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Institute for Environment and Human Security

DISASTER RISK AND READINESS FOR INSURANCE SOLUTIONS IN SMALL ISLAND DEVELOPING STATES

REPORT NO. 26

December 2020

Michael Hagenlocher, Davide Cotti, Jennifer Denno Cissé, Matthias Garschagen, Mostapha Harb, Delia Kaiser, Sönke Kreft, Jonathan Reith, Viktoria Seifert, Dominic Sett, Astrid Zwick

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UNU-EHS PUBLICATION SERIES
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InsuRisk Special Report 2020

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Antigua and Barbuda, 2019

List of abbreviations and acronyms

AIS	Atlantic, Indian Ocean and South China Sea
AOSIS	Alliance of Small Island States
BMZ	German Federal Ministry for Economic Cooperation and Development
CCRIF SPC	The Caribbean Catastrophe Risk Insurance Facility
COVID-19	Coronavirus Disease
CRED	Centre for Research on the Epidemiology of Disasters
ESA	European Space Agency
EM-DAT	Emergency Events Database
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Risk Reduction
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IGP	InsuResilience Global Partnership
IPCC	Intergovernmental Panel on Climate Change
LLIC	Low-Lying Islands and Coasts
NDC	Nationally Determined Contribution
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OECD	Organisation for Economic Co-operation and Development
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
RMI	The Republic of the Marshall Islands
SAMOA	SIDS Accelerated Modalities of Action
SIDS	Small Island Developing States
SISRI	Small Island States Resilience Initiative
SROCC	Special Report on the Ocean and Cryosphere in a Changing Climate
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNCED	United Nations Conference on Environment and Development
UN DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
SPSS	Statistical Package for the Social Sciences
UNCTAD	United Nations Conference on Trade and Development
UNFCCC	United Nations Framework Convention on Climate Change
UN-OHRLLS	Countries, Landlocked Developing Countries and Small Island Developing States
UNU-EHS	United Nations University, Institute for Environment and Human Security
V20	Vulnerable Group of Twenty Ministers of Finance
WHO	World Health Organization
WTTC	World Travel and Tourism Council

Antigua and Barbuda, 2019

Foreword

Dear Reader,

Small Island Development States (SIDS) are at particular risk from the impacts of climate change. When looking at the vulnerability of the countries more in depth, and on the basis of the analysis presented in this new InsuRisk Report, we can see that they form a very heterogeneous group of countries with varying levels of exposure and vulnerability to climate-related and natural hazards.

Moreover, it is sometimes difficult to fully capture how this translates into the realities of communities and families, seeing their homes and livelihoods affected by extreme weather events and their future heavily marked by uncertainty due to climate change. Therefore, it is crucial to better understand and address their needs and the diverse risk environment of Small Island Development States to provide well-tailored climate and disaster risk finance and insurance solutions.

The basis for such a thorough needs assessment lies in accessible and reliable data, which is still scarce in many of the most vulnerable countries. In an attempt to close the prevailing data gap, this report and the featured InsuRisk Assessment tool support different stakeholders – governments, implementing partners, the national and international insurance industry, as well as academia – each of them adding a different perspective and emphasizing different data needs.

This report marks an important contribution to this debate by providing the first comprehensive and comparative assessment of current climate and disaster risk for all 38 United Nations Member SIDS, considering also their readiness for insurance solutions thanks to the innovative InsuRisk Assessment tool. Aiming to give deeper insights into current environmental and development challenges, as well as the needs for, and status of, climate risk financing and insurance instruments in SIDS, this report offers transparent and comparable baseline information on countries' climate and disaster risks and their readiness for risk transfer through insurance solutions. The more differentiated knowledge gained through this report can also guide and focus the international community in identifying where strongest needs are and where coping capacities need to be strengthened.

The concept and approach presented in this report, which allows for monitoring risk trends over time, also has the potential to contribute to ongoing efforts to investigate the impact of insurance on resilience strengthening, and we hope that those insights help to raise resilience levels translating into meaningful action on the ground. We would like to emphasize that feedback on the report as well as on the InsuRisk Assessment tool is encouraged and welcomed.

Dr. Astrid Zwick

07 December 2020

Cuba, 2020

Executive summary

Small Island Developing States (SIDS) are confronted with serious challenges associated with climate-related extreme events and natural hazards. Risk financing and risk transfer measures can help manage these challenges, but for each country the likelihood of their adoption depends on the presence of a variety of enabling factors. The InsuRisk Assessment tool provides information on the levels of climate and disaster risk and countries' readiness for insurance solutions for each of the 38 United Nations Member SIDS. Results show that SIDS have common traits in terms of hazard exposure, but also peculiarities in terms of vulnerability and insurance-enabling factors. Of the seven hazards considered in this report (six of which are climate-related), cyclones and storm surges are a particular challenge for most SIDS. When considering both exposure and vulnerability, the resulting risk is generally higher for SIDS located in the Caribbean, with Haiti and the Dominican Republic being the first and second most at-risk SIDS countries globally. Readiness for insurance solutions is highest in Timor-Leste, Mauritius, Singapore, and Trinidad and Tobago. However, for some geographic clusters (e.g. the Pacific SIDS), the lack of available data on individual readiness (i.e. the ability of the public to consider and adopt insurance solutions) limits the possibility of more in-depth analysis. Low readiness for insurance solutions seems also to characterize countries with relatively small-size economies (in terms of GDP per capita), such as Haiti, Guinea-Bissau and Comoros, with possible implications on their attraction of private-sector insurance investors. Overall, the overview of risk and readiness for insurance solutions presented here shows the presence of countries with significant levels of risk and at the same time good predisposition to accept risk transfer solutions is not contained to a specific geographical cluster.

A number of important key messages emerge from the analysis presented here. First, the prevalent perception of SIDS as 'hotspots of climate change' which share a 'common vulnerability to climate change' does not reflect the reality. Second, SIDS governments face specific challenges accessing and facilitating access to insurance solutions given their small geographic and market size, making insurance either unaffordable or unavailable as small countries are often unattractive to the private sector. Regional approaches and public-private partnerships can help countries access sovereign risk insurance that is appropriate to their needs. Third, information on climate and disaster risk at the nation-state resolution, as presented in this report, is useful to better understand differences and similarities across SIDS, allow for the identification of priority countries, and ensure that certain high-risk SIDS do not go unnoticed. However, assessments at the sub-national and local scales are needed to better capture the spatial variability of risk and inform targeted risk reduction, risk transfer and adaptation. Lastly, lack of up-to-date, publically available, high-resolution data remains a key challenge for managing risk within SIDS. In order for scientific information to be useful for evidence-based risk management and adaptation, more efforts are needed to systematically collect, manage, and make relevant data and information on natural hazards vulnerability, and climate and disaster risk – as well as the development status of insurance markets – available.

Background

Small Island Developing States face extraordinarily high risks from climate change hazards (Magnan and others, 2019). Climate-related extreme events and natural hazards (e.g. tropical cyclones and storms, storm surges, floods, droughts and earthquakes) impose a heavy burden on vulnerable communities, marine and terrestrial ecosystems, livelihoods, major economic sectors and national budgets (Magnan and others, 2019), and in turn impede sustainable development in many small islands, including SIDS (GFDRR, 2016; OECD and World Bank, 2016; UN-OHRLLS, 2015). In April 2020, tropical cyclone Harold hit Vanuatu, Fiji, the Solomon Islands and Tonga with devastating winds accompanied by heavy rains, flash flooding and coastal flooding including storm surges. The result was approximately two dozen deaths, with the majority of the population affected; homes were destroyed, along with schools, crops and critical infrastructures, and there were large-scale economic losses (OCHA, 2020; UN, 2020).

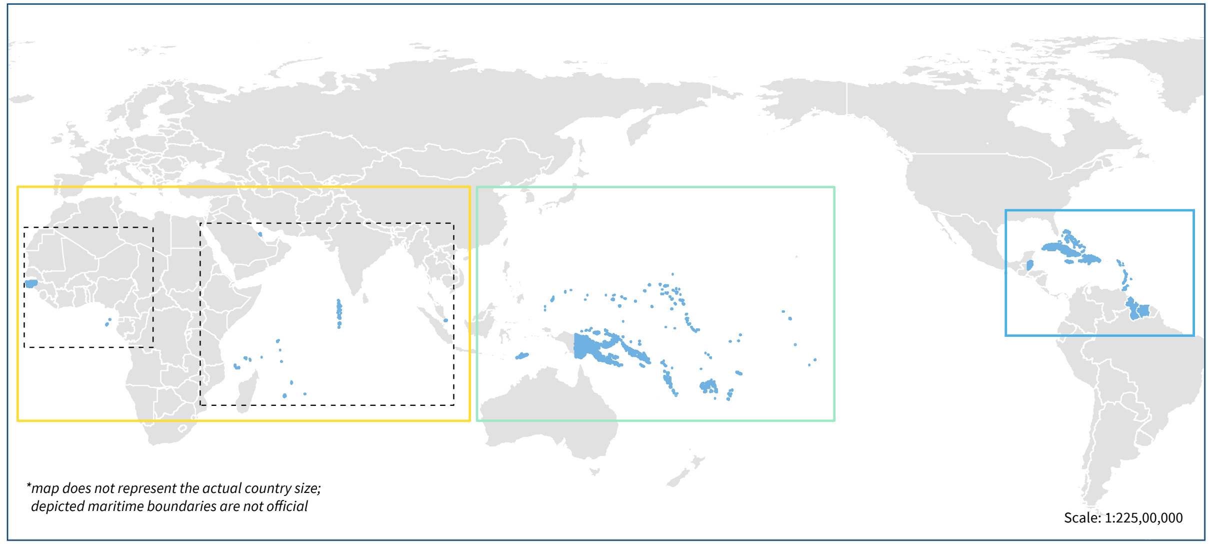
Impact data from the Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT) shows that the number of registered water- and climate-related disasters in SIDS increased from 212 (1978–1997) to 377 (1998–2018), corresponding to an increase of almost 178 per cent compared to an increase of 151 per cent globally (Gheuens and others, 2019). At the same time, many islands (including SIDS) also share specific characteristics that positively affect their resilience towards climate-related extremes and slow-onset events (Petzold and Magnan, 2019), a key aspect that is often neglected in the prevalent discourse of SIDS as "global hotspots of climate change" (Farbotko, 2010; Walshe and others, 2018). Examples include dense social networks, the experience of coping with challenging environmental conditions, and traditional knowledge (Nunn and Kumar, 2018; Ratter, 2018). For example, in the Pacific many communities are implementing climate-smart agriculture and they are revitalizing traditional practices that utilize drought-tolerant species, establish new protected areas, and plant vegetation to reduce erosion and flooding along coastlines (Mcleod and others, 2019). It was also leaders from SIDS who have been instrumental in shaping the Paris Climate Agreement (UNFCCC, 2015), calling for a loss-and-damages clause that allows islands to assess and quantify impacts of cyclones and weather-related events, and acting as vocal advocates to limit warming of the global mean temperature to 1.5°C. Further, despite their minimal contribution to global greenhouse gas emissions (Hoad, 2015), many SIDS included ambitious mitigation targets in their Nationally Determined Contributions (NDCs) to raise collective ambition to reduce greenhouse gas emissions globally (Ourbak and Magnan, 2018).

Maldives, 2005

BOX 1: Small Island Developing States

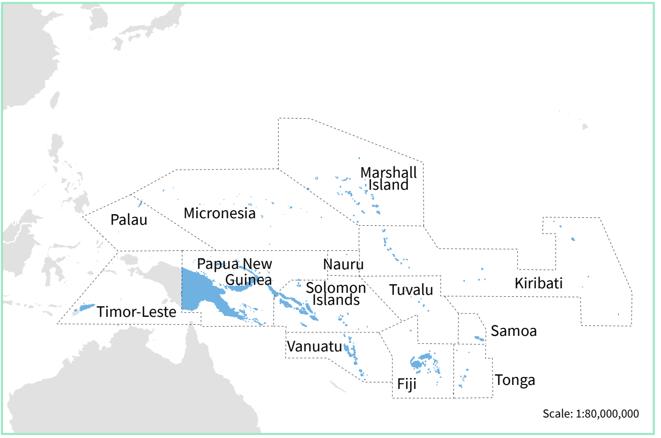
Small Island Developing States were first recognized as a distinct group of countries, primarily islands and archipelagos in the subtropics and tropics, facing specific social, economic and environmental challenges at the 1992 United Nations Conference on Environment and Development (UNCED), and its resulting Agenda 21 (UNCED, 1992). To date, the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS) lists 58 low-lying island nations as SIDS, including 38 United Nations Member States and 20 Non-United Nations Members/Associate Members of United Nations Regional Commissions. Many of these countries also are members of the Alliance of Small Island States (AOSIS), an intergovernmental organization of low-lying coastal and small island countries established in 1990. As shown in *Figure 1* (pages 14 and 15) SIDS are dispersed among three geographic regions: (i) the Carribean, (ii) the Pacific, and (iii) the Atlantic, Indian Ocean and South China Sea (AIS), making them a diverse and heterogeneous group of countries that nonetheless share strong commonalities, such as their generally small size and population (with few exceptions), fragile land and marine ecosystems, limited natural resources, and often narrow economic bases with high dependency on specific sectors (e.g. tourism, agriculture and fisheries, transportation) and remoteness from international markets resulting in high import and export costs (OECD, 2018; Scandurra and others, 2018; UNIDO, 2019).

ALL COUNTRIES



CARIBBEAN

PACIFIC



ATLANTIC, INDIAN OCEAN AND SOUTH CHINA SEA (AIS)

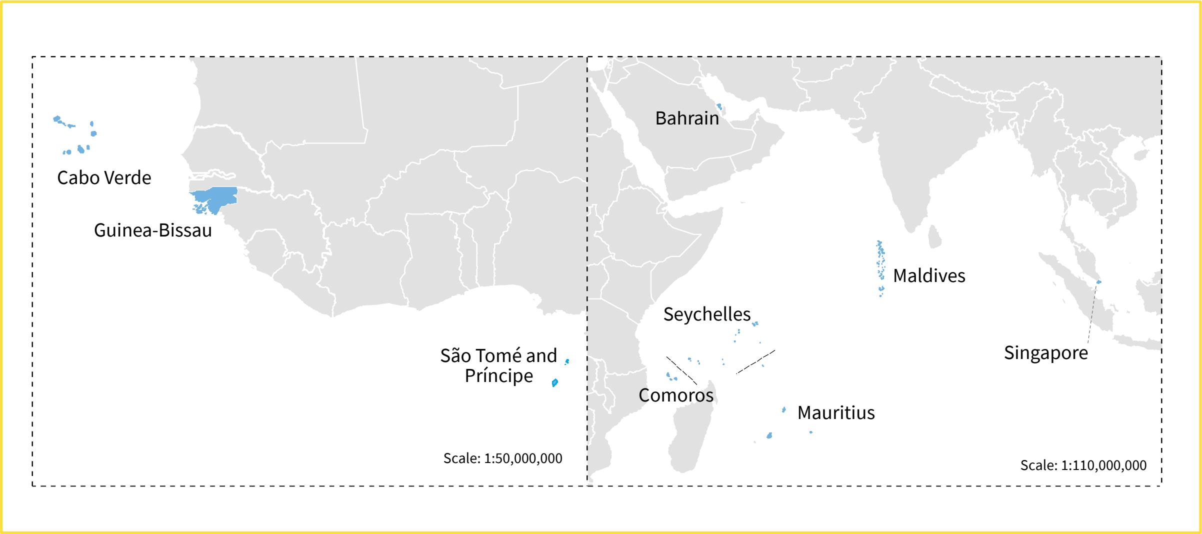


Fig. 1: Geographic location of UN-Member SIDS globally (p. 14), in the Caribbean (top left), the Pacific (top right), and the Atlantic, Indian Ocean and South China Sea (AIS) (below).

SIDS
World

ATLANTIC, INDIAN OCEAN AND SOUTH CHINA SEA

Bahrain (BHR)			Cabo Verde (CPV)			Comoros (COM)	V20	LDC
Guinea-Bissau (GNB)		LDC	Maldives (MDV)	V20		Mauritius (MUS)		
São Tomé and Príncipe (STP)		LDC	Seychelles (SYC)			Singapore (SGP)		

CARIBBEAN

Antigua and Barbuda (ATG)			Bahamas (BHS)			Barbados (BRB)	V20	
Belize (BLZ)			Cuba (CUB)			Dominica (DMA)		
Dominican Republic (DOM)	V20		Grenada (GRD)	V20		Guyana (GUY)		
Haiti (HTI)	V20	LDC	Jamaica (JAM)			Saint Kitts and Nevis (KNA)		
Saint Lucia (LCA)	V20		Saint Vincent and the Grenadines (VCT)			Suriname (SUR)		
Trinidad and Tobago (TTO)								

PACIFIC

Fiji (FJI)	V20		Kiribati (KIR)	V20	LDC	Marshall Islands (Republic of) (MHL)	V20	
Micronesia (Federated States of) (FSM)			Nauru (NRU)			Palau (PLW)		
Papua New Guinea (PNG)	V20		Samoa (WSM)	V20		Solomon Islands(SLB)		LDC
Timor-Leste (TLS)	V20	LDC	Tonga (TON)			Tuvalu (TUV)	V20	LDC
Vanuatu (VUT)	V20	LDC						

Table 1: List of United Nations Member SIDS by macro-region. Icons indicate the income classification according to the most recent World Bank country classifications for 2020-2021 (= high income; = upper-middle income; = lower-middle income; = low income). Labels in brackets show their country code. (V20 = Members of the Vulnerable Twenty; LDC = Least Developed Country)

Source: Authors' own

According to the recently published Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) and recently published studies it is likely that Low-Lying Islands and Coasts (LLIC), including SIDS, will face an increase in the frequency and intensity of such hazardous events in the future due to climate change (Magnan and others, 2019) which might exceed existing coping strategies. In addition, slow-onset hazards such as sea-level rise are likely to compound existing hazards, such as erosion, coastal flooding and salinity intrusion, further exacerbating climate and disaster risk in SIDS (Oppenheimer and others, 2019). It is anticipated that risks might continue to be disproportionately high for LLIC and SIDS in the coming decades, as a result of (i) increasing exposure due to interplay of increasing hazard frequency and intensity and the growing concentration of people and assets in low-lying coastal zones, (ii) the continued degradation of coastal ecosystem services, and (iii) context-specific social, demographic, economic, cultural and governance dynamics influencing vulnerability (Hay and others, 2013; Magnan and others, 2019). Further, due to their small economic bases, the disproportionally high debt-servicing burdens of many SIDS economies and their high dependency on specific sectors, such as tourism[1] and remittances from other economies that are now in lockdown, SIDS are particularly vulnerable to the effects of the coronavirus disease (COVID-19). According to a policy brief published by the United Nations Department of Economic and Social Affairs (UN DESA) in May 2020, the reported number of COVID-19 related deaths per 100,000 people was higher in these countries compared to other developing country groups and regions, including Least Developed Countries (LDCs) and Landlocked Developing Countries (LLDCs) (UN DESA, 2020). Posing new risks and compounding existing risks, COVID-19 hence poses a significant additional burden on these countries.

There is hence a critical need for accelerated action to mitigate greenhouse gas emissions, build resilience of communities, sectors and systems, strengthen monitoring and prevention, build awareness, and reduce current and future risks through targeted disaster risk reduction (DRR), risk transfer, and adaptation in LLIC and SIDS. These needs have also been clearly expressed in the SIDS Accelerated Modalities of Action (SAMOA) Pathway (UN-OHRLLS, 2014), and adopted by heads of state and government and high-level representatives in 2014 during the Third International Conference on Small Island Developing States, as well as by the Small Island States Resilience Initiative (SISRI) supported by the World Bank. Thereby, both the SAMOA pathway and SISRI emphasize the need for risk assessments and highlight the need to establish and strengthen climate risk finance and insurance mechanisms across SIDS at the national and regional levels (UN-OHRLLS, 2014; GFDRR, 2016). Although increasing scientific attention has been paid to the impacts of climate change and adaptation pressures on SIDS, the majority of studies focus either on single countries or a selected group of them, while a comparative analysis of climate and disaster risk for all SIDS is currently lacking (Robinson, 2020). A better understanding of climate and disaster risk is key to identifying priority countries, informing preventive action and policy, ensuring that certain high-risk SIDS do not go unnoticed, and can ultimately also, when monitoring changes in risk and its underlying drivers over time, contribute to taking stock of progress in risk reduction.

Addressing the above-stated needs and gaps, the report provides the first comprehensive and comparative assessment of current climate and disaster risk for all 38 United Nations Member SIDS, considering also their readiness for insurance solutions. The quantitative analysis draws on the InsuRisk Assessment tool developed over the past three years (Hagenlocher and others, 2017; Hagenlocher and Garschagen, 2018), and is complemented with detailed case studies for three selected SIDS, i.e. (i) the Republic of the Marshall Islands (RMI), (ii) Fiji, and (iii) St. Lucia, aimed to give deeper insights into current environmental and development challenges as well as the needs for, and current status of, climate risk financing and insurance instruments.

1 For example, in 2019 tourism contributed an estimated 56 per cent to the GDP of the Maldives as well as approximately 60 per cent of the (direct and indirect) employment (WTTC, 2020).

Antigua and Barbuda, 2019

The InsuRisk Assessment tool: Concept and methodology

Climate-related extreme events and natural hazards continue to compromise lives, livelihoods and assets, notably of the poor and most vulnerable. Acknowledging that solutions to prevent, prepare for, cope with and recover from catastrophic events are urgently needed, the **InsuResilience Global Partnership**[2] was officially launched at the United Nations Climate Conference COP23 in November 2017 in Bonn, Germany. The Partnership has two main objectives: first, it aims to enable more timely and reliable post-disaster response; and second, it aims at improving preparedness, increasing adaptive capacity and strengthening resilience, notably of the poor and most vulnerable, through the use of climate and disaster risk finance and insurance solutions.

In order to support these ambitious aims and objectives, the Secretariat of the InsuResilience Global Partnership commissioned the United Nations University's Institute for Environment and Human Security (UNU-EHS) and Social Impact Partners GmbH in 2017 to develop a comprehensive concept, methodology and tool that provides transparent and comparable baseline information on countries' climate and disaster risks and their readiness for risk transfer through insurance solutions.

2 www.insuresilience.org

The resulting **InsuRisk Assessment tool** (Hagenlocher and others, 2017; Hagenlocher and Garschagen, 2018) has been designed to provide answers to the following questions:

- *What is the level of exposure, vulnerability and climate/disaster risk of a country?*
- *What is a country's readiness to accommodate insurance solutions?*

In order to provide answers to these questions, the InsuRisk Assessment tool comprises two key components, displayed in *Figure 2* (page 21): (i) climate and disaster risk, and (ii) readiness for insurance solutions. The InsuRisk Assessment tool does not indicate when a country might be affected by a disaster, but highlights the risk of being confronted with adverse impacts associated with climate-related and natural hazards.

Following the latest definitions of IPCC (Abram and others, 2019; Garschagen and others, 2019), **climate and disaster risk**, i.e. the potential for loss and damage, results from the interaction of hazardous events (here: climate-related and other natural hazards) with the vulnerability of exposed elements (here: people, agricultural land, economic production, and infrastructure). **Exposure** is defined as the presence of people, agricultural land, production facilities and infrastructure in areas that are prone to natural hazards. The **vulnerability** component of the InsuRisk Assessment tool comprises two sub-components: (i) susceptibility, and (ii) lack of coping capacity. Lack of coping capacity refers to the lack of capacity of individuals and governments to cope with hazardous events, and hence presents the rather short-term capacity to deal with hazardous events shortly before, during or after an event.

Disaster preparedness, risk reduction, and innovative risk financing and transfer solutions can help protect lives, livelihoods, businesses, infrastructure, and public finances, enabling resilient economic development. Recent studies have confirmed the effectiveness of international climate finance and risk transfer instruments to reduce the vulnerability and risk for small islands (including SIDS), notably those where domestic resources alone are not sufficient to help exposed and vulnerable households and communities to cope with the effects of natural hazards and extreme events (Scandura and others, 2020). However, while in high-income countries almost half of all economic losses from disasters are covered by insurance, less than 5 per cent of losses are covered in poorer countries, with the poorest people suffering the largest 'protection gap'. Addressing this gap, one key innovation of the InsuRisk Assessment tool is the systematic consideration of a country's **readiness to accommodate insurance solutions**. The overall readiness of a country consists of three modules: (i) individual readiness, (ii) the enabling political environment to attract the insurance industry, and (iii) the current development status of a country's insurance market. High readiness for insurance solutions hence gives an indication of how ready a country is to successfully implement insurance solutions.

The **InsuRisk Assessment tool** builds on the most recent, publicly available data with global coverage for each of its components and sub-components. The latest version of the tool presented here considers the following hazards: heat waves, cold spells, river floods, droughts, storms, storm surges and earthquakes. *Table 2* (page 23) provides an overview of which hazards are considered for each exposed element, while *Table 3* (page 23) lists additional details on the exposure data.

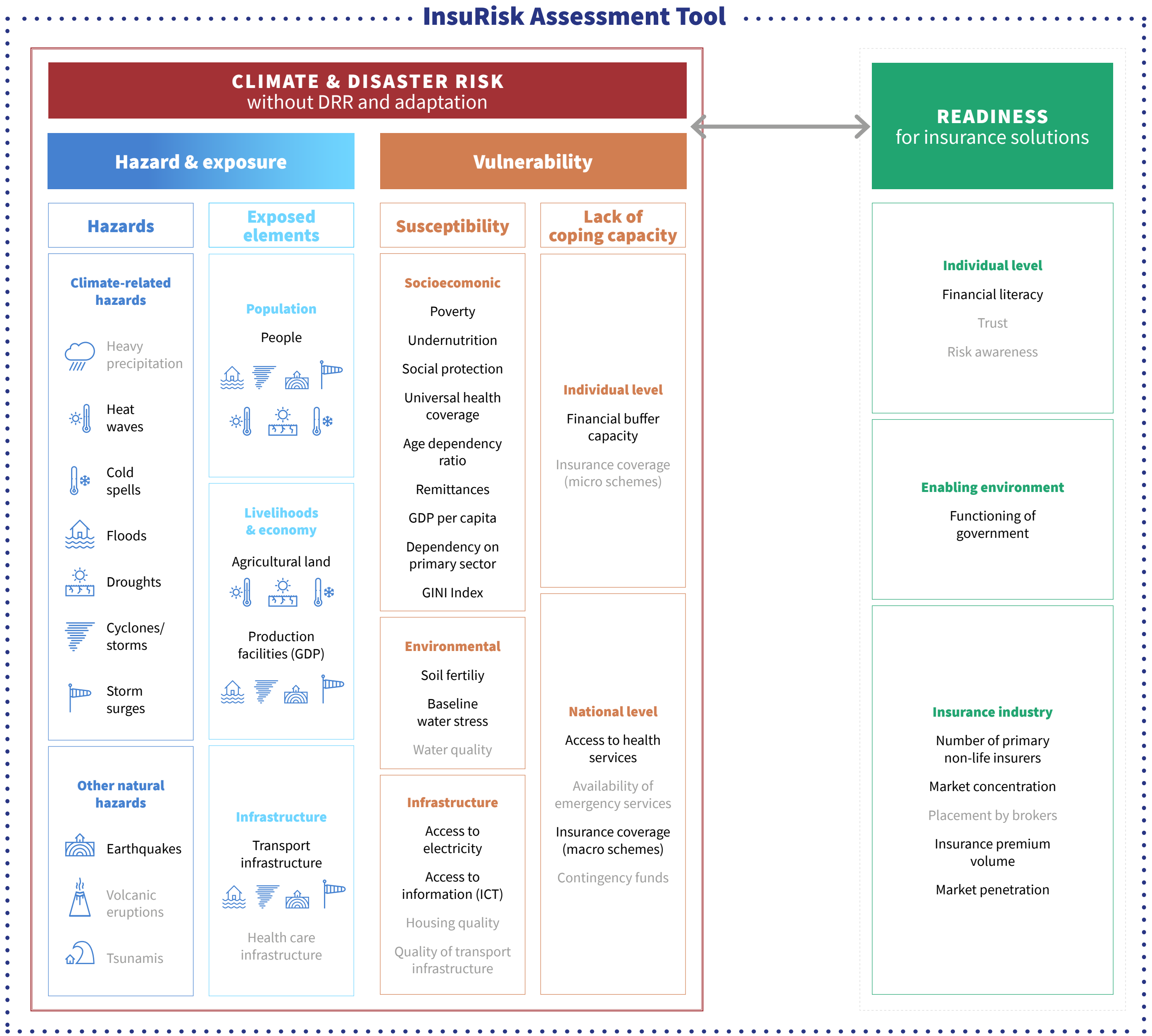


Fig. 2: Conceptual framework of the InsuRisk Assessment tool. The tool consists of two key components: (i) climate and disaster risk, and (ii) readiness for insurance solutions. Elements in grey font are considered relevant but lack publically accessible data with global coverage.

Source: Authors' own

Timor Leste, 2018

EXPOSED ELEMENT	HAZARDS CONSIDERED
Population	Heat waves, cold spells, river floods, droughts, storms, storm surges, earthquakes
Agricultural land	Heat waves, cold spells, droughts
Production facilities (GDP)	River floods, storms, storm surges, earthquakes
Infrastructure	River floods, storms, storm surges, earthquakes

Table 2: Hazards considered for the different exposed elements.

Source: Authors' own

EXPOSED ELEMENT	INDICATOR	YEAR	SOURCE
Population	Population	2020	WorldPop
Land use	Agricultural areas	2018	European Space Agency (ESA 2019)
Economic production	Gross Domestic Product (GDP)	2015	Kummu and others (2018)
Infrastructure	Major roads	2020	Open Street Map (OSM)
	Railways	2020	Open Street Map (OSM)
	Ports	2020	Maritime Safety Information
	Airports	2020	Our Airports

Table 3: Exposed elements considered in the InsuRisk Assessment tool and their data sources.

Source: Authors' own

The climate and disaster risk index is calculated based on 46 variables aggregated into 21 indicators and the readiness index based on six indicators, both for **188 countries globally** and the **38 United Nations Member SIDS**. This allows evaluation of the climate and disaster risk and readiness for insurance solutions of Small Island Developing States (SIDS) both in the global context, but also across SIDS. The assignment of the individual indicators to the two components is described in the modular structure of the InsuRisk Assessment tool in *Figure 2* (page 21). More detailed information on data sources and methodological steps in index construction are provided in the Annex (available online).

Figure 3 (below) shows how the InsuRisk Assessment tool is embedded in the broader context of **risk management** and **loss and damage**, where risk transfer (e.g. through insurance solutions) is part of the portfolio of options next to risk retention and risk reduction. Managing risks through insurance or other financial instruments is a key approach to address risk as well as residual risk (i.e. the risk that remains unmanaged after risk reduction measures have been put in place). A broad range of risk management options are available. Next to more conventional ways of reducing risk (e.g. through structural and nonstructural measures), we differentiate between risk transfer (e.g. through regional risk pools, national sovereign insurance pools, or microinsurance), risk retention (e.g. reserve funds, budgetary reallocation, donor assistance) and risk financing (e.g. contingent credit lines, loans) following a classification proposed by Schäfer and others (2016).

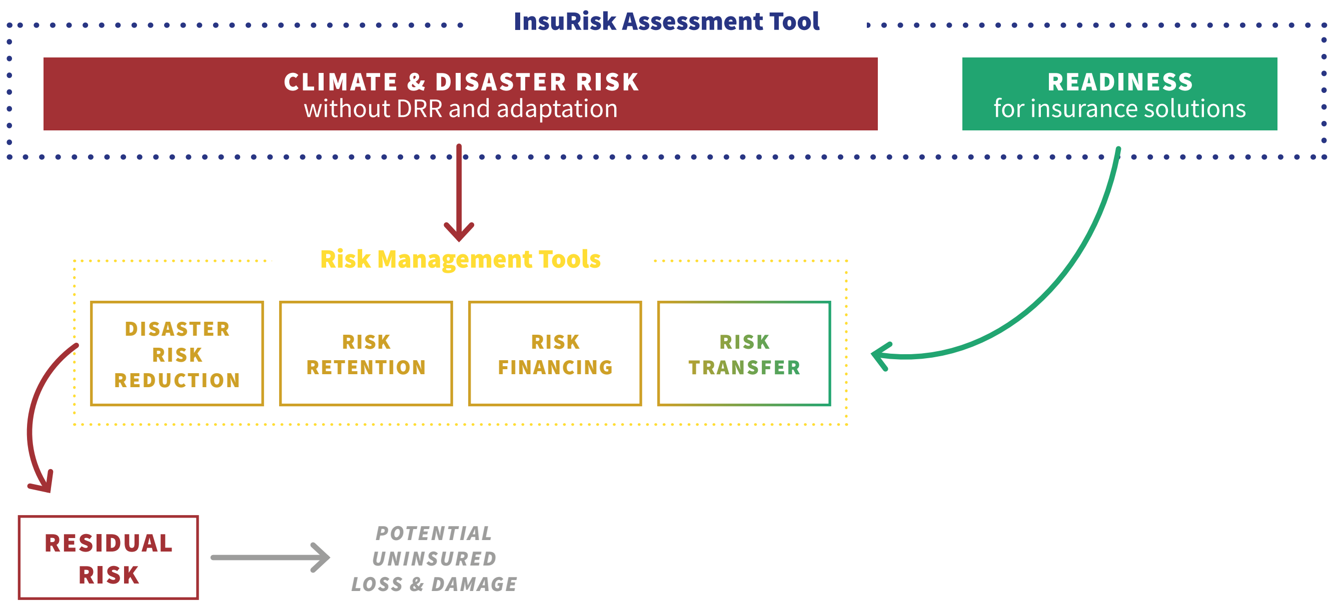


Fig. 3: The InsuRisk Assessment tool in the context of loss and damage. Baseline information on a country's climate and disaster risk and its readiness for insurance solutions can inform a range of risk management options, including disaster risk reduction, risk retention and risk transfer. Together these options allow reducing risk to residual risk (i.e. the risk that remains unmanaged after risk management options have been put in place). Depending on how far residual risk is reduced, there remains a potential for uninsured loss and damage.

Source: Authors' own

BOX 2: Return periods and risk transfer

Risk transfer products, such as insurance, transfer uncertainty from a client to an insurer for a fee. Clients pay a fixed premium in order to avoid a large loss should an undesired event occur. Insurers profit by understanding the likelihood that an event will occur and charging a premium that more than fully covers their risk over the long term, while also diversifying their exposure and purchasing reinsurance. Risk assessment is considered a fundamental tool for both risk communication and insurance. In this sense, a hazard's comprehensive historical data is commonly used to derive a possible picture of the future through statistical measures like return periods (or recurrence intervals) for a quantitative/probabilistic risk estimation. Return periods are an approach to expressing the probability of an event by referring to the average time between successive events of similar magnitude for a given location. For instance, a 50-year return period hazard event has a 2 per cent chance of being exceeded in any given year. Given the effects of climate change on the intensity and frequency of extreme events in many parts of the world (IPCC, 2012), there is however a significant risk that predicting the likelihood of future extreme events based on how frequently they occurred in the past might lead to significant underestimates (Diffenbaugh, 2020).

Although the typical insurance policy covers (economic) losses for a range of return periods (e.g. the range of 15-40-year return periods for CCRIF SPC [formerly known as The Caribbean Catastrophe Risk Insurance Facility] coverage), an integrated snapshot assessment that uses a return period of 50 years for climate-related hazards and 475 years for seismic hazards was used for the InsuRisk Assessment tool (see *Table 4*, below).

While insurance is generally considered most cost-effective for infrequent events, governments, firms and individuals often desire coverage for more frequent events (5- or 10-year return periods). Insurance for these types of events is incredibly costly, and highlights the need for clients to consider risk layering as a component of their disaster risk financing approach.

HAZARD	INDICATOR	RETURN PERIOD	SOURCE
Heat waves	Warm Spell Duration Index	n/a (1970-2016)	Mistry (2019)
Cold spells	Cold Spell Duration Index	n/a (1970-2016)	Mistry (2019)
River floods	n/a	50 years	Dottori and others (2016)
Droughts	4-6 months Standardized Precipitation Index (SPI)	50 years	He and Sheffield (2020)
Storms	Wind speeds >119 km/h	50 years	UNDRR (2015)
Storm surges	n/a	50 years	UNDRR (2015)
Earthquakes	Peak Ground Acceleration (PGA) > 8.1 cm/s	475 years	Pagani and others (2018)

Table 4: Hazard datasets considered in the InsuRisk Assessment tool and their return period.

Source: Authors' own

Vanuatu, 2020

EXPOSURE TO SLOW ONSET EVENTS

Next to the climate-related extreme events and natural hazards considered in this report (i.e., heat waves, cold spells, river floods, droughts, storms/tropical cyclones, storm surges, and earthquakes), many islands (including SIDS) are highly exposed to a wide array of additional slow-onset events, such as sea-level rise, and the associated, aggravated impact of swells, king tides, coastal erosion, and salt water intrusion. Due to the lack of comparable data across SIDS, these slow-onset events are — despite of their high relevance — not considered in the exposure analysis presented in this report. As a result, the exposure analysis assigns low values (and in turn possibly lower climate and disaster risk levels) to several SIDS, including Kiribati, Nauru, Tuvalu, the Marshall Islands, and the Maldives, which differs from the realities many of these countries face. In addition, uncertainties in the global hazard datasets used for the exposure analysis (see Box 4, p. 44) might lead to further underestimations for some countries. As a result, the actual exposure and climate and disaster risk levels of many SIDS may be substantially higher than the analysis which is presented here suggests.

Climate and disaster risk

SIDS countries stretch around different latitudes, continents and income groups (see *Table 1*, page 16), accounting for diversified types and intensities of exposures to environmental and climatic stressors as well as associated vulnerabilities.

Over the past decades, the occurrence of many different hazards has resulted in a remarkable number of actual disasters in SIDS countries and other small island states. Data from the Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT[3]) shows that SIDS countries have collectively experienced more than 600 disaster events in the last century, including 69 events in the AIS region (11 per cent), 348 in the Caribbean region (54 per cent), and 229 in the Pacific region (35 per cent). The majority (287 events; 44 per cent) of these were the consequence of meteorological hazards, notably storms, followed by (i) hydrological hazards (184 events; 28 per cent), including floods and landslides, (ii) geophysical hazards (67 events; 10 per cent), such as earthquakes and volcanic activities, (iii) epidemics (62 events; 10 per cent), and (iv) climatological hazards (46 events; 7 per cent), including both droughts and wildfires (*Fig. 4*, p. 28).

3 https://www.emdat.be

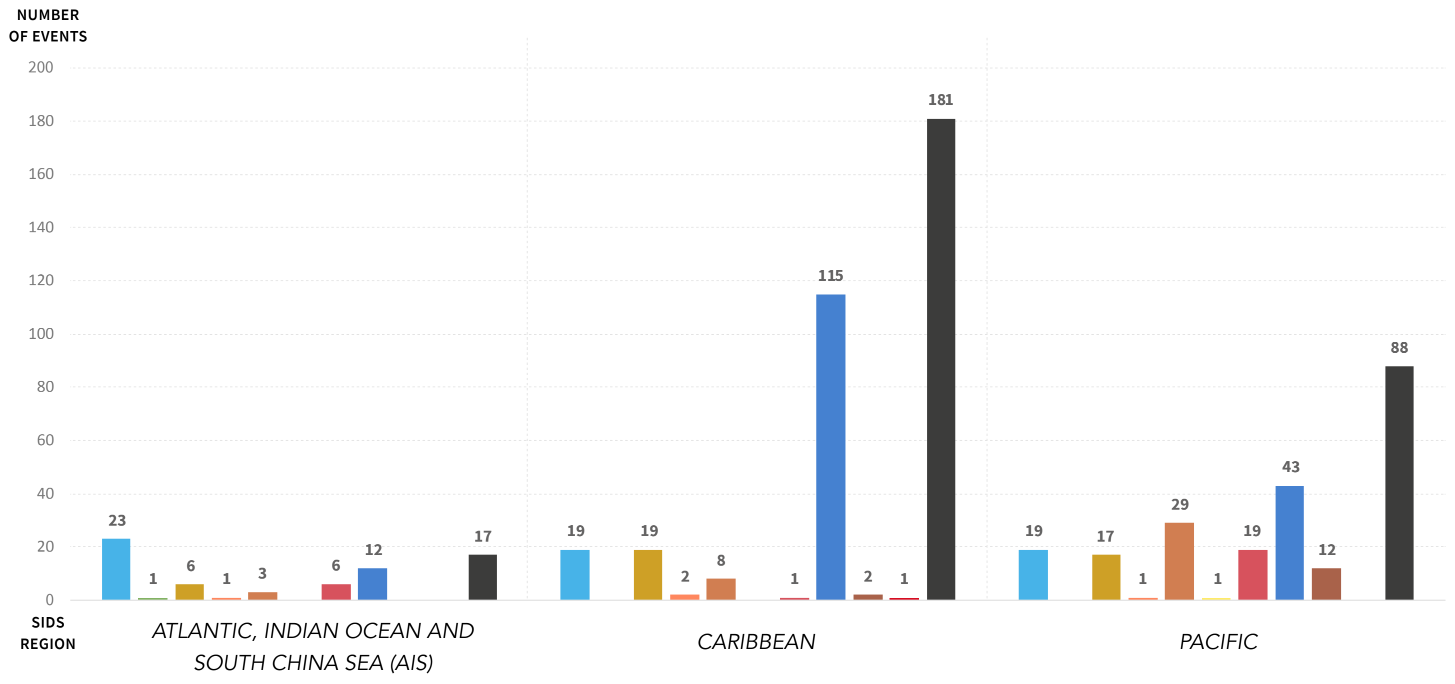
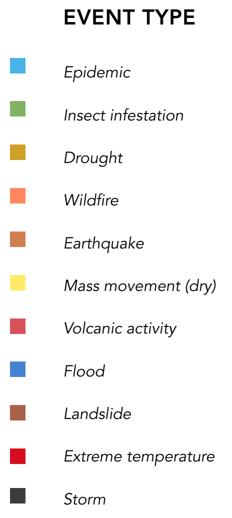


Fig. 4: Catastrophic events associated with different extreme events and hazards (1990-2020) in SIDS macro-regions (i.e. Caribbean, Pacific, AIS) based on impact data from EM-DAT.

Source: Authors' own

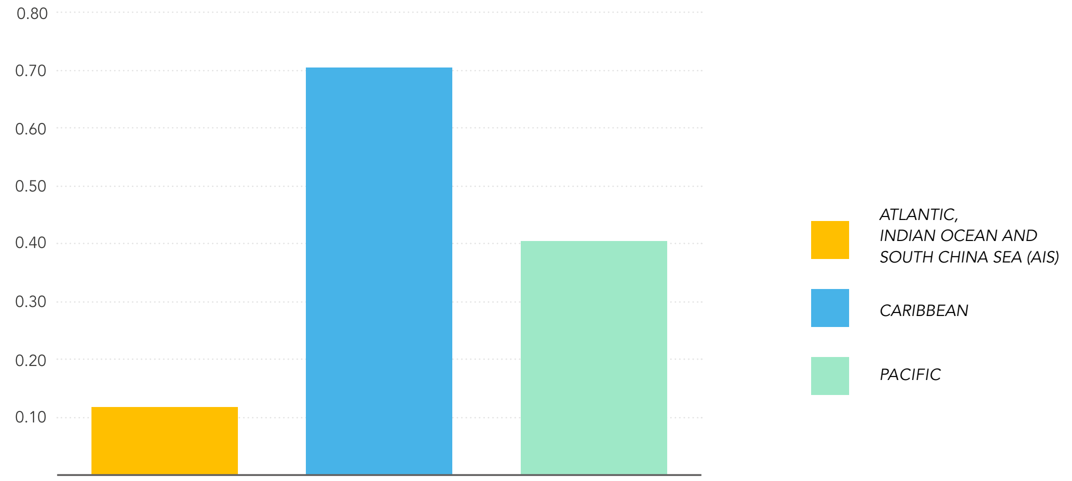


Exposure to climate-related extreme events and natural hazards

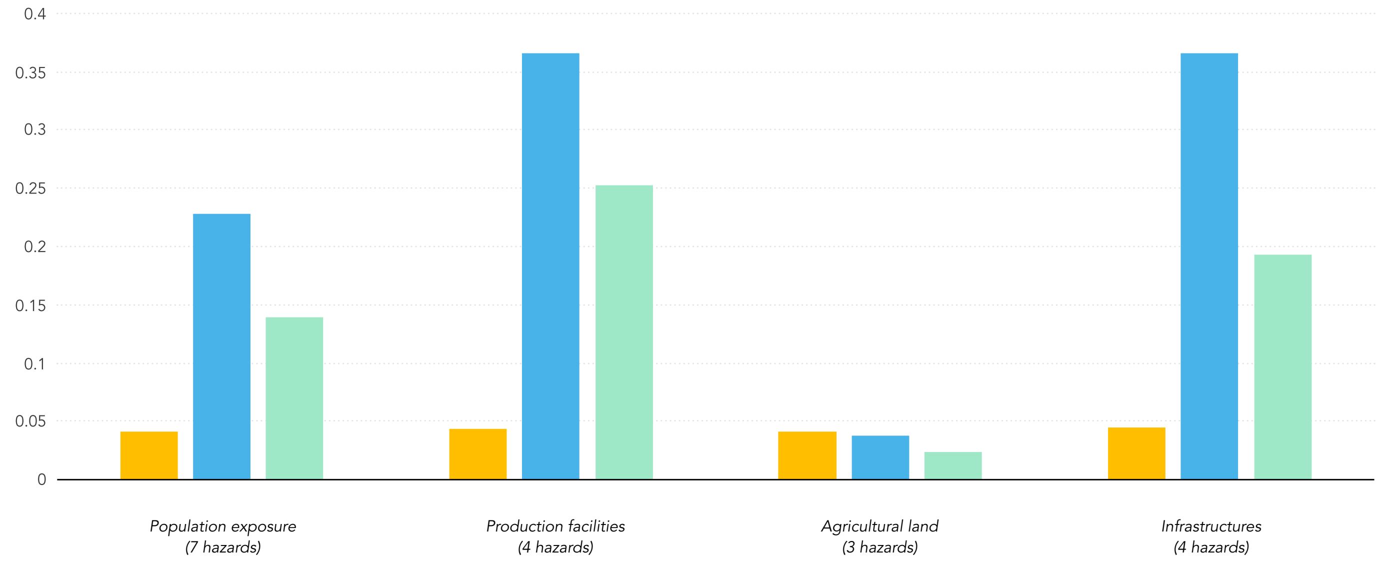
In order to assess exposure levels of the 38 SIDS United Nations Member States, a set of four exposed elements (i.e. people, agricultural land, production facilities and infrastructure) and seven different hazards (see *Table 2*, page 23) were taken into account. Exposure is calculated both in absolute (e.g. number of people in hazard-prone areas) and relative (e.g. percentage of population in hazard-prone areas) terms.

For the 38 United Nations Member SIDS, results indicate geographically-diverse trends for the three macro-regions (i.e. Caribbean, Pacific, AIS). The Caribbean region is on average the most exposed (*Fig. 5a*, p. 30): five of the six most affected countries in terms of overall relative exposure belong to this cluster (i.e. Dominica, Dominican Republic, Jamaica, Haiti, Saint Vincent and the Grenadines), whose high exposure is driven particularly by the presence of cyclones and earthquakes (*Fig. 5c*, p. 31). The Pacific region is on average the second most exposed, with Vanuatu and Tonga showing considerably higher values compared to their regional neighbours. Despite showing a much more contained level of overall exposure (*Fig. 5a*, p. 30), at a closer look the AIS region is however strongly diversified: while some of its members (i.e. Bahrain, São Tomé and Príncipe and the Maldives) do not have any exposure (note: this is based on global hazard datasets with a certain degree of uncertainty – see *Table 4*, page 25, for details on the hazard data) other countries in this regional cluster actually display the highest absolute and relative values across all SIDS for some exposure combinations. For instance, Tuvalu has the largest amount of agricultural land exposed to drought in relative terms, while Guinea-Bissau foreruns all SIDS in terms of absolute and relative population exposed to warm spells (63 per cent). Dominica and Saint Vincent and the Grenadines lead all countries worldwide in terms of GDP exposure to storm surges (21 per cent each), while Singapore reports the highest absolute value amongst SIDS countries and the 8th highest globally. Dominica, of the Caribbean cluster, precedes all SIDS in terms of absolute and relative population exposure to all seven hazards considered (0.32 in a scale between 0 and 1). The three geographical clusters show consistent disparities among them when considering the average exposure of single elements, with the notable exception of agricultural land, whose overall values are comparable across the regions (*Fig. 5b*, p. 30).

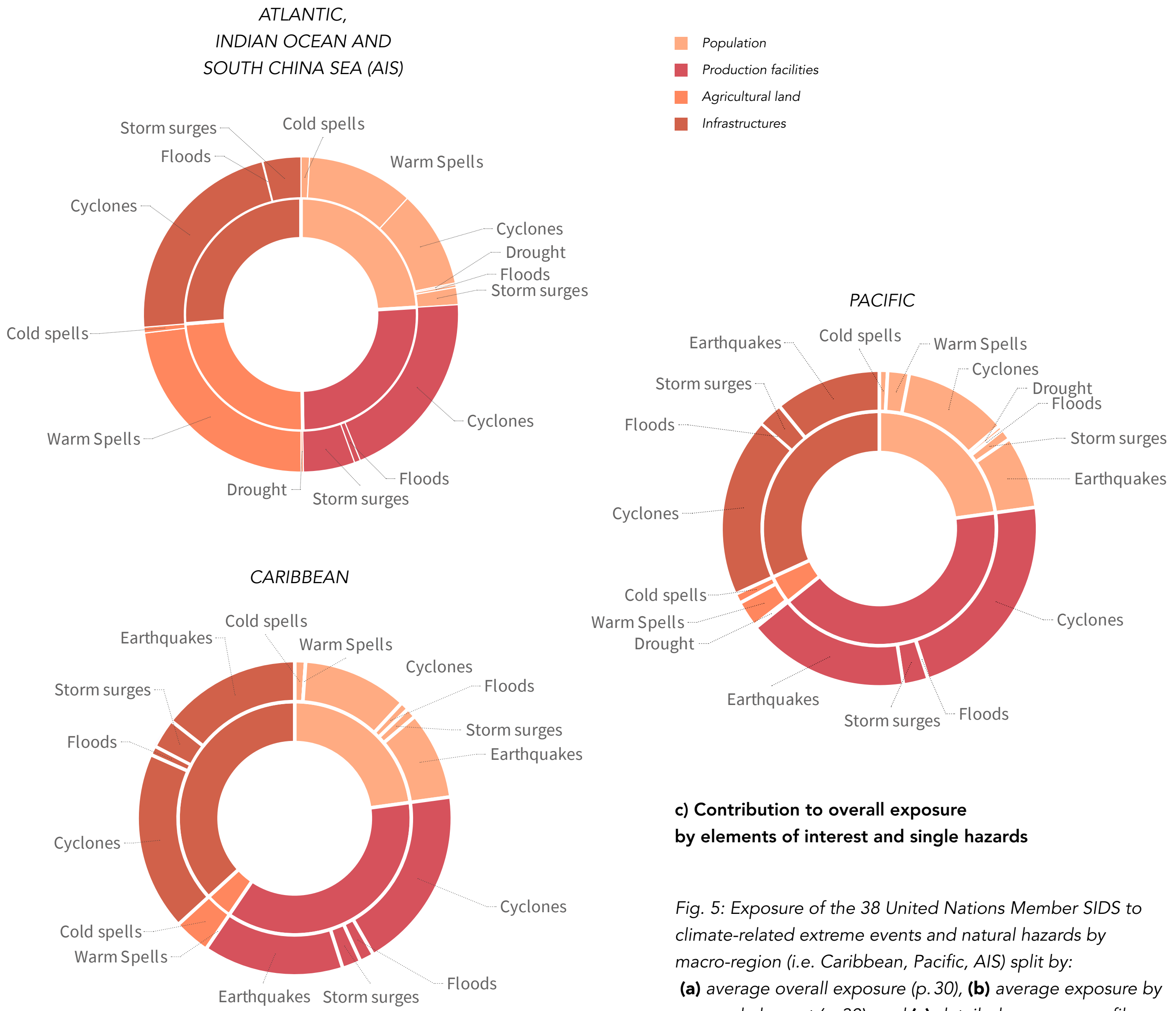
As indicated in *Figure 5c* (page 31), the three regions also differ in terms of which hazards contribute to the exposure of each element: for instance, the overall population exposure of the AIS countries group is largely affected by the presence of warm spells and cyclones, with storm surges as a distant third contributing hazard (outer ring in the chart). Countries in this group also display a disproportionately higher contribution of agricultural land to the overall exposure, largely driven by the impact of prolonged warm spells. The Caribbean and the Pacific countries are on the other hand severely impacted by the presence of earthquakes, which endanger the populations, production facilities and transport infrastructures in very high relative terms.



a) Average overall exposure



b) Average exposure by element of interest



c) Contribution to overall exposure by elements of interest and single hazards

Fig. 5: Exposure of the 38 United Nations Member SIDS to climate-related extreme events and natural hazards by macro-region (i.e. Caribbean, Pacific, AIS) split by: ***(a)*** *average overall exposure (p. 30),* ***(b)*** *average exposure by exposed element (p. 30), and* ***(c)*** *detailed exposure profiles.*

Source: Authors' own

Vulnerability and risk

Figure 6 (page 33) shows the two sub-components of vulnerability, susceptibility and lack of coping capacity, as well as the most recent poverty headcount ratio at national poverty lines for all 38 SIDS considered in this report.

Figure 6 (page 33) clearly shows that huge differences in regards to both poverty headcount ratios and vulnerability exist across SIDS as well as across macro-regions. For example, while in the Maldives, Mauritius, Bahamas, Solomon Islands and Vanuatu less than 15 per cent of the population is considered poor, in Suriname, Guinea-Bissau, São Tomé and Príncipe, and Haiti more than 50 per cent of the population is below the national poverty line.

The comparison of the two vulnerability sub-components (i.e. susceptibility and lack of coping capacity) also reveals noticeable regional patterns: Pacific SIDS countries are overall tightly concentrated in a mid-range window as far as lack of coping capacity is concerned, with values ranging from the 0.37 of Tuvalu to the 0.5 of Papua New Guinea (in a scale from zero to one). Caribbean SIDS show a similar pattern, with the added presence of clear negative outliers in Guyana, Suriname, the Dominican Republic, Cuba and Haiti, which are more vulnerable than their regional counterparts, notably because of their lacking capacity to cope with climate-related extreme events and natural hazards shortly before, during or after an event. On average, AIS SIDS are characterized by a high lack of coping capacity (lead by the African SIDS countries), with the noteworthy exception of the Comoros, which scores much lower than its regional cluster (with Singapore a distant second) and even performs better compared to the SIDS overall average for this component. The lack of coping capacity of SIDS in the AIS regional cluster, however, is somewhat counterbalanced by their lower susceptibility, which places them in a similar range to Caribbean and Pacific SIDS, with the exception of Guinea Bissau. By combining a high susceptibility and a high lack of coping capacity, Guinea Bissau is the most vulnerable of all SIDS, followed at a sizable gap by São Tomé and Príncipe, Guyana, Suriname and Cabo Verde, while Antigua and Barbuda, Tuvalu, Trinidad and Tobago, and Dominica are the least vulnerable SIDS to climate-related extreme events and natural hazards (*Fig. 7*, p.34).

The combination of a country's exposure to climate-related extreme events and natural hazards with its vulnerability produces the final level of climate and disaster risk. *Figure 7* (page 34) helps understanding of the performances of SIDS countries in relative terms by plotting the respective levels of exposure and vulnerability, thus making it possible to deconstruct the meaning of the final risk scores. Once more, the regional clusters display stark contrast and the need for differentiated climate and disaster risk management tools: Caribbean SIDS show an almost inverse relationship between exposure and vulnerability, with highly vulnerable countries like Guyana and Suriname being balanced by a relative lower exposure compared to their neighbours (e.g. Haiti and Dominican Republic), and Dominica showing the opposite combination (i.e. low vulnerability but very high exposure). Absence of exposure to the seven hazards considered in this report (see *Table 4*, page 25) neutralizes the effect of vulnerability in several SIDS, resulting in absence of climate and disaster risk for Nauru, Kiribati, São Tomé and Príncipe, the Maldives and Bahrain. However, these findings have to be treated with care, given that the analysis is conducted using global datasets with coarse spatial resolution while many SIDS are very small in size. Further, the analysis did not take into account slow-onset events, such as sea-level rise, which pose a

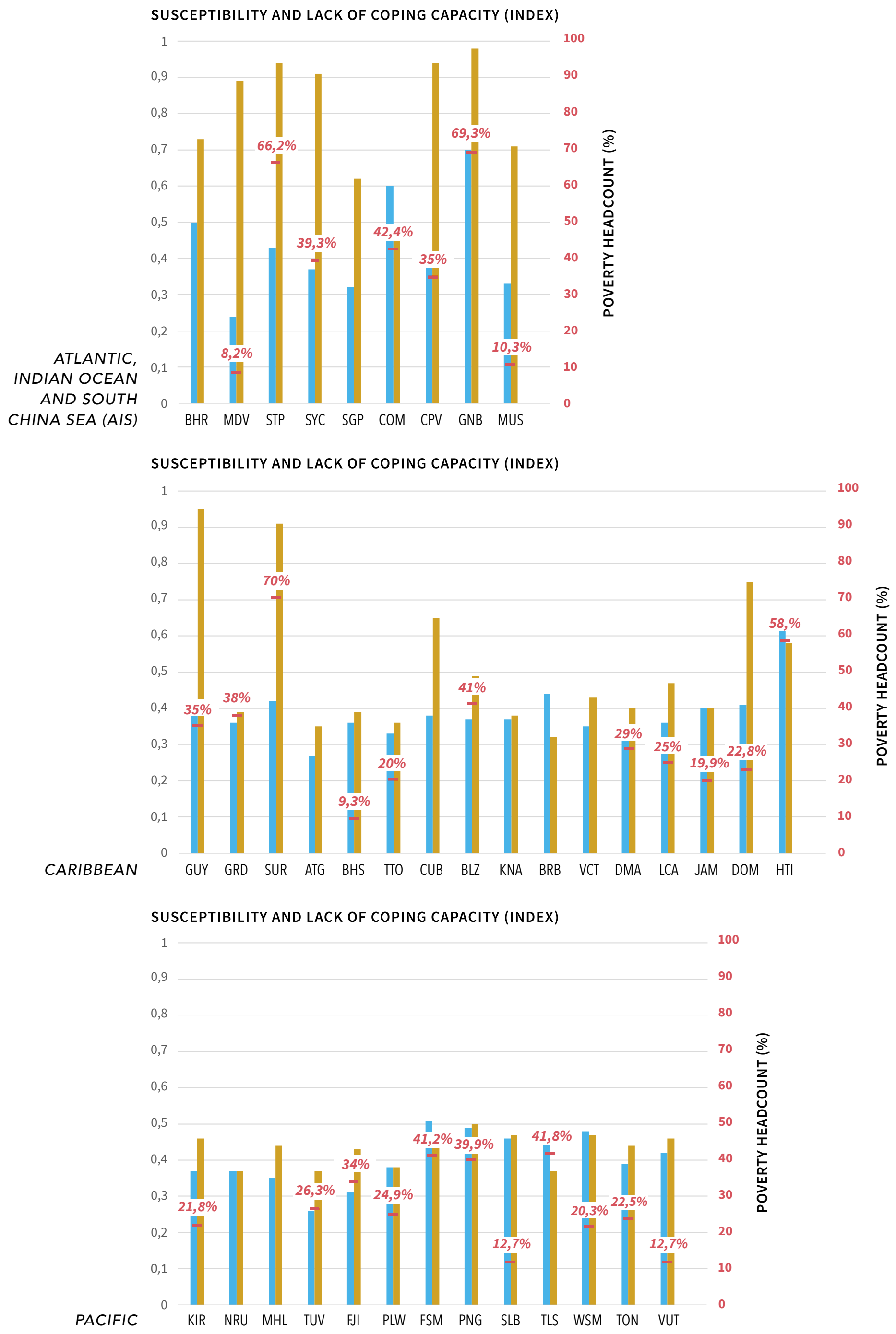


Fig. 6: Susceptibility, lack of coping capacity and poverty headcount ratios based on national poverty lines for the 38 United Nations Member SIDS. Note: for some countries no poverty headcount ratios are reported due to missing data. Country labels are listed in Table 1 (Box 1, page 14).

Source: Authors' own

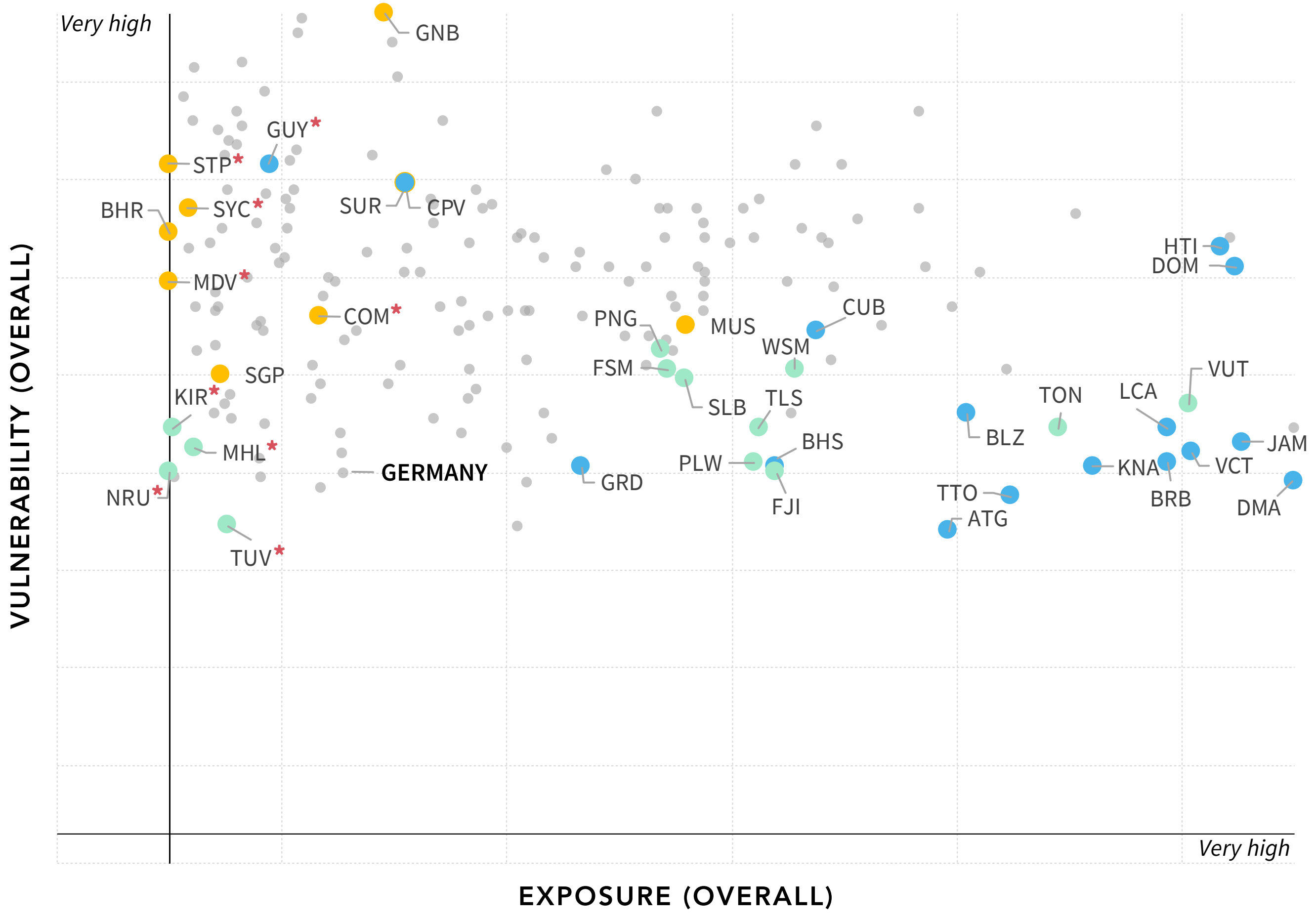


Fig. 7: Country profiles contrasting overall exposure (i.e. exposure for all elements) and vulnerability for the 38 United Nations Member SIDS (country labels provided in Table 1 (p.16), Box 1(p.14)). Grey dots represent non-SIDS country scores globally (Germany shown for comparison), while coloured dots cluster United Nations Member SIDS according to their geographic location (i.e. Caribbean, Pacific, AIS). Climate and disaster risk results from the interaction of exposure to climate-related and natural hazards and vulnerability.

NOTE: The exposure analysis is based on global datasets which, in some cases, might lead to under-/overestimation of the actual exposure for some countries. For example, several countries, such as Kiribati, Nauru, Tuvalu, the Marshall Islands, and the Maldives, are in fact highly exposed to climate impacts. Please refer to Box 4 (pp.46-47) for an overview of possible misestimates due to lack of high-granularity data. Further, the analysis only shows exposure to some hazards (i.e. heat waves, cold spells, river floods, droughts, storms, storm surges, earthquakes), and does not take into account slow-onset events, such as coastal erosion, degradation, pollution, salinity intrusion or the effects of sea-level rise.

Source: Authors' own

All countries

Caribbean

Atlantic, Indian Ocean and South China Sea (AIS)

Pacific

challenge for many SIDS. Combined, this might lead to an under- or, in some cases, also overestimation of exposure to natural hazards (see *Box 4*, pages 46 and 47). Even more so it is important to evaluate the level of vulnerability of these countries. When overall risk is taken into account, Haiti and the Dominican Republic stand out as the two most at-risk SIDS countries, with a sizable margin compared to Vanuatu, third in the SIDS ranking and the only non-Caribbean country that figures in the highest five SIDS at risk. Jamaica, Saint Lucia and Dominica follow closely, with levels of risk that are mainly explained by their high exposure to climate-related extreme events and natural hazards (see *Table 5*, below).

The high ranges of values in all sub-components of climate and disaster risk for SIDS countries suggest that, despite the common denomination, the 38 countries actually have highly diverse profiles and therefore very different challenges in terms of facing environmental and climate threats. Most of the variability of the climate and disaster risk index seems to be determined by differences in exposure and coping capacity.

	RANKING					
	Risk		Exposure		Vulnerability	
	SIDS	Global	SIDS	Global	SIDS	Global
Haiti	1	2	4	6	8	70
Dominican Republic	2	3	2	3	9	79
Vanuatu	3	11	5	7	19	149
Jamaica	4	14	2	3	25	166
Saint Lucia	5	17	7	9	21	157

Table 5: The top five United Nations Member SIDS with the highest climate and disaster risk and their ranking for risk, exposure (all hazards, all exposed elements) and vulnerability amongst SIDS and at the global level (based on the 188 countries considered in the InsuRisk Assessment tool).

Source: Authors' own

Cuba, 2020

Box 3: COVID-19 and Small Island Developing States

With more than 58 million confirmed cases and approximately 1.4 million deaths globally at the end of November 2020, the COVID-19 pandemic is inflicting high human and economic costs for countries across the globe, including many SIDS. Data from the World Health Organization (WHO) COVID-19 Dashboard[4] shows that, as of 24 November 2020, with 5.5 cases per 1,000 inhabitants SIDS have fewer confirmed cases on average compared to the global average of 7.6 cases per 1,000. However, the data also shows that there are huge differences across SIDS. Pacific SIDS are by far less affected (0.05 cases per 1,000) than Caribbean SIDS (4.77 cases per 1,000) or SIDS in the AIS region (13.1 cases per 1,000). In the AIS cluster confirmed cases are almost twice as high as the global average. However, there are not only differences across regional clusters, but also within regional clusters. With more than 50 cases per 1,000 Bahrain has the highest relative burden across all 38 United Nations Member SIDS, followed by the Maldives (23.3 cases per 1,000), both of which are located in the AIS cluster. At the same time, several countries in the same regional cluster have very low numbers (e.g. Mauritius, Comoros, Guinea Bissau or Seychelles – all with fewer than 2 cases per 1,000 inhabitants), and seven Pacific SIDS were COVID-19-free (i.e. Kiribati, Micronesia, Nauru, Palau, Samoa, Tonga and Tuvalu) as of 24 November 2020.

However, there are a number of factors that make SIDS particularly vulnerable to both the direct effects of COVID-19 as well as to the measures taken globally to reduce its transmission. These include their small economic bases, the disproportionally high external debt of many SIDS economies, their high dependency on tourism and remittances from other economies that have been or are now again in lockdown, as well as their partly limited capacity to cope with external shocks. On average the external debt of SIDS accounts for 72.4 per cent of their GDP, reaching up to 198 per cent in the Seychelles and 194 per cent in the Bahamas, according to data from UNCTAD. Accounting for 29 per cent of the GDP across all SIDS, as a group (with up to 66 per cent in the Maldives or Seychelles), tourism is key to the economy of most SIDS as data from the WTTC[5] shows. Due to COVID-19 many hotel beds in SIDS remain empty this year – even in countries with no cases – leading to major drops in GDP and employment, hence further exacerbating existing development challenges and in turn societal vulnerabilities. Lastly, by forcing people to leave their homes or destroying health infrastructure, natural hazards such as tropical cyclone Harold are leading to compounding risks for many SIDS by increasing exposure to COVID-19 and reducing the capacities of affected countries to provide much needed health services in times of a global pandemic.

4 https://covid19.who.int

5 https://wttc.org/Research/Economic-Impact

Guinea – Bissau, 2018

Readiness for insurance solutions

Recent studies have confirmed the effectiveness of international climate finance and risk transfer instruments to reduce the vulnerability and risk for small islands (including SIDS), notably those where domestic resources alone are not sufficient to help exposed and vulnerable households and communities to cope with the effects and impacts of natural hazards and extreme events (Scandura and others, 2020). However, the contribution of the insurance industry goes beyond providing protection against financial loss in case of a disaster. By (i) providing knowledge and promoting information on potential loss events as well as on options for saving lives and reducing damage to properties, (ii) offering jobs in the insurance industry, (iii) insuring and hence sustaining increasingly complex supply chains, and (iv) acting as capital infusers, the insurance industry also makes an important contribution to financial stability (Weisbart, 2018). While some SIDS have been pioneers in the use of market-based financing instruments, notably sovereign insurance, by creating regional risk pools with the support of the CCRIF SPC (formerly known as the Caribbean Catastrophe Risk Insurance Facility) or the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), the implementation of such solutions across SIDS remains low compared to other countries (OECD and World Bank, 2016). This corresponds with the persistence of comparatively weak enabling conditions for the implementation of insurance solutions in many SIDS, notably in terms of government performance and stability as well as individual capacity for their uptake.

The InsuRisk Assessment tool offers a picture of a country's readiness for insurance solutions based on the three modules of (i) individual readiness, (ii) enabling environment, and (iii) insurance industry based on selected key indicators. As for the climate and disaster risk index, this allows for a comparison of countries' performances at the global level, which can in turn foster further enquiries into understanding what challenges and opportunities are faced by at-risk countries. The three SIDS regional clusters (i.e. AIS, Caribbean and Pacific) show a relatively similar distribution of readiness values (*Fig. 8*, p. 41), with comparable maximum values for each regional top-ranking country (Timor-Leste, Trinidad and Tobago, Mauritius, respectively), and ranges between top and bottom performers that are contained between approximately one third and half of the total variation of the index (Pacific and AIS countries, respectively), a variability that is considerably more restricted in comparison to the climate and disaster risk index. However, it should be noted that the availability of indicators for readiness suffers from higher levels of missingness (see *Box 4*, pages 46 and 47) when compared with the climate and disaster risk index, in particular for the Pacific SIDS cluster.

The AIS cluster is characterized by a stark contrast between its top-performing countries (i.e. Mauritius, Cabo Verde and Singapore) and the bottom-ranking ones (i.e. Guinea-Bissau[6], Comoros and Seychelles) in terms of their readiness for insurance solutions. While the contribution of each module of readiness varies for each country, AIS countries are characterized by a lower presence of insurance industries (see *Fig. 8*, fourth column, p. 41) when compared to the Caribbean cluster (the 'most-performing' in this sense); this is, however, compensated by higher levels of 'enabling environment' and 'individual readiness' components in the top-three AIS countries compared to all other SIDS. With the exception of Haiti, Cuba and Saint Lucia, the Caribbean countries do not have particularly steep differences across them, with Trinidad and Tobago, Jamaica, Antigua and Barbuda, and Suriname leading the group. The interpretation of these results needs particular care because, as is apparent from *Figure 8* (page 41), data from the 'Insurance industries' module is the sole contributor to the overall readiness score for seven Caribbean countries. The scarcity of data affects the Pacific cluster as well, but is nonetheless interesting to note that the three countries for which the assessment could be carried out (Timor-Leste, Papua New Guinea and Fiji) display a level of 'enabling environment' in line with or higher than the overall average for SIDS. Of the three modules that constitute readiness, the enabling environment is of special interest as it aims to represent the level of functioning of governments, a characteristic that can contribute to attract risk transfer actors. This indicator, developed by the Economist Intelligence Unit as a component of their 'Democracy index', is based on experts' opinions on a variety of issues (e.g. presence of checks and balances, transparency, perceived corruption, etc.) that affect the well-functioning of governments and the willingness of insurers to establish or further develop insurance markets. Low levels of functioning of governments are particularly affecting Cuba, Haiti, Comoros and Guinea-Bissau, and contribute to the reduced overall readiness of these countries. The case of Haiti is particularly problematic, given that the country shows the highest risk across all SIDS, and risk transfer solutions are therefore particularly necessary to decrease future adverse consequences for the country.

Overall, according to our analysis the top 5 SIDS countries in terms of readiness for insurance solutions are Timor-Leste, Mauritius, Trinidad and Tobago, Singapore and Jamaica. This is not particularly surprising given that, for example, Singapore is the insurance hub for Asia. This result hints at no definitive bottleneck for any of the regional clusters considered, as each regional cluster is represented by at least one country in the list of the top five high-ranking SIDS countries.

6 Guinea-Bissau reports the lowest readiness for insurance solutions according to our analysis. However, due to missing data only one indicator (i.e. enabling environment) contributes to this score. Hence the findings have to be treated with care.

Fig. 8: Readiness for insurance solutions in the 38 United Nations Member SIDS. The overall readiness for insurance solutions (left) results from the combination of the (i) individual readiness, (ii) enabling environment, and (iii) current development status of a country's insurance market.

Source: Authors' own

Guinea – Bissau, 2013

Risk versus readiness for insurance solutions

One key innovation of the InsuRisk Assessment tool is that it allows comparison of a country's climate and disaster risk with its readiness for insurance solutions. *Figure 9* (page 44) and *Figure 10* (page 45) juxtapose those two pieces of information for the 38 United Nations Member SIDS considered in this report.

As is visible in these figures, the combination of climate and disaster risk with readiness introduces an important lens to the understanding of the challenges faced by SIDS countries, especially when analyzed through their regional clusters. Caribbean countries are generally confronted with high risk, and for some of its members (for instance Haiti) this is unfortunately coupled with a limited readiness for insurance solutions. This combination suggests the need for a deeper look at national policies, strategies and efforts to build up readiness, lest an important tool in fighting adverse consequences from climate and environmental change is missed.

In order to provide a measure of the scale that insurance tools would have to be when introduced to SIDS countries, as well as of the financial capacity countries have to cope with catastrophic events, *Figure 10* (page 45) also visualizes the size of each country's economy by plotting their GDP into their data points as 'bubbles': bigger economies (e.g. Singapore) are clearly identifiable and easily compared with their levels of

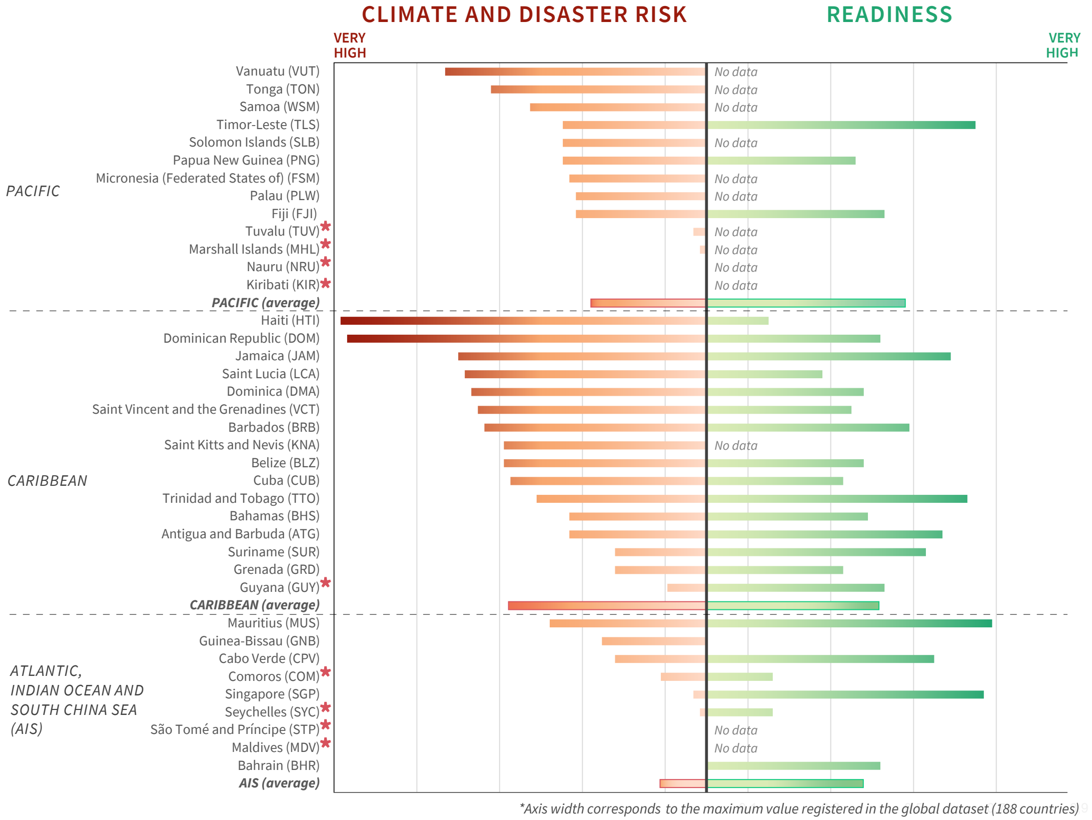


Fig. 9: County profiles contrasting overall climate and disaster risk (left) and readiness for insurance solutions (right) for SIDS considered in this report (United Nations Member States) by their geographic location (i.e. Pacific, Caribbean, AIS).

NOTE: The exposure analysis component of the climate and disaster risk levels is based on global datasets which, in some cases, might lead to under-/overestimation of the actual exposure for some countries. For example, several countries, such as Kiribati, Nauru, Tuvalu, the Marshall Islands, and the Maldives, are in fact highly exposed to climate impacts. Please refer to Box 4 (pp.46-47) for an overview of possible misestimates due to lack of high-granularity data.

Source: Authors' own

risk and readiness, so as to hint at the general requirements and possible commitments needed for insurance-based solutions. Conversely, countries apparently less attractive when only considered through their combination of risk and readiness (e.g. Haiti) might induce a closer look when their economic weight is taken into account, hopefully fostering interventions in those countries that might actually need them the most. Especially for such countries, where market conditions do not attract the private sector but where solutions are urgently required, regional approaches and public-private partnerships might offer potential ways forward.

In line with the first of the five pro-poor principles (i.e. create positive and long-lasting change for poor and vulnerable people) for insurance solutions (InsuResilience Secretariat, 2019), the innovative analysis provides guidance for the pre-selection of potential priority countries where risk is medium or high, and there is readiness for insurance solutions.

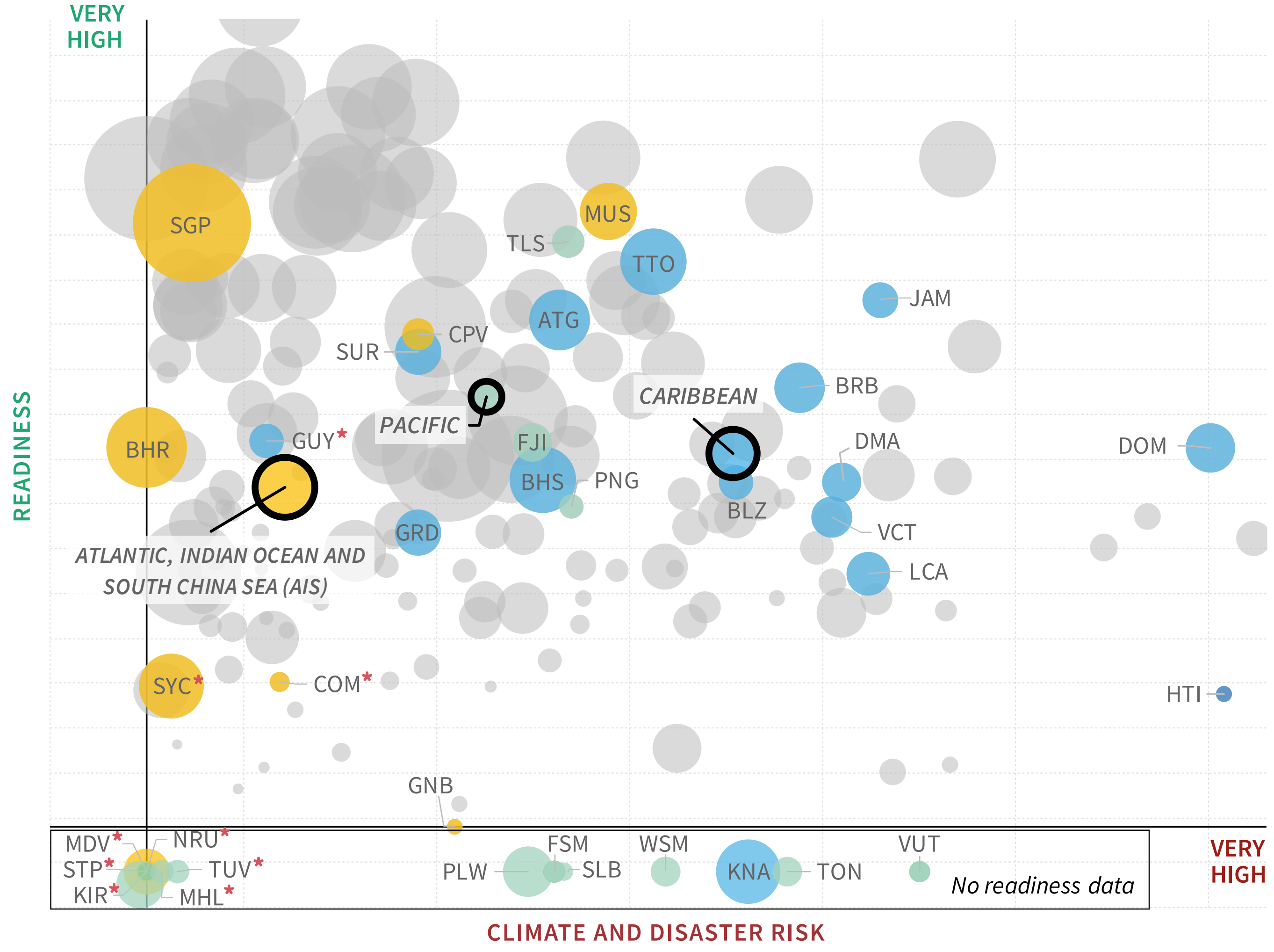
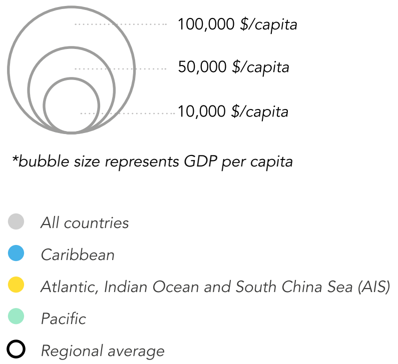


Fig. 10: Country profiles contrasting overall climate and disaster risk and readiness for insurance solutions. Grey dots represent non-SIDS country scores globally, while coloured dots cluster the 38 United Nations Member SIDS according to their geographic location (country labels provided in Table 1 (p. 16), Box 1 (p.14)). The size of the dots represents the GDP per capita of each country as an indication of the financial resources available for dealing with catastrophic events. Regional averages for SIDS (i.e. Caribbean, Pacific, AIS) are visualized by means of dots with a thicker outline. Countries appearing in the 'No readiness data' box do not have enough data for the calculation of the readiness index and are therefore plotted below the horizontal axis in order to show their climate and disaster risk values.

NOTE: The exposure analysis component of the climate and disaster risk values is based on global datasets which, in some cases, might lead to under-/overestimation of the actual exposure for some countries. For example, several countries, such as Kiribati, Nauru, Tuvalu, the Marshall Islands, and the Maldives, are in fact highly exposed to climate impacts. Please refer to Box 4 (pp.46-47) for an overview of possible misestimates due to lack of high-granularity data.

Source: Authors' own



BOX 4: Validity of the results and use of the InsuRisk Assessment tool

The analysis presented here is based on the collection, treatment and analysis of a large number of datasets (i.e. hazard, population, land use, as well as socioeconomic data) whose sources, granularity and temporal references are highly heterogeneous. In order to correctly interpret the results, attention should be placed on how these different parameters affect the aggregated risk and readiness scores for each country. In particular, the exposure assessment at the country level, obtained through spatial analysis by combining global gridded hazard data with gridded data representing population, land use, GDP and vector data representing key transportation infrastructure, is influenced by the use of global, publically available datasets that map the distribution of both hazards and exposed elements. These datasets are initially developed to provide a reasonable and coherent overview of phenomena at the global level, but inevitably their performance in the detection of variations and differences at lower spatial scales (such as small islands) is not ideal. The spatial resolution and uncertainty of the datasets used varies from hazard to hazard and across all types of exposed elements. For example, for the assessment of agricultural land use (i.e. the element of interest selected for the drought exposure analysis), relevant land use classes have been imported from the latest ESA global land cover database (C3S, reference year 2018). Studies performed on previous versions of the ESA global land use assessments, however, have shown that the accuracy of agricultural classes varies at the global scale, with a tendency for overestimation of irrigated croplands (Xiaoxuan and others, 2018; Meier and others, 2018).

In the case of non-spatial analysis (e.g. the assessments of vulnerability and readiness at country resolution), two determining factors are expected to influence the reliability of the final aggregated indexes: (i) the recency of the data, and (ii) the completeness of the dataset. For example, an indicator using data that was last collected in 2010 might miss important developments in a specific country in the last 10 years. This is especially relevant for social and economic indicators. Here, data often stems from national censuses, which are commonly only conducted every 5-10 years. Another aspect that affects the validity of the results is missing data. While some datasets are reported (and updated) frequently, for the majority of countries across the globe (e.g. GDP per capita) other datasets reveal a much higher missingness at the global level (e.g. breadth and depth of social protection coverage). A certain level of missingness is to be expected, and it is common practice in index construction to establish thresholds above which a case (e.g. a country) or an indicator must be dropped or imputed to safeguard the representativeness and completeness of the remaining dataset. For the InsuRisk Assessment tool, a case-deletion approach was adopted, for which countries and indicators were dropped in case their missingness was above 35 per cent and 25 per cent respectively (Becker and others, 2019).

From a conceptual standpoint, it is also important to underline that the concepts of vulnerability, risk and readiness used in the assessment have a variety of dimensions, nuances and peculiarities that are difficult to be captured with quantitative data (e.g. risk perception, the role of social capital, or structural and political root causes) aggregated into an index alone.

In order to evaluate the validity of the results presented in this report, different metrics and comparisons have been performed for each country (details available in the Annex).

For the hazard component of the InsuRisk Assessment tool, a comparison was made between the types of hazards affecting any given country and the presence of recorded catastrophic events and impacts associated with these hazards in that country based on data from the CRED Emergency Events Database (EM-DAT[7]) for the past 30 years (1990-2000). However, as highlighted by EM-DAT in their annual report (UCLovain, CRED and USAID, 2020) and the scientific literature (Osuteye and others, 2017; Panwar and Sen, 2020), it has to be noted that, despite major improvements in making event and impact data available in a standardized manner, there are still prevalent issues with underreporting of specific hazard types (e.g. heat waves) and associated impacts, notably in developing countries. Despite these challenges, the comparison allows a sense of possible under- and overestimations of the occurrence of specific hazards at the country level. This is, however, to be considered with care, given that the comparison pins potential hazards with different return periods (such as earthquakes) against recorded data of disaster events and losses of the past 30 years.

For the vulnerability and readiness components, a reliability metric was constructed using the information on the recency (i.e. year of collection) for the available indicators, and the percentage of missing data in the construction of the final indexes. For the SIDS countries, these comparisons and metrics reveal regional variations in the levels of validity of the results. The comparison of hazard extents and recorded disaster-related losses show a tendency for overestimation of certain hazards for certain regions (e.g. earthquakes in the Caribbean cluster), while an underestimation occurs for the same hazards in different regions (e.g. earthquakes in the AIS cluster) or for different hazards across all regions (e.g. floods). The reliability metric for the vulnerability component shows similar performances for all three clusters, with Nauru and Saint Kitts and Nevis having the lowest score of completeness (i.e. the highest percentage of missing indicators) and the average reference year close to 2016. On the opposite end, the Dominican Republic boasts a complete dataset that spans from 2010 to 2019 (with an average of 2016). The metric for the readiness component shows that some countries are characterized by very high completeness (e.g. Singapore, Mauritius and Bahrain), very high recency (e.g. Guinea-Bissau, Cabo Verde and Singapore) of the data, while others have very low completeness (e.g. Guinea-Bissau) or rather outdated data (e.g. Seychelles).

Hence, the results of those countries (e.g. Seychelles, Palau, and Saint Kitts and Nevis) with a potential under- or overestimation of their exposure, high levels of missingness and/or where data is several years old need to be treated with extra care. Further, while the outcomes of the analysis presented here are useful to identify priority countries, inform preventive action and policy, ensure that certain high-risk SIDS do not go unnoticed, and ultimately, when monitoring changes in risk and its underlying drivers over time, to take stock of progress in risk reduction, they should (due to an insufficient resolution for in-situ planning) not be used for critical (e.g. lifesaving) decisions at the local level. Detailed information on the reliability metric and its results is provided in the Annex.

In order to see how risk and readiness for insurance solutions translate into country experiences, the following three case studies look beyond the data considered in this report to explore the local context and availability of insurance solutions. Case studies are provided for the two InsuResilience Global Partnership member states that are also SIDS: Fiji and the Marshall Islands. Given the high levels of risk (among SIDS) in the Caribbean region, a third case study exploring risk and readiness in St. Lucia is also included.

7 https://www.emdat.be

CASE STUDY
The Republic of the Marshall Islands

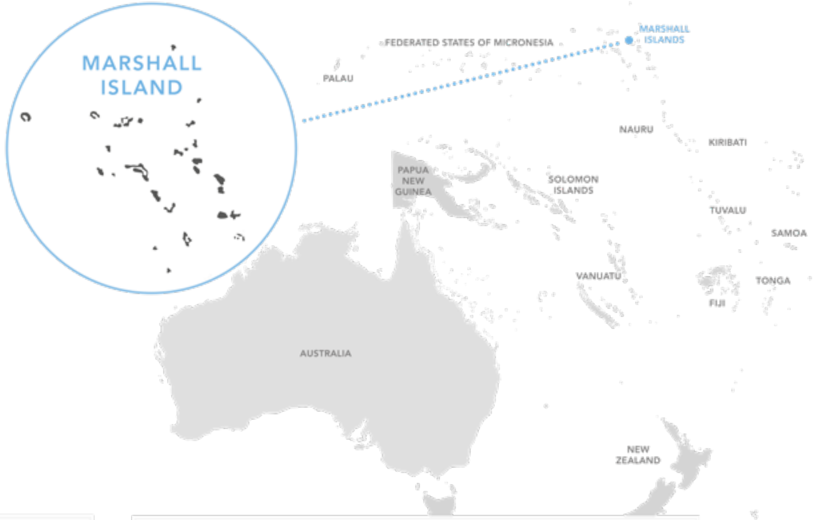
The Republic of the Marshall Islands (RMI) is a coral atoll nation, made up of over 1,000 islands and 29 atolls dispersed across almost 2 million km^2 in the North Pacific. The islands are located just 2 m above sea level – which makes RMI one of the world's lowest-lying and thus highly hazard-prone countries, particularly to coastal hazards (Government of RMI, 2018). The Marshallese are a seafaring people, closely connected with their land, water and cultural heritage (Jetnil-Kijiner, 2017). Yet, due to a rapidly changing climate, the population of roughly 59,000 people with an average annual income of US$3,986 stands to lose it all (Asian Development Bank, 2019; Word Bank, 2019).

For one, droughts, floods and swells, tropical cyclones and storms are increasing in their frequency and severity due to climate change. A drought in 2016, for example, led to total economic losses of almost $5 million, wiping out more than 2.5 per cent of the country's GDP (Leenders and others, 2017; World Bank, 2019). Moreover, sea-level rise combined with increasing king tides and tropical cyclones not only causes severe damages to public and private property, but also strengthens salt-water intrusion and salinization of the country's fresh-water reservoirs (Government of RMI, 2018) Looking ahead, models of PCRAFI suggest that RMI can expect to incur a direct annual loss of $3 million due to earthquakes and tropical cyclones, which corresponds to a reduction of almost 1.4 per cent of its GDP. Furthermore, for the next 50 years PCRAFI projects a 50 per cent chance that a major natural hazard might lead to losses close to 25 per cent of the country's GDP (PCRAFI, 2017; World Bank, 2019). In comparison, the unprecedented and much more unlikely event of the COVID-19 crisis, which has brought with it severe reductions in fishery activities, exports and sovereign rent receipts, is expected to lead to a 6.9 per cent GDP decline and the loss of 716 jobs (US Department of Interior 2020, subject to periodic review).

The private insurance market in RMI is, however, under-developed: for non-life products, the penetration rate is amongst the lowest in Pacific Islands, with mandatory car insurance showing the largest uptake (PCRAFI, 2015). Tailored insurance coverage to protect against natural hazards is not offered yet, and there is also no formal property insurance programme for key public buildings or infrastructure (Ramachandran and Masood, 2019). Without substantial support for the ambitious adaptation goals of RMI by the international community, the utility of such insurance may, however, be questioned from the start. High investments in data, civil engineering and legislation are required to protect people, homes and infrastructure. Without interventions to reduce current and future climate risks to levels where risk financing instruments are cost-effective, disaster risk financing, including insurance, will have little impact over the medium or long term, gradually becoming even less affordable as climate change impacts and disaster risks increase. While a new National Building Code, which would enable the introduction of, for example, cyclone insurance is under way, significantly more international resources are needed to improve investment and financing capacities, and to increase training for disaster risk management and soft and hard engineering (Lucas, 2015; Ramachandran and Masood, 2019; Government of RMI, 2018).

Marshall Islands, 2018

Marshall Islands



Country overview

Population (2020)
59,000

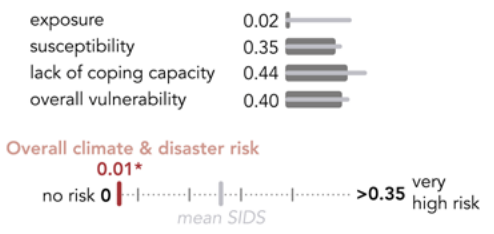
Annual rate of population change (2015-2020)
+ 0.6 %

World Bank income classification
Upper middle income

GDP per capita, ppp (current international $, 2018)
$3,986

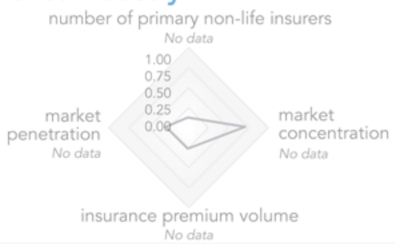
GDP per capita growth (% annual, 2017)
+ 3 %

Climate & disaster risk

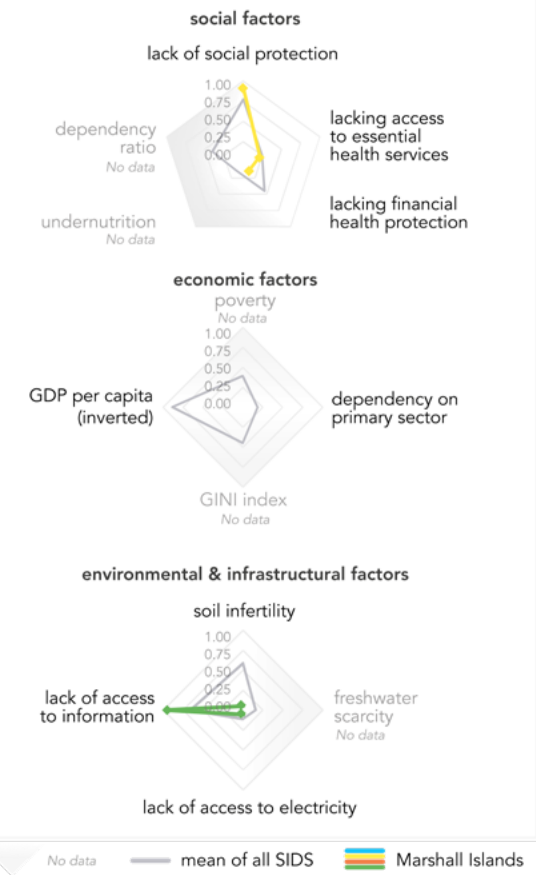


Readiness for insurance solutions

Insurance industry

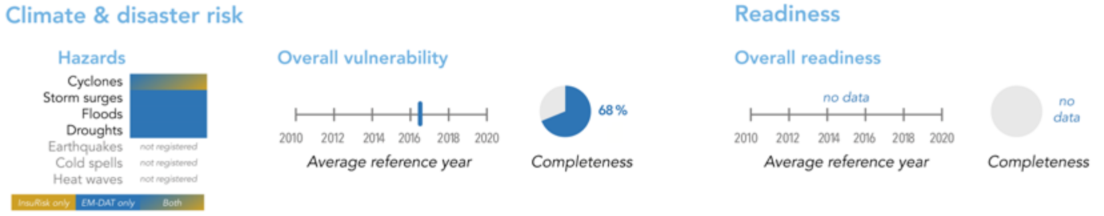


Vulnerability



Data reliability

Data reliability was assessed by contrasting the average reference year and the average completeness across indicators. Hazards occurrence was assessed by comparing the results of InsuRisk's spatial analysis with the recorded disaster events in the EM-DAT database: the 'hazards' figure below shows when this results in overestimation (yellow colour), underestimation (blue colour) or overall match (mixed colour). The Republic of the Marshall Islands shows potential underestimation of hazards occurrence, a reduced completeness of vulnerability data (68%) and lack of data for the overall readiness altogether. * For further information on validity see *Box 3* (pp.46-47) and Annex.



The RMI Government, while cognisant of the devastating impacts climate change may have on its homeland, is determined to protect the survival of its people. The second Nationally Determined Contribution (NDC) of RMI thus also mentions the need for broader disaster risk reduction investments, including the development of financial mechanisms to fund investments and response and recovery efforts (Government of RMI, 2018). In its acknowledgement of the importance of risk financing, RMI combines different tools to support public expenditure in the aftermath of disaster. These tools respond to different types of risk and include the National Disaster and Assistance Emergency Fund, with national contributions matched by the US, totaling approximately $450,000 to $500,000; access to $500,000 under the Contingency and Emergency Response Component of the Pacific Resilience Program; and coverage for tropical cyclones and earthquakes offered by the Pacific Catastrophe Risk Insurance Company (PCRIC). Additionally, RMI can request further support from the US, if needed (Martinez and others, 2019; Vyas and others, 2019).

Yet, while mindful of the benefits of risk financing, the current protection provided by these tools remains insufficient for RMI. Droughts, for example, represent a severe risk for the Marshalls, but are not covered under the Pacific Catastrophe Risk Insurance Company (PCRIC). Moreover, even when accumulated the financing available barely matches the annual $3 million in disaster losses as projected by PCRAFI. Other, additional solutions are needed to address these gaps. Most importantly, however, the country will need increased and accelerated investments in climate-proof infrastructure, for it is only in alignment with such risk reduction measures that the development of a comprehensive toolkit of disaster risk financing instruments can be truly effective and support the quest of RMI for survival and prosperity .

CASE STUDY
Fiji

Fiji is an island group country in Oceania. The country is made up of over 300 islands, over 100 of which are inhabited. The population is approximately 900,000, 70 per cent of whom live on the island of Viti Levu. Fiji's per capita (annual) GDP is approximately $9,800 and the country's foreign exchange earnings primarily come from tourism and remittances (CIA, 2020).

Climate and disaster risk in Fiji

Fiji is highly exposed to climate-related extreme events and natural hazards. Located in the Pacific's tropical cyclone belt, it is affected by tropical cyclones and associated strong winds, extreme rainfall, storm surges and flooding. As a result of climate change, average annual losses from cyclones in Fiji are expected to increase in the future. Buildings (especially those in and around the capital of Suva), infrastructure and agriculture are all exposed to strong storms (PCRAFI, 2013).

Over one in every three Fijians in the labour force works in agriculture (World Bank, 2020a), and farmers know the agricultural sector is highly exposed to climate hazards. Cyclones damage crops, trees, aquaculture facilities and agricultural equipment; they kill livestock and damage critical infrastructure for the agricultural sector, such as roads. Similarly, about a third of Fijians are directly or indirectly employed by tourism. The tourism industry is affected by natural hazards and climate change on many fronts. Not only do cyclones and storms damage tourism assets and infrastructure, but also tourism typically drops after an event. The Government is also concerned that climate change will affect the environmental and natural assets Fiji is known for, potentially decreasing tourism (GoF and others, 2017). The tourism industry in Fiji has been hugely impacted by COVID-19, and Fiji's economy is expected to contract by 16 percentage points in 2020 (XinhuaNet, 2020a).

While Fiji is exposed to geophysical hazards, the Government of Fiji does not expect significant average annual losses from earthquakes or tsunamis. The Government is, however, concerned about other climate change impacts, including sea-level rise, ocean acidification, and possible spread of vector-borne diseases, and the potential these have to increase poverty in Fiji. Climate change impacts also occur in a context of intersecting vulnerabilities – over a third of the deaths resulting from tropical cyclone Winston (a category 5 cyclone that made landfall in Fiji in 2016) were people above the age of 65 (GoF and others, 2017). Fiji also has high rates of gender-based violence, which often increases during and following disasters (UNDRR, 2019).

FIJICARE

FijiCare initially had very low take-up of its bundled microinsurance product, which combines indemnities for life and funeral, personal accident, and fire. With support from the Pacific Financial Inclusion Programme, FijiCare was able to decrease the product cost and expand outreach, covering over 100,000 Fijians while building trust and awareness of insurance products.

MICROLIFE

Life Insurance Corporation of India offers microinsurance in Fiji covering death, disability, accident, and funeral expenses.

BIMA

BIMA offered life and hospitalization microinsurance, but recently closed its operations in Fiji.

Fiji, 2016

Fiji

Country overview

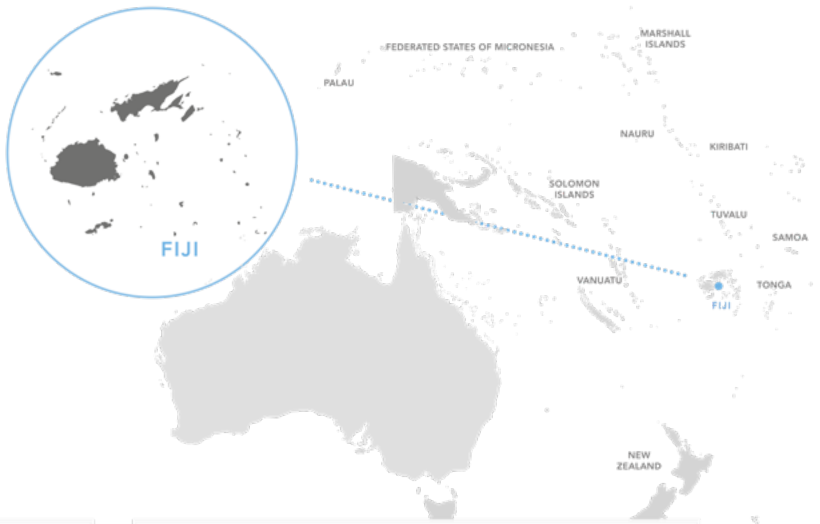
Population (2020)
896,000

Annual rate of population change (2015-2020)
+ 0.63 %

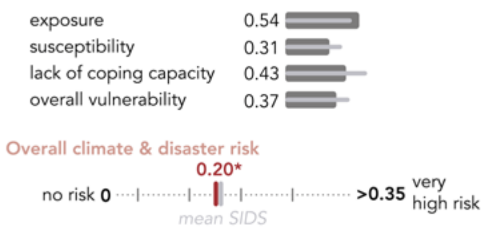
World Bank income classification
Upper middle income

GDP per capita, ppp (current international $, 2018)
$14,133

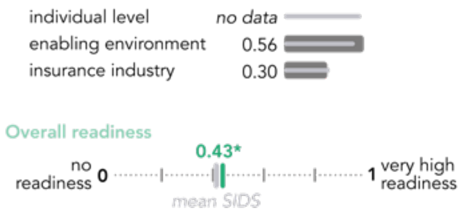
GDP per capita growth (% annual, 2017)
+ 2.8 %



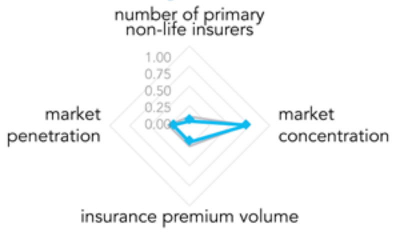
Climate & disaster risk



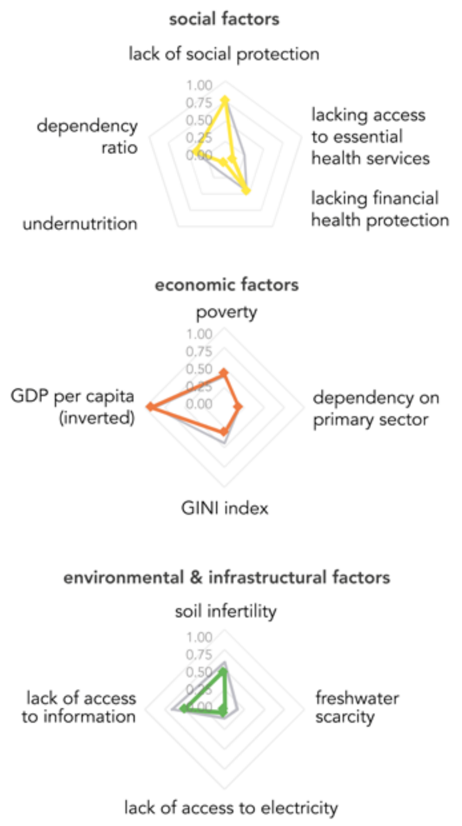
Readiness for insurance solutions



Insurance industry



Vulnerability



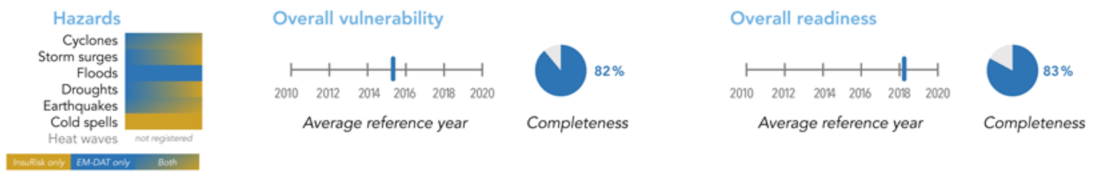
mean of all SIDS Fiji

Data reliability

Data reliability was assessed by contrasting the average reference year and the average completeness across indicators. Hazards occurrence was assessed by comparing the results of InsuRisk's spatial analysis with the recorded disaster events in the EM-DAT database: the 'hazards' figure below shows when this results in overestimation (yellow colour), underestimation (blue colour) or overall match (mixed colour). Fiji shows potential underestimation of flood hazards and overestimation of cold spells, and a relatively high completeness of vulnerability (89%) and readiness data (83%). * For further information on validity see *Box 3* (pp.46-47) and Annex.

Climate & disaster risk

Readiness



Readiness for insurance solutions in Fiji

Fiji already has relatively high, but unequal, levels of financial inclusion (compared with other Pacific island and lower-middle-income countries), but barriers to financial inclusion exist, particularly in remote areas, and there is limited understanding of insurance. Fiji has a national strategy for financial inclusion and works with partners in the country, such as the Pacific Financial Inclusion Programme, to expand access to financial services, including insurance (Reserve Bank of Fiji, 2015).

Despite the commitment of the Government to increase access to finance, there are challenges for the private sector. According to the Ease of Doing Business Ranking, Fiji is ranked 102nd in the world (32nd in the ranking for upper-middle-income countries; between Sri Lanka and Tonga) (World Bank, 2020b).

Use of insurance is also low in Fiji. Government analysis suggests that Fijians likely only have insurance if it is provided by their employers (Reserve Bank of Fiji, 2015). Although a few life-related microinsurance products have been piloted in Fiji (see the text box above for more information), no non-life or disaster risk microinsurance has been piloted. The small population size and large area of Pacific Islands makes the rollout of affordable insurance difficult. The United Nations Development Programme (UNDP), United Nations Capital Development Fund (UNCDF), and United Nations University Institute for Environment and Human Security (UNU-EHS) are launching a programme in Fiji in 2020 that aims to develop affordable disaster risk financing solutions for Fijians.

The Government is supportive of this and other efforts to pilot climate and disaster risk finance solutions, and increasing access to financial services – including insurance – is part of the country's National Adaptation Plan (Government of Fiji, 2018). The county has, however, chosen not to purchase sovereign risk insurance through the Pacific Catastrophe Risk Insurance Company, which has been criticized for non-payment events and inappropriateness of products. Fiji is also a vocal critic of global inaction on climate, and recently pushed the international community to reform climate finance and take advantage of post-pandemic recovery plans to support green and blue economies (XinhuaNet, 2020b). Without urgent action on climate, Fiji's risk level will only continue to increase.

CASE STUDY
Saint Lucia

Saint Lucia (St. Lucia) is a Small Island Developing State in the eastern Caribbean. The island's population is just over 180,000. The country is prone to a wide variety of natural hazards, including both high- and low-frequency events. St. Lucia's per capita (annual) gross national income is approximately $7,090, with nearly two-thirds of the country's income usually coming from tourism (CIA, 2020). The tourism sector has been decimated by COVID-19, creating further liquidity challenges (World Bank, 2020c) in a country already encumbered by high levels of public debt and high debt-servicing obligations (CIA, 2020).

Climate and disaster risk in St. Lucia

St. Lucia is exposed to a number of climate-related extreme events and natural hazards. Despite being further south than most recent damaging hurricane activity in the region, St. Lucia still experiences moderate to strong rainfall, winds, waves and surges as a result of tropical storms and hurricanes, as well as associated landslides (CCRIF, 2013). Historical data (World Bank, 2017) does not suggest that drought is a serious hazard in St. Lucia, but the country's 2018 National Adaptation Plan stated that St. Lucia has experienced drought each year since 2012 (Government of St. Lucia, 2018) and the worst drought in its history occurred in 2016 (teleSUR, 2016). Although St. Lucia is a volcanic island, the risk of volcanic activity is low. St. Lucia has no recorded history of magmatic (magma ejecting) volcanoes, although deadly volcanoes have occurred in the past and there is a range of possible eruption scenarios (Lindsay and others, 2002). The country does have a history of earthquakes, and may be overdue a large earthquake (St. Lucia News Online, 2018), although risk levels are considered medium. The expected average annual losses from earthquakes are about half those from tropical cyclones (CCRIF, 2013).

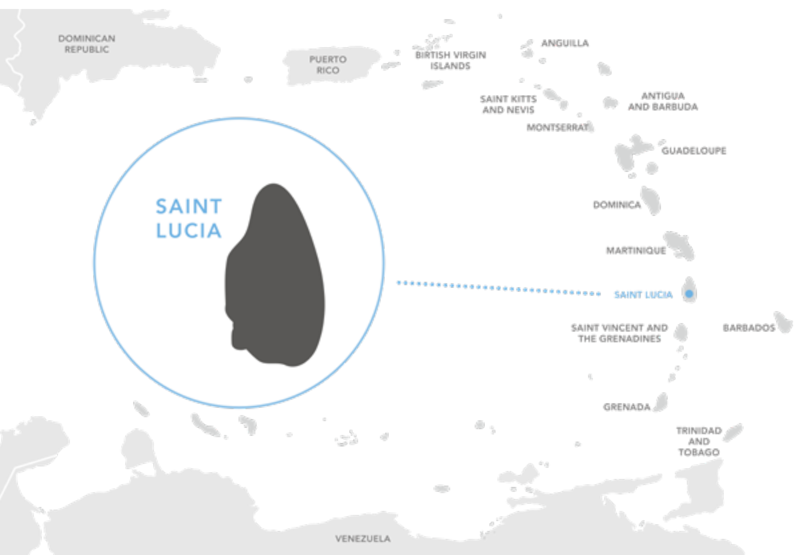
St. Lucia is exposed and vulnerable to climate change and the Government recognises the challenges inaction on climate (estimated to cost over 12 per cent of GDP annually by 2025) pose for its population (Government of St. Lucia, 2018). In terms of general exposure, the Government of St. Lucia should expect to cover annual average losses of nearly $16 million, three quarters of which will likely come from damaged infrastructure (World Bank, 2017). Given the importance of the tourism sector, and the fact that much of the tourist infrastructure is along the coast, tourism infrastructure is particularly exposed to tropical cyclones (CCRIF, 2013).

Farmers in St. Lucia worry about the impact of extreme climate on their crops. While agriculture is a relatively small sector in terms of GDP (contributing less than 3 per cent of GDP in 2015), it is a critical sector when it comes to employment, employing a fifth of the population (World Bank, 2017). Crops, especially cash crops, are vulnerable to extreme rainfall and wind. According to CCRIF SPC, as of 2013 preparedness levels were quite low given the risks posed by both tropical cyclones and earthquakes (CCRIF, 2013).

The average St. Lucian works in tourism, in a country with relatively low rates of poverty (1.3 per cent pre-pandemic). St. Lucia has, however, been heavily impacted by COVID-19, particularly due to the impacts on the tourism sector, and GDP is expected to contract by 8.5 per cent in 2020. This is especially damaging as tourism employs over half of all workers in St. Lucia and severe poverty is projected to increase substantially (UNICEF, 2020). Although the InsuRisk Assessment tool does not capture information on housing quality due to insufficient data in many countries, single-family, plywood housing (common in St. Lucia) is incredibly vulnerable to hurricanes, and accounts for 30 per cent of annual average losses in St. Lucia (World Bank, 2017).

St. Lucia, 2017

Saint Lucia



Country overview

Population (2020)
184,000

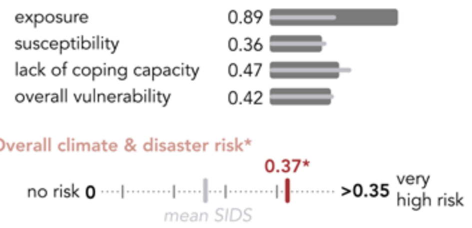
Annual rate of population change (2015-2020)
+ 0.5%

World Bank income classification
Upper middle income

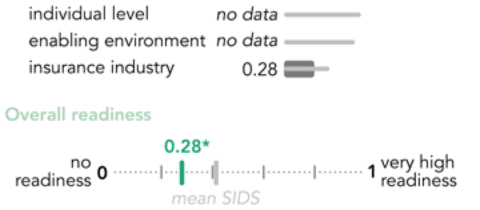
GDP per capita, ppp (current international $, 2018)
$15,621

GDP per capita growth (% annual, 2017)
+ 2.1%

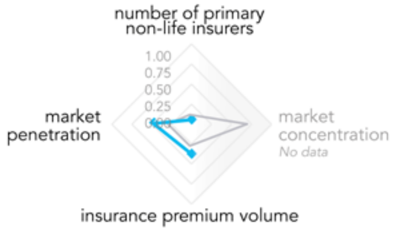
Climate & disaster risk



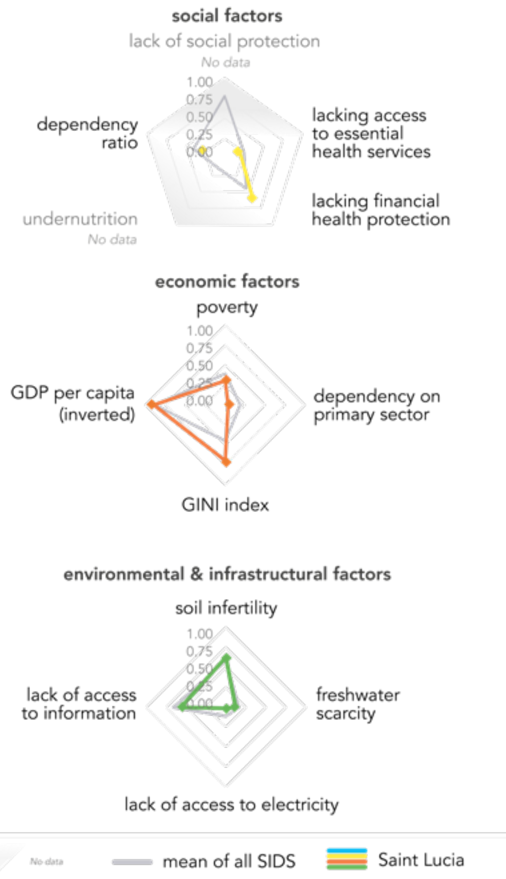
Readiness for insurance solutions



Insurance industry



Vulnerability



Data reliability

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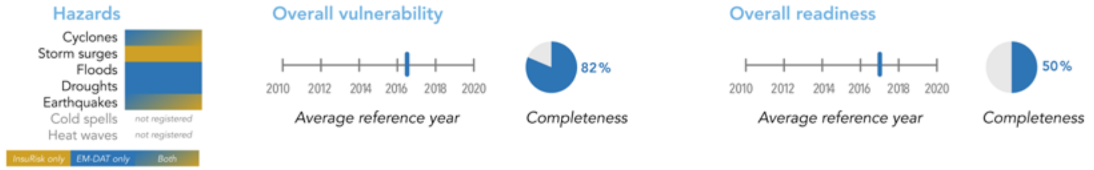
Climate & disaster risk

Readiness



Readiness for insurance solutions in St. Lucia

CCRIF SPC
St. Lucia has been a member of the CCRIF SPC sovereign risk pool for the Caribbean since its inception in 2007. St. Lucia has received over $8 million (combined) in payouts following the Martinique earthquake in 2007, tropical cyclone Tomas in 2010, tropical cyclone Matthew in 2016, and tropical cyclone Maria in 2017. The country has also received over $250,000 in aggregated deductible cover payments (CCRIF SPC payments that function like a reserve fund by providing a small payment for events that do not trigger a policy payout).

CARIBBEAN OCEANS AND AQUACULTURE SUSTAINABILITY FACILITY
COAST – a parametric insurance product covering fisher folk for losses incurred as a result of rough seas, extreme rainfall, high winds or storm surge – was piloted by CCRIF SPC in St. Lucia and Grenada in 2019-2021, and will likely be offered as part of CCRIF SPC coverage moving forward.

LIVELIHOOD PROTECTION POLICY
Livelihood Protection Policy was an index insurance policy available to everyone in St. Lucia, covering extreme wind and rainfall. It was available on the market from 2013 to 2019. CCRIF SPC and MCII are currently working on a revised Livelihood Protection Policy microinsurance product for St. Lucia and other countries in the region.

WINDWARD ISLANDS CROP INSURANCE
WINCROP was an indemnity crop insurance available to St. Lucia Banana Corporation farmers to help manage damage from tropical storms. In the early 2000s, WINCROP incurred losses as a result of low premium income, decreasing banana farming and high reinsurance costs.

St. Lucia has welcomed innovation in disaster risk financing. There are a variety of insurance schemes that have been piloted and/or implemented in St. Lucia. For more information on these, see the text box, above.

Leaders in St. Lucia and the region are aware of the importance of risk awareness and financial literacy. Risk awareness is a critical component of disaster risk reduction, and the National Emergency Management Organization has carried out a variety of initiatives to educate the public (NEMO, 2014). Data is not available on the level of financial literacy or trust in insurance, but the Caribbean Association of Banks carried out a financial literacy campaign in September 2020 (The Voice, 2020) and St. Lucia's Department of Cooperatives has provided training to fisher cooperatives on financial management, loans and insurance. The Ministry of Finance and insurance regulators have also been supportive of microinsurance initiatives in the country.

Despite this leadership, the enabling environment is not always favourable. According to the Ease of Doing Business Ranking, St. Lucia is ranked 93rd in the world (28th in the ranking for upper-middle-income countries – between Bosnia and Herzegovina, and Guatemala) (World Bank, 2020b). St. Lucia also has high levels of public debt and debt-servicing obligations, and disaster risk financing tools may not be able to meet the country's needs (CIA, 2020; World Bank, 2017). While market penetration in St. Lucia may be somewhat higher than in other SIDS, the penetration rate still indicates that the private sector in St. Lucia is underinsured (World Bank, 2017).

The Government of St. Lucia is committed to tackling challenges associated with climate change and increasing its financial management of disaster risk. Continued innovation in the insurance space will help St. Lucians manage their exposure to tropical storms, droughts and earthquakes.

Belize, 2016

Antigua and Barbuda, 2019

Findings in a nutshell

The need for solutions to reduce current and future climate and disaster risk and strengthen resilience in SIDS has been clearly expressed by policy and decision makers, scientists and practitioners over the past years. The potential of risk financing and risk transfer mechanisms for doing so has been widely acknowledged, and is anchored in a number of relevant policy documents (e.g. the SAMOA Pathway). However, there is still a strong need for guidance and better data and information to ensure such solutions are targeting the most vulnerable countries for those potential solutions to be successful.

Responding to the call for more comprehensive risk assessments and data, as stated for example in the SAMOA Pathway and by the Small Island States Resilience Initiative (SISRI), this special report analyses climate and disaster risk and juxtaposes it with readiness for insurance solutions for 38 SIDS based on most recent, publicly available data. The results presented in this report are a contribution to supporting and guiding the selection of potential priority countries and enabling efforts to reach the poor and most vulnerable.

The analysis shows that the majority of the island states considered in this report are exposed to multiple climate-related and natural hazards and have a medium-to-high climate and disaster risk – albeit with strong differences across SIDS and geographic regions. A common trait among SIDS is the role played by specific hazards in their risk profiles: cyclones in particular play a dominant role in shaping exposure in

countries across the geographic regions considered here, suggesting that in all regions populations, infrastructures and production facilities are likely to face the effects of cyclones making landfall. Conversely, some hazards are more regional, e.g. earthquakes playing a bigger role in the Caribbean and Pacific clusters and warm spells overwhelmingly characterizing the exposure of the AIS SIDS.

Based on the risk assessment metrics used in this report, SIDS in the Caribbean (e.g. Haiti, Dominican Republic, Jamaica, Saint Lucia and Dominica) have a higher risk, for example, compared to SIDS located in the AIS (e.g. Seychelles, Singapore and Comoros). The breakdown of this pattern shows, however, different contributions to this assessment: in particular, AIS SIDS tend to have lower exposure compared to Caribbean or Pacific SIDS when analyzed with global hazard datasets, but at the same time their levels of vulnerability, and especially lack of coping capacity, are far above the averages of the other clusters (with Cabo Verde showing the lowest coping capacity of all SIDS). This suggests that special attention should be given to monitoring and enhancing the coping capacity of SIDS in this cluster. In this sense, low levels of risk should not automatically be interpreted as unproblematic, as they might conceal the situation of countries that retain very high levels of vulnerability (for instance São Tomé and Príncipe). While the final aggregated risk scores provide an intuitive understanding of a country's risk profiles, the advantage of an indicator-based assessment is the possibility of tracing the contribution and role of each indicator selected for the analysis. When looked at through this lens, regional differences can be further explained: for instance, it is interesting to notice that access to essential health services is relatively higher in the Pacific cluster, which however shows a more disadvantaged situation in terms of financial protection mechanisms. When looking at the most vulnerable groups of countries, it is also important to couple the results of the risk analysis with the performance of specific indicators. For instance, Haiti, Guinea-Bissau, São Tomé and Príncipe, Suriname and Timor-Leste show very different levels of overall risk (ranking from 1st, Haiti, to 34th, São Tomé and Príncipe, in the overall ranking of SIDS); however, these countries have all in common disproportionally higher levels of poverty and malnutrition compared to other SIDS, suggesting that while the overall impact of climate and natural hazards might be different at the country level, the most disadvantaged groups in these countries might actually undergo similar challenges.

The analysis has also revealed stark differences in regards to the readiness for insurance solutions across SIDS. For example, Timor-Leste, Mauritius, Singapore, Trinidad and Tobago, and Jamaica have a very high readiness, while for example the Seychelles and Comoros have a rather low readiness. On average SIDS in the Pacific reveal the highest readiness, although differences across geographic regions (e.g. Caribbean, AIS and Pacific) are relatively small. When looking at the individual modules of readiness, it is interesting to notice how the components of 'individual readiness' are generally higher in AIS countries (albeit the comparison is flawed by the lack of data for the Pacific SIDS), but with a stark sub-regional separation, with higher values and higher availability of data characterizing countries in the Asian and Indian Ocean subsets (Singapore, Bahrain, Mauritius). Cabo Verde is the sole AIS SIDS of the Atlantic subset that stands out in terms of overall readiness compared to its cluster, and this is wholly attributable to its well-performing 'enabling environment' module. This is a very interesting combination for a country that ranks 4th among all SIDS in terms of overall vulnerability.

Combining the outcomes of the risk and readiness analysis, a number of SIDS emerge that are characterized by both medium-to-high risk and medium-to-high readiness. Examples in the Pacific region include Timor-Leste, Fiji and Papua New Guinea; in the Carribean region Jamaica, Trinidad and Tobago, and the Dominican Republic; and in the AIS region Mauritius or Cabo Verde, among others.

Maldives, 2005

Key recommendations

SIDS-specific recommendations

→ Information on climate and disaster risk at the nation-state resolution, as presented in this report, is useful to better understand differences and similarities across SIDS, allow for the identification of priority countries, and to ensure that certain high-risk SIDS do not go unnoticed. However, assessments at the sub-national and local scales are needed to better capture the spatial variability of risk and inform targeted risk reduction and adaptation.

→ Lack of up-to-date, publically available, high-resolution data remains a challenge for managing risk within SIDS. In order for scientific information to be useful for evidence-based risk management and adaptation, more efforts are needed to systematically collect, manage and make relevant data and information on natural hazards vulnerability, climate and disaster risk as well as development status of insurance markets available.

→ The prevalent perception of SIDS as 'hotspots of climate change' which share a 'common vulnerability to climate change' does not reflect the reality. SIDS form a highly diverse and heterogeneous group of countries with varying levels of exposure and vulnerability to natural hazards. Island-specific key environmental, social, economic and institutional differences need to be more systematically considered in the public discourse around SIDS as well as when prioritizing international finance flows and preventive action.

→ SIDS governments face specific challenges accessing and facilitating access to insurance solutions given their small geographic and market size, making insurance either unaffordable or unavailable as small countries are often unattractive to the private sector. Regional approaches and public-private partnerships can help countries access sovereign risk insurance that is appropriate to their needs. Regional approaches may also be appropriate to increase access to microinsurance for extreme weather through streamlining of regulation and consumer education. At the same time, SIDS governments should maintain efforts to improve their enabling environment for insurance solutions.

→ Similarly, insurers in SIDS face specific challenges due to limited market size, high exposure levels, and a limited ability to diversify geographically. Insurers may also benefit from regional approaches that allow them to diversify over space and package risks for regional or global reinsurance markets.

→ While many SIDS are exposed and vulnerable to climate-related and natural hazards (as considered in this report), SIDS are increasingly impacted by slow-onset events, such as salinity intrusion or the effects of sea-level rise. These events, which are a result of climate change that was not caused by the SIDS themselves, are generally not insurable. As a result a more systematic approach to the development and funding of creative slow-onset risk financing solutions, with support from the international community (e.g. through mechanisms such as the Green Climate Fund), is needed for SIDS.

General recommendations

→ While insurance is an important tool for the transfer of catastrophic risk, insurance solutions need to be integrated into disaster risk management and finance strategies that include disaster risk reduction, investments in adaptation, and a risk-layering approach. Financial support from the international community is needed to assist SIDS, Least Developed Countries (LDCs) and V20 countries to efficiently manage and reduce their climate risk.

→ Indebtedness is a major concern, particularly post-pandemic, and disaster risk finance solutions, including insurance, need to avoid increasing the debt burdens of vulnerable countries. There is a need for concerted and creative action by the international community, such as debt swaps, to ensure debt levels are sustainable without sacrificing action on climate or risk management.

→ In order to ensure that 'no island is left behind', the global debate on risk and adaptation finance needs to go beyond SIDS and also consider other small islands that face similar environmental and development challenges as the most at-risk SIDS.

→ Lastly, as the compounding effects of cyclone Harold on Pacific Islands amidst the COVID-19 pandemic have shown, risk is increasingly systemic. Further research on the dynamics of multi-hazard and compounding risks based on a systemic risk lens is urgently needed to ensure that countries (including SIDS) are better prepared in the future.

Antigua and Barbuda, 2019

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Imprint

Publisher: United Nations University – Institute for Environment and Human Security (UNU-EHS), Munich Climate Insurance Initiative (MCII), Ludwig-Maximilians Universität München (LMU), Federal Ministry for Economic Cooperation and Development (BMZ), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, and InsuResilience Global Partnership (IGP)

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Supported by

Suggested citation: Hagenlocher, M., Cotti, D., Cissé, J.D., Garschagen, M., Harb, M., Kaiser, D., Kreft, S., Seifert, V., Sett, D., Reith, J. and Zwick, A. (2020). Disaster risk and readiness for insurance solutions in Small Island Developing States. UNU-EHS, MCII, LMU, BMZ, GIZ. Bonn, Munich, Germany.

Acknowledgements: The authors would like to thank Hnin Wuit Yee Kyaw for her support in map design and for downloading data from the EM-DAT events database as well as from the WHO COVID-19 Dashboard. Further, the authors would like to acknowledge the support of Axco Insurance Information Services Ltd for providing data on the insurance market development status.

As of December 2020.

Layout by Aileen Orate, UNU-EHS

Proofreading: Stephen Boyle

UNU-EHS, MCII and LMU are responsible for the content of this publication. The InsuResilience Secretariat commissioned this product as an independent scientific input for the InsuResilience initiative. The content does not reflect any political views of the InsuResilience Global Partnership and partners.

Annex: A detailed description of the methodology (incl. indicators and data sources) is available at **http://collections.unu.edu/view/UNU:7879**.

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