs such as drinking water and sanitation – recognized by the United Nations as “the human right to water and sanitation”[63].

62. Prepared by Mr. Kris Terauds, Economic Affairs Officer, SIDS and Status Issues Section, UNCTAD and Mr. Darell Bloch, Intern, SIDS and Status Issues Section, UNCTAD.
63. United Nations General Assembly, 2010. Resolution 64/292: The human right to water and sanitation. Available at: https://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/64/292. Retrieved: 7 May 2021.

Indeed, water is ubiquitous in the Sustainable Development Goals (SDGs). Clean water and sanitation feature as SDG 6 and water is a prerequisite for achieving SDG 2 (zero hunger) and SDG 3 (ensuring healthy lives). Water is a critical consideration in economic goals, such as SDG 7 (clean energy), SDG 8 (economic growth) and SDG 9 (industry, innovation and infrastructure), as well as environmental goals, such as SDG 12 (responsible production and consumption), SDG 13 (climate action) and SDG 15 (life on land).

Historically, the relationship between water and economic development has been a complex one that has often defied straightforward classification. Many advanced economies are among the most water-secure countries in the world, while developing economies, particularly LDCs and SIDS, are among the most water-scarce. Meanwhile, advanced economies have invested far more than developing countries in conserving existing water resources, and developing costly new ones, as well as implementing water-saving infrastructure, management systems and production methods (Sadoff, et al., 2015).

By contrast, poorer countries, or those at greater risk of water-related hazards, often lack sufficient wealth to invest in minimum levels of water-secure infrastructure. As a result, when water-related hazards strike, these countries suffer greater shocks to economic growth and, over time, a self-reinforcing, vicious cycle of lower growth, productivity and wages.

Considering these macroeconomic risks, the World Bank (2016) estimated that, without corrective action, water scarcity could erode economic growth by as much six per cent per year by 2050 in some water-scarce regions. The same report estimated that water-smart policies and investments could mitigate many of these risks and, in some cases, even contribute to an acceleration of economic growth by as much as six per cent per year.

The temptation at this juncture is to infer – rather too straightforwardly – that a country's available water resources predetermine its development potential; that economic development in advanced economies was water-smart, while water-scarce developing countries are following unsustainable strategies; or that economic development drives water security, with the resulting wealth enabling water-smart policies and investments. However, the economic literature offers no definitive support for such conclusions, highlighting the need for a multifaceted approach to understanding the relationship between economic development and water security. This includes studying the relationship from both directions,

Box 4.1. Water security and scarcity

UN-Water defines water security as follows:

"The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability."

Meanwhile, "water scarcity" is a general term that covers a spectrum of worsening states of water availability, measured in terms of water supplies per capita. Areas where water supplies fall below 1,700 cubic metres (m3) per person are under "water stress"; those with less than 1,000 m3 per person are "water scarce"; while less than 500 m3 per person denotes "absolute scarcity".

in other words, to see how economic development and water management decisions can help or hinder one another (United Nations, 2015).

At a strategic level, understanding the relationship between water and economic development can help countries assess how extensively and appropriately they are making use of their water resources, and whether these uses are aligned with long-term development priorities, such as a productive transformation of the economy.

At a planning level, such an understanding can inform decisions on, for example, water allocation, regulatory standards, infrastructure investments and improvements to water management.

For productive uses of water – such as for agriculture, energy and industry – understanding trade-offs is particularly important, since it is possible for policies, activities and production models to engender opportunities and arguably countervailing risks at one and the same time. For example, developing a mining project can deliver economic growth, jobs, revenues, business opportunities for local suppliers and an increase in productive capacity. But if water-efficient policies and practices are not followed, the project can simultaneously consume an unsustainable share of scarce water resources, leading to considerable disbenefits and obstructing national objectives.

4.2.1. Water scarcity

Water scarcity is a strategic challenge that is central to the various economic and environmental vulnerabilities of SIDS. Their small land area means they have relatively few aquifers and a short surface water circulation cycle, limiting availability of groundwater. The degree of scarcity varies among SIDS, for example in relation to their topography, with the higher average altitude of volcanic islands lengthening their water circulation cycle, while low-lying islands or atolls are at greater risk of water scarcity. Nevertheless, SIDS are among the most water-scarce countries in the world: seven in ten SIDS face risks of water shortage, including nine in ten low-lying SIDS (UNESCO, UNEP, 2016).

In terms of consumption, the scarcity of freshwater in many rapidly urbanizing SIDS with growing populations is exacerbated by the competing demands of agriculture, household consumption and tourism. Meanwhile, these same trends drive an increasing pollution problem in many SIDS, where a shortage of wastewater treatment facilities and suitable solid waste disposal sites, for example, mean a growing volume of pollutants that contaminate freshwater resources, reducing water quality and supply (Gheuens, Nagabhatla, & Perera, 2019).

These trends leave water-scarce SIDS increasingly vulnerable to acute shocks to freshwater availability. This not only threatens a regular supply of drinking water, but also threatens economic activities, particularly agriculture, and environmental services derived from freshwater, such as flood abatement, the conservation of biodiversity, and recreational facilities[64]. The risk of chronic water shortages is also growing, threatening social cohesion, food security and the health of their populations (UNESCO & UN-Water, 2020).

Long-term economic development prospects in SIDS are also vulnerable to water scarcity, through its effect on the feasibility of productive investments. For example, agriculture and fisheries remain important sectors in many SIDS economies. But these countries typically have few processing facilities to add value to these raw materials. Agri-food and fish processing being relatively water-intensive, water scarcity is one of the factors limiting investment in these activities.

64.Climate Policy Watcher, 2020. Types of Freshwater Ecosystem Services. Available at: https://www.climate-policy-watcher.org/ecosystem-processes/types-of-freshwater-ecosystem-services.html. Retrieved 5 November 2020.

The scarcity of water also has a negative effect on investments in more productive technologies. Agriculture is the compelling example in SIDS, where rainfed production predominates and the sector consumed, on average, 95 per cent of water withdrawals in 2017[65] in the 38 SIDS[66]. Water scarcity, coupled with low water prices that do not reflect the full value of water resources, often render investment in irrigation unfeasible.

4.2.2. Climate change

The relationship between climate change and water scarcity in SIDS is complex, and the impact of changing rainfall patterns on freshwater availability varies by region. Under the intermediate scenario in its 2014 Fifth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) predicted that by 2100 annual rainfall will increase by nine per cent in the North Indian Ocean and one to two per cent in the Pacific region, while falling by five per cent in the Caribbean (Nurse, et al., 2014).

Rising sea levels also threaten available water resources in SIDS through an increased risk of flooding, erosion and saline intrusion. Under its most optimistic scenario, the IPCC projects a global mean sea level (GMSL) rise of 0.43 m by 2100, with regional variation of +/- 30 per cent (Oppenheimer, et al., 2019).

Meanwhile, water scarcity threatens environmental services, such as conservation of biodiversity, flood abatement, and a regular supply of drinking water[67], aggravating the effects of climate change hazards, such as extreme weather, sea level rise or flooding.

Climate change therefore threatens to exacerbate existing water scarcity risks in SIDS, with knock-on effects on macroeconomic stability, involving economic activity, employment, food and energy security, human health and habitats.

4.2.3. COVID-19

The pandemic hit SIDS hard. Despite a low incidence of infections across most SIDS throughout 2020 and the beginning of 2021, the economic shock induced by the pandemic put considerable strain on key sectors such as tourism and exports, underlining the extreme economic vulnerability of these countries.

The COVID-19 crisis has also accentuated water stress in affected SIDS. On the demand side, sanitary measures, such as handwashing, disinfection and sterilization, have increased consumption, although this was mitigated by reduced consumption in the drastically diminished hospitality and tourism subsectors. Meanwhile, the supply of water has been interrupted by the general disruption in transportation, especially in poorer, more isolated communities and islands that depend on deliveries of freshwater. In this way, the pandemic crisis has exacerbated existing weaknesses in basic needs provision in contexts already prone to environmental and economic shocks.

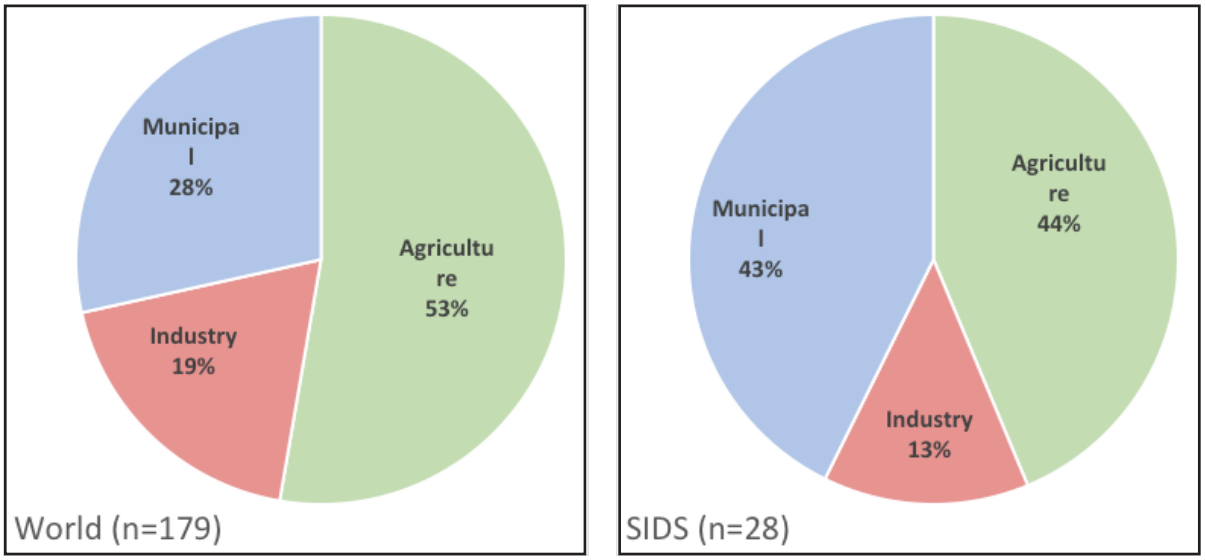
4.2.4. Water as an input in economic activities

4.2.4.1. Agriculture

Agriculture, in particular for food production, consumes the majority of global water withdrawals. As shown in Figure 4.1, agriculture represented over half of world freshwater withdrawals in 2017, followed by municipal uses (28 per cent) and industry (19 per cent). In SIDS, withdrawals were relatively equally distributed among agriculture (44 per cent) and municipal uses (43 per cent), with a smaller share for industry (13 per cent).

65. Source: FAO AQUASTAT
66. For this study, we used the list of 38 United Nations Member States classified as SIDS. See: http://unohrlls.org/about-sids/country-profiles/
67. Climate Policy Watcher, 2020. Types of Freshwater Ecosystem Services. Available at: https://www.climate-policy-watcher.org/ecosystem-processes/types-of-freshwater-ecosystem-services.html. Retrieved 5 November 2020.

Figure 4.10: Share of water withdrawals by sector, world and SIDS, 2017



Notes: "Agriculture" includes all crops, livestock and grazing
"Industry" includes industry, mining and power generation
"Municipal" includes drinking water, fire protection, street cleaning and uses in households, businesses and public buildings
Source: FAO AQUASTAT

Agriculture in SIDS is typically less water efficient than the global average. For example, 26 SIDS grew sweet potatoes as a staple crop during the 1996-2005 period, consuming an average of 1,347 m3 of water per ton of crops, or 3.5 times the relatively water-efficient global average of 383 m3 per ton (Mekonnen and Hoekstra, 2010).

The relatively inefficient use of water in agricultural production suggests SIDS should adopt more water-efficient production models and techniques for their priority crops. Investing in irrigation infrastructure may be feasible in isolated cases, but is probably too expensive and draws too heavily on surface and groundwater sources to be a general solution, especially on low-lying islands. In most cases, SIDS should therefore look to adopt water-saving techniques for rainfed agriculture, such as: water harvesting, conservation tillage, planting on ridges and furrows and using bio-mulches.

Although it is rarely addressed in development plans, SIDS could also improve the water efficiency of food consumption by using public awareness and education campaigns to promote diets based on water-efficient crops, such as roots, tubers, vegetables and some fruits, while de-emphasising thirstier agricultural products, such as meats, oils, nuts and cereals.

4.2.4.2. Industry

Industry uses water mainly to wash and cool machines, with a smaller proportion incorporated (or evaporated) in the production process itself. When used on machines, water absorbs pollutants, such as solids, chemicals, microorganisms or heavy metals. The resulting wastewater is one of the main by-products of industrial processes.

The United Nations (2017) reports that, as of 2017, high-income countries treated up to 70 per cent of wastewater for reuse. By contrast, low-income countries, including many SIDS, treated only eight per cent of their wastewater, contributing to more than 80 per cent of wastewater worldwide being discharged into the environment without treatment.

Interventions to improve water efficiency in the industrial sector should therefore focus on:

- Improving and expanding wastewater treatment infrastructure;
- Working with industry to implement new applications for wastewater;
- Creating incentives for private investment in wastewater treatment facilities; and thereby
- Working towards a more circular industrial water cycle, with fewer freshwater withdrawals.

4.2.4.3. Energy

In recent years, many SIDS have adopted ambitious plans to shift their energy mix away from fossil fuels and into renewable technologies, in line with their climate change adaptation strategies and a desire to reduce consumption of water and imported fossil fuels. Nonetheless, the implementation of renewable technologies has been slow, due to a lack of financing and a lack of identified sources of cost-competitive renewable energy. As a result, SIDS currently rely almost exclusively on diesel-fired generators and thermal power plants to generate electricity. These plants are expensive to operate, due to a reliance on imported diesel, and have a large water footprint (IRENA, 2018).

Energy transition is therefore a cross-cutting priority for climate change adaptation, water security and sustainable economic development in SIDS. Possibilities for water-saving policy interventions include:

- Research and incentives for the development of wind and solar energy;
- Development of biomass energy;
- Upgrading and improving cooling systems in thermal plants; and
- Continued improvement of wastewater recycling in thermal plants.

4.2.4.4. Virtual water trade

The concept of "virtual water trade" estimates the invisible flows of so-called "embedded" water contained in traded goods. This concept allows for the reconciliation, across countries, of water used in production, with its final consumption in finished goods.

In principle, policy makers in water-scarce countries can also use virtual water trade data as an input in trade policy, to try to shift local production to water-efficient goods – such as roots, tubers and vegetables – and import water-intensive ones, such as coffee. This would reduce the volume of embedded water contained in exports and improve the country's virtual water trade balance.

In fact, empirical results show that virtual water trade may actually be a symptom of well-understood economic factors that typically structure international trade. Recent studies show a strong correlation between virtual water trade patterns and land and water productivity (expressed as $/m3), underlining the ability of more advanced economies to devote their land and water resources to more productive activities, importing goods and services from less productive activities. This fits the classic dynamics of production and trade between advanced and developing economies that reinforce economic inequality and shift negative externalities, such as water scarcity, pollution and environmental degradation onto poorer countries (Chen, Kang, & Han, 2021; Duarte, Pinilla, & Serrano, 2019; Liu, et al., 2018; Afkhami, Bassetti, Ghoddusi, & Pavesi, 2020).

The importance of water and land productivity in trade patterns implies that policies in water-scarce SIDS should go beyond strategies to adapt production and consumption to water scarcity, or to alleviate it through virtual water trade. In addition, they should seek to improve land and water productivity, especially in agriculture, upgrading to higher-value activities and products, as these strategies are associated with greater water security.

4.2.4.5. Management challenges

In many countries, improving water management is constrained by a complex of outdated mindsets. These can include: a belief among users that water is a virtually limitless resource; that water is a social service, rather than a finite resource or an economic good; or that a user's right to abundant, cheap water supersedes any obligation to limit their own consumption. These mindsets are often embodied and reinforced by the management system itself, typified by:

- Pricing and cost recovery policies that provide no incentives for users to reduce consumption or conserve water resources, or for governments to invest in productivity-enhancing infrastructure;
- Fragmentation of policies, management systems and infrastructure among the various uses to which water is put; or
- Governance approaches that fail to foster compromise among competing user groups.

Effective management of these competing uses is necessary to avoid a vicious cycle that intensifies aggregate demand for increasingly scarce water resources.

4.3. Policy analysis

In this section, we present an evaluation of how well water and economic development policies are aligned in the 38 SIDS in our sample. Our objective was to identify policy gaps, for which we recommend remedies in the following section.

4.3.1. Methodology

As outlined, the relationship between water and economic development is multifaceted. For the purposes of this chapter, we therefore focussed our analysis on how well economic policies incorporate water security as a strategic objective.

To examine this question, we evaluated national economic development plans. Of the 38 SIDS in our sample, 29 had publicly available plans that met our basic criteria[68].

We used a comparative approach to evaluate how well the economic plans incorporated water security, as defined by UN-Water (see Box 4.1). According to our eligibility threshold, we considered that a plan incorporated water security if it included a range of policy actions or standards related to both water supply and demand, for example conserving and expanding freshwater resources, while raising public awareness of water conservation and expanding access to clean water and sanitation. These criteria did not require a plan to refer specifically to "water security", provided that it treated the underlying factors substantively.

At the outset, we assessed whether economic plans included a substantive treatment of the following five strategic priorities common to SIDS[69], including water security:

1. Climate change adaptation;
2. Disaster risk reduction;
3. Energy security;
4. Food security; and
5. Water security.

Following this comparative analysis of the treatment of water security as a strategic objective in economic plans, the remainder of the section summarizes our analysis of the types of policy interventions on water and/or water security contained in the 29 economic plans, according to questions such as:

- What overarching objectives are in evidence, such as: a comprehensive vision of water security; more specific objectives, such as conservation of water resources; or specific outcomes, such as a specific outcome of access to drinking water and sanitation (i.e., SDG 6)?

68.The countries from which the national development plans were analyzed included: Antigua and Barbuda, Bahamas, Bahrain, Barbados, Belize, Cape Verde, Comoros, Cuba, Dominica, Dominican Republic, Federated States of Micronesia, Fiji, Grenada, Guinea-Bissau, Guyana, Haiti, Jamaica, Kiribati, Maldives, Marshall Islands, Mauritius, Nauru, Palau, Papua New Guinea, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, São Tomé and Príncipe, Seychelles, Singapore, Solomon Islands, Suriname, Timor-Leste, Tonga, Trinidad and Tobago, Tuvalu and Vanuatu.

69. Given SIDS' vulnerabilities in these areas, these priorities feature prominently in the 2014 SIDS Accelerated Modalities of Action (SAMOA) Pathway, which is part of the United Nations 2030 Agenda for Sustainable Development.

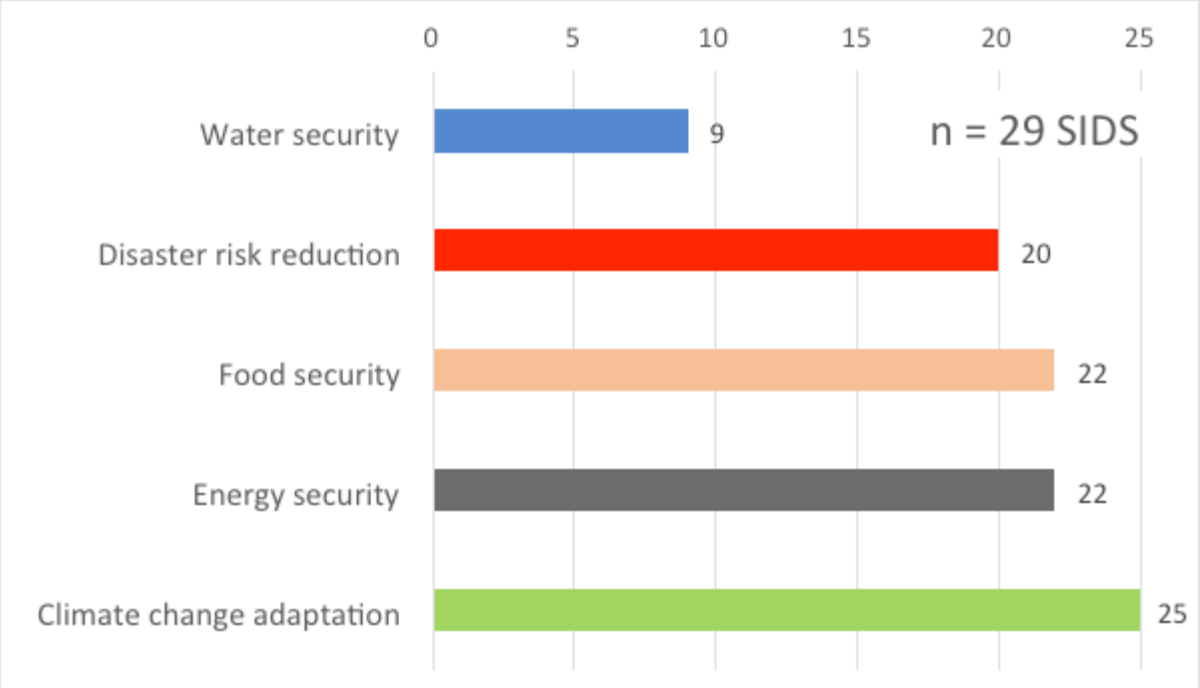
- What types of interventions are envisioned, for example: fiscal incentives, management actions or systems, investments in infrastructure, adoption of new technologies, or the enforcement of standards?
- What water-related standards are envisioned for economic activities, such as efficiency (water consumed per unit of output) or productivity (output per unit of water consumed)?

4.3.2. Water security in economic plans

Among the 29 economic plans we analysed, only nine substantively addressed water security. As shown in Figure 4.2, the four other strategic priorities were considered more widely.

The nine SIDS whose plans tackled water security were not evenly distributed by region, with four

Figure 4.2: Selected strategic priorities treated in SIDS' national development plans



Note: Among the 38 SIDS studied in this chapter, 29 had recent national development plans available in English or French

Source: Authors' analysis of national development plans

Caribbean SIDS (Dominica, Grenada, Jamaica and Trinidad and Tobago), two from the Indian Ocean (Maldives and Mauritius) and one each from Southeast Asia (Singapore), the Middle East (Bahrain) and the Pacific (Vanuatu).

Only Bahrain, the Maldives, Mauritius and Singapore used the term "water security" in their plans. These countries also numbered among those with the most comprehensive range of interventions. On the supply side, these included projects to develop new sources of freshwater (in Bahrain, Mauritius and Singapore) and, in all four countries, to increase water treatment to recycle wastewater and improve overall water quality. On the demand side, interventions included a broad public awareness campaign on water management issues in the Maldives and Singapore and, along with Mauritius, integrated water pricing strategies.

In general, water security in the nine SIDS plans involved tackling a broad range of supply issues, from conservation of watersheds and aquifers, to treatment and water quality. The framing of demand issues was narrower, at least in terms of the different uses

and values of water. All plans devoted their primary water-related focus to access to clean water and sanitation, with a secondary focus, in some plans, on the production of food and energy.

Only Jamaica's plan included policy actions aimed at water as an input in non-food, non-energy economic activities, such as growing cash crops, or in industrial or service sectors. Indeed, Jamaica's plan contained the clearest language on the importance of water in economic development:

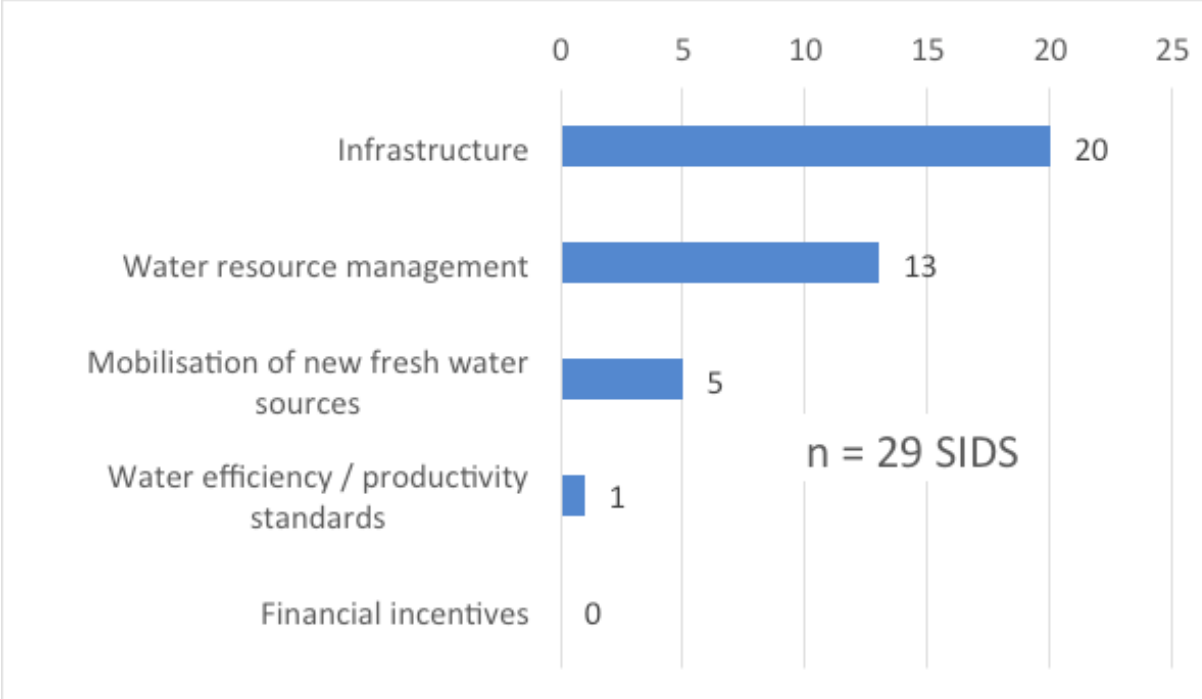
"… improvement in physical economic infrastructure (such as roads, energy and water supplies, air and sea ports, and telecommunications networks) usually has higher payoffs in the form of higher rates of economic growth than equivalent investment in health and education… because such improvements have a faster impact on total factor productivity."[70]

None of the 29 plans offered qualitative or quantitative statements on the value of water or an ordered list of priorities that might guide the allocation and pricing of water among economic sectors, for example.

4.3.3. Types of interventions

As shown in Figure 4.11, water-related policy interventions in 20 of the 29 plans focussed mainly on improving and expanding infrastructure to process, store and deliver freshwater to residents. Meanwhile, 13 SIDS included policy interventions on water resource management. Only the plans in five SIDS (Bahrain, Maldives, Mauritius, Singapore and Trinidad and Tobago) included strategies and targets to develop new sources of freshwater to meet growing demand. Only Singapore's plans included actions or targets to improve the water efficiency or productivity of economic activities. None of the plans included water-related financial incentives, such as tax breaks, preferential pricing, grants or subsidies.

Figure 4.11: Selected types of water-related policy interventions in SIDS



Source: Authors' analysis of national development plans

70. Vision 2030 Jamaica, National Development Plan, p. 155.

Figure 4.11 demonstrates that most SIDS limit themselves to more traditional policy actions, based on improving water resource management and infrastructure. Singapore's policies were the only ones to feature the economic payback of investments in new water sources, and continual improvements in water efficiency in households and industry.

4.3.4. Gaps

In general, SIDS need to make of water security a more robust strategic priority within their economic plans, alongside other priorities, such as climate change adaptation, disaster risk reduction and food and energy security. Even in the nine SIDS whose plans already address water security to some degree, the incorporation of a water security strategy could be more complete, with a wider consideration of the different uses and values of water. Access to clean water and sanitation (SDG 6) has its rightful place as a priority in these plans, but water as an input to productive economic activities requires more attention.

By extension, most SIDS' economic plans lack a coherent logic on how sustainable water management is fundamental to economic development. Admittedly, conserving water resources is important, as is alleviating water scarcity; likewise, ensuring access to clean water and sanitation is also crucial. However, when tackled individually, in isolation one from another, these considerations fail to cohere into water-smart economic policies that allow for decisions on the "highest and best" uses of water most conducive to long-term sustainable development.

Alignment of economic and water policies can demand a reconciliation of potentially contradictory processes. Development plans that emerge from a narrow economic perspective can therefore only partially succeed in incorporating water security as a strategic priority. Water policies in SIDS typically do not contain clear statements on the multiple societal values of water, or any consequent hierarchy or framework of priorities that economic planners could apply to the policies, investments and standards contained in national development plans.

The national development plans of SIDS largely limit their water-related policy actions to water management and infrastructure, based on the traditional vision of delivering low-cost water to users. Actions to change the status quo – for example, to develop new sources of freshwater, to capture its full value as a lever of sustainable development and to set and measure water-smart targets for economic activities – rarely appear in these national development plans.

Indeed, only Singapore set economic targets for water use, such as water efficiency and productivity. Without such targets and standards, policy makers in SIDS will struggle to create incentives, change behaviours and foster water-smart development in key areas, such as: improving agricultural productivity, transitioning to water-efficient renewable energy technologies, and increasing the treatment and reuse of wastewater in non-residential sectors.

4.4. Policy recommendations

4.4.1. Mainstream water security in economic planning

SIDS need to incorporate water security as a strategic priority in economic planning, alongside other priorities, such as climate change adaptation, disaster risk reduction, food and energy security. Water-smart economic policies should be based on a coherent logic of: a) water's multiple uses and values; and b) how water's multiple uses can enhance or detract from the country's sustainable development. On this basis, economic plans should incorporate desired water-related outcomes, specific policy actions and relevant targets. Given the interdependence of water, food and energy outcomes, plans can even treat these policies in an integrated way, according to the water-food-energy nexus.

For those SIDS that already tackle water in a limited way in their national development plans – for example with a focus on access to clean water and sanitation (SDG 6) – we recommend adopting the more holistic vision of water security, involving, for example: conserving existing water resources and developing new sources of freshwater, while meeting demand from different user groups and proactively using water as a lever for sustainable development.

With respect to economic development models, the literature on water scarcity and virtual water trade suggests that policies designed to simply adapt production to water scarcity, or alleviate it by importing water-intensive goods, are unlikely to achieve the desired result. Instead, policies should take account of the considerable influence of the productivity of land and water on domestic output and trade patterns, including on virtual water trade. SIDS should therefore incorporate water efficiency and productivity into their water-smart economic plans.

4.4.2. Implement Integrated Water Resource Management (IWRM)

Water-smart economic planning relies on coherent water policy. SIDS should therefore redouble their efforts to implement Integrated Water Resource Management (IWRM), the accepted international framework for the holistic management of water resources. IWRM is a process organized on three principles: social equity, economic efficiency and ecological sustainability. The IWRM approach allows countries to consider their specific water management context and priorities, apply good management practices and arrive at an approach that can guide sustainable water management[71].

In general, SIDS score poorly on implementation of IWRM policies. According to the United Nations Environment Programme–Danish Hydraulic Institute (UNEP-DHI) Centre on Water and Environment, which tracks SDG Indicator 6.5.1 (degree of implementation of IWRM on a scale of 0-100) the 2017 baseline showed that most SIDS scored below the world average of 49, in the "low" (10-30) or "medium-low" (30-50) categories. Only a handful of SIDS outperformed the world average, namely Cabo Verde (64), Mauritius (64), Samoa (70), Cuba (82) and Singapore (100)[72].

Although the IWRM approach varies among the handful of good performers, they offer general lessons for other SIDS on the importance of ensuring the building blocks of a strong management system, such as: platforms for broad-based participation across user groups, an enabling policy environment, robust institutions and management tools, all underpinned by sufficient financing.

4.4.3. Collect more detailed data on water supply and consumption

SIDS should use the IWRM process to improve data collection and management, in support of evidence-based water governance and regulation. Currently, only data on water withdrawals from municipal systems (so called "blue water") is widely reported. This excludes, for example, data on the supply of rainwater ("green water") and on the production of wastewater ("grey water"). In many cases, these data gaps represent blind spots for policy analysis on key questions, such as how to improve the water productivity of rainfed agriculture, or how to incentivize the treatment and reuse of wastewater in agriculture and industry.

Countries therefore need to collect more granular data on water, to enable evidence-based policy analysis at the national and international levels. Whether based on the water footprint or another conceptual framework, countries need regular collection and

71. Global Water Partnership. What is IWRM? Available at: https://www.gwp.org/en/GWP-CEE/about/why/what-is-iwrm/. Retrieved 7 May 2021.

72. Source: IWRM Data Portal. UNEP-DHI Centre on Water and Environment. Available at: http://iwrmdataportal.unepdhi.org. Retrieved 9 November 2020.

reporting of data on: the full range of water sources (i.e., green, blue and grey); consumption by use, user group, or product; water efficiency and productivity in the main productive sectors; as well as the full cost of water, comprising the marginal production cost, plus management, infrastructure and ancillary costs.

4.4.4. Engage water stakeholders in a participatory process

In the 2021 World Water Development Report on "Valuing Water", the United Nations (2021) recommends a multi-value approach to governance. This involves engaging water stakeholders in a participatory process to agree on an ordered list of qualitative values that policy makers will use to govern water resources. This kind of participatory approach is already built into the IWRM process; however, as an alternative it could be organized as a parallel governance process. Stakeholders can also agree on the indicators to be used in monitoring and evaluating the management of use of water resources.

4.4.5. Prioritize the "highest and best" uses of water

At governance level, economic planners can use an ordered list of the multiple values of water as a criterion in selecting industries for development. Adding water-related criteria may change decisions related to selecting, planning and evaluating the development of priority industries. This could shift the focus away from water-intensive activities that might otherwise be appropriate to SIDS, such as fish processing, beverages, textiles, or mining, in favour of more water-efficient ones, such as renewable energy or services. An agreed list of values can also help to structure compromises among competing uses, although tensions will always exist, to some extent.

Agreed values of water can also be applied at the management level in economic plans when:

- Setting water-related financial incentives, such as tax breaks, preferential pricing, grants or subsidies;
- Assessing investments in water-saving improvements to public infrastructure, as well as new investments in, for example, desalination plants and renewable energy technologies; and
- Funding water-related programmes, such as: awareness-building and behaviour change in economic sectors, extension services and credit for farmers, and capacity-building.

With these governance and management actions, SIDS can orient their plans on the "highest and best" uses for water, towards the achievement of national objectives.

4.4.6. Set and monitor water efficiency and productivity targets

In support of a strategic focus on water security and productivity, SIDS must include relevant new targets and indicators in their plans, to monitor and evaluate progress. These indicators need not be complicated, simply relating desired economic outcomes to water indicators, such as consumption volume or costs.

For example, at the macroeconomic level, relevant indicators could include:

- Growth in per capita water consumption versus growth in GDP per capita;
- The ratio of water consumption to GDP, value added or agricultural production; or
- Change in water use efficiency over time (SDG Indicator 6.4.1).

At the sector and firm level, the relevant indicators are similar, such as:

- Water productivity: output or value added per volume of water consumed ($/m3); or
- Water efficiency: volume of water consumed per unit of output (m3/$).

SIDS governments can use these targets and indicators to work with their main industries on plans, at the sectoral or firm level, to improve water-related performance, including supporting them through capacity-building, incentives and subsidies for water-saving investments.

4.4.7. Incorporate water security and productivity in sector-specific strategies

In addition to national development plans, many SIDS have dedicated policies and strategies for their key economic sectors, such as agriculture, fisheries and tourism. After incorporating water security into their national plans, the next step is to align the sectoral plans.

Although it was beyond the scope of this chapter to analyse sectoral strategies in SIDS, our findings suggest that greater emphasis on water security requires revisiting a few key sectoral policies. In particular, applying the multiple values of water, as well as water productivity targets, is likely to change the policy rationale in the following areas:

- **Agriculture: Invest in more productive models, such as more capital-intensive ones based on irrigation, or rainfed ones involving water harvesting, conservation tillage, planting on ridges and furrows and using bio-mulches.**
- **Energy:**

o **Pursue energy transition by developing water-efficient renewable energy sources, such as geothermal, wind and solar, in preference to more water-intensive ones, such as hydropower and biomass; and**

o **Create incentives for existing fossil fuel-fired plants to install water-efficient cooling systems.**

- **Industry: Incentivize industrial users, including power plants and mines, to invest in on-site wastewater treatment and by-product recovery technologies, and to reuse wastewater.**

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CM: Control measure; GAP: Good Aquaculture Practice; GHP: Good Hygienic Practices

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