The Commonwealth Universal Vulnerability Index

For a Global Consensus on the Definition and Measurement of Vulnerability

April 2021

Embargoed until 10.30am GMT, 24 June 2021

The Commonwealth

EMBARGOED UNTIL 10.30AM GMT, 24 JUNE 2021

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A Report prepared by the Commonwealth Secretariat

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Published by the Commonwealth Secretariat.

Foreword

This year has seen the devastating impacts of the COVID-19 pandemic, which has exacerbated the dangers already inherent in the crisis created by climate change and the economic fall-out suffered by all countries. Small vulnerable states and least developed states in our world are particularly impacted by this lethal combination of factors. The need to reset the agenda so that it better reflects the challenges we face and better enables us to find the viable solutions with which to act has never been greater.

It cannot be business as usual. If we are to save lives and livelihoods we need to build a new consensus about what constitutes vulnerability which can mutate iteratively, in order to encompass the multiplicity of inter-linking challenges with which every state now has to deal. This cannot be done in isolation. We need a global consensus. The Commonwealth, representing as it does, one-third of humanity from five regions, over 2.5 billion people, 60 per cent of whom are under the age of 30, has the capacity to craft a multidimensional response based on an understanding of people and place which should form a sound foundation from which others may be able to benefit.

In the past, the unique constitution of our Commonwealth family has enabled us to craft valuable responses to climate change, debt, vulnerability and good governance, including as it does countries both rich and poor, developed and developing, small and large, island states and landlocked. Any successful solution to our current crisis has to be based on the needs of all, leaving no one behind.

Consistent with our history we are building consensus with our member countries a new definition and assessment of vulnerability, so that eligibility for resources such as concessional finance is no longer solely dependent on narrow measures such as GDP per capita. This has long been regarded as desirable by a broad coalition of those concerned for inclusive development internationally. Indeed, at the Commonwealth Ministerial Meeting on Small States convened in London during the week of the 2018 Commonwealth Heads of Government Meeting, Ministers acknowledged the need to build international consensus on defining and measuring vulnerability, and expressed support for engagement by the Commonwealth Secretariat in this area.

In presenting this report on work undertaken by the Commonwealth Secretariat to devise a robust methodology which truly takes into account the realities of vulnerability, our desire is to provide a sound basis on which to create multilateral consensus and mobilise global action. We do so conscious of the central transformative promise of the 2030 Agenda for Sustainable Development and its Sustainable Development Goals to 'Leave No One Behind', and in accordance with our Commonwealth Secretariat memorandum of understanding with the United Nations, in which we commit to work together for universal agreement on the definition and measurement of vulnerability.

There has been growing acceptance of the need for donors and multilateral organisations to consider factors other than GDP when addressing the vulnerabilities of developing countries. Recent experiences of consequences arising from the COVID-19 pandemic have raised awareness and deepened appreciation of the pressing urgency for action to be taken.

The 75th UN General Assembly in December 2020 adopted a resolution calling for 'immediate and substantial actions to facilitate the responses of small island developing States to recover from the unfolding crisis caused by the COVID-19

pandemic and address the unprecedented health and economic crisis unfolding in such States' and requesting recommendations to its next session 'on the potential development and coordination of work within the United Nations system on a multidimensional vulnerability index for small island developing States'.

With the Commonwealth bringing together one-third of sovereign nations of the world, we therefore have a special opportunity at the Commonwealth Heads of Government Meeting being convened in Rwanda in June 2021 to make a distinctive and substantive contribution through the proposed Commonwealth Universal Vulnerability Index to accelerate progress with more inclusive global sustainable development.

In commending the recommendations made in this Report on the Commonwealth Universal Vulnerability Index, I would draw attention in particular to the scope its innovative approach offers for enabling the relative vulnerabilities of each country to be identified and taken into account so that beneficial support can be made available more equitably where it is most needed among small states and least developed countries.

The time to act is now, particularly for the small, vulnerable and least developed states in our family.

The Rt Hon Patricia Scotland QC
Secretary-General of the Commonwealth

Contents

Executive Summary

1. The *vulnerability* of a country is defined as the risk of being affected by exogenous shocks of various form, origin and intensity, the effect of which is contingent on a country's specific characteristics and features, including its ability to respond to shocks as reflected in its level of resilience.

2. In the Commonwealth's universal and multidimensional framework of vulnerability, *economic vulnerability to external and natural shocks* is considered alongside *vulnerability to climate change*, and *socio-political or societal fragility*. Additionally, it integrates built-up and contemporary policy sources of resilience.

3. Specifically, indicators used to compile the universal vulnerability framework separate out endogenous and exogenous or structural elements, the latter of which do not result from current policies, but which may result from previous policy choices that the present authorities have inherited, such as the structure of trade.

4. The *structural vulnerability* of a country therefore depends both on the historical probability and size of shocks, as reflected by the instability of exports, for example, as well as on the structural exposure of the country to these shocks, illustrated for instance by the degree of trade dependency, often linked to small country size.

5. In contrast, the *resilience* of a country, defined as its capacity to cope with (or to react to) exogenous shocks is the opposite of vulnerability, and to large extent depends on the current will of countries, but also on structural factors, which make resilience policies more or less effective. For instance, remoteness or weak capacities reflect a country's lack of structural resilience, while mismanaged macroeconomic policies reflect a lack of policy resilience. The Commonwealth universal vulnerability framework distinguishes between the *structural resilience* and the *policy resilience* of countries.

6. The lack of structural resilience (non-structural resilience) is distinct from structural vulnerability as it does not result directly from the probability and size of future shocks, but instead determines the potential impact of shocks on sustainable development.

7. Both a high level of structural vulnerability and a lack of structural resilience should be considered as positive criteria for aid allocation, as they reflect structural handicaps and corresponding financing needs, while the lack of policy resilience (non-structural resilience), should be viewed as a factor of poor performance, representing a negative criterion of aid allocation, consistent with a performance-based aid allocation framework.

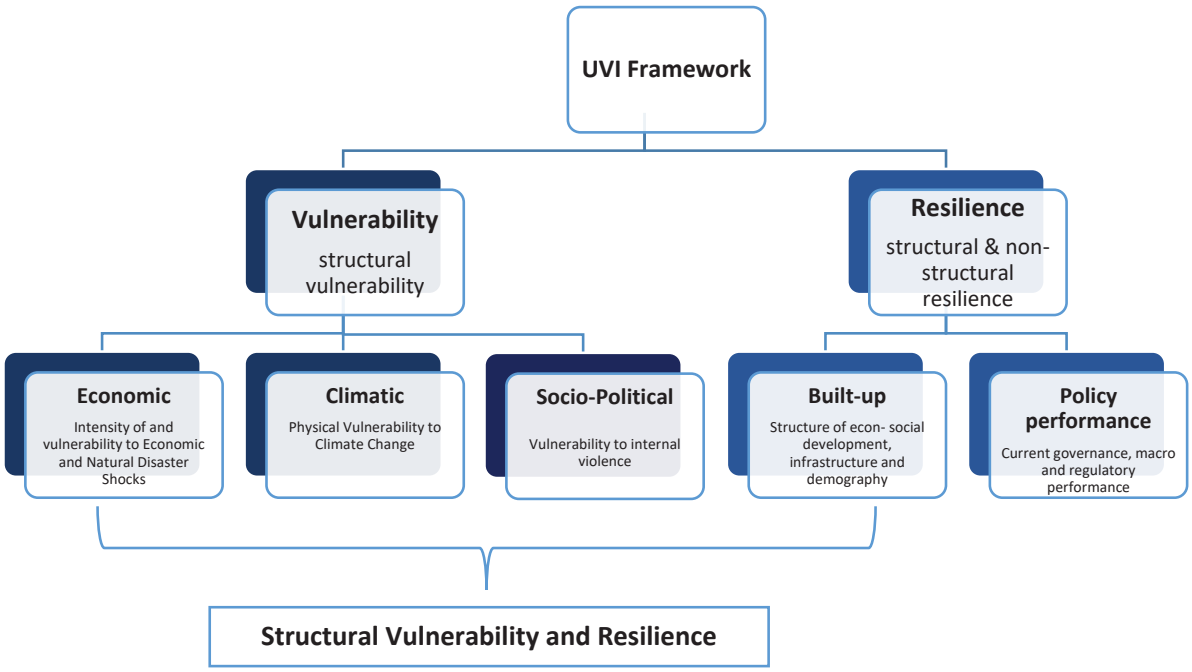
8. There are various other indicators of vulnerability, as the concept has been widely explored over the years. However, most of the existing indices are unsuitable for aid allocation purposes since their composition mix structural components with other components that depend on the present will of government.

9. The universal vulnerability framework sets itself apart from existing indicators by allowing one to consistently define and measure vulnerability and resilience, all while remaining compatible with current performance based aid allocation frameworks.

10. The Commonwealth vulnerability framework includes three structural vulnerability indices:

    a. An *Economic Vulnerability* to External and Natural Shocks Index (EVENSI) taking into account both the structural exposure of countries' to those type of shocks and the intensity of past (and recurrent) shocks.

    b. A *Physical Vulnerability to Climate Change Index* (PVCCI) reflecting the growing influence of climate change measured only through its physical manifestation and assessed according to country exposure to those manifestations.



c. A *Socio-Political Vulnerability Index* (IVI) measuring the recurrence of conflicts and violence in its various dimensions that the organization of society is unable to ward off.

11. Taken together the three indices represent a country's risk of being affected by exogenous shocks, summarised here as its structural vulnerability. So as not to diminish the relative importance of each of these sources of vulnerabilities, the three vulnerability indices are aggregated through a *quadratic, rather than an arithmetic average*, preventing the impact on a country's sustainable development from a single but significant source of vulnerability being under-represented.

12. Two equally structurally vulnerable countries may well show different abilities to withstand shocks, primarily because of their different levels of resilience, whether due to structural characteristics or good policies.

13. The Commonwealth universal vulnerability framework therefore introduces a *Structural Resilience Index* (SRI), as well as a *Non-Structural Resilience Index* (NSRI) capturing the quality of policies and regulations, with both explaining shock absorption and the magnitude of impact of shocks on sustainable development.

14. The structural resilience index takes into account the levels of capital (physical and human) and income per capita. When they are low, and poverty is high, economies do not have the capacity or resources to respond to shocks. The structural resilience index also includes indicators reflecting infrastructure and connectivity development, as well as demographic dependency.

15. Taking together the structural vulnerability index and the structural resilience index, is viewed within this framework as a *Universal Structural Vulnerability and Resilience Index* (SVRI). This index is the average of the three components of the structural vulnerability index and the structural resilience index. (It may also be calculated as the ratio of the Structural Vulnerability Index to the Structural Resilience Index).

16. The non-structural or policy resilience index relies on a selection of readily available indicators of policy performance which represent the quality of policies aimed at reducing the impact of shocks on sustainable development or indirectly leading to this result.

17. The Universal Vulnerability Index (UVI) framework is represented in figure above.

18. According to the *Universal Vulnerability Index* (UVI) built in this report, the largest number of highly vulnerable countries are located in sub-Saharan Africa, where most low-income countries (LIC) and a large proportion of least developed countries are located. According to the UVI, 25 of the 30 most vulnerable countries are LDCs. This is consistent with the fact that there is some conceptual and statistical overlap with the UN-CDP indicators of LDCs.

19. According to the *Structural Vulnerability Index* (SVI), which relies only on the three structural vulnerability indices, many small states and Commonwealth members appear to be among the more vulnerable developing countries: In 2018 the index of 21 SIDS (out of 34) and 26 Commonwealth member countries (out of 46) is above the median SVI value. This is notably due to their high economic vulnerability and very high vulnerability to climate change.

20. According to the *Structural Vulnerability and Resilience Index* (SVRI), many SIDS and Commonwealth members also appear among the more vulnerable developing countries: the index of 22 SIDS and 29 Commonwealth member countries is above the median SVRI value in 2018.

21. *For the allocation of development assistance* the relevant index to be considered as a positive criterion is the SVRI, or the SVI if the (lack of) structural resilience is taken into account separately, knowing that policy resilience may be taken into account in the assessment of policy performance

22. Commonwealth members , and notably Commonwealth small states are displaying specific characteristics. According to the present framework, those countries are among the most vulnerable when considering vulnerability to climate change or economic vulnerability. Alternatively, only a small proportion of those countries rank highly in the internal violence index.

23. Contrary to most LDCs, Commonwealth small states have built institutions and mechanisms to help them mitigate the adverse effects of exogenous shocks.

24. This apparent disconnect between vulnerability and resilience is a key message to draw from this framework. While resilience is strongly correlated with income per capita levels, it is not the case for the structural vulnerabilities. In this framework, the median SVI value for upper middle-income countries is above that of lower middle-income countries.

25. It is very difficult for some countries and notably small states to significantly and rapidly reduce their structural exposure to exogenous shocks, notably climatic ones, and consequently, to less extent, their vulnerability in general, even if long term strategies are needed and can be put in place to progressively do it.

Background

Since the 1980s, the Commonwealth has been a champion of the smallest and most vulnerable states, and has advocated internationally for special attention to their needs. This is largely because small states have been, and continue to be, the most disproportionately affected by emerging issues in trade, debt, international regulation and climate change, particularly by way of natural disasters. Climate change and natural disasters pose a direct threat to small states' existence. For example, Dominica lost more than 100 per cent of its GDP in 2017 due to Hurricane Maria, and several other countries in the Commonwealth – Tonga, Grenada, Antigua and Barbuda, Mozambique and Malawi have recently suffered similar fates. Further, small states' vulnerabilities are being severely exacerbated by the Coronavirus pandemic, which is still affecting much of the world.

On the back of almost 40 years of Commonwealth advocacy, international agencies such as the World Bank have now set up dedicated small states offices; various special funds have been created to address small states' specific needs; and small states have been given a stronger voice in international discussions by way of the Commonwealth's annual engagement with the G20. However, there is still a lack of consensus on how to characterize and by extension,

Understanding Vulnerability: Commonwealth Secretariat Contributions to Small State Vulnerability Dialogue

The Commonwealth Vulnerability Index has evolved over the years. Vulnerability was initially conceptualised as the consequence of (i) the incidence and intensity of risk and threat – i.e. 'impact' and (ii) the ability to withstand risks and threats and bounce back from external economic and environmental shocks – i.e. 'resilience'. The earliest Commonwealth Vulnerability Index was a composite measure of these two elements. Eventually, there was a shift in thinking and a deliberate distinction was made between inherent vulnerabilities and the policy-induced measures that lead to resilience. The separation of vulnerability and resilience allows the vulnerability index to identify permanent or quasi-permanent features over which the country can exercise no control and whose effects cannot be attributed to poor policy approaches. Additionally, the focus on a separate resilience index helps to identify what a country can do to exacerbate or mitigate its vulnerability.

The key publications which exemplify the Commonwealth Secretariat's contributions to the vulnerability dialogue are:

1985: Vulnerability: Small States in the Global Society. Commonwealth Consultative Group Report

1996: Measurement of the Vulnerability of Small States. Chander, R.

1997: Composite Vulnerability Index: A Revised Report. Wells, J.

1997: A Future for Small States: Overcoming Vulnerability. Commonwealth Advisory Group Report

1998: A Study on the Vulnerability of Developing and Island States: A Composite Index. Atkins et al

2000: Commonwealth Vulnerability Index for Developing Countries: The Position of Small States. Atkins et al

2004: Vulnerability and Resilience of Small States. Eds. Briguglio, L. and EJ Kisanga

2006: Building the Economic Resilience of Small States. Eds. Briguglio, L. G Cordina, and E Kisanga

2010: Profiling Vulnerability and Resilience: A Manual for Small States. Briguglio et al

2014: Building the Resilience of Small States: A Revised Framework. Ed. Lewis-Bynoe, D

arrest small states' vulnerabilities. In this vein, the Commonwealth Secretariat continues to work towards establishing an accepted measure of vulnerability that could better track and quantify the challenges faced by small states relative to other groups of countries.

In 2018, Foreign Ministers at the Commonwealth Ministerial Meeting of Small States (CMMSS) mandated that the Commonwealth Secretariat build universal consensus on a measure of vulnerability. This mandate was endorsed by Commonwealth Heads of Government and later led to the Secretariat's project to build a Universal Vulnerability Index (UVI). The rationale behind the Commonwealth's proposal for a UVI stems from the realisation that none of the existing indices – Commonwealth Economic Vulnerability Index; UN Committee for Development Policy (UN CDP) Vulnerability Index; or the Caribbean Development Bank (CDB) Multidimensional Vulnerability Index would help to forge global consensus. This is because all of the aforementioned have been developed with one specific group of countries in mind, whether it be small states in the case of the Secretariat; the Caribbean as was done by the CDB; or least developed countries, which is the focus of the UN CDP vulnerability index.

It is the Secretariat's view that to achieve universal consensus on vulnerability, one requires a measure that is universal in nature, and therefore, it was decided that the UEVI should be an index including all countries.

The Commonwealth's UVI is dynamic, multidimensional and comprehensive. It captures by way of indexation, changes in countries' net vulnerability over time, improving on the traditional static indices. Realising the importance of resilience in assessing the true magnitude and nature of countries' vulnerability, the Secretariat defines the UVI as the difference between countries' vulnerability and measures implemented to build their resilience. In so doing, the creation of the UVI carries forward the work done by the Secretariat in 2009 and 2014 on economic resilience, and merges it with former work to construct an Economic Vulnerability Index in 1999 (See Figures 1-2). It in addition builds on the work recently conducted by the UN CDP (2020) and the CDB (2019).

Introduction

The purpose of this report is to present an index of vulnerability which can be agreed by the international community on a consensus basis for use as a criterion for determining the support given to the most vulnerable countries, in particular, but not exclusively to small states and/or small island developing states.[1]

The vulnerability of an economy as defined here results from the risk of exogenous shocks of various origins, such as economic, climatic, or societal shocks. This may be due to the instability of the international price of primary products for countries still dependent on commodity exports, or to episodes of severe weather, which drastically reduce agricultural production, or to lasting violence, for instance when a country becomes the hub of an international drug trade or is facing a high level of criminality. Moreover, as recent history has shown, to epidemics resulting in a loss of human lives and economic activity.

Many structural factors lead to the high sensitivity and exposure of small states to exogenous shocks, whether it is their small size itself, their geographic location, or simply their low level of development resulting in a lack of infrastructure and low diversification of economic activities. It is the responsibility of national policies to mitigate the consequences of exogenous shocks. However, while resilience depends largely on the will of governments, there are also structural factors, which condition resilience. A low level of development of any developing country is usually accompanied by a low level of education and health, an age structure of the population involving a high proportion of young people, and sometimes the presence of refugees from other vulnerable countries. These characteristics of developing economies weigh on their public finances and make counter-cyclical fiscal policies difficult to implement. In addition, low human capital reduces the capacity of the public and private sectors, which are critical to resilience. The common history of many countries has shown how economic growth and human development are threatened by exogenous shocks of various origins.

This is why the fight against vulnerability must be at the heart of international policy aimed at supporting small developing states (and other vulnerable developing countries). Admittedly, however, the choice of the appropriate vulnerability indicators likely to be used for this policy is a difficult issue.

For over a decade, development organisations including the Commonwealth Secretariat, UN and FERDI have argued that aid allocation should take into account the structural vulnerability of recipient countries supported by a variety of theoretical and practical work on the subject. Some progress has occurred in this area. Firstly, the United Nations General Assembly in 2012 adopted a resolution on the "smooth" transition out of the category of Least Developed Country (LDC), which invites partner countries to use the identification criteria of LDCs, one of which is vulnerability, the other two being per capita income and a human capital indicator, as criteria for allocating development assistance. And secondly, the European Commission in 2014 adopted an aid allocation formula, which uses these criteria for the allocation of the European Development Fund and the Development Cooperation Instrument.

The proposals contained in this report aim at harnessing the collective experience of these organisations to design a new and innovative universal vulnerability index.

To design a new general framework for vulnerability, it is necessary to 1) restate the different components of structural vulnerability (economic, climatic and socio-political, 2) specify the criteria that vulnerability indicators have to meet for their expected use.

Further, given the need to go beyond the indicators of vulnerability already available in the literature to retain coherence with the new and general framework, a new set of indicators that can be computed with available data are selected.

It is equally necessary to specify other structural factors which condition a country's capacity to adapt and respond to shocks, namely its

1 The Commonwealth refers to small states whilst the UN to small island developing states or SIDS. The marked difference is that the Commonwealth also recognises landlocked small developing countries with high vulnerabilities and populations below 1.5 million, whilst the UN focuses solely on island states.

structural resilience: The characteristics of a country's population, such as its level of human capital, age distribution, as well as the presence of refugees, and more generally a country's level of income per capita are clear determinants of its structural resilience.

Even more important, the "universal" vulnerability indicator, to be used for allocation of development assistance should clearly differentiate between exogenous factors – that is, those that are structural or independent of current policies, and the other factors - linked to the present policies of countries. The vulnerability indicators available in the literature generally do not differentiate between these two categories of vulnerability factors.

Finally, selected indicators should be available over significant periods to allow for the analysis of time variations of their various components or sub-components and thus to help with preventative strategies.

Part 1: The Conceptual Framework

Which kind of vulnerability should be reflected in a universal framework?

In a universal framework, the index should reflect all the exogenous shocks affecting sustainable development. This means not only economic shocks, such as a drop in international prices of commodities, but also natural shocks, such as droughts or flooding, in particular those related to climate change, and socio-political shocks, related to state fragility.

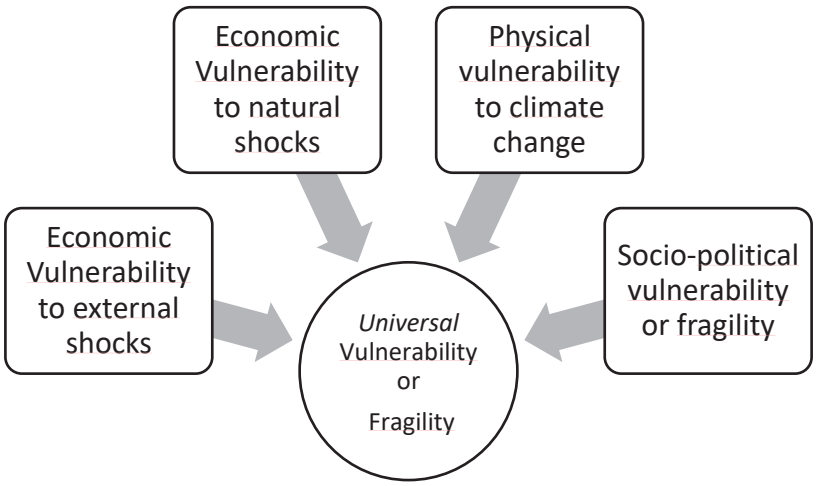
Historically, the Commonwealth Secretariat has focused on *exogenous economic shocks* (mostly prices). Shocks related to climate were considered only in 2014, as it became evident that climatic vulnerability, notably that related to storms, was critical to understanding the vulnerability profile of small states. However, the newly introduced variables reflected only partially the extent of countries' exposure to harm. In particular, the country's population and its economic exposure to disasters were inadvertently omitted.

The Commonwealth's new framework, inspired by the work of FERDI, therefore places specific focus on "economic and environmental shocks" and in this way is similar to the approach adopted by the UN Committee for Development Policy (CDP) of the United Nations in its new Vulnerability Index (EVI). However, the Commonwealth approach differs through its consideration of two main sources of shocks missing in the UN CDP EVI framework:

- *Shocks related to climate change* that are a central challenge for many countries, evidenced by physical impacts (such as desertification, sea-level rise or the intensification of storms, droughts, etc.), however not fully captured by disaster proneness indices that rely on partial assessments of the loss of income due to a disaster.
- *Internal shocks related to socio-political factors, such as conflict and violence*. These are linked to structural factors including ethnic tensions, inequalities, regional dynamics to mention a few, the recurrence of which is explained to some extent by other kinds of vulnerabilities (economic and climatic shocks, climate change, etc.).

Hence, vulnerability in this framework differs slightly through encompassing economic vulnerability to external and natural shocks, physical vulnerability to climate change, and political or societal fragility.

Figure 1: The Different Forms of Vulnerability or Fragility



With many nations now faced with the effects of the coronavirus pandemic, a natural question is why the kinds of vulnerability mentioned above do not include a health dimension. The reason is that the approach employed here is based on "channels" of transmission of shocks and their "national" impact, rather than on their origin. The impacts of health shocks, including Covid-19 (see box 2 below), are well captured in the proposed framework and interact closely with the 3 categories of vulnerability mentioned above.

It is worthy to note that this new expression of vulnerability also allows a convergence between the main approaches of vulnerability (UN-CDP (2020), Commonwealth (2014), CDB (2019), etc.) developed in recent time and the debate around the state fragility held mainly by the Multilateral Development Banks (MDBs) or the OECD.

Disentangling structural and non-structural vulnerability: Its meaning for access to development finance

The notion of structural vulnerability is of paramount importance and must be clearly explained with regard to its use in the allocation of concessional resources. *Vulnerability* results from the occurrence of shocks likely to affect a country. Most often, as considered here, shocks are exogenous, either natural or external, although they may sometimes be "endogenous" when they result from policy changes. *Structural vulnerability* only results from exogenous and persistent factors, rather than on endogenous contemporary country policies: In particular, the underlying factors determining structural vulnerability represent the risk of exposure to exogenous shocks and the extent of a country's (historical persistence and intensity) exposure. *As* structural vulnerability reflects that which is outside the control of governments, structural vulnerability is the more appropriate criterion for aid allocation.

Thus, vulnerability indicators should separate out *endogenous* and *exogenous* factors, which are not influenced by current country policies but which could also result from previous policy choices that the present authorities have inherited. The challenge is indeed to distinguish between those two components of vulnerability. To be consistent with the Performance Based Allocation (PBA) model used by most multilateral developments banks, vulnerability resulting from the weakness of present policy (or performance) should lead to less allocation of aid, while the opposite should hold for vulnerability resulting from increased structural impediments. A vulnerability index that does not disentangle structural and policy factors cannot be used for access to development finance.

The current PBA frameworks of most MDBs, because they refer mainly to per capita income and the quality of economic policies, do not directly address the issue raised by the main structural handicaps, which hinder development. It is the opposite of the UN's approach to identify Least Developed Countries (LDCs) by their per capita income and two indicators of structural handicaps, one related to vulnerability and the other to the lack of human capital, which affect a country regardless of its present will.

The lack of human capital, as reflected by an appropriate index, corresponds to a low level of health and education. The disadvantages of high structural vulnerability and low human capital interact. A low level of human capital exacerbates the adverse effects of recurrent shocks by lowering the resilience of countries. Moreover, the effects of poor accumulation in human capital are in turn worsened by the irreversible impact of negative shocks on health and education.

This is why taking into account both the structural vulnerability of countries to external shocks and the structural factors of low resilience, including in particular a low level of human capital is a fair response to meet the objective of equalizing opportunities between countries.

This approach also challenges the meaning of performance as referred to in the PBA. To be fair, the performance of countries should be assessed with respect to their structural handicaps. Once well identified, structural vulnerability and structural (or lack of) resilience factors taken into account in the aid allocation process will lead to a better formula and assessment of performance[2].

2 There is a vast literature on performance (see, among others, Guillaumont and Chauvet, 2001, Kanbur, 2005, Tang, 2010, Guillaumont, Mc Gillivray, Wagner, 2015).

The structural dimension of resilience: how should it be highlighted?

Resilience refers to the ability to cope with exogenous shocks by implementing measures to correct or mitigate their effects. It influences the magnitude of the impact of external shocks on sustainable development. However, resilience, as suggested above, not only depends on the current will of countries; it also depends on structural factors of the countries, such as their physical or human capital, their infrastructure and more generally their level of development or per capita income that result in a more or less effective implementation of resilience policies.

At the same time, structural resilience is distinct from (structural) exposure to shocks. A country's exposure to shocks determines the potential impact of shocks. For instance, a country's degree of trade dependency (exposure) determines the potential impact of trade instability (shock). On the other hand, the structural resilience of a country interacts with its exposure to shocks in determining the final impact of that shock on the country's development. It is worthy to point out as well that resilience factors do not influence directly the probability of future shocks but only their likely impact.

Resilience can be more easily assessed *ex post* than *ex ante*, as it is revealed by social or economic outcomes in the aftermath of a shock. However, this revealed resilience mixes structural and non-structural factors.

When looking for a possible indicator of resilience, these two components should be explicitly taken into account separately, since it is primarily the lack of structural resilience which is more suitable for use as a positive criterion for aid allocation reflecting significant financing needs.

Comparing the two elements – structural and non-structural resilience – note that it is easier to assess structural factors of resilience as they evolve rather slowly over time, as opposed to non-structural factors of resilience which involve capturing the possible reaction of public and private agents after a shock, as well as the expected effectiveness of public policies.

Is non-structural or policy resilience different from average policy performance?

Measuring non-structural or policy resilience is a difficult exercise. Which policies are the most important to allow a smooth absorption of shocks (of various origins)? Facing interconnected phenomena, many aspects of good governance matter.

A broad non-structural resilience index would be very similar to a policy performance index such as the World Bank Country Policy and Institutional Assessment (CPIA), the Worldwide Governance Indicators (WGI) and the Doing Business index (DB), the Word Economic Forum Competitiveness Index (WEF), or other similar indices that select sub-components from those sources and aggregate them in a different way.

As can be seen in Table 1 below, the rank correlations between those indices are very high.

Ideally, the policy resilience index should be able to capture specific features related to vulnerability and the quality of macro policies and regulations dedicated to shock absorption. However, such data does not seem to be available on the required scale to be used in this framework. So for convenience and to ensure wide coverage, it is necessary to refer to some extent to one of the general policy indices referred to above.

Table 1: Simple correlations between the CPIA, WBI indicators in 2017 (developing countries)

	CPIA – Average score of 16 components (IDA countries)	WGI – Average score of 6 components	Ease of Doing Business (DB) – Average score of 10 components
CPIA	1.00 (74)	-	-
WGI	0.69 (74)	1.00 (138)	-
DB	0.79 (73)	0.71 (132)	1.00 (132)

Note: All correlations are significant at the 1 percent level. The number of countries is between brackets. The CPIA ranges from 0 to 6 while the WGI ranges from -2.5 to 2.5. The DB ranks countries from 1 to 100 (1 being the least business friendly and 100 the most). See appendices A1–A3 for the components of each composite indicator. Source: Goujon and Wagner in Guillaumont edr. (2019).

As such, the assessment of policy resilience will rely on general performance indicators, not specifically on what an individual country has put in place to mitigate future possible shocks, or to build its "policy resilience". It is highly plausible that these general policy indicators are compatible with various countries' specific policy choices and therefore consistent with the principles of alignment and ownership adopted in 2005 in the Paris Declaration on aid effectiveness, reformulated during the Accra (2008) and Busan (2011) conferences, and often reaffirmed at international meetings.

Should the vulnerability index measure only exposure to shocks or both intensity of and exposure to shocks?

The Commonwealth has argued previously that in a Vulnerability-Resilience framework using only indices of exposure to shocks is the best approach for measuring vulnerability (Briguglio, in Lewis-Bynoe 2014). However, this approach raises several issues. It assumes that the set of variables chosen in the index (exposure and resilience) explains fully the probability or risk of impact from shocks affecting a country, whatever the intensity of past shocks, their size and recurrence. This line of reasoning ignores the fact that the intensity, size and recurrence of past shocks also reflects the probability of such shocks to occur in the future (it is a proxy for future hazard).

The previous direction of enquiry was largely influenced by the Commonwealth's focus on economic vulnerability and on SIDS. Nevertheless, the Secretariat recognises that it is not the most appropriate strategy given the need for a broader depiction of vulnerability. Introducing multidimensions in the vulnerability framework, particularly with reference to climate change and socio-political factors necessitate inclusion of both exposure and recurrence elements, primarily because their economic impact is indirect and cannot therefore be easily assessed by exposure indicators alone. Even if a measure of economic damages from past natural disasters is introduced as a proxy of "environmental vulnerability", as was done in the past Commonwealth index, will not capture all the likely impacts of climate change, which can only be assessed in physical terms.

Moreover, assessing the vulnerability-resilience nexus from economic results alone does not allow disentangling structural vs policy factors.

Briefly stated, in a universal vulnerability index, to capture what is exogenous or structural, it is necessary to assess the probability of future shocks through variables reflecting the intensity and recurrence of past shocks, as well as a country's inherent exposure to these shocks.

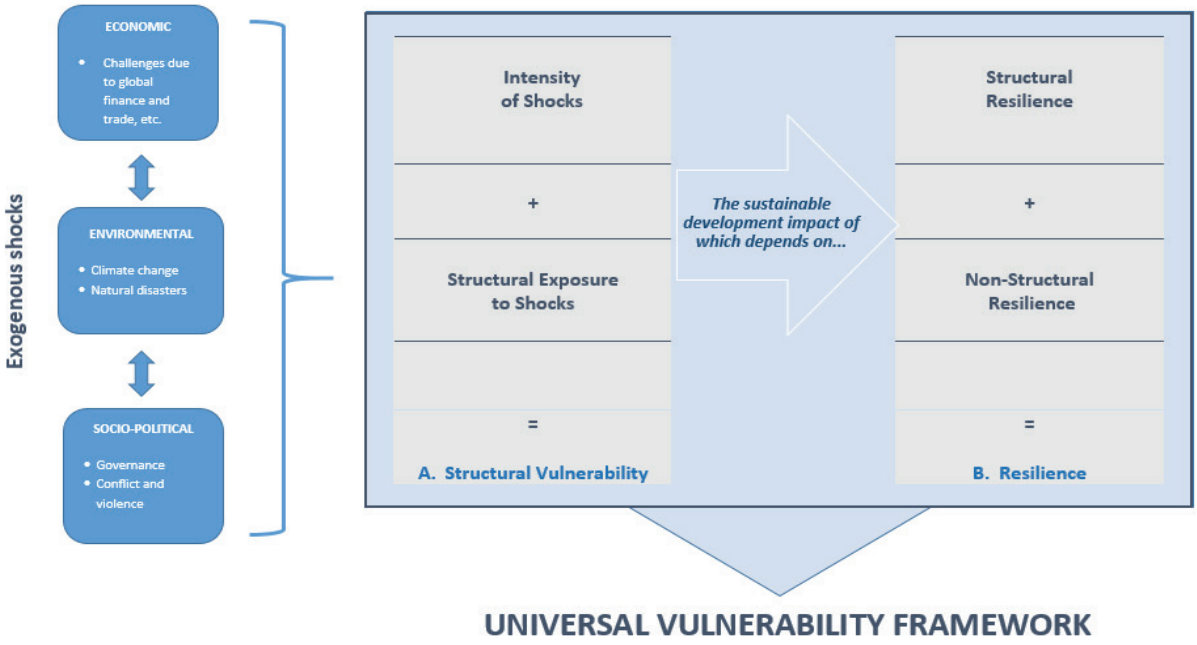
What is the rationale for considering economic vulnerability to external and natural (environmental) shocks together?

In 2020, a major revision occurred in the Economic Vulnerability Index used by the UN CDP for the identification of the Least Developed Countries, renamed Economic and Environmental Index and including components reflecting not only the economic factors of vulnerability, but also environmental factors for their potential economic consequences.

Indeed, the economic vulnerability of developing countries is linked both to natural and external shocks, making it difficult to disentangle economic and environmental vulnerability. For many developing countries, most of production and exports come from agriculture and a large part of the population still lives from subsistence farming. Natural or environmental shocks are therefore a main source of economic instability and they are often measured through their immediate economic impact. Natural disasters directly affect countries' economic outcomes through three main channels reflecting different kinds of exposure: (i) Impact on human lives (death, injury, homelessness); (ii) Impact on capital (destruction of infrastructure, productive capacities or housing, lower human capital accumulation); (iii) Impact on natural resources (destruction of forest, farmland or crops, lower yields). Each channel in turn can affect economic growth and development, depending on resilience.

So, while this Report distinguishes the economic (external) and environmental (disasters and climate) origins of shocks, it considers, as was done by the UN CDP, the *economic vulnerability* to external and natural or environmental shocks together. At the same time, to set up a universal vulnerability index, it separates out vulnerability *to climate change* illustrated through capture of its various physical

Figure 2: The Universal Vulnerability Framework



impacts (not captured by the previous index), as well as the *socio-political vulnerability* reflected by violent events, resulting in a vulnerability index that is multidimensional.

Should the index value be changing from year to year?

Since vulnerability reflects mainly structural factors it is likely to evolve slowly overtime. Even if vulnerability is successfully mitigated through economic development or the effectiveness of targeted policies such as diversification strategies, exposure factors will decrease only slowly. In addition, if we consider vulnerability to climate change that also is slow moving, despite baring significant consequences. Likewise, the structural component of resilience should evolve slowly as well.

In contrast, at least at the theoretical level, the evaluation of the quality of policies should move at a faster pace. For example, the CPIA index used by most MDBs display some volatility.

The analysis of time variations of the universal vulnerability index will only be relevant if the design of the index allows one to distinguish between its structural components expected to evolve slowly, and its non-structural or policy components likely to move more rapidly.

Interconnected vulnerabilities: A general conceptual framework

While vulnerability indices are designed specifically for each dimension, there are relationships between them, as well as interactions between structural and policy-related vulnerabilities. This justifies the presentation of an integrated framework for vulnerability analysis. The three forms of structural vulnerability (economic vulnerability, physical vulnerability to climate change, societal vulnerability) as well as the factors of resilience to these vulnerabilities, are summarized in the general framework presented in Figure 2 below:

i. The first column presents three kinds of exogenous shocks that are directly taken into account by the framework through the dimensions of vulnerability highlighted above.

ii. For each kind of structural vulnerability an index is constructed by measuring both the probability of corresponding shocks assessed from the intensity and recurrence of past shocks and the structural exposure to those shocks. The combination of these two main components, shocks and exposure, can be seen as a measure of the probability of being impacted by an exogenous shock in the future.

iii. The last column represents resilience. It is separated into two distinct components. (1) structural, which is not influenced by current policies and can only be enhanced slowly overtime (2) The other policy-related, and depends on current macroeconomic policy and the quality of governance and regulation put in place by the government – thus moving more rapidly. This column can be seen as reflecting the factors that determine the final impact of exogenous shocks on a country's sustainable development after factoring that country's structural exposure.

Box 1: "Health vulnerability, Covid 19, and the Universal Vulnerability Framework"

How this universal vulnerability framework can address "health vulnerability" and in particular the vulnerability to the Covid 19 pandemic?

Health vulnerability is an ambiguous concept. It may designate either the vulnerability of the economy to health shocks, such as a pandemic, or a country's health vulnerability to shocks of any kind (economic, natural, related to climatic change or socio-political). Further, the vulnerability of the general level of health to specific health shocks, such as epidemics. Due to this ambiguity, the word health vulnerability is avoided in the present framework. However, all the three aspects of health related vulnerability are captured in this framework.

For instance, the recessionary effects of lock-downs reflect the vulnerability of the economy to a health shock, imported or domestic. Alternatively, the effect of imported recession on health and mortality in developing countries reflects the vulnerability of health to an economic shock. This shock is likely to be particularly severe with Covid-19 in countries highly dependent on tourism or migrant remittances, as well as oil or raw materials in exporting countries for which prices are negatively affected by the global recession. In low-income countries, for instance, the economic shock from COVID-19 is likely to impact mortality more than does the pandemic directly.

Economic and health shocks reinforce each other: the recession will make it more difficult to combat the virus, while the pandemic will contribute to a slowdown in economic activity, first in the short term, but also in the long term because of its consequences on human capital. Moreover, the interaction of the two shocks creates a fertile ground for internal conflicts, in the context of state fragility.

In the universal vulnerability framework, structural economic vulnerability to external and natural shocks is accounting for the vulnerability to the global recession caused by the pandemic, as well as the structural resilience index through its income per capita and human capital components. Finally, in the framework the economic effects of the pandemic on sustainable development are also captured through the resilience components.

What may appear to be missing is an assessment of the likelihood of a health shock, such as COVID-19 (or similarly, an earthquake). As shown by the recent history, predicting the occurrence of a global health crisis (or earthquakes) is very difficult. The magnitude of past health shocks, measured for instance by the burden of disease, does not constitute an indicator of recurrence, but rather reflects both countries' structural vulnerability as well as their resilience, structural or not.

Turning to the issue of resilience, most of the factors explaining the magnitude of the impact of a health shock on sustainable development is already taken into account in the resilience index (GDP per capita, Poverty Rates, HAI, etc.). One also has to keep in mind that countries' characteristics are often highly correlated and that the proposed framework aims at avoiding redundancies.

Considering all those issues, it does not appear appropriate, nor feasible at this stage to design a specific vulnerability index taking into account health shocks.

Part 2: How to Design Vulnerability Indices?

Criteria for selecting indicators: five principles to be met

Let us first recall that the universal vulnerability index will rely on indices reflecting the various dimensions of vulnerability and will be a multidimensional index. In building each of these indices, five principles should be met.

The first principle follows directly from the previous considerations. **The vulnerability indicators chosen must make it possible to isolate the exogenous elements**, which are not influenced by the current policy of countries. This makes it possible to consider indicators which reflects a "structural" situation, either because it is the result of events that are completely independent of countries' will (such as a climatic event), or because it is the result of previous policy choices that the present authorities have somehow inherited. The challenge is to distinguish between these two components of vulnerability.

Secondly**, the indicators must be relatively simple and transparent**, so that they can be easily read [1]. An important trade-off is concerning the number of components in each composite indicator, recognising that the frequent search for a large number of components has the disadvantage of weakening the weight and visibility of those that best represent what the indicator should reflect.

1 It is common to recommend building SMART indicators (specific, measurable, achievable, relevant, time-bound).

Box 2: Using the quadratic mean rather than the arithmetic average

The choice of the quadratic mean (also called root mean square, RMS) instead of the arithmetic mean is based on the idea that the vulnerability of a country may critically depend on the levels of only one or two components, whatever the level of the others. The quadratic mean gives greater weight to larger values (and is greater than the arithmetic mean) and allows a limited substitutability between components.

The vulnerability of a country may depend on the levels of only one or two components, and the use of a quadratic mean enhances the impact of the component(s), which reflect(s) the higher levels of vulnerability or resilience. As an example, an island with a very large share of area likely to be flooded and an arid country suffering from a highly increasing trend in the instability of the level of temperatures are both highly vulnerable, due to each of these two countries to a specific component, even they are not vulnerable with respect to other components of the index. Thus, a high vulnerability to climate change will be better evidenced by using the quadratic average, rather than an arithmetic average. A quadratic average evidences the vulnerability of each country in its specificity.

By organically giving more weight to the components representing the highest source of vulnerability for each country, it allows us not to rely on an ad hoc weighting scheme.

The quadratic mean is used both at the index levels to combine sub-indices but also at the sub index level to combine individual variables. It should also be noted that prior to aggregation, each component is first normalized following the max-min method ensuring that all indices range from 0 to 100. All five components are then normalized a second time using a quantile normalization technique to make the distribution of each index comparable.

Thirdly, **redundancy of components from one indicator to another should be avoided**. Each indicator should have a specific meaning, which is necessary for the clarity of the conceptual framework and its formulation.

Fourthly, it is desirable **wherever possible, to start from internationally recognized indicators**, even if it means adapting them to be as consistent as possible with the conceptual framework.

Fifth**, vulnerability indices should be used in a comparative manner, not only between countries, but also over time**. To assess changes in vulnerability and to compare levels of vulnerability between countries, the indices must be designed and calculated in the same way and use equally reliable data. Most often, comparisons using vulnerability indices are made between countries. Comparisons over time (has vulnerability decreased or increased?) are much less common (see Cariolle et al. 2014). In the case of this analysis, there is interest in both aspects, so the Report strives to use measures that are consistent over time and make comparisons across countries possible.

In the following sections, the Report outlines how to design three indices that, each in its own dimension, meet these criteria.

Economic (and Environmental) Vulnerability: A new Economic Vulnerability Index, to External and Natural Shocks (EVENSI)

In order to be used in the general framework and to be appropriate in the context of the allocation of concessional resources, the economic vulnerability indicator, like the other vulnerability indicators, must be an indicator of structural handicap. It should not depend on current economic policies. There are various indicators of economic vulnerability, but they are unsuitable as a criterion for aid allocation, since their composition mixes structural components with other components that depend on the policy of the government of developing countries, or that reflect the effect of previous policies on their present will. In addition, the level of income per capita is often included, which is already is taken into account separately in the formula, leading to redundancy.

The new index must then represent only the structural factors reflecting the probability that a shock will occur and that this shock will impact the economy. The structural factors reflecting exposure have to be as exogenous as possible with regard the current will of policy makers. The extent to which this effect will be severe, long lasting, threatening the inclusiveness of growth and countries' social cohesion will be reflected by the resilience component. For clarity, the new index should also separate exposure from the intensity of recurrent shocks. Focused on the economic impact of shocks, it should take into account both natural (environmental) shocks and external economic shocks. Finally, it should remain parsimonious, representing a selective synthesis of the literature on economic vulnerability indexes.

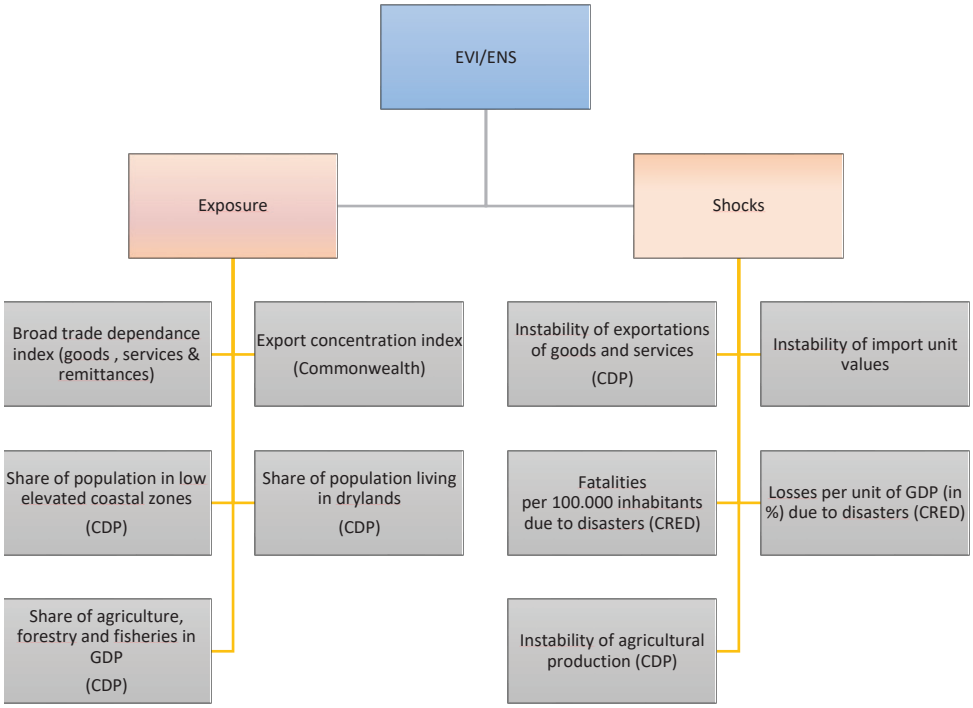
So considered here are two main kinds of exogenous shocks as well as two main sources of economic vulnerability: (i) environmental or 'natural' shocks, such as earthquakes or volcanic eruptions, and the more frequent climatic shocks, such as typhoons and hurricanes, droughts, floods, etc., and (ii) external (trade- and exchange-related) shocks, such as slumps in external demand, world commodity prices instability (and correlated instability of terms of trade), international fluctuations of interest rates, and so on. From the review of the evolution of economic vulnerability indicators provided in appendix A2, it appears that both the previous Commonwealth EVI and the new UN-CDP EVI are now mixing (external) economic and (natural) environmental factors of (economic) vulnerability.

Thus this Report establishes a new index of structural economic vulnerability with 10 sub-components representing a fair synthesis of the literature:

Exposure to shocks

1. **Broad trade dependence index**: The higher the dependence of a country on international trade and external flows (goods, services and remittances), the higher is its exposure to external shocks.
2. **Export concentration index**: It reflects exposure to trade-related shocks resulting from an export structure concentrated on few goods and services. The more concentrated is a country's export base, the more exposed is the country to shocks.

Figure 3: The new Economic Vulnerability to External and Natural Shocks Index (EVENSI or EVI/ ENS)



3. **Share of agriculture, forestry, and fisheries in GDP**: It reflects country exposure caused by its economic structure, such as that including large shares of agriculture, forestry, and fisheries that are particularly subject to natural and economic shocks. The larger the share of such industries or sectors in the economic structure, the less resilient and higher the country's exposure to shocks.

4. **Share of population living in Low Elevated Coastal Zones (LECZ)**: It represents the share of population living in storm or flood-prone areas located near sea level.

5. **Share of population living in drylands**: Countries with a significant share of population living in dryland are more exposed to the consequences of temperature shocks and scarcity of rainfall.

Intensity of shocks

6. **Instability of exports of goods and services (+remittances)**: High variability in export earnings in both goods and services (and remittances) has an impact on output, unemployment rates, and the availability of foreign currency, with negative consequences for sustainable economic growth and development.

7. **Instability of import unit values**: Countries that import significant quantities of products either for direct consumption or as inputs (eg energy) can face negative economic consequences when the price of those products fluctuate significantly.

8. **Fatalities per 100.000 inhabitants due to disasters**: It reflects vulnerability to natural shocks, in particular the human impact of natural disasters associated with these shocks (the larger, the bigger the shocks).

9. **Losses per unit of GDP (in %) due to disasters**: It reflects vulnerability to natural shocks, in particular the short-term economic impact of natural disasters associated with these shocks (the larger, the bigger the shocks).

10. **Instability of agricultural production**: the vulnerability of countries to climate shocks is evidenced by high variability in agricultural production. It reflects the vulnerability of countries to natural shocks, in particular impacts of droughts and disturbances in rainfall patterns (the higher, the larger the shock).

The Physical Vulnerability to Climate Change Index (PVCCI)

There are 2 components of general vulnerability to climate change. First, there is the exogenous vulnerability, which results from climate shocks faced by a country and for which policymakers are not responsible, and which justifies external support. Note, this is not the same as vulnerability that a country could reduce by improving its policies. However, most of the available vulnerability to climate change indices combine the two types of vulnerability, and in particular, factors of resilience, which allows for a broad view of a country's vulnerability but makes them unfit for current purposes[2].

For a similar reason, it is not appropriate to use the assessment of the economic damage expected from climate change for international comparisons and for aid allocation[3]. Considerable progress has been made in the assessment of damage from natural disasters, and while they are extremely useful for global resource mobilization, cost estimates of potential damage or of adaptation carried out on a global scale cannot be the basis for cross-country allocation of aid[4].

The vulnerability, which we want to capture here, is the "physical vulnerability to climate change" and not "climate vulnerability" itself, which is taken into account by some components of the EVENSI presented above, notably through the instability of agricultural production and the number of victims due to natural disasters.

This Report proposes using a physical vulnerability to climate change index, which is exogenous, does not imply any socio-economic assessment, and measures the impact of changes caused by climate change rather than the climate itself. The index must be constantly updated since it must reflect the change which is likely to occur in the future, because non-questionable change is only what we can observe, and the outlook varies with each new observation.

An indicator of physical vulnerability to climate change meeting the above criteria (exogeneity of its components, absence of socio-economic variables, and emphasis on the impact of change) was established by FERDI in 2011[5], updated and revised several times to account for new data and methodological improvements[6], the last version being published in *Ecological Economics*, the reference review in the field (2020)[7]. It is shown in Figure 6 below. Though based on past data, it is a dynamic, forward-looking indicator based on a distinction between 2 kinds of risks due to climate change:

- Risks associated with gradual shocks, such as sea level rise (e.g. risk of flooding), trends in increasing temperatures, or decreasing rainfall (e.g. risk of desertification)
- Risks associated with the intensification of recurrent shocks, whether rainfall shocks, temperature shocks, or cyclones.

Like the EVENSI, for each of type of shock, the physical vulnerability to climate change index is based on a distinction between magnitude of shocks and exposure to shocks. Since the sources of vulnerability are heterogeneous and the vulnerability of each country is specific, sub-indices corresponding to the various types of shocks are aggregated by quadratic mean, which gives greater weight to the components evidencing highest vulnerability.

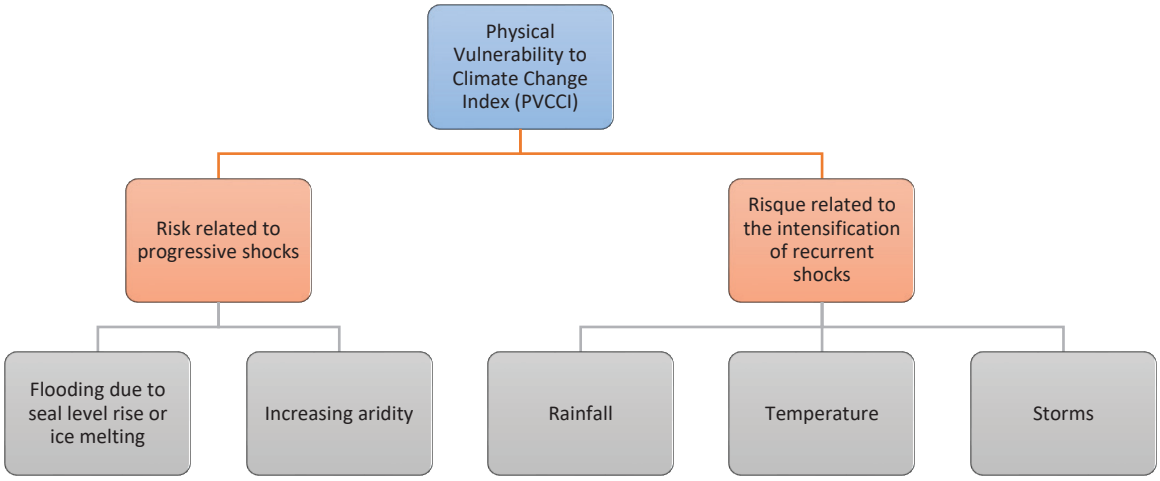
The challenge of measuring socio-political vulnerability

It is essential to take into account "societal vulnerability" alongside economic and climatic vulnerabilities in the design of a truly multidimensional vulnerability index. The main manifestation of this vulnerability is the recurring existence of conflicts and violent events that the organisation of society is unable to ward off. It is accepted that the insecurity existing in the populations of developing countries, hinders their development potential. Poverty and political fragility are inextricably linked to the degree of violence experienced by some countries (UNDP 2008).

2 An example is the ND-GAIN index (University of Notre Dame Global Adaptation Index).
3 Wheeler (2011) in particular refers to the losses in agricultural productivity estimated by Cline, 2007.
4 The World Bank highlights the fragility of cross-country conclusions on adaptation costs (2010, p.89).

5 Guillaumont, P. and C. Simonet (2011)
6 Guillaumont, P., C. Simonet, M. Closset and S. Feindouno (2018), Feidouno and Guillaumont (2019).
7 Feidouno, Guillaumont and Simonet (2020).

Figure 4: The Physical Vulnerability to Climate Change Index (PVCCI)



Source: Feindouno S., Guillaumont P. Simonet C. (2020) "The Physical Vulnerability to Climate Change Index: An Index to Be Used for International Policy", Ecological Economics, vol. 176, October 2020

In order to use a societal vulnerability indicator as a positive factor of aid allocation, it is necessary to isolate, as for other forms of vulnerability, the structural components of insecurity or conflict. Again, it is only structural vulnerability, seen as exogenous, that justifies allocating more aid. The list of structural factors of insecurity is long, controversial, and composed of elements for which the quality of available measures is debatable and not precise. Moreover, the concept of state fragility, which mixes structural and present policy factors, is not relevant for our purpose.

Important to highlight as well is most of the common factors highlighted by the literature on conflicts and violence are already taken into account in the UVI, either by way of other types of vulnerabilities or by variables reflecting structural and non-structural resilience (such as governance). Meaning that the exposure part of this particular vulnerability is already proxied by the other indices of vulnerability and resilience and should not therefore be introduced in the socio-political vulnerability component so as to avoid redundancies.

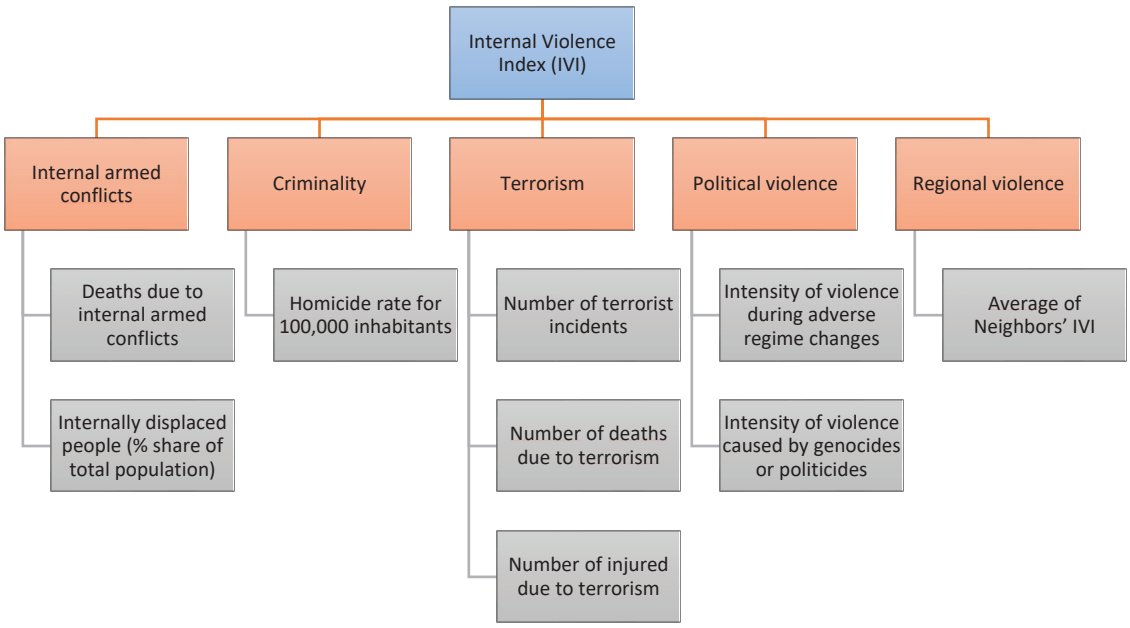
The Report proposes a measure of societal fragility by an Internal Violence Index (IVI). This index focuses on internal violence, since internal conflict and crime may have more structural roots than inter-state conflict. In addition, the number of large-scale inter-state wars has declined in recent decades, whereas domestic violence and crime has increased. However, it is noted that internal violence and crime are phenomena that take many forms, and thus requires a composite index.

The construction of an internal violence indicator requires the collection of reliable data that can capture the intensity of violence in developing countries. The IVI is built directly from quantitative data; it is data-based, without subjective assessments by various observers or experts. The data used do not take into account the perception of violence but its occurrence. The perception of violence is only used to correct quantitative indicators if it is well documented and highly discordant with the data. The costs of violence (i.e. damage) are also not included in the index because they are short term, debatable and related to the level of income.

By continuously and dynamically measuring violence on a continuum ranging from social protests to civil wars, the IVI is able to act as a proxy for tensions arising from socio-political vulnerability. The data on violence is of good quality and easily observable. Data points have little delay between the actual events and their accounting. The IVI is a "S.M.A.R.T." indicator, which integrates the different dimensions of violence, but uses a moderate number of sub-components to remain transparent[8]. The composition of the IVI is shown in Figure 7, below. Ten quantitative variables related to violence are divided into 5

8 For alternatives see Feindouno, Goujon, Wagner, 2016.

Figure 5: The Internal Violence Index (IVI)



clusters: internal armed conflict, crime, terrorism, political violence and regional violence. An identical weight is assigned to each cluster. Firstly a "direct" IVI is calculated as a quadratic mean of the 4 first clusters. This makes it possible to measure the level of violence of each country without taking into account neighbor effects. Secondly, an "indirect" IVI is calculated, measuring the level of violence observed at the regional level by averaging the "direct" IVIs of neighboring countries. Finally, the "overall" IVI is calculated as the average of the five components. In measuring societal vulnerability by the degree of past violence the index reflects a structural component of political fragility, because violence is a phenomenon whose recurrence is well established in the literature, and the consequences of past violence remain on the shoulders of the present policymakers.

Part 3: How to Design Resilience Indices?

Building a resilience index consistent within the new framework

The economy's structural characteristics that create a lack of resilience are also sources of structural vulnerability. Those are features linked to the overall level of development. Measures that give information as to the level of human capital (such as health and education), and variables that influence the ability of countries to respond to shocks (such as level of income per capita) are critical characteristics impacting on structural vulnerability. Specifically, where human capital and income levels are particularly low, economies do not have the flexibility or resources to respond adaptively to shocks. Further, as such countries are prone to being hit harder by shocks, they fall into a "trap" or a vicious circle where, because they are underdeveloped, they bear more costs as the result of a shock, which further lowers their human capital and income levels over time, leaving them even more vulnerable in the future (Guillaumont 2009a). In essence, the risk of getting trapped results from the conjunction of structural economic vulnerability (*stricto sensu*) and low human capital, in countries with low income per capita. This is the reason why a low level of income per capita, a high EVI, and a low level of human capital are considered complementary criteria for the identification of the LDCs.

Resilience depends on so many factors that, in the end, it seems difficult to measure. However, once again, it is necessary to distinguish two kinds of factors influencing the level of resilience, structural characteristics, that are not influenced by the present will of government and evolve slowly over time, and present policies. Policies that contribute to resilience consist, for example, factors that discourage the buildup of large external financial imbalances (unless they are used for productive investments that can finance debt repayment over time); to promote financial market stability and the prudential behavior of financial entities; to promote depth and access to the financial system, including insurance. Covering all those topics requires building a broad index of good governance.

In short, two separate but complementary indices proxing structural resilience on one hand and non-structural resilience on the other are needed. While the resilience concept is not new, disentangling structural aspects from non-structural ones prevent us from using pre-existing indices of resilience such as the Commonwealth's 2014 Economic Resilience Index (see annex A5).

How to measure structural resilience?

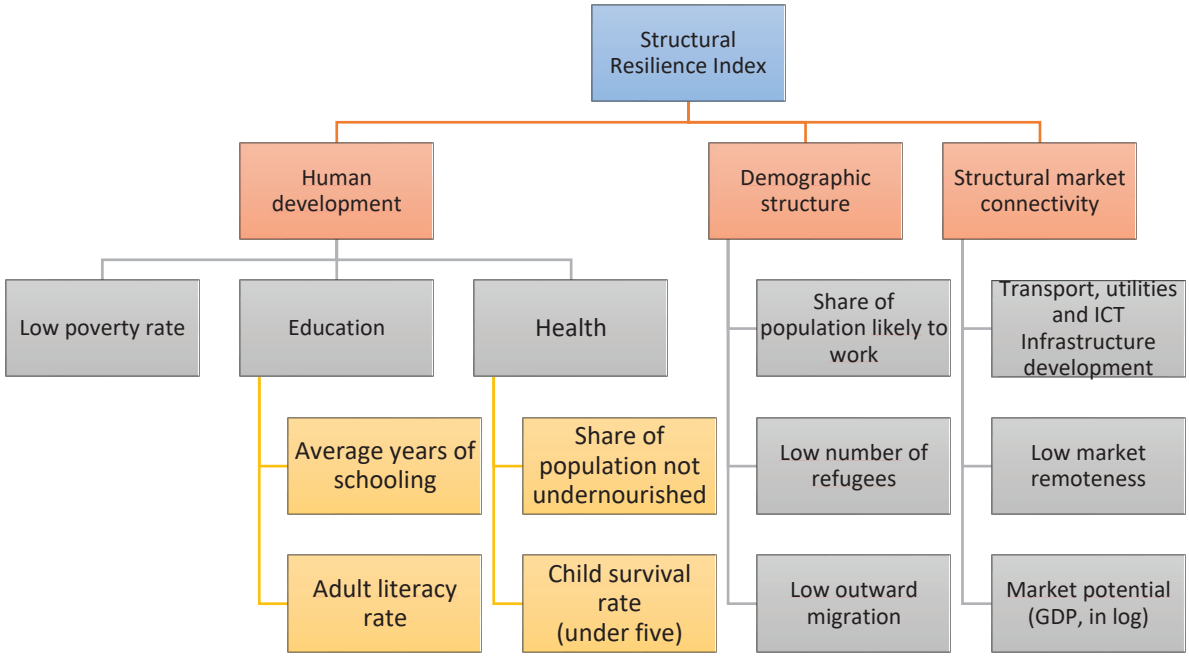
Resilience does not depend solely on the present will of countries. The structural characteristics of the economy also create a lack of resilience. A low level of income per capita and/or of human capital (mainly health and education) indicate the extent to which a country's inhabitants won't be able to cope with shocks and also condition the ability of governments to implement an effective macroeconomic policy. When income per capita and capital accumulation (physical and human) is low and poverty and inequalities are high, economies do not have the flexibility or resources to respond adaptively to shocks.

The first consideration is an index that measures a human structural handicap. Some indices already exist such as the Human Development Index (HDI), the UN CDP Human Asset Index (HAI) or the new World Bank Human Capital Project Indicator, the component of which may be used, as they were in the Economic Resilience Index previously employed by the Commonwealth Secretariat (from the HDI).

There are two other aspects of structural resilience that the index has to take into account:

1. Demographic tensions: Several demographic aspects can reinforce the impact of exogenous shocks on sustainable development. Countries with large share of population too young or too old to work means a less flexible workforce to adapt in

Figure 6: The Structural Resilience Index (SRI)



the aftermath of an exogenous shock. A large number of refugees also represents a significant cost for host countries as well as a factor of social tension. Finally, brain drain, notably in small states, implies a less educated and hence less flexible domestic workforce.

2. Poor physical infrastructure and connectivity: Countries that have better access to regional and international markets can more easily integrate global value chains. Remoteness inhibits growth and opportunities to trade by increasing transportation costs, making difficult the diversification of the economy. The size of the domestic market also reflect the relative ease of access to diversification opportunities. Finally, the general level and quality of infrastructure, while influencing the two factors above, particularly impacts the resilience to natural shocks, especially if they are themselves less likely to be impacted by such shocks: They can then lead to an easier response (at a lower human and economic cost) to natural disasters.

How to best capture non-structural (or policy) resilience?

Following the conceptual framework presented above, what is now missing is policy or non-structural resilience (NSR). NSR represents the present political choices and will of countries facing exogenous shocks, including the quality of macroeconomic management, the quality of the crisis response framework or early warning systems; the design of insurance schemes and appropriate regulations to make the economy more resilient and less exposed to future shock.

There is no obvious way to select what aspects of governance are most relevant in this context. Available resilience indicators are often mixed bags of various broad components covering many issues. Furthermore, it is very difficult to find purely non-structural aspects of resilience as the outcome of public policies are more often than not influenced by structural factors themselves.

Among available alternatives (see annex 6 in appendix), the elements of the World Bank's Governance Indicators or its Doing Business Survey, while not covering all those aspects of policy performance, constitute in this Report's view, the most appropriate option readily available today.

The Worldwide Governance Indicators (WGI) are the most widely available indices of governance. They have the widest coverage, cover most of the aspects of non-structural resilience and are widely regarded and used (for example, in the aid allocation formula of the European Commission). The WGI defines governance as "the set of traditions and institutions by which authority in a

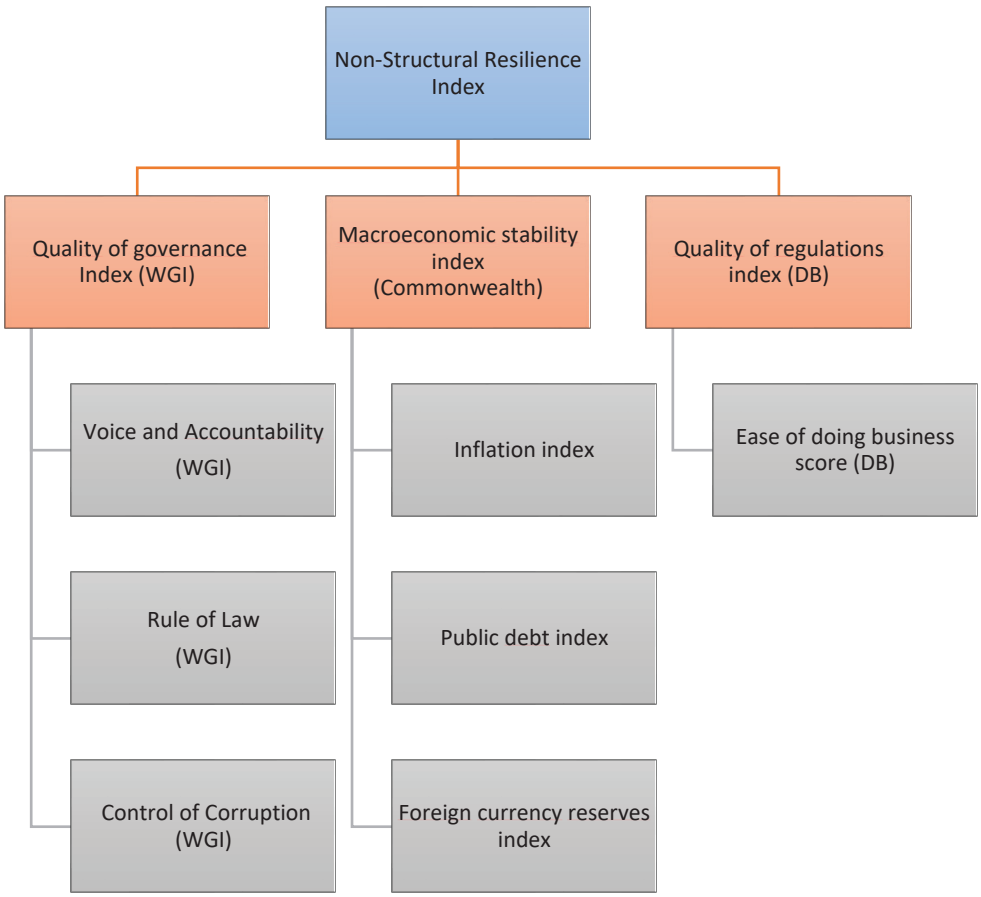
country is exercised" (Kaufmann et al. 2010). The WGI capture six dimensions of governance since 1996 for 212 countries and territories. Coverage by country and over time is then broader than for the CPIA. Moreover, in the WGI the focus is more on institutions and less on policies, and the rating on "political stability and absence of violence" does not seem to have an equivalent in the CPIA. Like the CPIA, the WGI is primarily based on subjective information. However, while the CPIA rating is based only on the judgements of World Bank staff, the WGI consists in the aggregation of various governance ratings (including the CPIA). The country scores are based on several variables, drawn from about 30 separate databases reflecting subjective perceptions of a wide range of issues.

The WGI are composed of six variables among which:

- Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
- Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.
- Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Those first 3 components represent what could be defined as governance quality. The core institutional components that allow a stable and transparent governing process.

Figure 7: The Non-Structural Resilience Index (NSRI)



Two other governance indices are particularly correlated with components already taken into account in the vulnerability and structural resilience index and should be excluded:

- Political Stability and Absence of Violence/Terrorism
- Government effectiveness

This last index is excluded because of its important overlap with the infrastructure, health and education cluster of the SRI. It means that in order to capture the quality of policy formulation and implementation it is necessary to take macroeconomic management directly into account by using something similar to the macro stability index of the previous Commonwealth resilience index (despite the limitations exposed above).

Finally, the last WGI index, regulatory quality, captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. This index is replaced by indicators from "Doing business", which, even if sometimes controversial, is well understood by governments and constitute the reference in terms of regulatory quality measure.

Part 4: Vulnerability According to the Universal Vulnerability Index

As illustrated by figure 8 below, the universal vulnerability framework is composed of the five indices designed in the previous section. The Universal Vulnerability Index (UVI) is a multidimensional index, which aggregates the five components into one number representing the extent of vulnerability in a given country.

How to aggregate the components of the UVI framework?

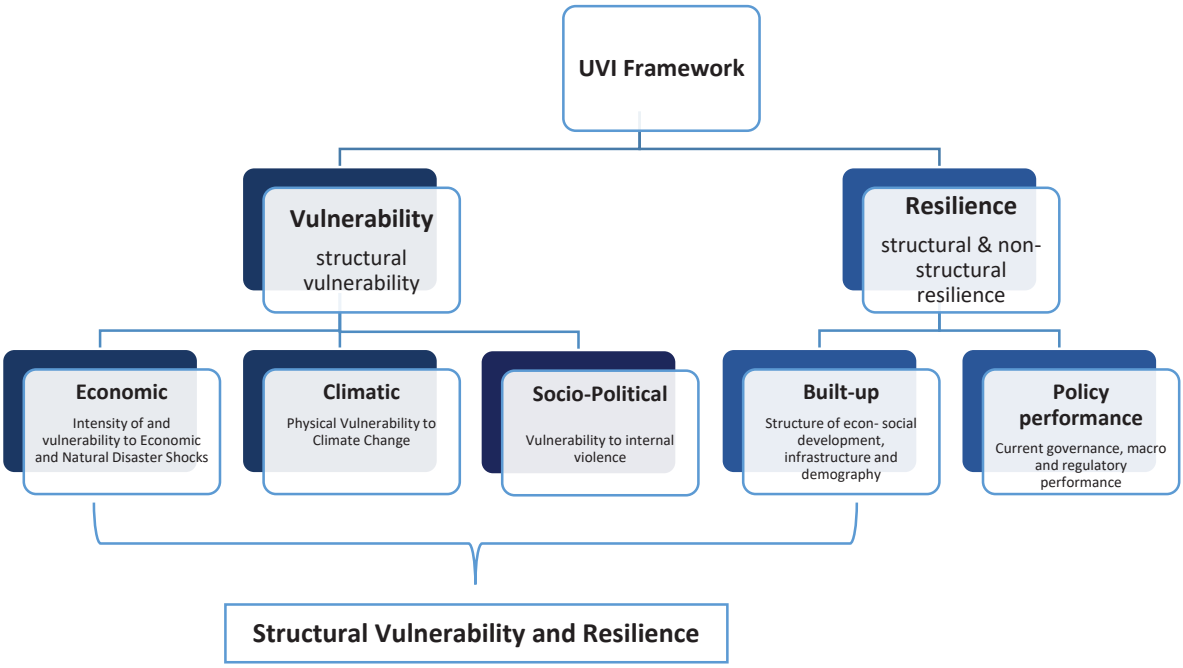
As discussed above, the quadratic average is used to build the five components. For each one it allowed the amplification of countries that present high degrees of vulnerability according to one of its sub-components (but for which the other forms of vulnerability are low) rather than countries with a mid-level vulnerability across all sub-components. By doing so, there is no need for an *ad hoc* weighting scheme, as for each country weight is naturally placed on its most vulnerable feature through a data generating process rather than looking for a uniform weighting method, reflecting a consensus on which specific aspects of vulnerability matter the most for all countries. (see Box 2 above).

To be consistent within the framework it is logical to apply the same methodology to aggregate the three vulnerability components into one Universal Structural Vulnerability Index (SVI).The Structural Vulnerability Index is a multidimensional index highlighting the most vulnerable component or dimension for each country (economic vulnerability to external and natural disasters, physical vulnerability to climate change, socio-political vulnerability to internal violence).

As noted above, prior to aggregation, each component is first normalized following the max-min procedure ensuring that all indices range from 0 to 100. All five components are then normalized a second time using a quantile normalization technique to make the distribution of each index comparable.

To obtain the Structural Vulnerability and Structural Resilience Index (SVRI) it is necessary to take into account the fact that the vulnerability and resilience variables or components do not follow the same logic and move in opposite directions. Since it would not be consistent to calculate a difference, possibly negative, between vulnerability and resilience

Figure 8: The Universal Vulnerability Index (UVI)



indices, two options are considered, both intuitive and easy to understand, and always leading to a positive level of the universal index (and of the structural vulnerability and resilience index as well).

First consideration is a multiplicative approach where the final index would be the ratio of SVI over RI (or SVI over SRI), such as an increase in SVI increases UVI (or SRVI) and an increase in RI (or SRI) decreases it. This approach underlines the interaction between vulnerability and resilience.

The second option is to compute an index of Low Resilience or of Lack of Resilience that is the difference between 100 and the index of resilience (such as LRI = 100-RI), a high value of LRI meaning a low resilience level. Using this approach, the same quadratic averaging method used to aggregate SVI could be employed to construct the index of structural vulnerability and resilience (SVRI), which in effect becomes the quadratic average of the three indices of structural vulnerability and the index of lack of structural of resilience (LRI).

The two aggregating methods based on normalized indices are as follows[1]:

Method 1 (multiplicative)

$$UVI\_1 = \frac{SVI}{GRI}$$

with $SVI = \sqrt{\frac{EVENSI^2+PVCCI^2+IVI^2}{3}}$ and $GRI = \sqrt{\frac{SRI^2+NSRI^2}{2}}$

Method 2 (additive)

$$UVI\_2 = \sqrt{\frac{EVENSI^2 + PVCCI^2 + IVI^2 + LSRI^2 + LNSRI^2}{5}}$$

with $SVRI\_2 = \sqrt{\frac{EVENSI^2+PVCCI^2+IVI^2+LSRI^2}{4}}$

with $LSRI = 100 - SRI$ and $LNSRI = 100 - NSRI$

Each method provides two distinct and parallel indices: i) one strictly structural, leaving aside non-structural (or policy) resilience, leading to a "Structural vulnerability and resilience index" (SVRI); ii) the other taking into account the five components, and leading to the "Universal vulnerability index" (UVI). While the (UVI) encompasses the whole ranges of factors explaining the probability of shocks as well as their impacts on sustainable development, the other (SVRI) represents the extent of vulnerability that is outside of the direct control of governments. This structural or exogenous notion of vulnerability is critical for aid allocation purposes as it allows vulnerability to be taken into account as a positive factor in aid allocation.

Of the two methods, the preference is for the multiplicative approach which is most intuitive in its construction and interpretation as it avoids having to invert the GVI into a lack of resilience index, which could confuse policy makers. As for its interpretation the multiplicative approach leads to a classification of vulnerability above and beyond the ranking of countries.

How are countries vulnerabilities classified within the UVI?

In the UVI countries vulnerabilities are classified in two ways: (1) by their overall ranking when comparing a country's vulnerability score with the rest of countries represented in the index, and (2) by the level of vulnerability relative to the level of resilience.

As regards the latter, it should be understood that a UVI score of 1, reflecting an equivalence of vulnerability and resilience does not imply resilience of a country or their ability to cope with shocks. The classification of vulnerability with respect to the ratio of vulnerability to resilience considers the extend to which the country has built up resilience factors to cope with its exposure to shocks. In this line of reasoning, a country with a UVI of 1.5, meaning that its vulnerability is 50 percent larger than its assessed resilience is regarded as *extremely vulnerable*. Likewise, countries with UVI scores between 1 and 1.5 are deemed to be *highly vulnerable; vulnerable* for UVI scores of between 0.5 and 1; and resilient if its UVI scores is below 0.5. The latter reflects the situation where the country's assessed resilience is determined to cover more than 50 percent of its vulnerabilities.

Classifying countries in this way creates an incentive for aid allocation, whose goal would be to move countries from the position of vulnerability to resilience. It allows for the tracking of aid performance over time and also incentivises the governments themselves to build resilience.

Though UVI rankings present a useful comparative analysis, it should not be regarded as the main classification or barometer of the degree of a

1 UVI=Universal Vulnerability Index, SVRI= Structural Vulnerability and Resilience Index, SVI= (Universal) Structural Vulnerability Index, RI=Resilience Index, EVENSI=Economic Vulnerability to External and Natural Shocks Index, PVCCI=Physical Vulnerability to Climate Change Index, IVI=Internal Violence Index, SRI=Structural Resilience Index, NSRI=Non Structural Resilience Index, LSRI=Lack of Structural Resilience Index, LNSRI=Lack of Non Structural Resilience Index

Classification of Vulnerability in the UVI

UVI > 1.5:	Vulnerability significantly greater than resilience:	Extremely Vulnerable
1.5 < UVI > 1:	Vulnerability somewhat less than resilience:	Highly Vulnerable
1 < UVI > 0.5:	Vulnerability partially matched by resilience:	Vulnerable
UVI < 0.5:	Resilience significantly exceeds vulnerability:	Resilient

country's overall vulnerability, nor should it be used to discriminate between countries for the purposes of aid allocation. The more appropriate classification is the bench marked scores which allows even countries who are vulnerable but near to the resilient threshold to be afforded aid. This is so because the aim of the multilateral organisations should be to move all vulnerable countries to a position of resilience. The same multiplicative and classification approach can be applied to the USVRI, which strictly speaking, is as mentioned the preferred index for aid allocation.

It is important to also add that using rankings to classify countries' vulnerability results in having to apply ad hoc thresholds, mostly quartiles or quintiles, to differentiate between the vulnerability of countries. We do still present an iteration of this for illustration and comparative analysis but it is strongly preferred to apply the more intuitive vulnerability classification as expressed above, which is grounded in practical reasoning.

Probably most important to note is that the Commonwealth UVI classification framework is more useful for an augmentation of a GDP per capita criterion than an arbirtary dissection of vulnerability rankings. The per capita income criterion sees countries at low-income levels being afforded concessional finance. With agreement on a measurement and definition of vulnerability such as ours, which is universal and multidimensional, and carries an intuitive threshold criteria, it is possible to design a new criteria for aid which could see middle-income countries that are nonetheless classified as highly vulnerable still be provided access to concessional resources.

This is the type of aid considerations that the Commonwealth is aiming to promote and why the UVI framework is the framework of choice.

Discussing the main results

The following section will provide the results obtained using UVI_1 while specific results obtained are presented in more details in the appendix. Consistent data for all components were obtained for the period 2010-2018.

As shown in table 2 and figure 9 below, the largest share of highly vulnerable countries is located in sub-Saharan Africa, where most low-income countries (LIC) and a large part of the Least Developed Countries (LDC) reside. Among the first thirty ranked countries, about twenty-five of these are LDCs. This is consistent with the fact that there is some conceptual and statistical overlap with the UN-CDP indicators used to classify countries into the LDC category. Looking at the results from the perspective Commonwealth countries, and highlighting small states, as depicted in figures 15 and 17, it is also clear that small states generally only rank in the top 50 most vulnerable countries when considering only strictly the SVI.

However, Commonwealth members and notably Commonwealth Small States members are displaying specific characteristics. According to the UVI framework, those countries are amongst the most vulnerable when considering vulnerability rankings by vulnerability to climate change or economic vulnerability to external and natural shocks. Alternatively, only a small proportion of those countries rank high in the internal violence index. It is also important to note that, while structural vulnerability seems higher in Commonwealth small states compared to LDCs, the picture becomes radically different once resilience is taken into account and notably non-structural resilience. Contrary to most LDCs, Commonwealth small states have built institutions and political mechanisms to help them mitigate the adverse effects of exogenous shocks.

Table 2: The vulnerability profiles of different categories of countries

Average of categories1	Physical Vulnerability to Climate Change Index*	Economic Vulnerability to External and Natural Shocks Index*	Internal Violence Index*	Structural Vulnerability Index	Lack of Non-Structural Resilience Index*	Lack of Structural Resilience Index*	Lack of Resilience Index	Structural Vulnerability and Resilience Index (SVRI_1)	Universal Vulnerability Index (UVI_1)	Structural Vulnerability and Resilience Index (SVRI_2)	Universal Vulnerability Index (UVI_2)
	PVCCI	EVENSI	IVI	SVI	LNSRI	LSRI	LRI	(SVI / (100-LSRI))	(SVI / (100-LRI))	RMS (PVCCI, EVI, IVI, LSRI)	RMS (PVCCI, EVI, IVI, LSRI, LNSRI)
Global average (138 countries)2	*45,35*	*45,35*	*45,35*	46,5	*45,35*	*45,35*	45,82	0,93	0,92	46,54	45,35
Region (CW)											
Africa	*45,75*	*45,15*	*46,72*	46,75	*52,69*	*58,20*	55,84	1,20	1,13	50,18	48,96
Asia	*38,85*	*44,61*	*41,95*	42,85	*40,90*	*35,29*	38,37	0,70	0,74	41,02	40,18
Caribbean and Americas	*40,12*	*38,73*	*49,17*	43,98	*39,39*	*38,71*	39,34	0,72	0,74	42,70	41,68
Europe	*39,06*	*45,48*	*44,58*	44,15	*44,26*	*33,13*	39,40	0,66	0,74	41,42	40,56
Middle East & North Africa	*58,60*	*49,58*	*49,76*	53,70	*47,77*	*34,68*	41,93	0,86	0,99	49,74	48,16
Pacific	*54,56*	*58,44*	*30,30*	49,94	*36,55*	*52,99*	45,84	1,07	0,93	50,87	*49,07*
Income group (WB)											
LIC	46,71	49,72	49,67	49,64	58,20	62,66	60,84	1,40	1,33	53,70	52,19
LMIC	44,24	43,85	43,80	45,01	47,29	46,42	47,24	0,87	0,88	45,56	44,57
UMIC	45,90	44,19	46,89	47,07	40,54	39,07	40,48	0,79	0,81	45,20	44,01
HIC	44,41	44,70	38,01	43,46	31,49	29,96	30,96	0,63	0,64	40,42	39,27
Commonwealth members	46,63	46,81	43,06	46,73	39,09	46,96	43,59	0,92	0,85	47,12	45,87
Commonwealth small states	50,76	52,14	41,61	49,54	35,31	44,97	40,82	0,93	0,85	48,65	47,37
SIDS	48,88	51,91	38,31	47,82	39,47	44,98	42,74	0,90	0,85	47,45	46,02
LDCs	47,13	49,35	45,35	48,31	54,35	59,23	57,26	1,26	1,19	51,66	50,26

Notes: All indices use quadratic averages (RMS).

1 The scores and ranks of individual components for each of the 138 countries can be found in Table A2 & A3 in appendix.

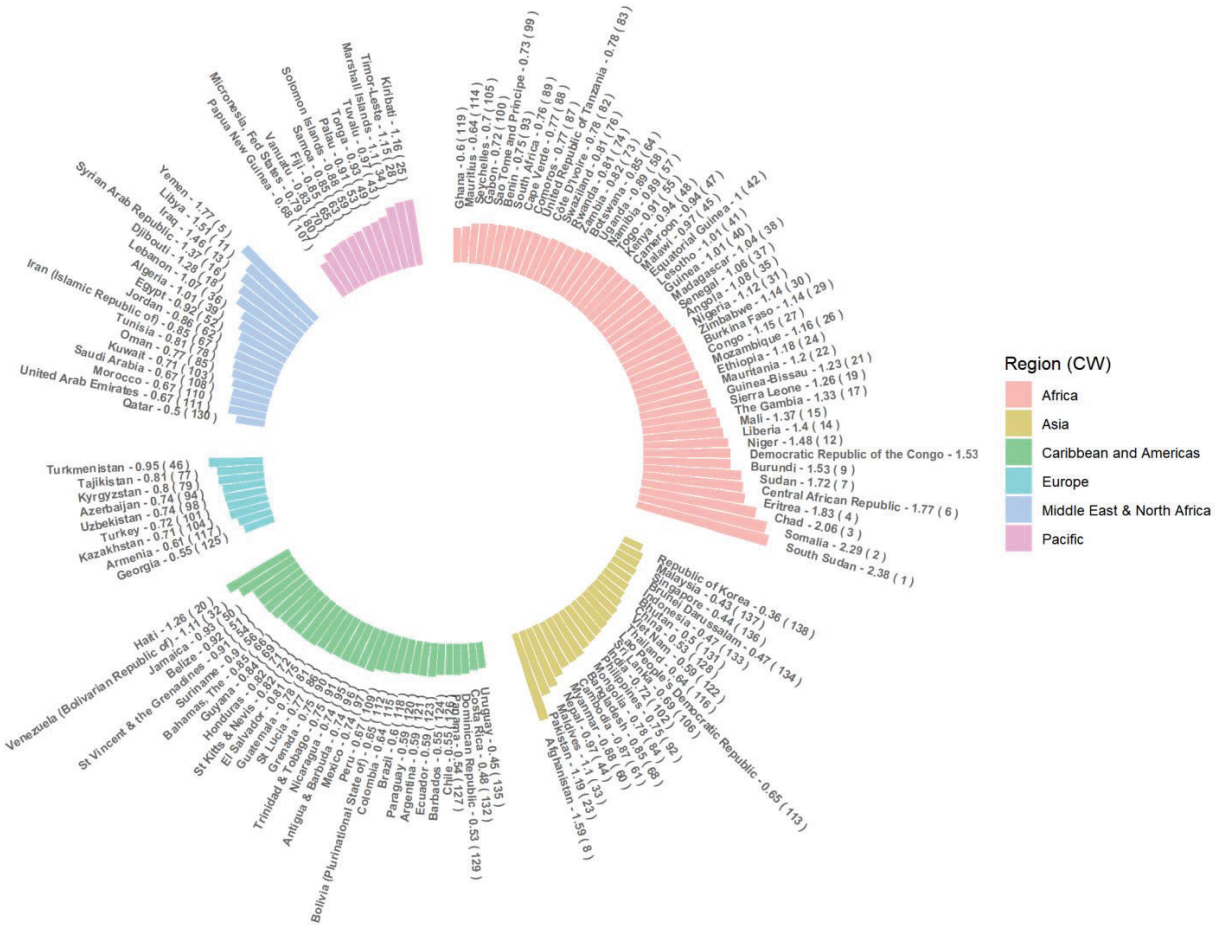
2 The similar means for the five components are the result of the quantile normalization process that allows combining the index more accurately.

This is reflected in Figures 13-15 which show the UVI from the angle of the UVI vulnerability classification expressed above, and by median UVI scores. Specifically, the results from the Commonwealth's UVI classification criteria align with that of the more arbitrary classification by quintiles, with LDCs showing the highest percentage of countries classified as extremely and highly vulnerable. SIDS make up the group with a the largest number of vulnerable countries but as opposed to LDCs, reflect countries classified as resilient. The median rankings according to income classification suggest an alignment with income and vulnerability but this is further qualified in figure 18 which shows that when only focusing on structural vulnerability, upper middle-income countries actually show a higher level of vulnerability than lower middle-income countries, disputing the notion that per GDP alone is a perfect barometer of need.

The apparent disconnect between vulnerability and resilience is another key message to draw from this framework. While resilience is strongly correlated with income levels as shown in Figure 21, it is not the case for vulnerabilities. Even if long term strategies can be put in place to reduce exposure factors to the effect of climate or climate change, it is very difficult for some countries and notably small states to reduce significantly their structural exposure to shocks and their vulnerability in general.

To illustrate further the specificity of each form of vulnerability and the relationship between structural vulnerability and resilience, Figure A1 in the appendix shows the simple correlations among the five components of the UVI. While there is a low but significant relationship between EVENSI and PVCCI, meaning that countries for which the economy is vulnerable to external and natural shocks are to some extent relatively vulnerable to climate change, most of the correlations are low and mostly insignificant. It shows that while the phenomenon detailed in the previous section interact, the five indices designed in this report capture specific aspects of vulnerability and resilience not overlapping, with their specificity enhanced thanks to the use of the quadratic average.

Figure 9: The UVI_1 for the 138 countries in 2018



Two other significant observations can be drawn from figure A1. First, IVI is the only structural vulnerability index correlated with resilience in a significant way, illustrating the fact, as explained above, that factors of exposure to violence being already taken into account by other components, which were not reintroduced in the IVI but instead relies only on past violent events to measure socio-political vulnerability in the UVI framework. Second, EVENSI appears to be correlated, albeit weakly, with structural resilience. This finding illustrates the poverty trap that many vulnerable countries fall into, where recurring adverse exogenous shocks reduce growth and increase poverty leading to lower structural resilience levels over time.

Figure 10: The SVI on the map in 2018, according to the quintiles

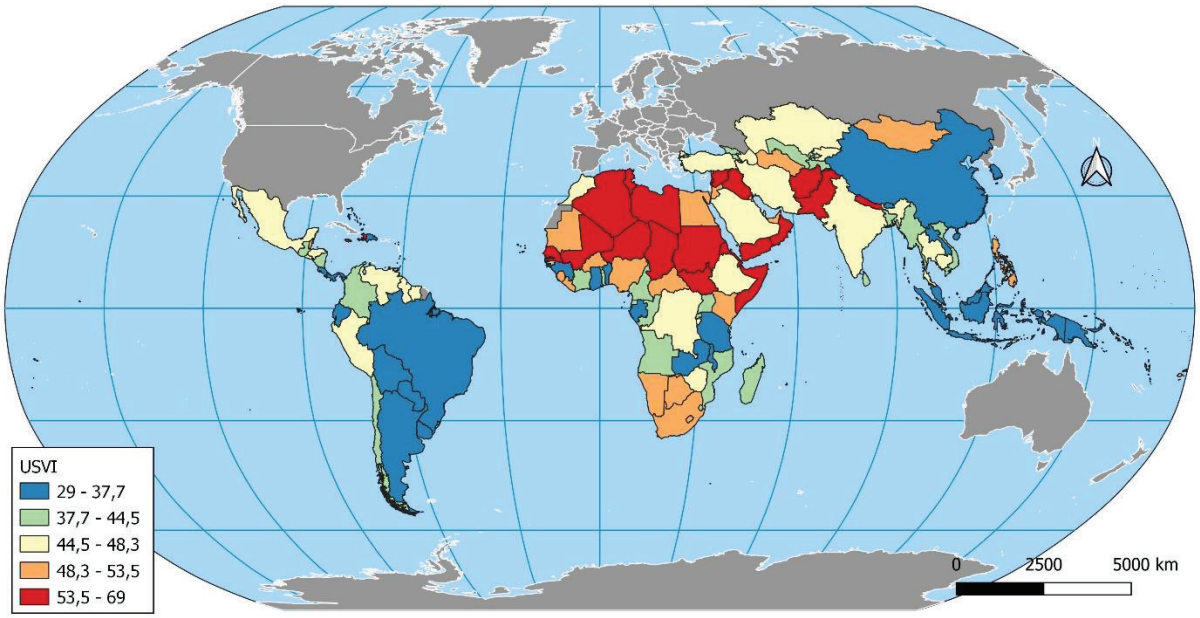


Figure 11: The RI on the map in 2018, according to the quintiles of RI

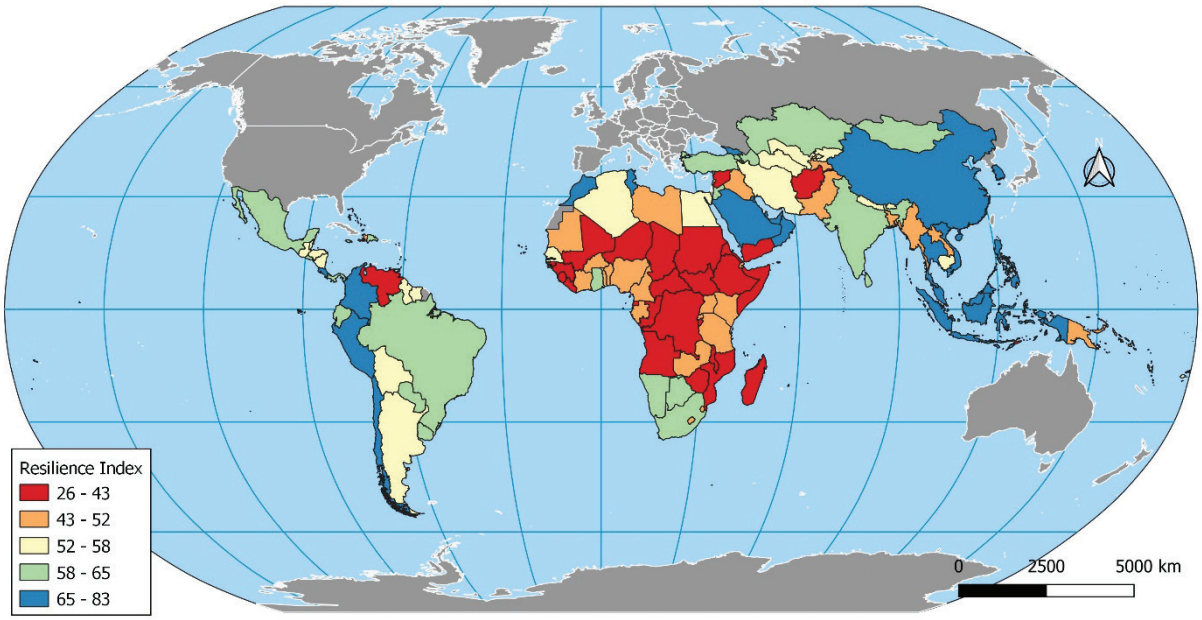


Figure 12: Classification of countries according to UVI criteria and country groupings

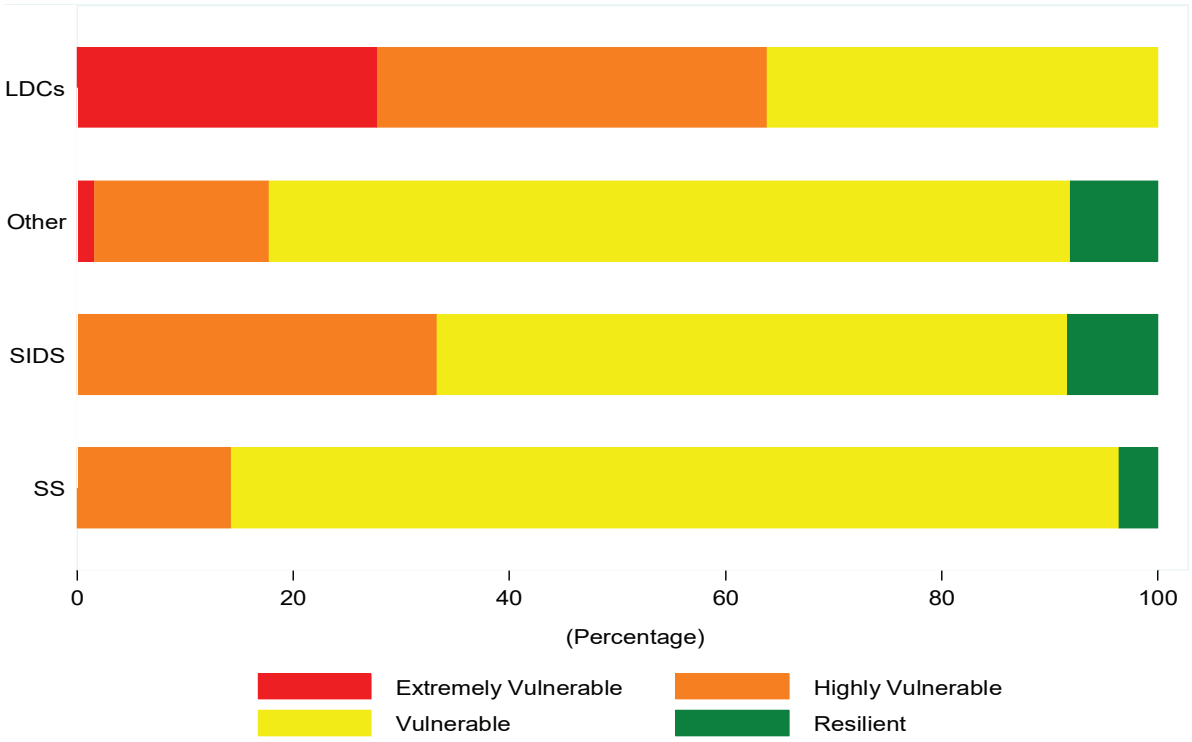


Figure 13: Classification of countries according to UVI criteria and income group

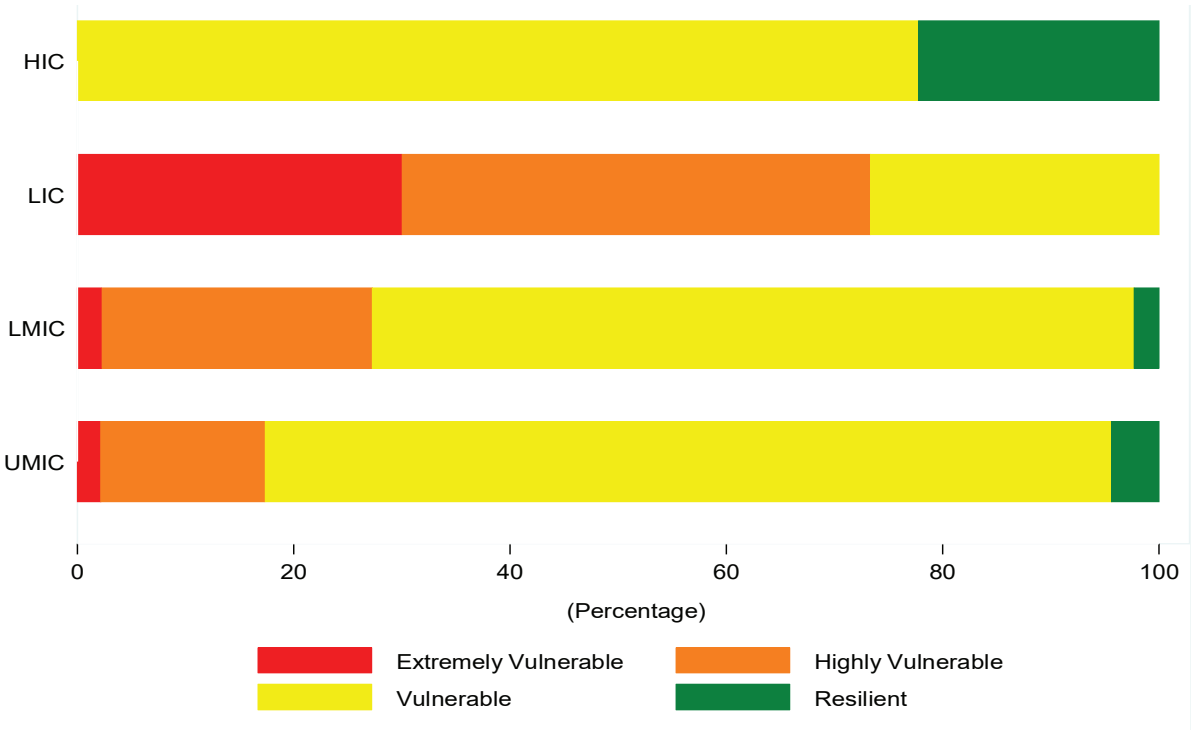


Figure 14: Ranking of countries by median UVI and income group

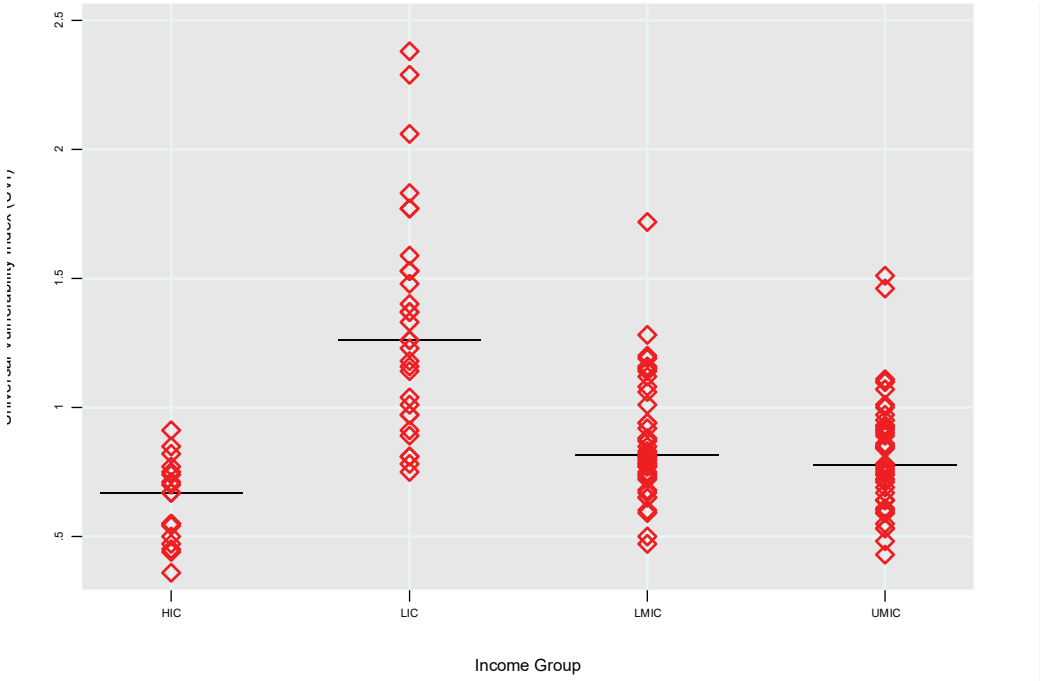


Figure 15: The UVI rankings for Commonwealth countries in 2018

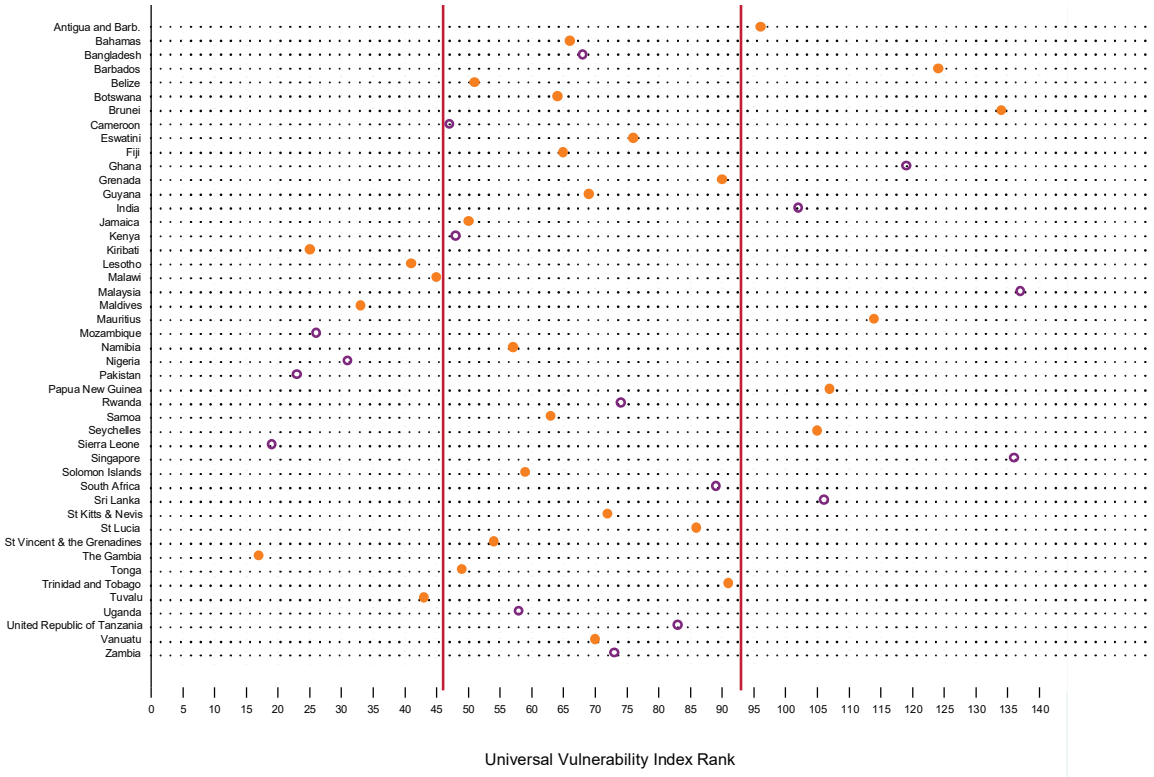


Figure 16: The SVI for the 138 countries in 2018

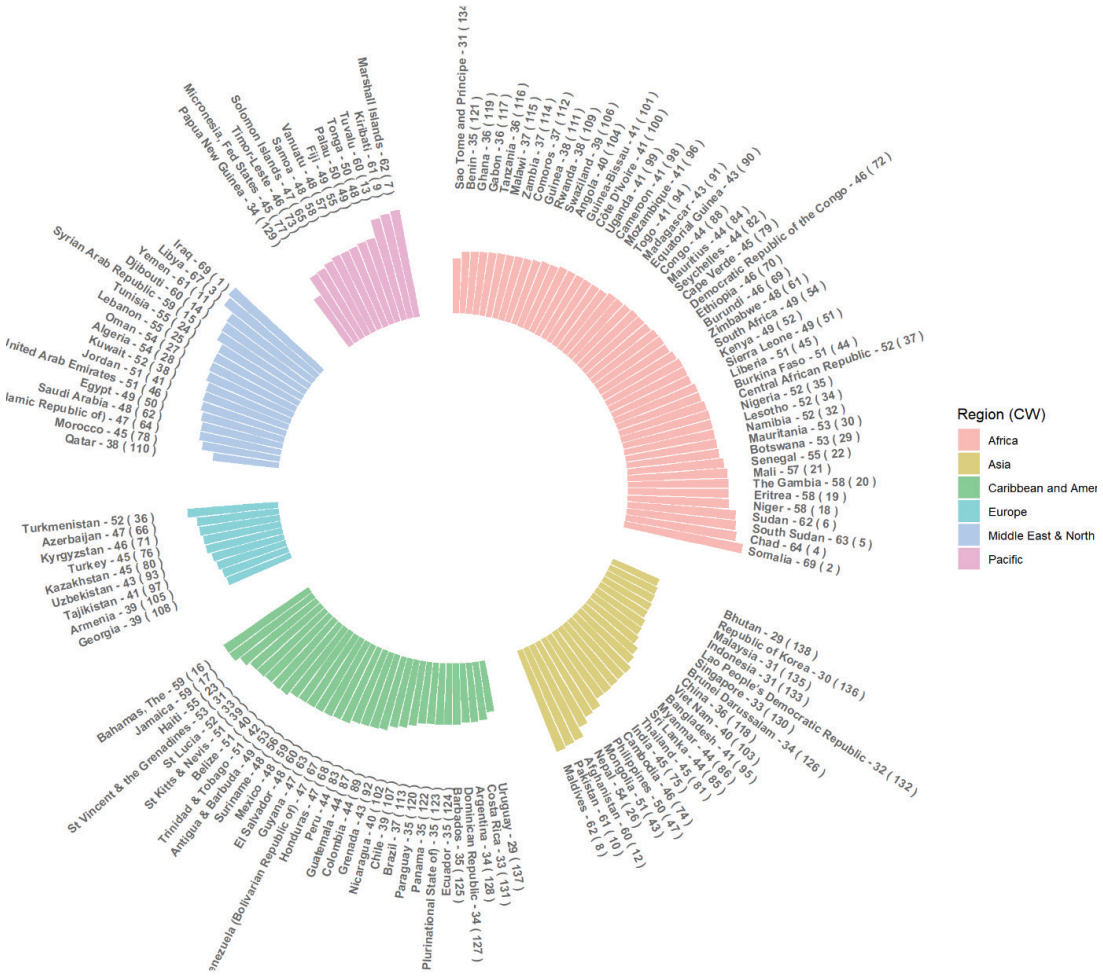


Figure 17: The SVI rankings for Commonwealth countries in 2018

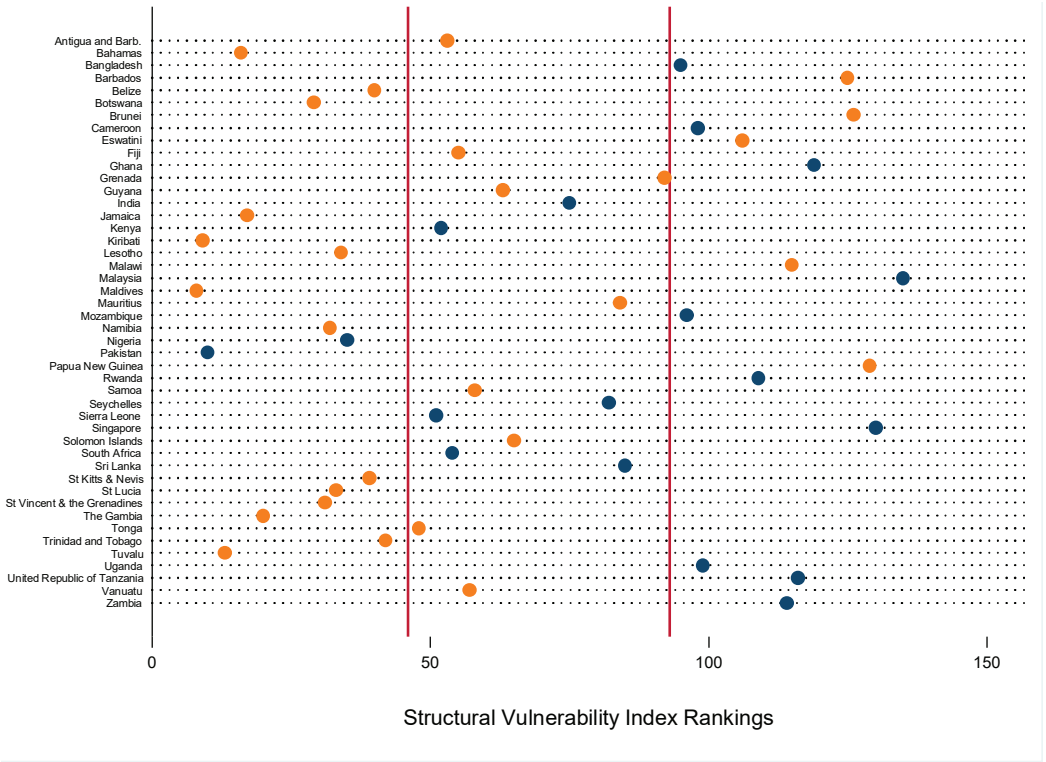


Figure 18: Ranking of countries by median SVI and income group

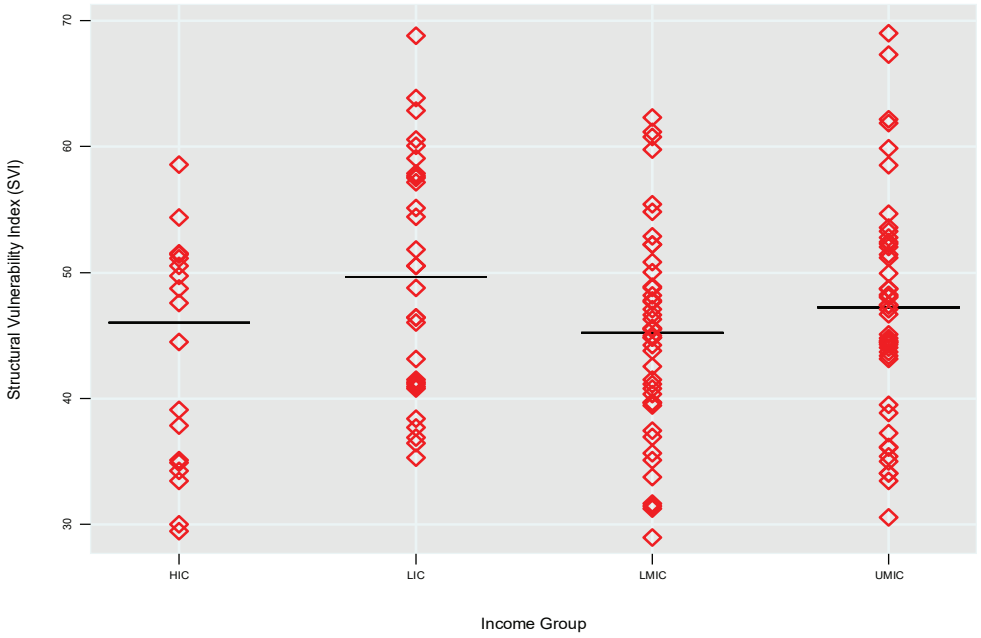


Figure 19: The RI for the 138 countries in 2018

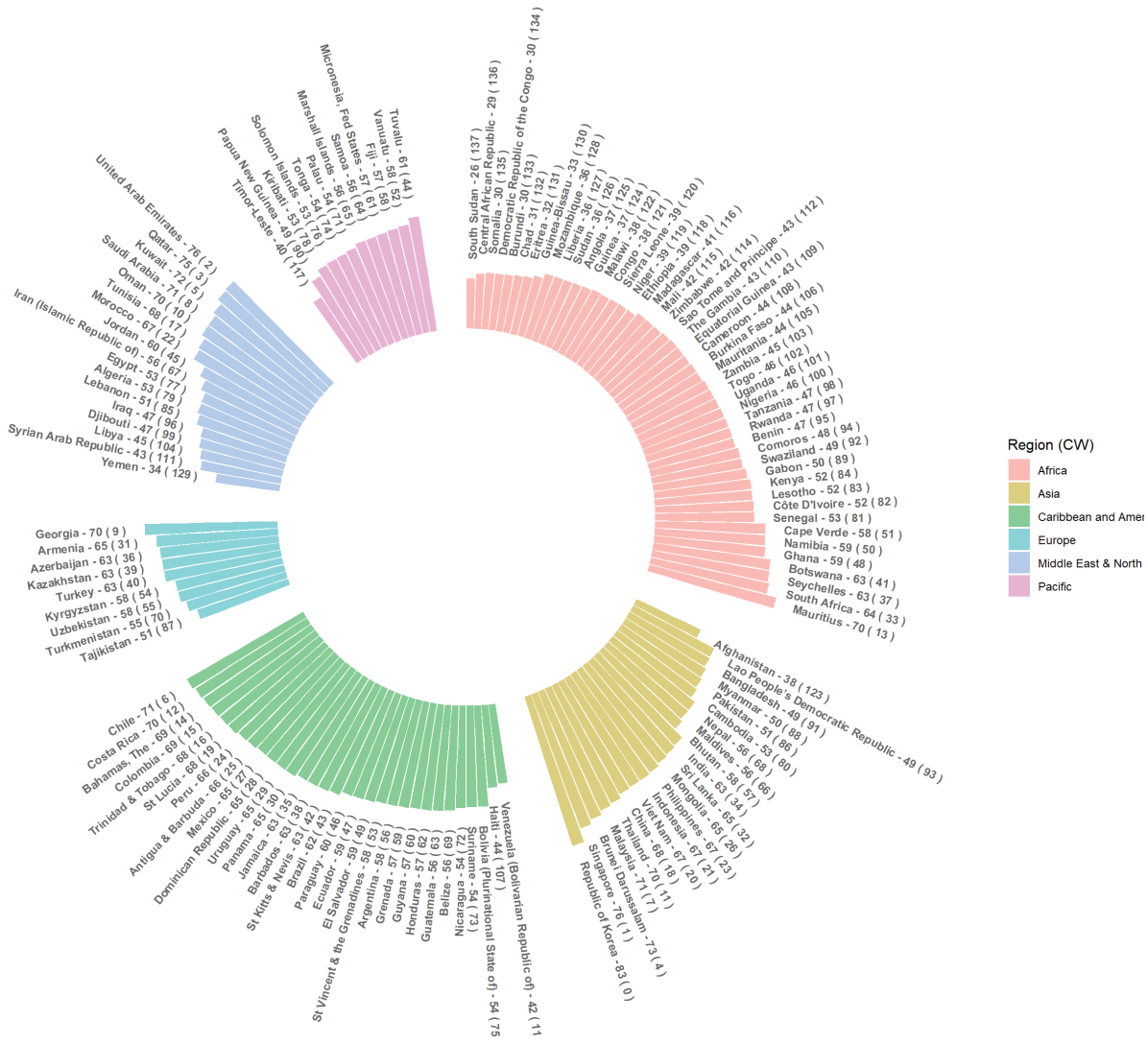


Figure 20: The SVI ranking of Commonwealth countries in 2018

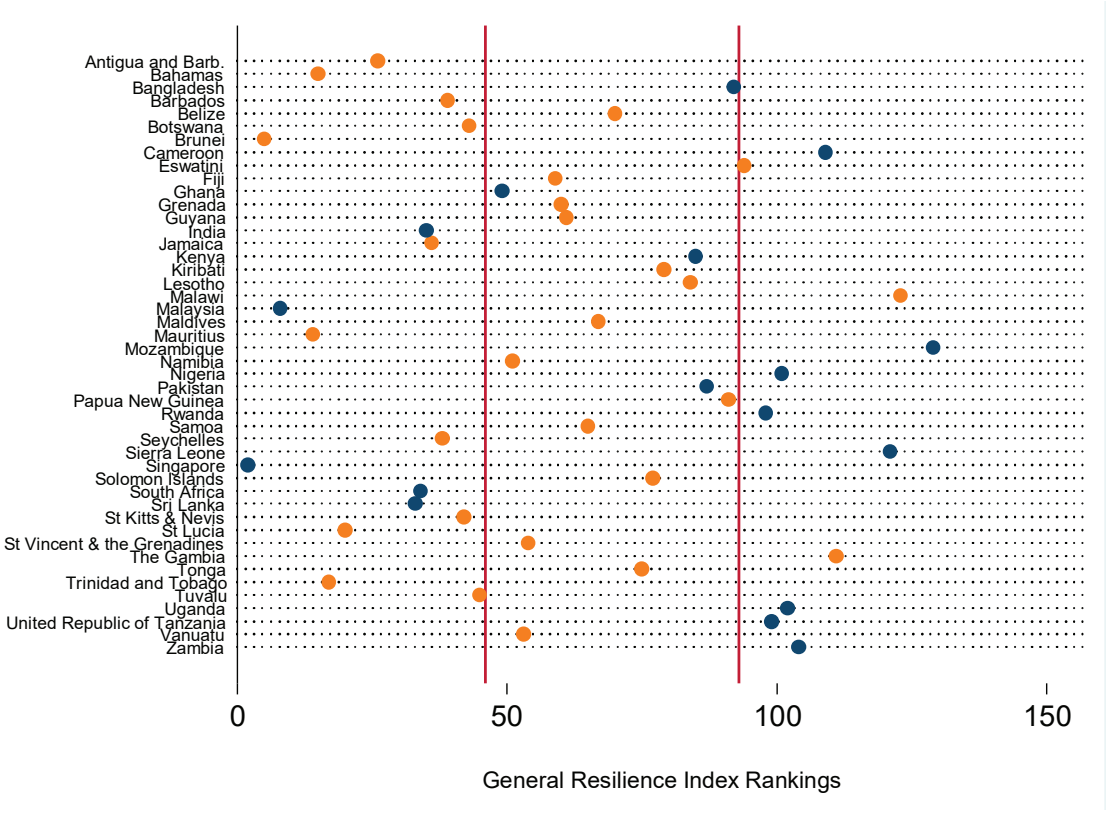


Figure 21: The ranking of countries by median RI and income group

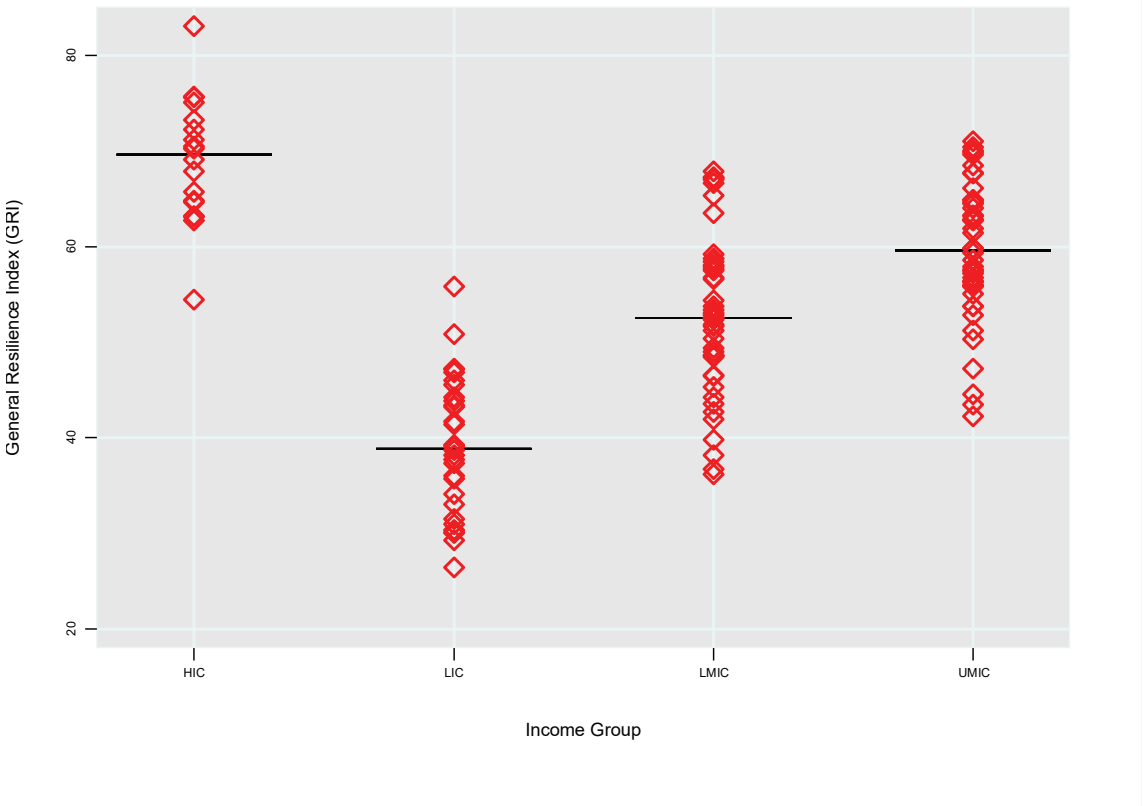


Figure 22: The relative levels of vulnerability and resilience for the 138 countries in 2018

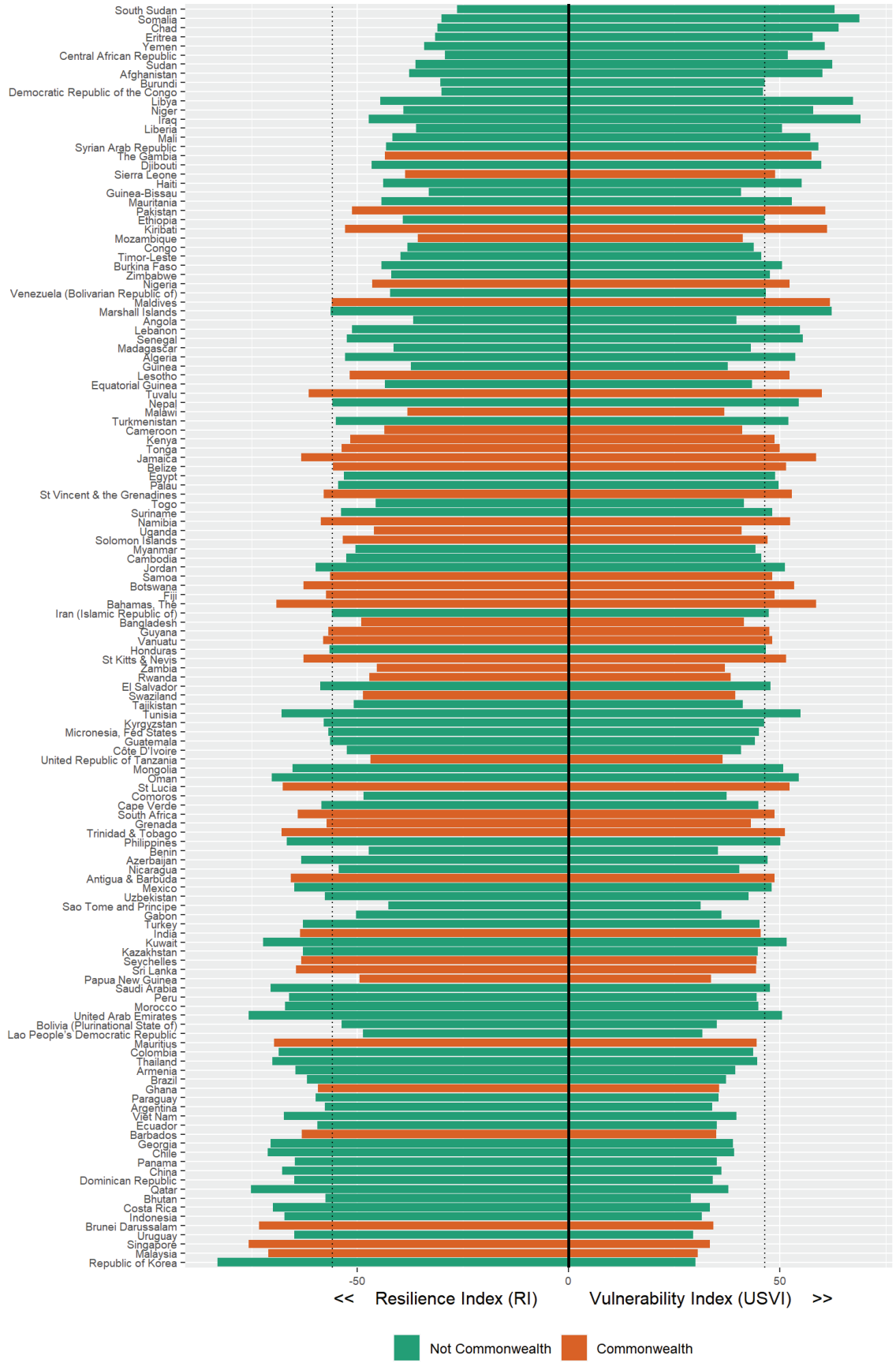


Table 3: Number of countries above the median value of each index in 2018 by category

	SVI	SVRI	UVI
Category			
Commonwealth members (46)	26	29 (30)	29 (25)
Commonwealth small states (23)	17	16 (14)	17 (12)
SIDS (34)	21	22 (20)	23 (18)
LDCs (47)	25	35 (40)	34 (38)

Note: Number of countries obtained using the additive (method 2). The number of countries obtained using the first method (multiplicative) is in parenthesis.

Vulnerability and Resilience gathered and compared

Figure 22a and 22b below provide a visual way to conceptualize the relationship between vulnerability and resilience. For figure 22a, countries are ordered according to the values of the UVI. The most vulnerable countries are displaying high structural vulnerability and low resilience, and at the bottom of that figure, one can find countries with low structural vulnerabilities and high resilience levels. Countries such as Afghanistan or Democratic Republic of the Congo display median values of structural vulnerability but their resilience is so low that even a relatively small exogenous shock can have devastating consequences on sustainable development. It is the opposite situation of some small states for which their structural vulnerability is among the highest in the world but where structural and non-structural factors allow coping with most adverse exogenous shocks, more adequately. However, if the shock is very severe or extreme, such as a category 5 hurricane, the consequences for development as evidence has shown, can still be devastating.

Another striking visual aspect derived from figure 22a (relying on the ratio of SVI to SRI for measuring SVRI) above is the relative homogeneity of the Commonwealth member category highlighted in orange[2]. Most of them display medium values of UVI and are often characterized both by high structural vulnerability and high resilience levels.

By being highly structurally vulnerable and relatively well governed at the same time, Commonwealth countries would gain significantly from the introduction of a vulnerability index such as a SVRI in a performance and vulnerability based allocation formula (where governance is taken into account separately).

Mapping Structural Vulnerability and Lack of Resilience, either global or only structurally

Comparing Figures 23 and 24[3], the role of non-structural resilience or governance for Commonwealth members is illustrated further. If only the structural part of resilience is taken into account, a larger share of Commonwealth member countries displays above median value of SVRI_1. Commonwealth member countries, and notably small states, are highly vulnerable but relatively well-governed countries (see also Figure A7 in appendix).

Evolution the UVI over time

The UVI framework was designed with the clear objective to produce indicators that could be computed each year while remaining consistent in its structure to allow for time comparison. That property allows us to analyze how vulnerability and resilience has evolved since 2010. As explained above, being structural in nature the UVI (1 and 2) should vary only slowly overtime. Over the whole sample, this property is confirmed

2 The Gambia, Sierra Leone, Pakistan, Kiribati and Mozambique are among the thirty most vulnerable countries in 2018 according to the UVI_1 (see figure A6a & A6b in appendix). Alternatively, The Gambia, Pakistan, Kiribati, Maldives, Nigeria, Tuvalu are among the thirty most vulnerable countries in 2018 according to the UVI_2.

3 If we separate the whole sample of 138 developing countries in two sub-sample according to the median of UVI_1 (figure 16) or SVRI_1 (figure 17) represented by the red lines, it appears that most Commonwealth states display UVI_1 values above the median of the sample in 2018. The ranking is even clearer when considering SVRI in figure 17.

Figure 23: Vulnerability and Resilience of Commonwealth member countries in 2018

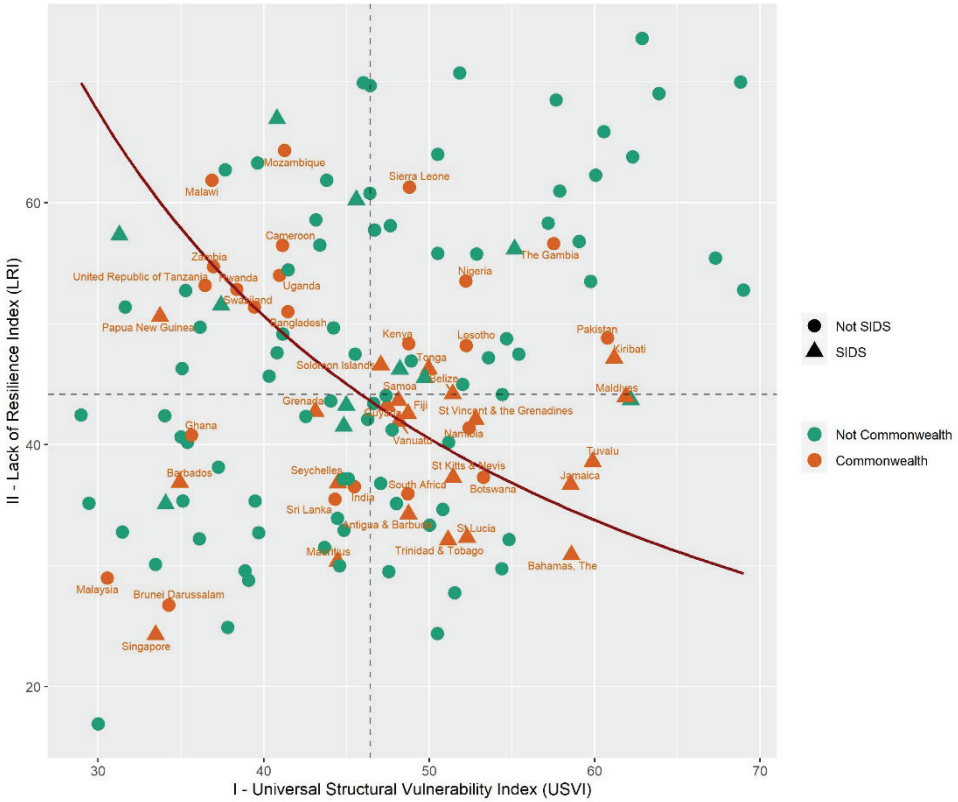


Figure 24: Vulnerability and Structural Resilience of Commonwealth member countries in 2018

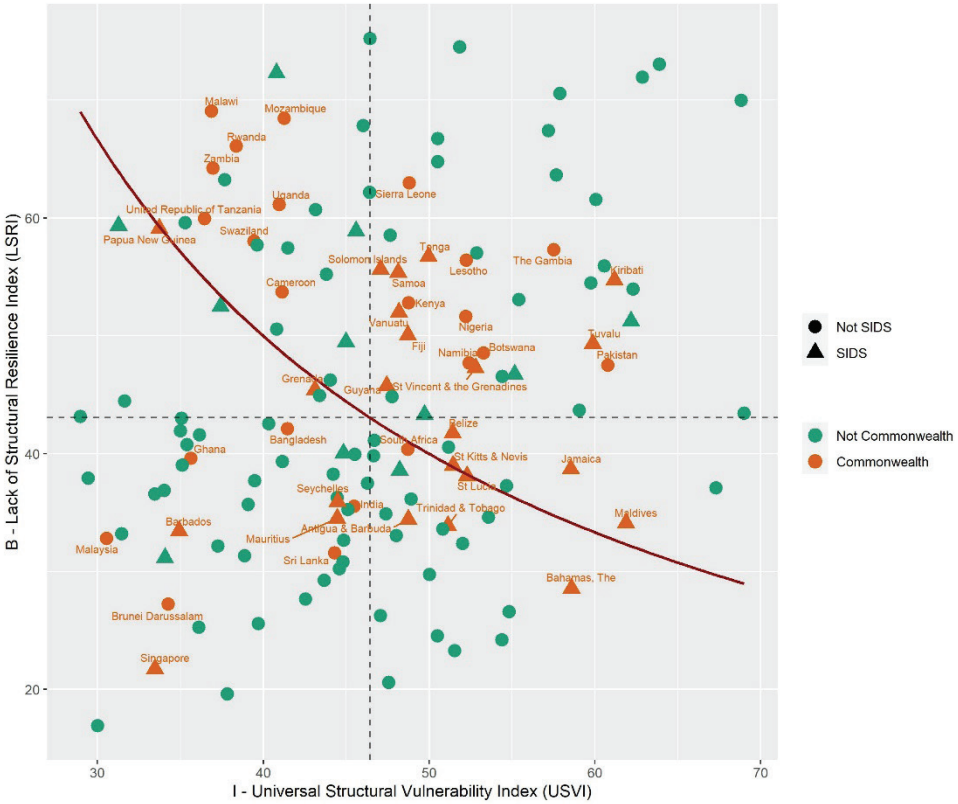


Figure 25: Evolution of UVI_1 by regions over the period 2010-2018

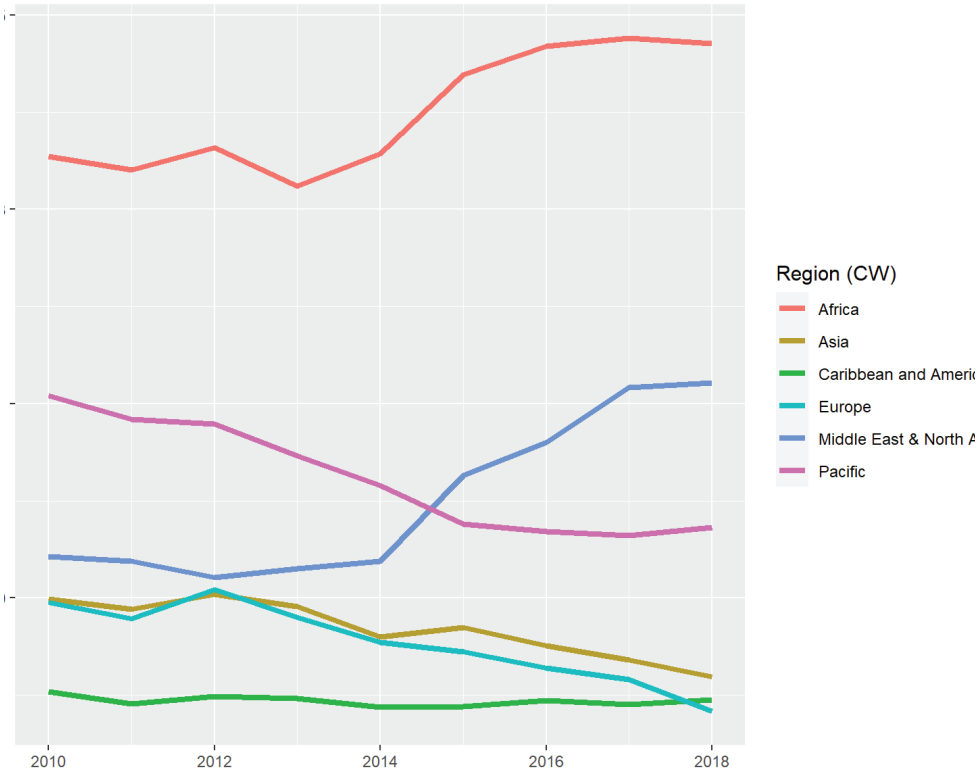


Figure 26: Evolution of the SVI by regions over the period 2010-2018

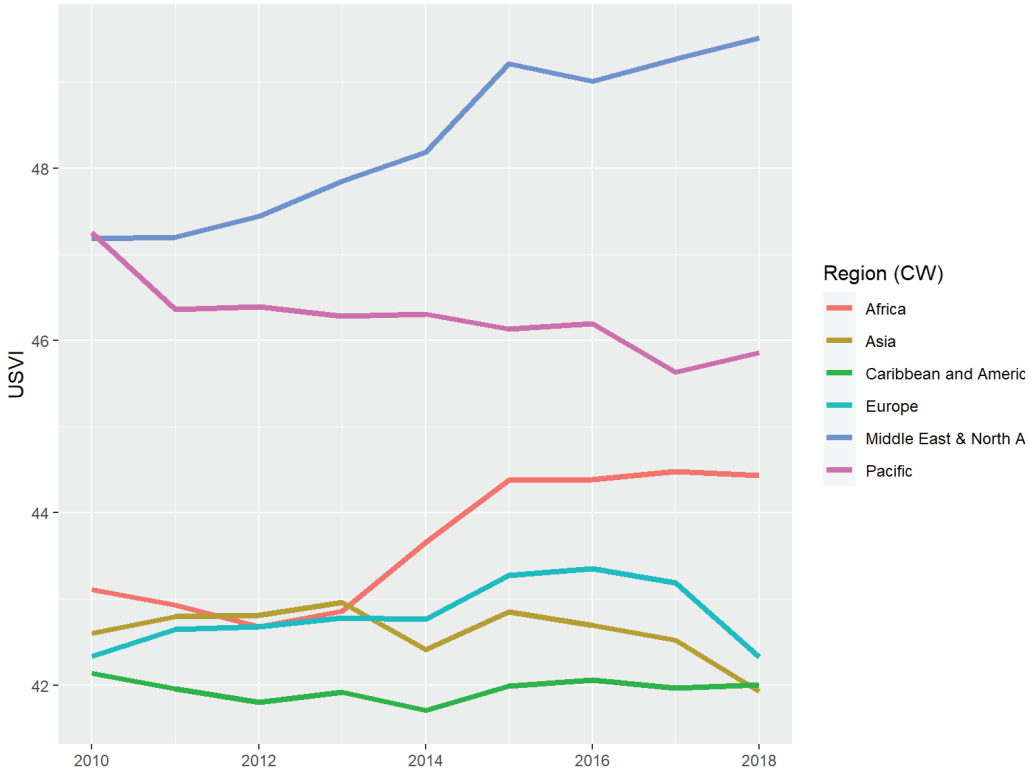
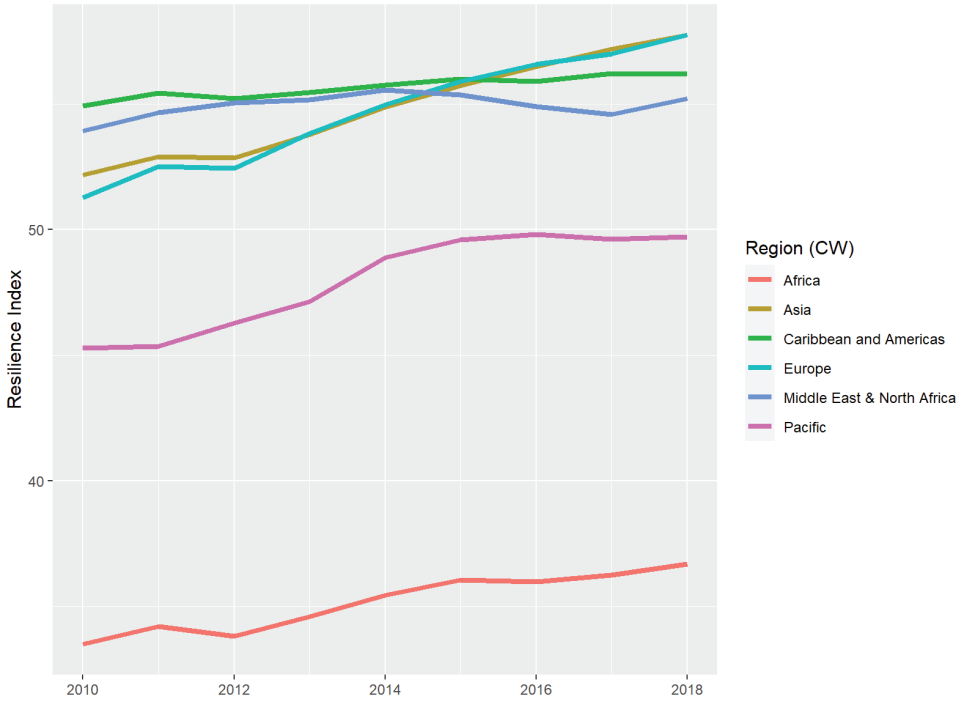


Figure 27: Evolution of the RI by regions over the period 2010-2018



and we only see very limited time variation on average (see figure A8 in appendix). However, some specific variations are clearly visible for some countries and groups of countries.

Figure 17 displays the evolution of UVI across regions over the period 2010-2018[4]. Evolutions, albeit limited in magnitude, appear to be heterogeneous across regions with rising average levels of vulnerability in Africa and the Middle East and decreasing levels in the Pacific, Asia and Europe. The vulnerability of Caribbean and Americas region appears to have remained low on average even if the Europe region became the least vulnerable region in 2018.

As UVI is the ratio of structural vulnerability over resilience, a rise in UVI can be caused by increasing vulnerability levels or decreasing resilience. Figures 18 and 19 show that both factors played a role over the period. Vulnerability of the Pacific and Middle East regions sharply diverged over the period driven by increasing socio-political vulnerability levels in Syria, Iraq or Yemen. A significant rise in vulnerability can also be seen for sub-Saharan Africa, again due to rising violence levels, notably in the Sahel region (see figure A9 for the detail of each component of vulnerability). Vulnerability in the Pacific region remained stable over the period. However, resilience and more precisely non-structural resilience rose sharply on average in the Pacific region (see figure A10 for the detail of each component of resilience) accounting for the effort of those countries to strengthen the management of their structural vulnerabilities. It is also interesting to note the stable rise of structural resilience across most regions between 2010 and 2018 evidencing the slow moving nature of this component.

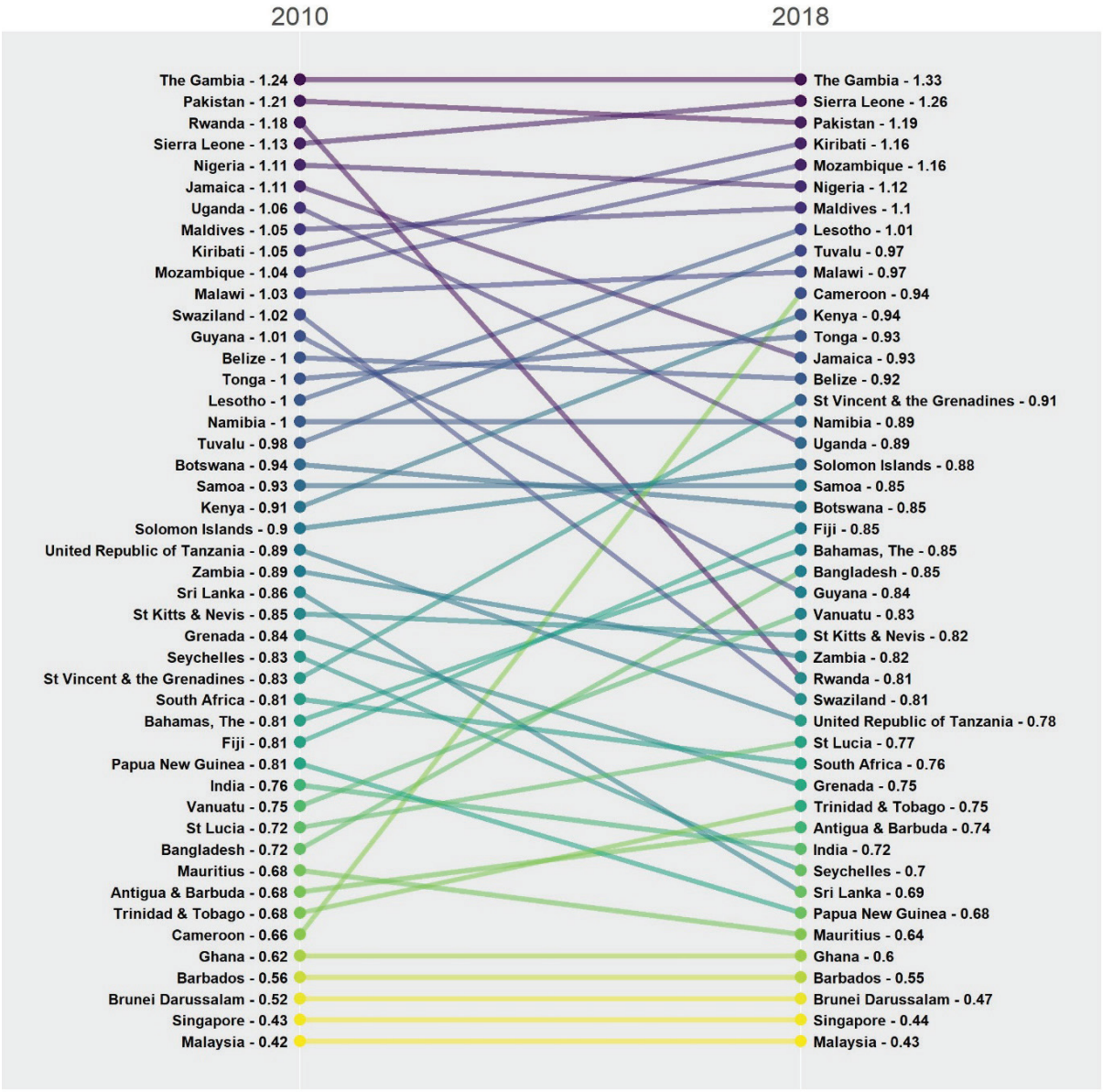
Evolution the UVI over time among Commonwealth member States

Figure 29 shows the variations in value of the UVI and ranks among Commonwealth member countries between 2010 and 2018.

Most countries remain stable over the period, which illustrates the structural and slow moving nature of vulnerability. However, for some countries and notably Cameroon, vulnerability deteriorated sharply over the last decade due to a combination of an increase in SVI and a decrease in RI (see figures A11 and A12). Alternatively, the situation of Rwanda improved significantly.

4 UVI_2 displays a similar pattern.

Figure 28: Evolution of the UVI for Commonwealth members between 2010 and 2018

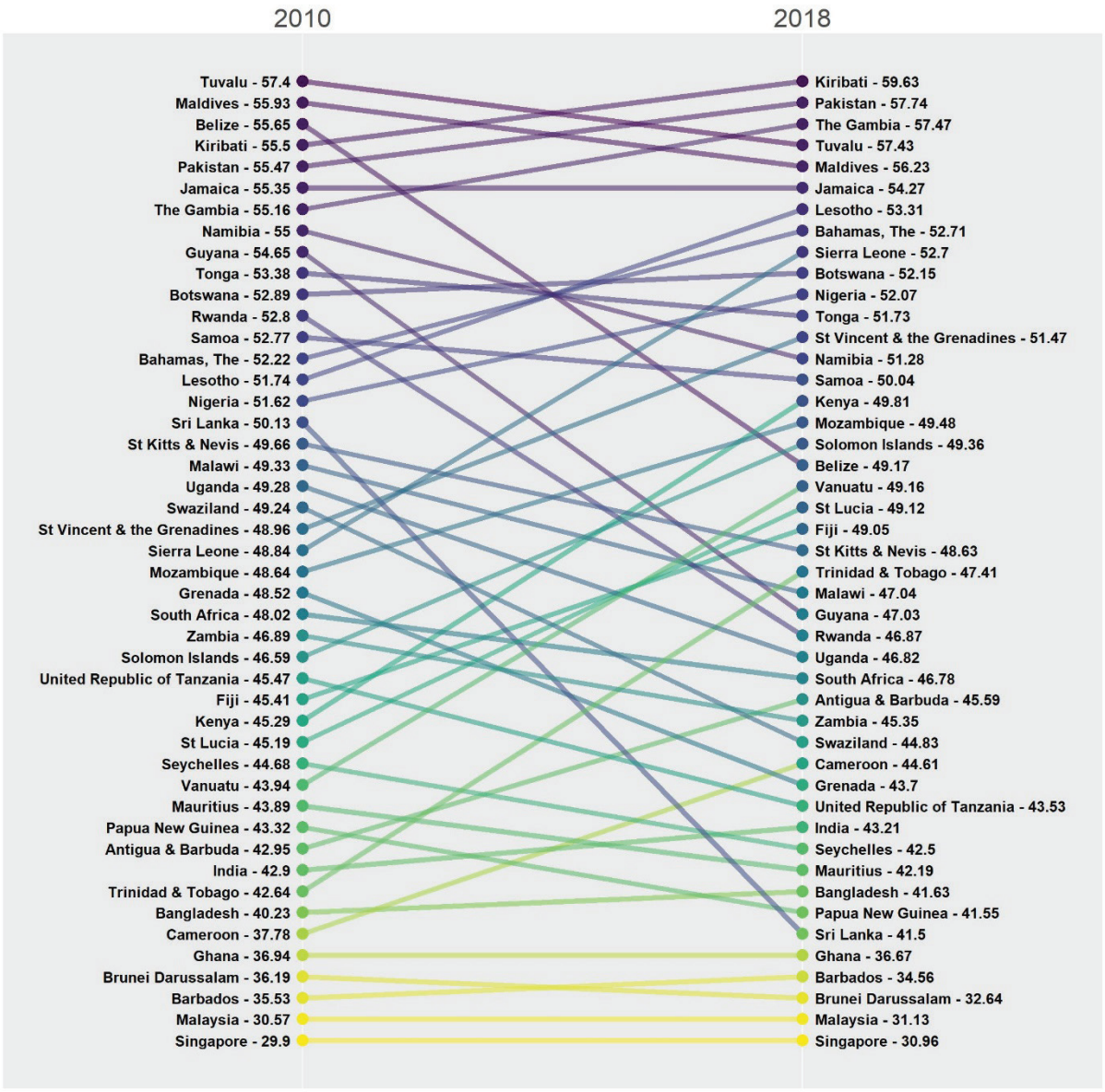


Note: Commonwealth member States are ranked each year according to the SVRI_2. An increase in the ranking of any individual country does not necessarily imply a positive variation of SVRI_2.

Note: Commonwealth member countries are ranked each year according to the UVI_1. An increase in the ranking of any individual country does not necessarily imply a positive variation of UVI_1.

Another important factor to analyze is the evolution of SVRI that could be used directly for aid allocation. Year to year variation of the index at the individual level would mean higher or lower relative shares in total available funds. As shown in figure 21, Rwanda is still one of the countries for which its vulnerability has decreased the most over the period but other countries such as Sri Lanka or Belize have also improved significantly. However, many small states have seen their structural vulnerability ranks rise over the same period, notably due to the increasing frequency of natural shocks.

Figure 29: Evolution of the SVRI for Commonwealth members between 2010 and 2018



Conclusion

Addressing vulnerability requires the identification of sources of vulnerability, including a conceptual clarification with respect to its broadening scope. Since a country's vulnerability is its risk of being affected by exogenous events, it can be evidenced by the impact on economic, environmental, or socio-political variables. To be "*universal*", an index should capture the full list of developing countries whilst "*multidimensionality*" requires incorporation of these three main areas of vulnerability.

An important feature of the multidimensional index is the aggregation of components that illustrate the various dimensions of vulnerability through a *quadratic average*, so that more weight is given to the components reflecting higher vulnerability. In this way, the vulnerability of each country is measured according to its specificity.

Another important characteristic of the index is the combination of *structural vulnerability*, which depends on long-lasting or structural factors beyond the immediate control of a country, and *resilience*, which depends both on structural factors and on the country's policies. Only structural factors, as measured by an appropriate index, are put forward for consideration in decisions around the allocation of concessional resources to vulnerable countries (partly in place of or alongside other traditional development aid criteria). Nevertheless, all factors are to be considered for guiding policies to reduce vulnerability and monitoring their impact.

The report proposes a conceptual framework for a Universal Vulnerability Index, which is comprised of several parts, corresponding to the expected uses. The main measurable concepts retained are:

1. The *Universal Vulnerability Index (UVI)* relies on three indices of structural vulnerability (economic, climate change, and socio-political) and on the two components of the Resilience Index (RI), that are the Structural Resilience Index (SRI) and the Non-structural or Policy Resilience Index (NSRI).
2. The (Universal) *Structural Vulnerability and Resilience Index* (SVRI) relies on the three indices of structural vulnerability and the index of structural resilience. The SVRI is the appropriate index to be used as a criterion for access to development finance, except if the structural resilience is taken into account separately.
3. The (Universal) *Structural Vulnerability Index* (SVI) relies only on the three structural vulnerability indices: a new *Economic Vulnerability Index to External and Natural shocks* (EVI/ENS or EVENSI), the *Physical Vulnerability to Climate Change Index* (PVCCI), and the *Socio-political Vulnerability to Domestic Violence* (IVI): The SVI reflects the core of the structural vulnerability in its three main dimensions; it is another potential criterion for aid allocation.

According to the Universal Vulnerability Index (UVI), the largest number of highly vulnerable countries are located in sub-Saharan Africa, where most low-income countries (LIC) and a large proportion of the Least Developed Countries are located. According to the UVI, 25 of the 30 most vulnerable countries are LDCs. This is consistent with the fact that there are some conceptual and statistical overlap with the UN-CDP indicators of LDCs.

On the contrary, with regards the Structural Vulnerability and Resilience Index (SVRI), which relies on all the structural components of the UVI, many SIDS and Commonwealth members appear in the more vulnerable proportion of developing countries: The index of 22 SIDS (out of 34) and 29 (out of 46) Commonwealth member countries and 35 (out of 47) LDCs is above the median value of SVRI in 2018.

According to the Structural Vulnerability Index (SVI), which relies only on the three structural vulnerability indices, many small states and Commonwealth members still appear to be among the more vulnerable developing countries: the index of 21 SIDS (out of 34) and 26 Commonwealth member countries (out of 46) is above the median SVI value (in 2018). This is notable due to their high economic vulnerability and very high vulnerability to climate change. Thus the UVI provides a comprehensive understanding of structural vulnerabilities, as well as structural an non-structural resilience of countries.

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Appendix

Annex A1: The current Commonwealth framework.

The Vulnerability-Resilience framework (Briguglio *et al.*, 2009) updated in 2014 measures risk of being harmed by external economic shocks as vulnerability minus resilience. It allows classifying countries across the two dimensions, similarly to other indices such as the ND-GAINS index of Notre-Dame University. For the commonwealth EVI, vulnerability reflects only exposure to external shocks. Resilience is a broader index reflecting the effectiveness of macroeconomic policies, institutional quality, health and education levels, etc. The resilience component is the main specificity of the framework compared to the Economic Vulnerability Index (EVI) of the Committee of Development Policy (CDP) of the United Nations or the Universal Vulnerability Index (UVI) of the Caribbean Development Bank (CBD).

Figure A1.1 : The Commonwealth vulnerability framework

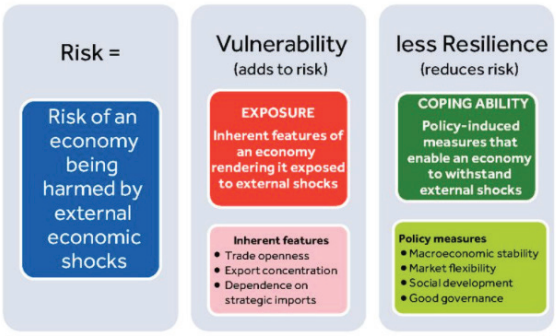
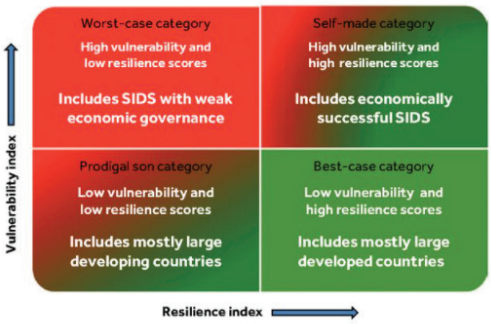


Figure A1.2 : The Vulnerability/ Resilience nexus



Source: Lewis-Bynoe, D. (dir. pub.) (2014), *Building the Resilience of Small States: A Revised Framework*, Commonwealth Secretariat, London

Annex A2: How to measure economic vulnerability? What does the literature say?

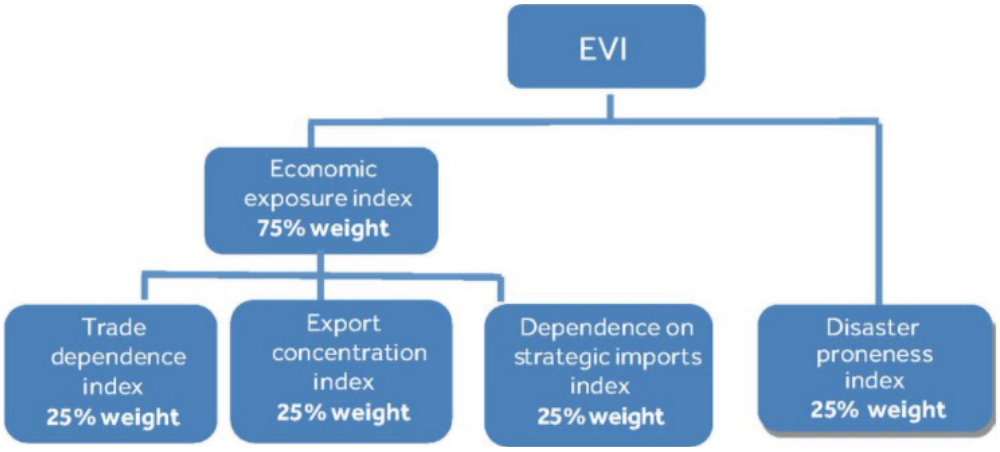
The Briguglio index (1995), which covers 114 countries and has 3 main components: (i) exposure to external economic conditions measured by ratio of imports and exports to GDP, (ii) remoteness and insularity as measured by the ratio of transport and freight costs to export earnings, (iii) the propensity of natural disasters as measured by the ratio of value the damage caused by disasters relative to GDP. In 2007, the author modified the index by adding 3 new variables (concentration of exports, dependence on strategic imports, and dependence on external sources of financing) while excluding the variable for the propensity of natural disasters. Briguglio and Galea (2003) have since proposed another index of economic vulnerability for 117 countries (including 23 small states). Their index uses 4 components: economic openness (share of exports and imports over GDP), dependence on a very narrow range of export products, dependence on strategic imports (average imports of energy as a percentage of national energy production), remoteness (ratio of freight and transport costs over trade revenues).

The current Commonwealth EVI framework is based on those various iterations and is presented in further details in figure 3 below. Vulnerability is mostly viewed only as an issue of exposure to trade shocks. Its original scope was only on imported instability through international shocks (mostly international commodity prices). The 2014 update incorporates natural shocks (damages). It became an economic and environmental vulnerability index.

This new index has several issues which do not allow its use directly into our framework:

- It does not take into account the intensity of the shocks.
- It does not take into account the impact of environmental shocks on agricultural production.
- It does not take into account the level of exposure to environmental shocks.

Figure A2.1: The Commonwealth updated economic vulnerability index



Source: Lewis-Bynoe, D. (dir. pub.) (2014), Building the Resilience of Small States : A Revised Framework, Commonwealth Secretariat, London

Over the period 1999-2000, the UN Committee for Development Policy decided to use a vulnerability indicator for LDC identification. When looking at the available indicators it was decided not to retain the Briguglio index for the same reason that it should not be used for aid allocation (see Guillaumont, 2009). Indicators from other sources were also reviewed and discarded for identification process of LDCs in part for the same reason (Atkins et al., 1998, 2000)[1]. Other authors have since proposed vulnerability indices that suffer from the same caveats[2].

The only index designed in accordance with the required properties (structural index without redundancy compared to the other variables included in the formula) is the Economic Vulnerability Index (EVI) established by the Committee for Development Policy (CDP) of the United Nations as one of the three criteria for identifying LDCs. As LDCs are defined as poor countries with high structural handicaps, the EVI was designed to reflect truly exogenous factors.

The EVI was originally designed in 2000, revised in 2005 for the CDP's 2006 triennial review of the list of LDCs, unchanged during the 2009 review, and then slightly revised in 2011 for the 2012 review[3]. Since 2005, the EVI has consisted of a simple average of two sub-indices, reflecting respectively the exposure to exogenous shocks and the magnitude of these shocks, each sub-index being a weighted average of several components.

The index used from 2005 to 2009 had 7 components:

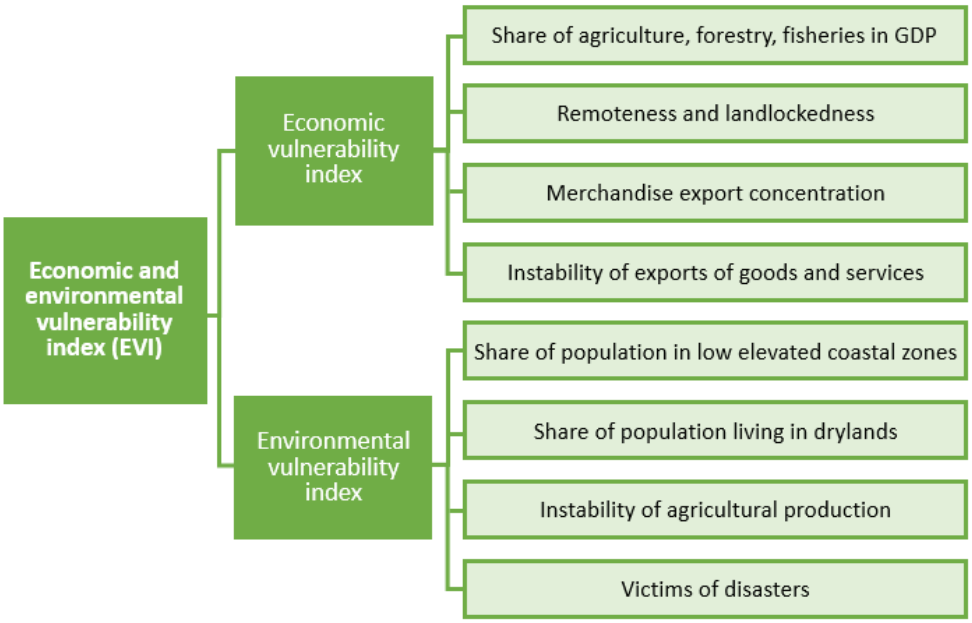
- 4 components for exposure to shocks: size of the population, distance from world markets, concentration of merchandise exports, share of agriculture, forestry and fisheries in GDP.

1 Atkins et al consider the volatility of GDP as a sign of economic vulnerability. To build their index, they regress the volatility of GDP on 3 explanatory variables: economic openness (measured by the percentage of exports of goods and services over GDP), lack of diversification of exports, impact of natural disasters (measured by the proportion of the population affected by such events). The final index is an average of the 3 explanatory variables weighted by the coefficients obtained from the regression. The index covers 111 countries.

2 Turvey (2007) assesses countries economic vulnerability by their exposure to human and physical risks as well as the risks and dangers that may arise over time and the geographical context. 4 indicators are used by Turvey: (i) a "coastal" indicator measuring the risk of flooding, (ii) a "remoteness" indicator measuring remoteness and insularity, (iii) an urbanization indicator expressed as the proportion of the population living in urban areas, (iv) an indicator capturing natural disasters _expressed as the percentage of the population affected by natural disasters. Vulnerability due to external economic shocks is not taken into account, however some indicators cut across it. Barrito (2008) proposes an index of vulnerability to external economic and financial shocks called "GVI" (Geographic Vulnerability Index). Barrito tries to estimate the negative impact of natural disasters on economic growth from the ratio of the value of economic losses to net capital formation.

3 See history and comments in Guillaumont 2009a, 2009b, 2015a, 2015b, 2017). This index was recommended by the United Nations General Assembly as a criterion for aid allocation (as well as the other two criteria for identifying LDCs)

Figure A2.2: The UN-CDP EVI (as revised 2020)



Source: UN-CDP

- 3 components for magnitude of shocks: percentage of homeless people due to natural disasters, instability of agricultural production, instability of exports of goods and services[4].

Two changes were made in 2011. Firstly, the definition of one of the components relative to natural hazards was changed by replacing the displaced (homeless) population share due to natural disasters by the share of the population affected by these disasters, which is a broader but vaguer concept. Although the change may seem minor, especially since both indices come from the same source (Emergency Disaster Database (EM-DAT)), it appeared to be a significant change, as indicated by a very low rank correlation (23%) between the two versions of the component (Cariolle, Goujon and Guillaumont, 2015).

A second, conceptually significant modification was to include among the components relative to exposure a "climatic" component - the risk associated with sea level rise - as measured by the share of the population living in Low Elevation Coastal Zones (LECZ), and also reducing the weighting of population size in the sub-index. These changes were a problem for a straightforward reason. The introduction of this single climatic component, unbalances the EVI indicator to the detriment of countries facing other climatic risks, such as the risk linked to desertification[5]. Therefore, in order to keep this climatic component in the exposure sub-index, the introduction of the share of arid lands in the total country area should also be considered. As a result, the specific vulnerability of West Africa and the Sahel countries, as well as of countries such as Botswana and Eritrea, would be captured alongside that of small island states.

To address this issue and to attempt clarify the index, the last revision of the UN CDP EVI no longer differentiates between shocks and exposure but rather tries to disentangle economic vulnerability from environmental vulnerability. Taken together both vulnerability now represent economic and environmental vulnerability.

This new index has several issues which do not allow its use directly into our framework:

- It does not take explicitly into account openness to trade.
- Remoteness is not sufficient to proxy for openness (now that population size is gone).

4 The raw data are drawn from different databases (Emergency Disaster Database (EM-DAT) of the Center for Research on the Epidemiology of Disasters (CRED) in collaboration with the WHO, and the World Bank's World Development Indicators database).

5 We have quantified the impact of the change made in 2012 by the CDP to the rank of various types of country with regard to the index: Landlocked countries from the Sahel, but also some small mountainous island states would be classified as less vulnerable (Guillaumont, 2014).

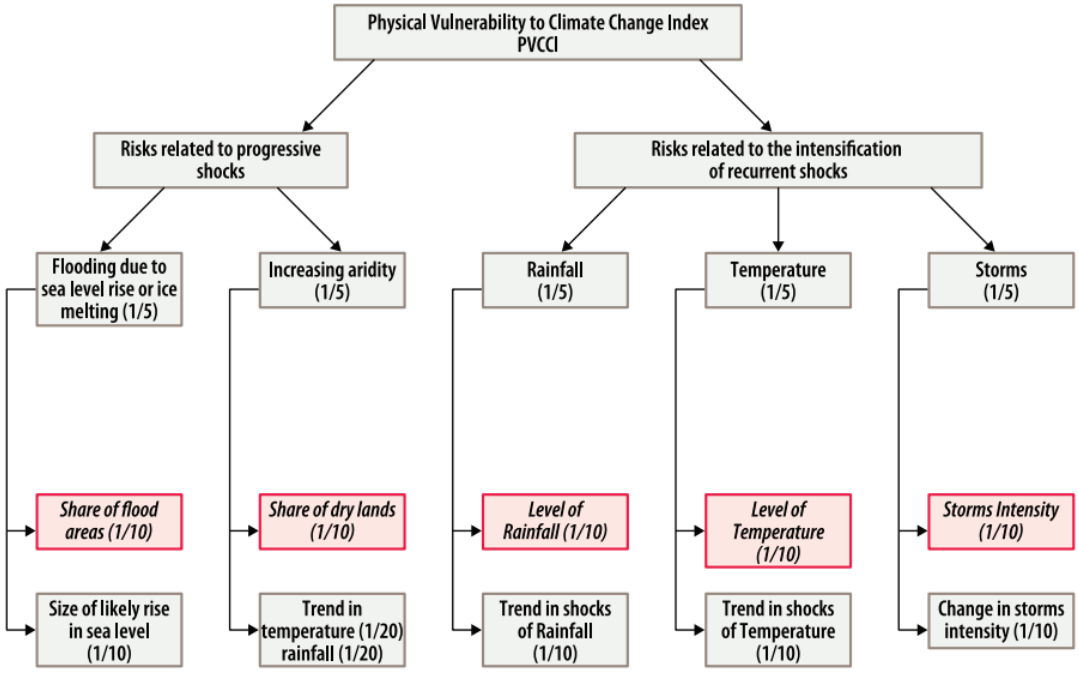
- It does not take into account services (tourism) in the concentration index, or the remittances.
- It includes data on the number of people « affected » by natural disasters per capita. While being widely used, the ambiguity in the definitions and the different criteria and methods of estimation of the number of "affected people" produce vastly different numbers, which are rarely comparable.

Annex A3: Vulnerability to climate change: What does the literature say?

Many indices have been developed following growing awareness of the phenomenon of climate change: Disaster Risk Index (UNDP, 2005), Natural Disaster Hotspots (Dilley et al, 2005), Predictive Indicator of Vulnerability (Adger et al, 2014), Social Vulnerability Index (Cutter et al, 2003), Climate Vulnerability Index (Sullivan et al., 2005), *Quantitative Assessment of Vulnerability to Climate Change* (ICRISAT, 2009), *ND-GAIN Country Index* (Notre Dame Global Adaptation Initiative , University Notre Dame). Most of these indices are constructed at the country level, allowing for cross-country comparisons. The principle behind these indicators of vulnerability to climate change[6] is based on the definition of vulnerability by the Intergovernmental Panel on Climate Change (IPCC). According to the IPCC, the vulnerability of a system depends on 3 essential components: exposure, sensitivity, and adaptability. Schauser et al (2010) highlight the difficulty of disentangling these 3 aspects, because of the overlap between sensitivity and adaptability. These indices do not meet the required conditions mentioned above to be used for aid allocation, in particular due to the fact that they include components that depend on the policy of the government of developing countries, or the effect of previous policies and/or that are redundant with respect to other variables in the allocation formula. Most available indexes are composite and integrate a wide range of variables, combining the physical, social, economic, and political dimensions of vulnerability. Cutter et al (2003) developed the "Social Vulnerability Index" from 42 socio-economic variables (age, race, ethnicity, education, family cohesion, etc.). Wongbusarakum and Loper (2011) focus only on the social aspect of vulnerability using 10

6 European Environment Agency, UK Department of Environment, Food and Rural Affairs, United Nations Framework Convention on Climate Change.

Figure A4.1: The Physical Vulnerability to Climate Change Index (PVCCI)



Notes: The boxes corresponding to last rows of the graph respectively refer to exposure components (red boxes, in italics) and to size of the shocks components.

indicators: an exposure indicator, a sensitivity indicator, and 8 indicators which reflect adaptive capacity, thus measuring the level of vulnerability to climate change of various communities. Their indicators reflect the households' subsistence level, the diversity of the sources of income, the ability of a society to reorganize after a shock, governance and leadership, equitable access to resources, etc. One of the most prominent indexes is the Notre Dame University "Notre Dame Global Adaptation Index" or "ND-GAIN". The index aggregates 14 indicators gauging the state of readiness of each country (rule of law, political stability, etc) and 36 vulnerability indicators (number of endangered species, dependence on natural resources, maternal mortality rate, etc). The final country score is the difference between the vulnerability score and the readiness score.

It is easy to see that these indices, because of the plethora of variables they contain and the blurred relationship between vulnerability and resilience they are based on, do not meet the conditions required to be used in our framework. They were not designed for this purpose. They also cannot be used as a criterion for the allocating concessional resources in general.

Annex A4: The Physical Vulnerability to Climate Change Index (PVCCI)

Exposure to shocks

1. **Share of flood areas**: Countries with a high proportion of flood areas are more exposed to increased rainfall shocks.
2. **Share of drylands**: Countries with a high proportion of drylands are more exposed to rising temperatures and scarcity of rainfall.
3. **Level of precipitation**: Low rainfall countries are more exposed to increased rainfall shocks.
4. **Level of temperature**: Very hot countries are more exposed to increased temperature shocks.
5. **Intensity of cyclones**: High levels of cyclone intensity imply high exposure to increases in intensity of future cyclones.

Intensity of shocks

6. **Risk of flooding due to sea level rise**: Ocean warming and melting glaciers increase the frequency and severity of floods. Hazard-prone areas are those located near sea level.
7. **Trends in rising temperatures and declining rainfall**: Rising temperatures and shortages of rain are one of the physical manifestations of climate change.
8. **Trend in increasing rainfall shocks**: Global warming is characterized by an increase in rainfall shocks and longer dry seasons.
9. **Trend in increasing temperature shocks**: Global warming is characterized by an increase in temperature shocks, with longer episodes of heatwaves.
10. **Trend in increased cyclone intensity**: The upward trend in cyclone intensity is one of the manifestations of climate change. Tropical cyclones increasing in intensity.

Annex A5: The current Commonwealth resilience framework

Resilience is a complex notion as reflected by the index. The first two sub-indexes tend to reflect policy outcomes and the quality of the regulatory framework which is non-structural in nature. The last sub index includes more structural aspect of resilience such as education and health but also institutional performance and the Environmental Performance Index (EPI) of Yale University which are less structural. The EPI measures environmental policies performance mostly through their results on the environment.

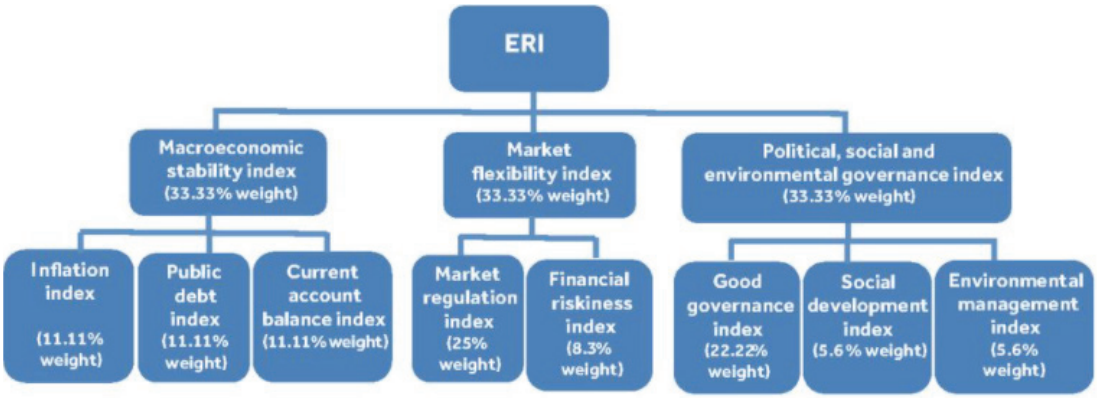
Annex A6: How to measure purely non-structural aspects of resilience?

Economic policy uses different instruments. Instruments and their use define the policy stance. The policy stance and its efficiency give the impact of the policy on economic outcome.

Exogenous structural features then affect economic outcomes in three ways:

- Directly.

Figure A5.1: The components of the Commonwealth's environmental resilience index (ERI)



Source: Lewis-Bynoe, D. (dir. pub.) (2014), Building the Resilience of Small States : A Revised Framework, Commonwealth Secretariat, London

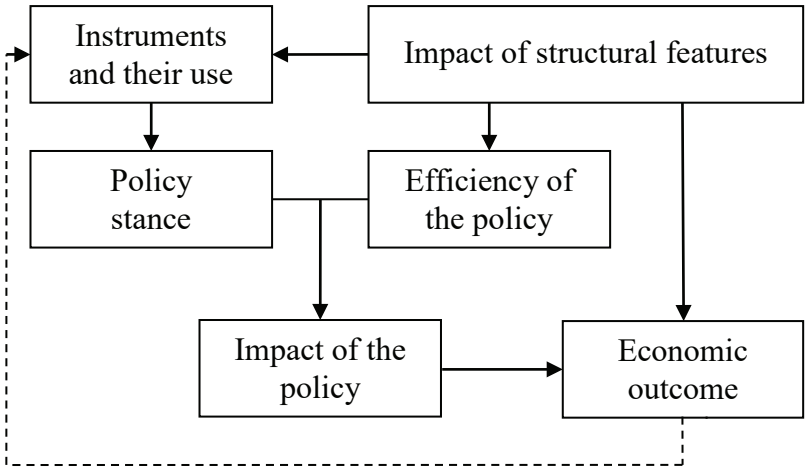
- Through the choice and the use of policy instruments by governments, so that policy stance is then partly induced by the nature and the level of structural features.
- Through the efficiency of the policy or the degree of "response" of the economy to policy actions. In other words, policy efficiency is partly function of structural features.

Policy stance, policy efficiency and its impact on outcome and the various impacts of structural features are not observable directly, so there is a need for synthetic indicators of policy. The construction of a policy indicator can then follow two directions:

- Through policy instruments (or policy stances), giving the instrument-based indicators.
- Through the impact of policy on outcome (policy stances associated with efficiency), giving the outcome-based indicators.

The two kinds of indicators may not generate the same diagnostic, the difference being explained mainly by policy efficiency, which should depend on the length of transmission channels between instrument use and outcomes. However, the difference between diagnostics is not systematic. First, instrument-based indicators may include efficiency in instrument

Figure A6.1: How to measure purely non-structural aspects of resilience?



Source: Goujon and Wagner in Guillaumont edr. (2019)

Figure A1: The UVI for the 138 countries in 2018 according to the second aggregating method (UVI_2)

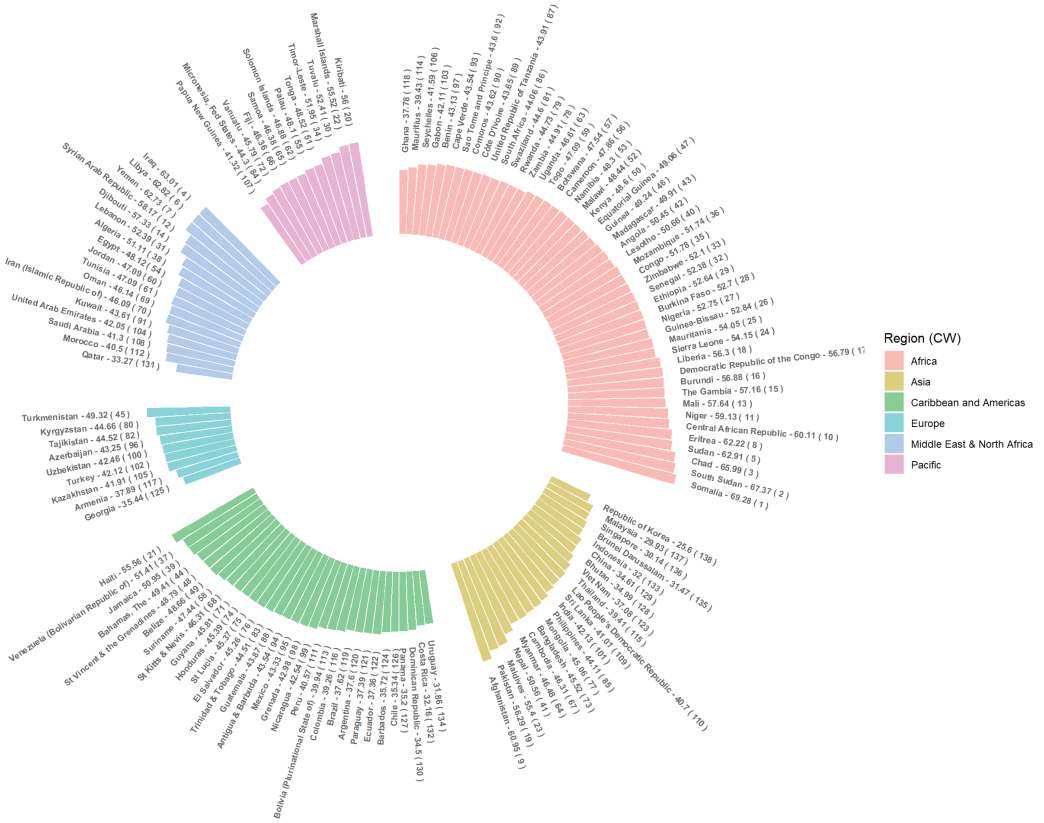
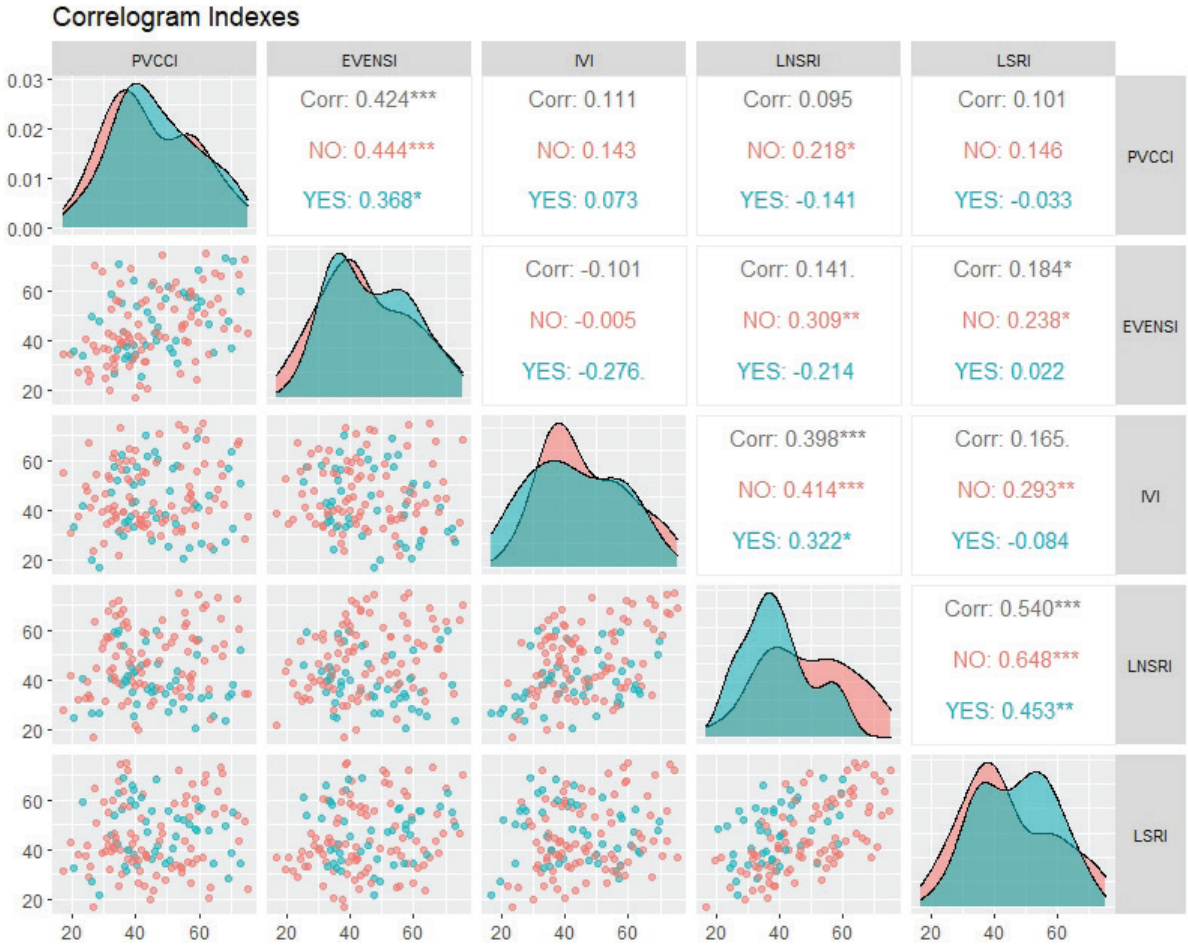


Figure A2: The UVI for the Commonwealth members in 2018 according to the second aggregating method (UVI_2)

Figure A3: Correlogram of the five indices



use. Second, outcome-based indicators may be approximated by intermediate policy outcomes instead of final outcomes.

There are no criteria to favor, a priori, one kind of indicator over the others. On one hand, instrument-based indicators require much work to gather data on the different instruments. They suffer from a high degree of subjectivity, since questions about policy instruments and the assessment of the changes can be ambiguous. In addition, it is difficult to compare all of the characteristics of policies between countries and to derive a quantitative and synthetic indicator. Moreover, arbitrariness is unavoidable when characteristics or instruments are aggregated to build a synthetic indicator. On the other hand, outcome-based indicators are influenced by exogenous factors and cannot represent policies alone.

We could turn to econometrics to regress the effect of structural vulnerabilities and structural resilience on the volatility of GDP growth. The residuals could then be interpreted as the revealed non-structural resilience. However, this particular methodology lead to a set of technical issues (specification, stability, etc.) that renders its use doubtful in this context.

This means we should rely on instruments when relevant. We could use a selective approach based on a census of instruments aimed at mitigating the effects of shocks. This approach comes with it own set of issues, namely:

- How to make sure that the list of instruments is really comprehensive using publicly available data?
- How to take into account the effectiveness in the use of those instruments?

Alternatively, we could use a global approach relying on readily available indicators of policy performance. The Country Policy and Institutional Assessment (CPIA) of the World Bank, AfDB and AsDB could be used, but their coverage is not large enough.

Figure A4: The components of SVI on the map in 2018, according to the quintiles of each component

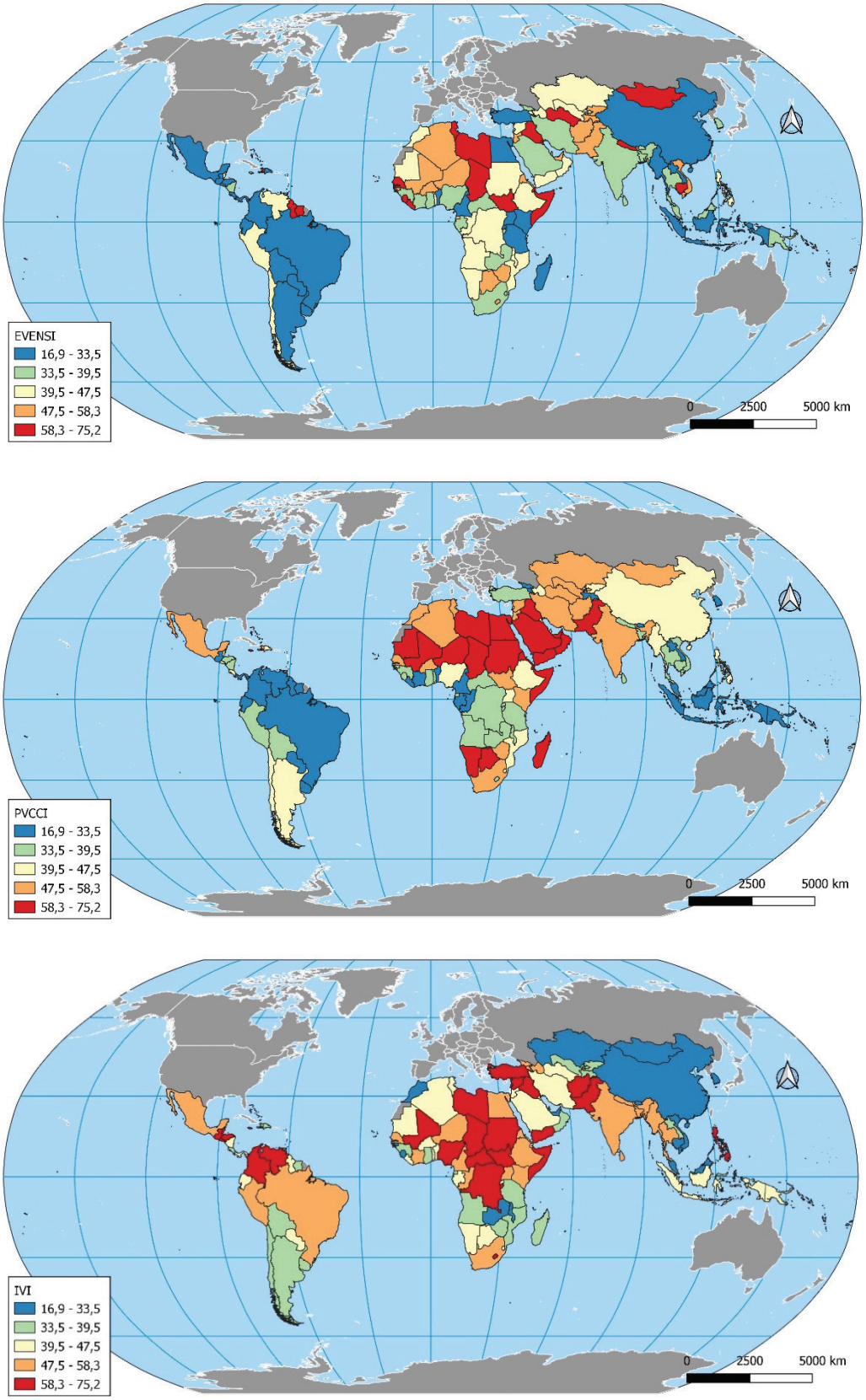
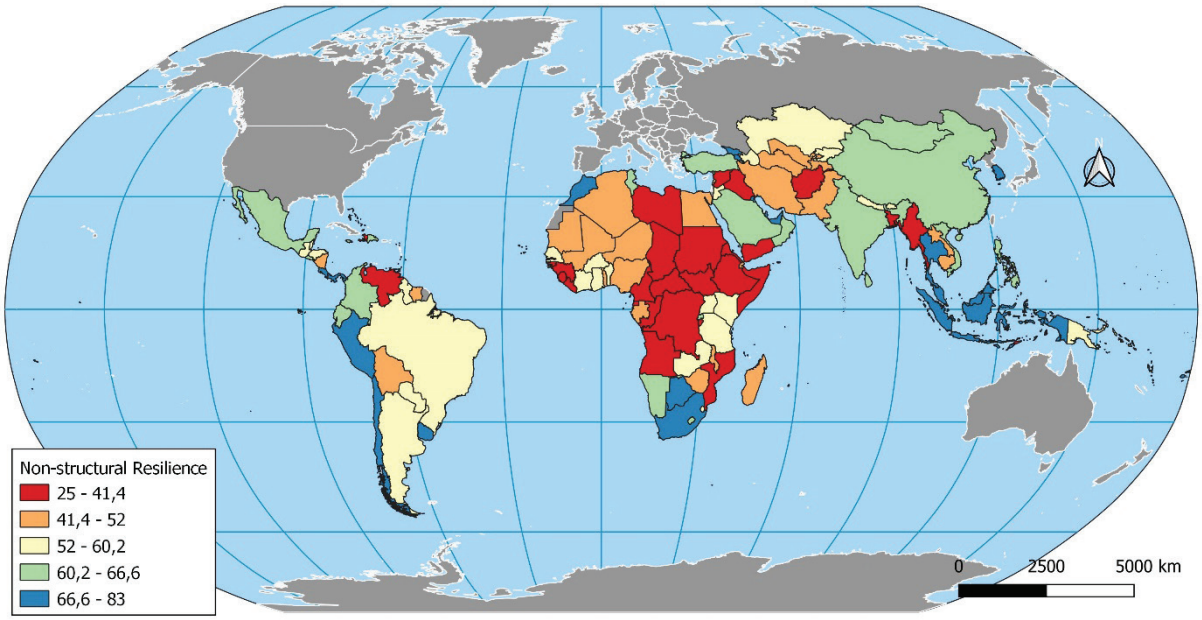


Figure A5: The components of RI on the map in 2018, according to the quintiles of each component



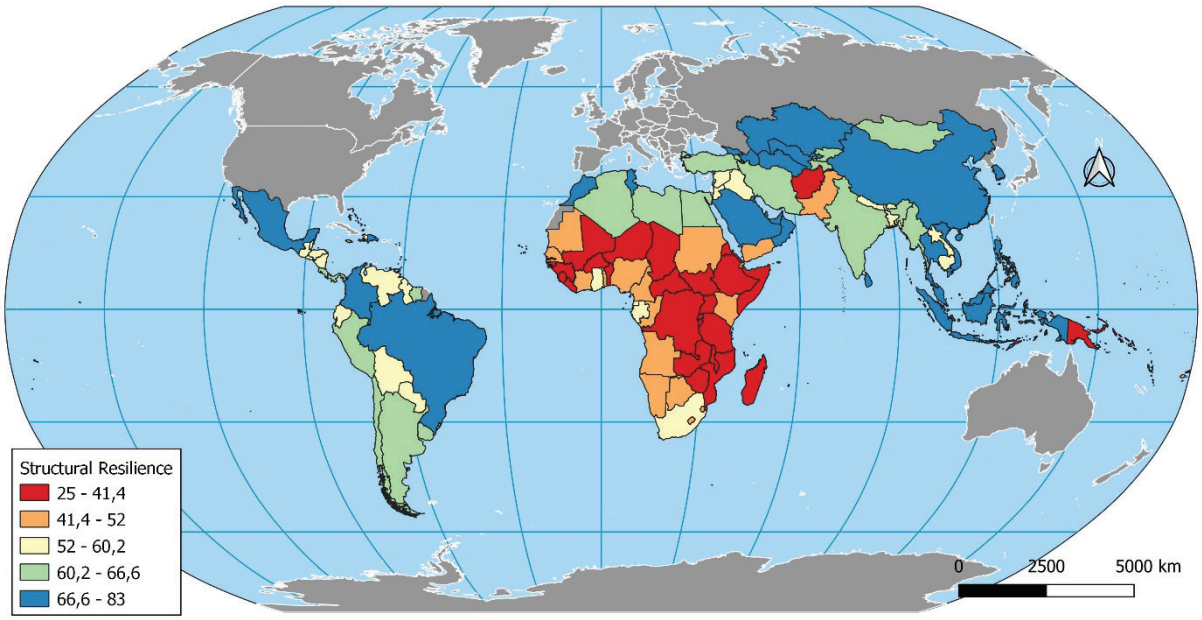


Figure A6: The UVI_1 for the Commonwealth member countries in 2018

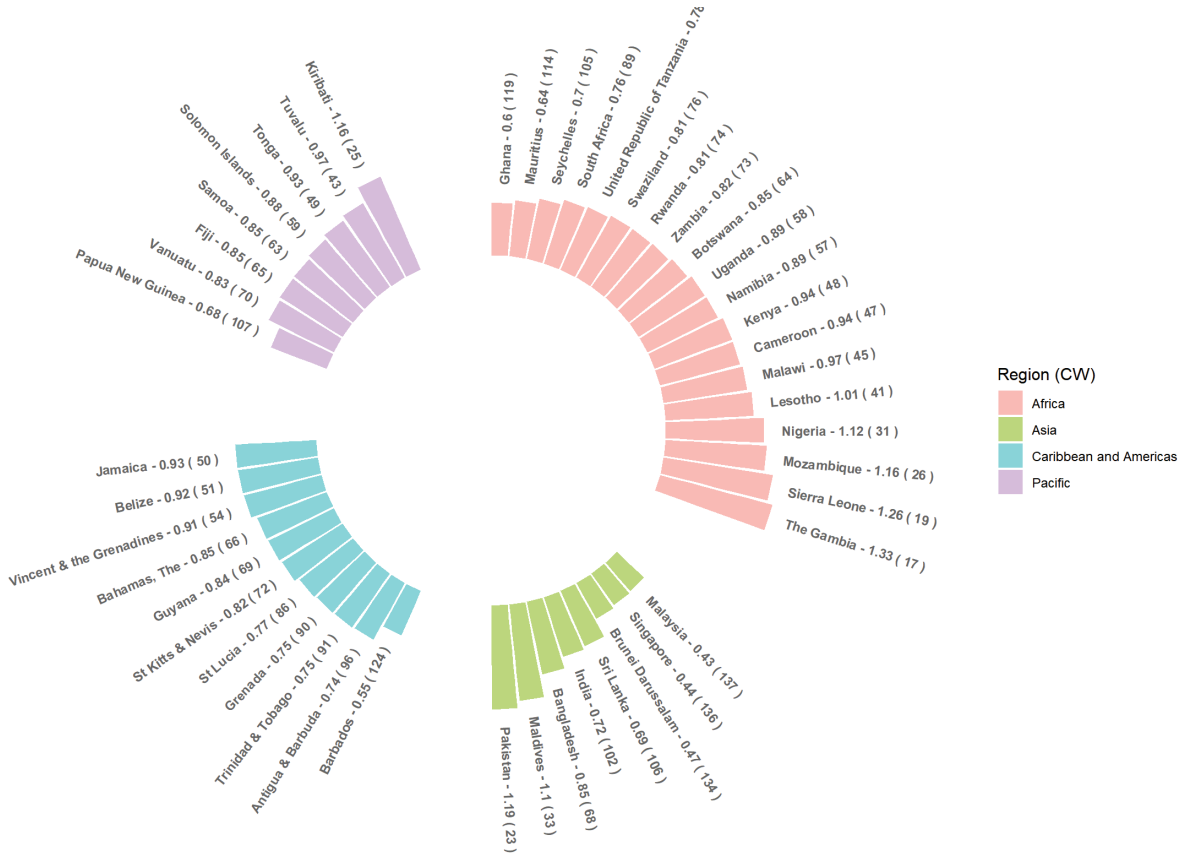


Figure A7a: The SVI for the Commonwealth member countries in 2018

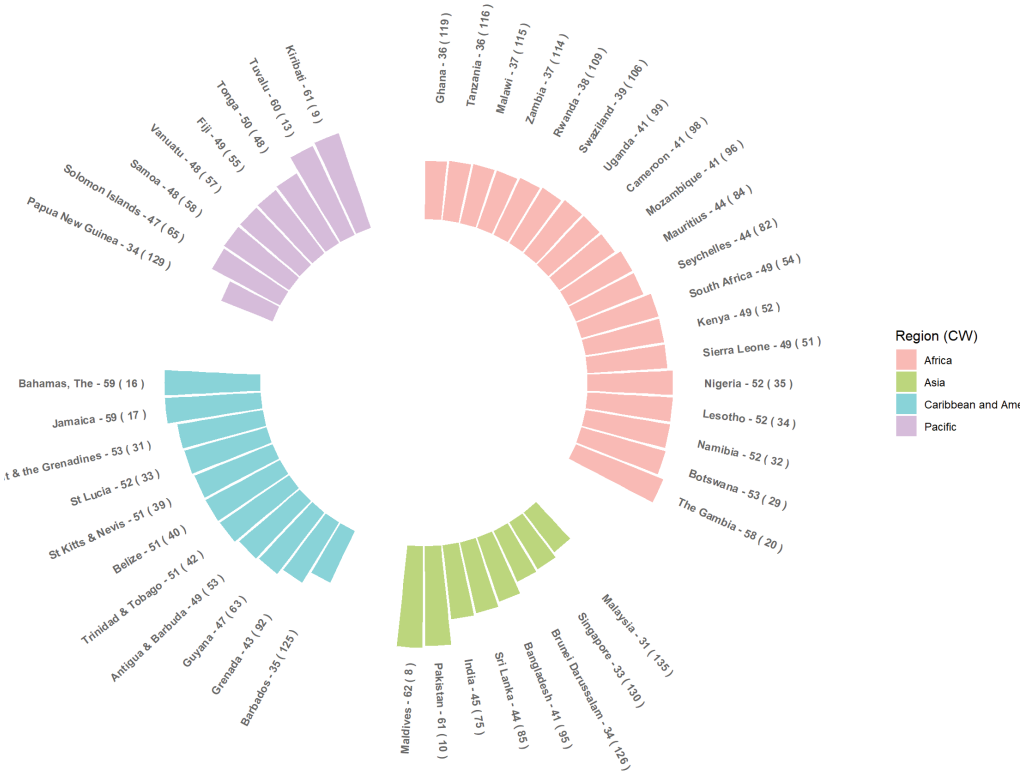


Figure A7b: The RI for the Commonwealth member countries in 2018

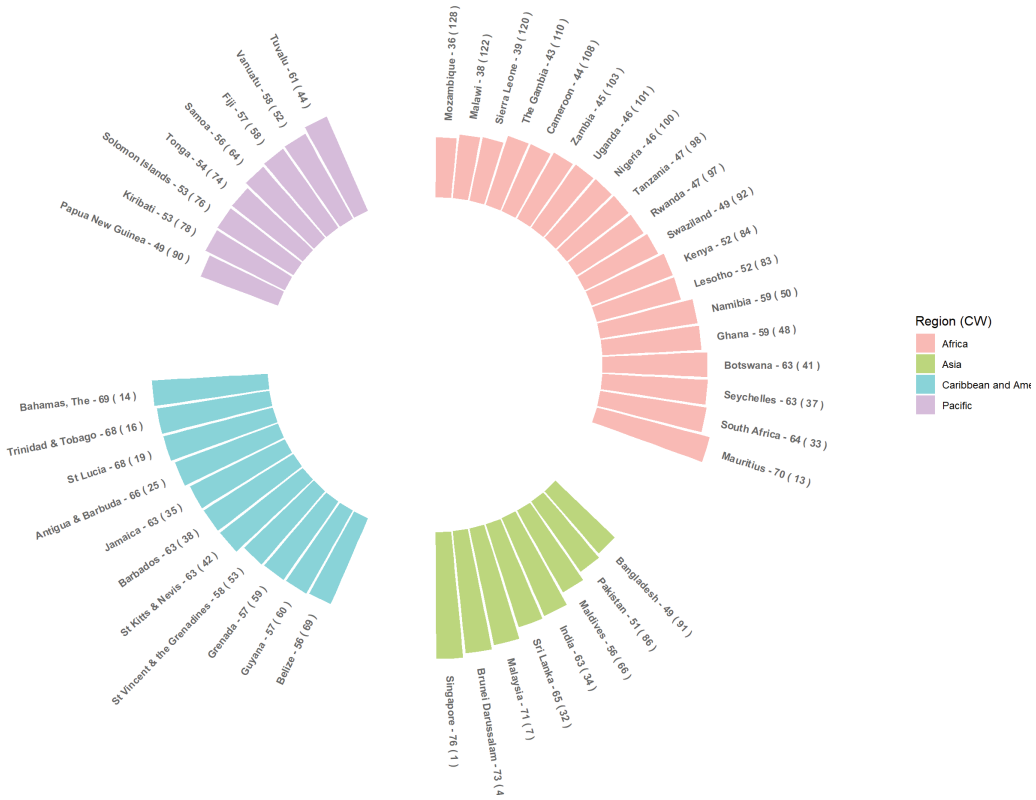


Figure A8: Evolution of the average of UVI_1 over the period 2010-2018

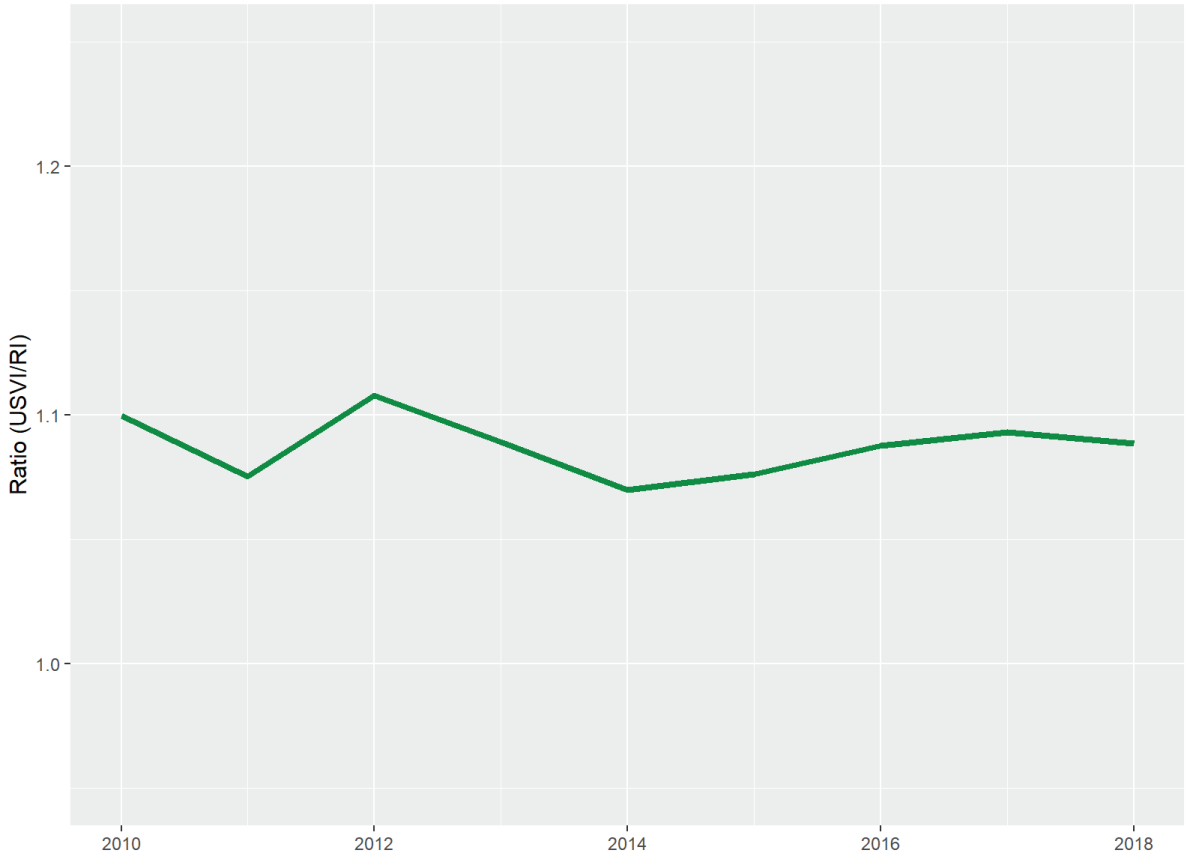
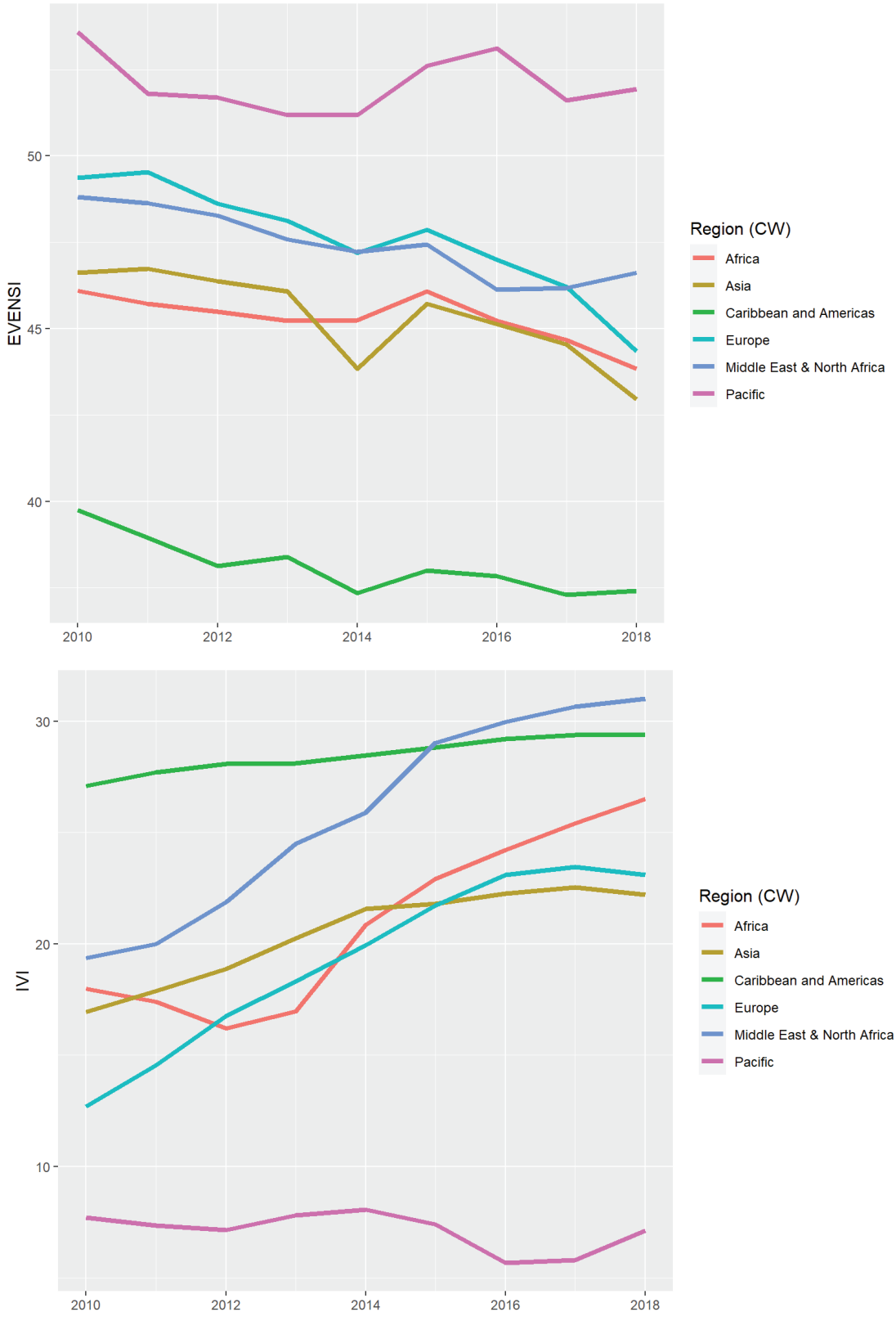


Figure A9: Evolution of the components of SVI by regions over the period 2010-2018



Note: the PVCCI by definition remains fixed over the period.

Figure A10: Evolution of the components of RI by regions over the period 2010-2018

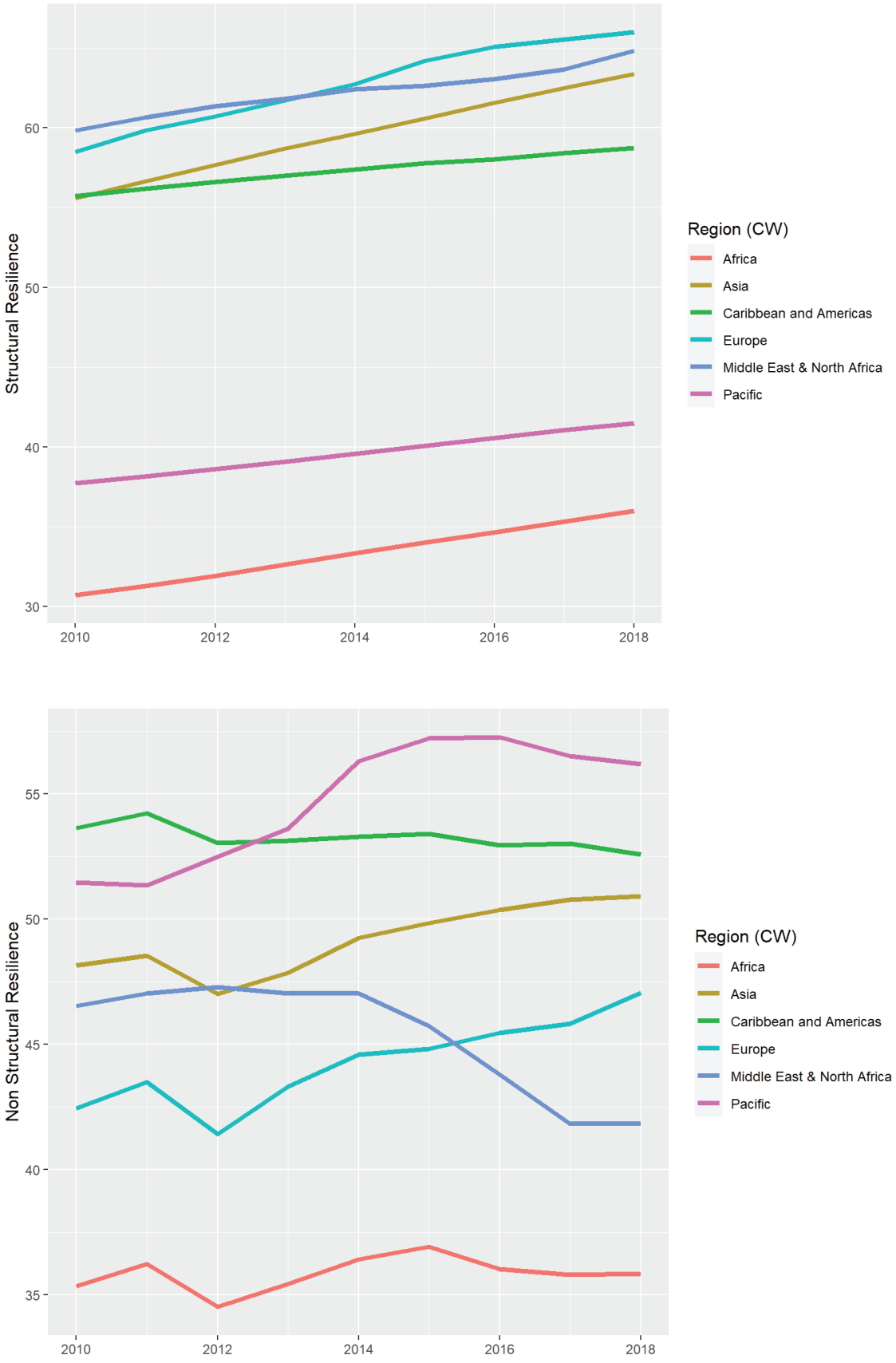


Figure A11: Evolution of the SVI for Commonwealth members between 2010 and 2018

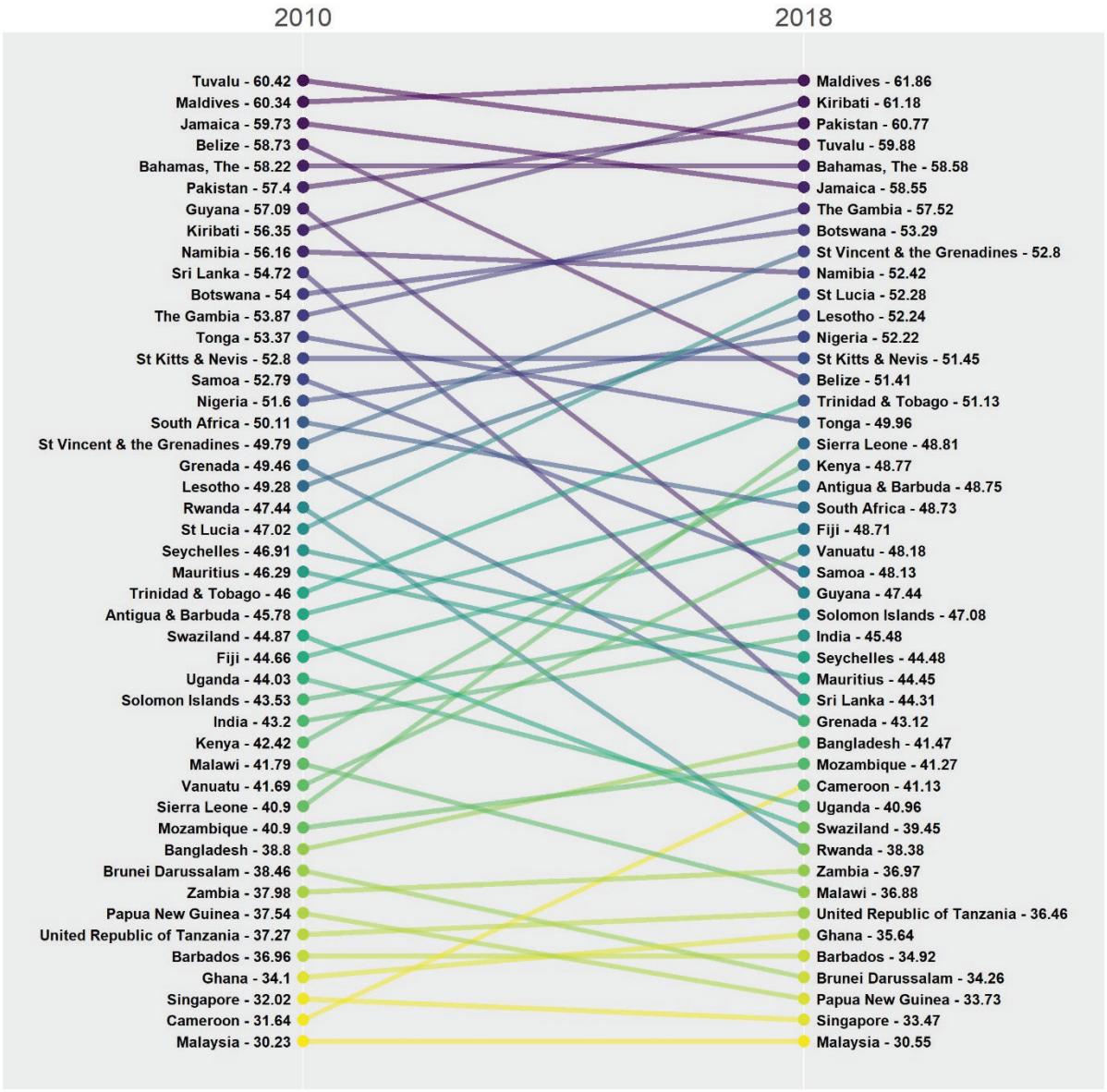


Figure A12: Evolution of the RI for Commonwealth members between 2010 and 2018

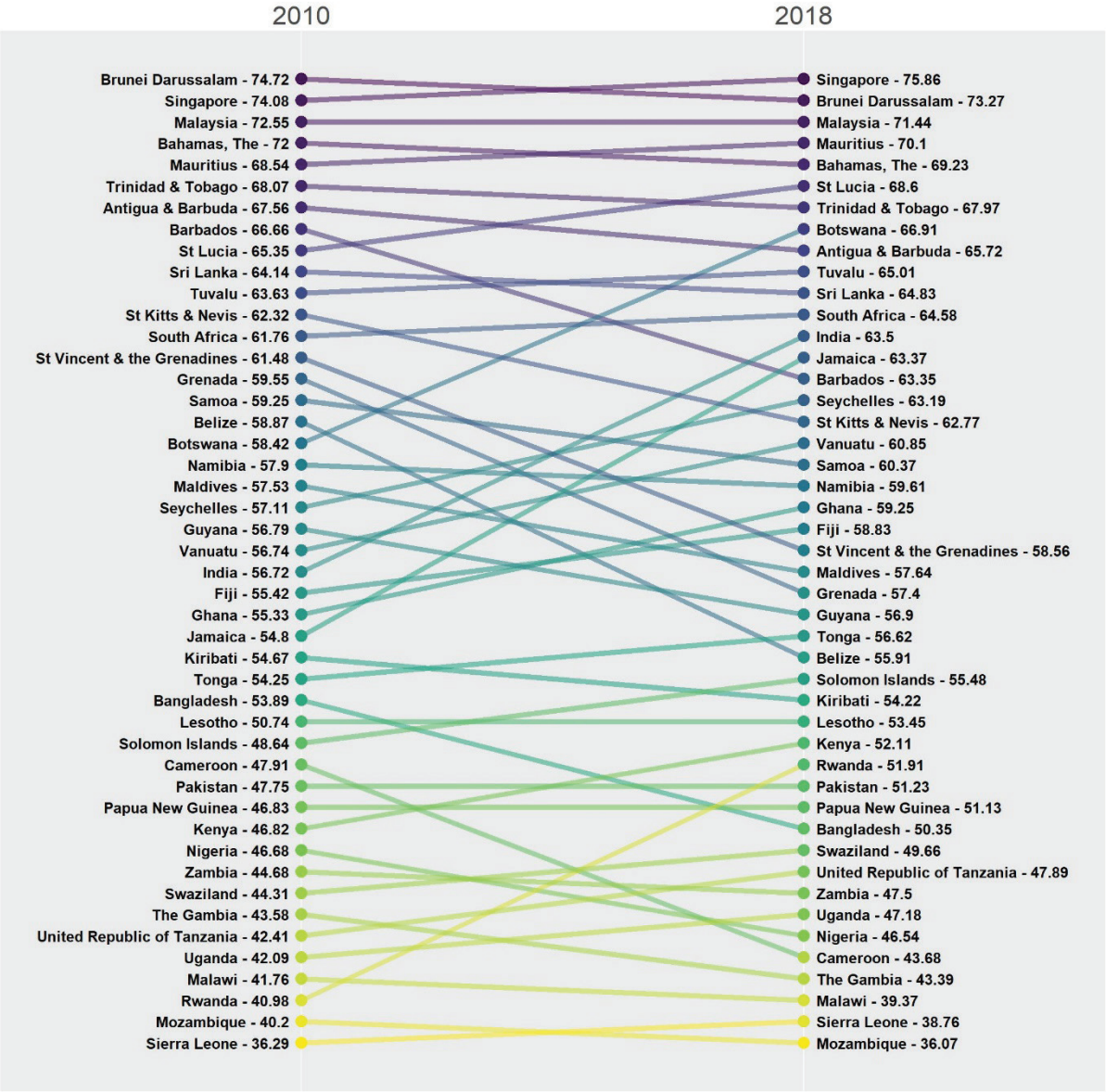


Table A1: Structure and data sources for the five components of the UVI

	Component	Variable	Source
EVENSI	Exposure	Broad trade dependence index defined as (X + M + Remit)/(GDP + M)	WB WDI and UNCTAD
		Export concentration index (Commonwealth method)	UNCTAD
		Share of population in LECZ	UN CDP
		Share of population in living in drylands	UN CDP
		Share of agriculture, forestry and fisheries in GDP	UN CDP
	Shocks	Instability of exportations	UN CDP
		Instability of import unit values	WB WDI
		Fatalities per 100.000 inhabitants due to disasters (Log)	EM-DAT, CRED
		Losses per unit of GDP (in %) due to disasters (Log)	EM-DAT, CRED
		Instability of agricultural production	UN CDP
IVI	Internal armed conflicts	Deaths due to internal armed conflicts per 100.000 inhabitants (Log)	Prio, UCDP Battle-related Deaths Dataset
		Internally displaced people per 100.000 inhabitants (Log)	Internal Displacement Monitoring Centre (IDMC)
	Criminality	Homicide rate for 100,000 inhabitants	United Nations office on Drugs and Crimes (UNODC) and WHO
	Terrorism	Number of terrorist incidents per 100.000 inhabitants (Log)	Global Terrorism Database (GTD)
		Number of deaths due to terrorism per 100.000 inhabitants (Log)	Global Terrorism Database (GTD)
		Number of injured due to terrorism per 100.000 inhabitants (Log)	Global Terrorism Database (GTD)
	Political violence	Regime transition Scaled violence	CSP PITF
		Genocide/Politicide Scaled annual number of deaths	CSP PITF
	Regional violence	Average of neighbor's direct IVI	Authors' calculations

	Component	Variable	Source
PVCCI	Risk of flooding due to sea level rise	Proportion of country located less than 1 meter from sea level.	Altitude data calculated from two digital terrain models (Scuttle Radar Topography Mission and Global 30-Arc-Second Elevation).
	Trends in rising temperatures and declining rainfall	Positive trend for temperatures (increasing) and negative trend for precipitation (declining).	Temperature and precipitation data: Climate Research Unit (CRU TS), East Anglia University
	Trend in increasing rainfall shocks	Measures trend in the magnitude of precipitation shocks. The magnitude of rainfall shocks is measured as the square root of the square deviation of rainfall series from their long-term trend.	Temperature and precipitation data: Climate Research Unit (CRU TS), East Anglia University
	Trend in increasing temperature shocks	This indicator measures the trend in the magnitude of temperature shocks. The magnitude of temperature shocks is measured as the square root of the square deviation of temperature series from their long-term trend.	Temperature and precipitation data: Climate Research Unit (CRU TS), East Anglia University
	Trend in increased cyclone intensity	Measures trend in cyclone intensity over a long period.	National Climatic Data Center, National Oceanic and Atmospheric Administration (NOAA)
	Share of drylands	The proportion of drylands over the country's area (excluding deserts). Drylands are defined following the UNEP terminology as lands for which the ratio of average annual precipitation to potential evapotranspiration is between 0.05 and 0.65, the ratio being less than 0.05 for deserts.	Precipitation and evapotranspiration data: Climate Research Unit (CRU TS), East Anglia University
	Level of precipitation	Average level of precipitation over the period 1950–2016.	Precipitation data: Climate Research Unit (CRU TS), East Anglia University.
	Level of temperature	Average level of temperature over the period 1950–2016.	Temperature data: Climate Research Unit (CRU TS), East Anglia University
	Intensity of cyclones	Average intensity of cyclones over the period 1970–2014.	National Climatic Data Center, National Oceanic and Atmospheric Administration (NOAA)
Non-structural Resilience Index	Quality of governance index	Voice and accountability	WB WGI
		Rule of Law	WB WGI
		Control of corruption	WB WGI
	Macro-economic stability index	Inflation index growth rate (Log(SqRoot(I + I² + 1)))	IMF WEO
		General government gross debt as % of GDP	IMF WEO
		Current Account Bal. As % of GDP	IMF WEO
	Quality of regulations index	Ease of doing business	WB Doing Business

	Component	Variable	Source
Structural Resilience Index	Human development	Low poverty rate	WB PovcalNEt
		Average years of schooling	UNDP
		Adult literacy rate	UN CDP
		Share of pop. not undernourished (stunting)	UN CDP
		Child surival rate (under five)	UN CDP
	Structural market connectivity	Transport, utilities and ICT Infrastructure development (Road density, Access elec, Access water, Access Internet)	WB WDI and WRS 2015
		Low market remoteness	UN CDP
		Market potential (GDP in Log)	WB WDI, Unstats, IMF
	Demographic structure	Share of pop. Likely to work (15-64)	WB WDI
		Low number of refugees per 100.000 inhabitants (Log)	UNHCR
		Structural outward migration (median net migration rate over 1970-2020, positive rates set to zero)	UN DESA

Table A2: Details and ranks of UVI components for SIDS in 2018

Country	Physical Vulnerability to Climate Change Index (PVCCI)	PVCCI Rank	Economic Vulnerability to External and Natural Shocks Index (EVENSI)	EVENSI Rank	Internal Violence Index (IVI)	IVI Rank	Structural Vulnerability Index (SVI)	SVI Rank	Lack of Non-Structural Resilience Index (LNSRI)	LNSRI Rank	Lack of Structural Resilience Index (LSRI)	LSRI Rank	Lack of Resilience Index (LRI)	LRI Rank
Antigua & Barbuda	49,49	52	56,71	34	38,26	89	48,75	53	34,13	108	34,42	107	34,28	113
Bahamas, The	69,06	8	47,69	55	57,02	33	58,58	16	33,04	113	28,58	125	30,89	124
Barbados	36,58	97	32,81	114	35,27	103	34,92	125	40,02	80	33,45	111	36,88	100
Belize	46,75	58	45,41	62	60,69	22	51,41	40	46,55	59	41,74	74	44,21	69
Cape Verde	41,74	74	54,73	40	35,93	100	44,83	79	42,99	70	40,02	80	41,53	87
Comoros	41,93	73	36,28	98	33,60	110	37,43	112	50,56	50	52,49	46	51,53	44
Dominican Republic	41,13	76	21,75	135	36,28	98	34,06	127	38,70	87	31,18	120	35,14	110
Fiji	56,71	34	57,45	31	24,54	132	48,71	55	33,45	111	50,07	51	42,58	80
Grenada	52,78	45	40,02	80	34,51	106	43,12	92	39,93	81	45,41	62	42,76	79
Guinea-Bissau	37,70	92	50,07	51	32,65	115	40,80	101	61,13	21	72,31	4	66,95	8
Guyana	32,38	116	58,90	27	47,28	57	47,44	63	40,56	78	45,76	61	43,24	78
Haiti	48,55	54	74,49	2	34,90	104	55,15	23	64,22	15	46,75	58	56,17	31
Jamaica	69,97	7	36,58	97	63,63	16	58,55	17	34,62	105	38,70	87	36,72	103
Kiribati	70,57	6	71,92	5	32,81	114	61,18	9	38,12	90	54,73	40	47,16	60
Maldives	73,02	3	59,93	23	50,56	50	61,86	8	51,99	47	34,13	108	43,98	72
Marshall Islands	74,49	2	72,31	4	28,58	125	62,17	7	34,51	106	51,24	49	43,69	73
Mauritius	64,22	15	34,90	104	24,20	133	44,45	84	25,57	130	34,51	106	30,37	125
Micronesia, Fed States	47,69	55	53,97	42	29,75	123	44,99	77	35,93	100	49,49	52	43,25	77
Palau	47,28	57	60,69	22	38,70	87	49,72	49	47,69	55	43,30	68	45,55	67
Papua New Guinea	23,28	134	33,60	110	41,74	74	33,73	129	40,38	79	59,09	26	50,61	48
Samoa	50,07	51	61,56	20	25,57	130	48,13	58	27,22	127	55,38	38	43,63	74
Sao Tome and Principe	29,75	123	36,86	96	26,24	129	31,26	134	55,20	39	59,36	25	57,32	26
Seychelles	44,84	64	48,55	54	39,59	83	44,48	82	37,70	92	35,93	100	36,83	101
Singapore	28,58	125	47,51	56	16,93	138	33,47	130	26,60	128	21,75	135	24,30	137
Solomon Islands	44,93	63	62,17	19	27,67	126	47,08	65	35,27	103	55,66	37	46,59	62
St Kitts & Nevis	45,76	61	42,99	70	63,23	17	51,45	39	35,53	102	38,98	86	37,29	96
St Lucia	39,59	83	64,22	15	50,07	51	52,28	33	25,28	131	38,12	90	32,34	119
St Vincent & the Grenadines	43,69	66	51,62	48	61,56	20	52,80	31	36,13	99	47,28	57	42,08	85
Suriname	29,24	124	67,84	10	38,98	86	48,22	56	52,78	45	38,58	88	46,23	65
Timor-Leste	55,38	38	39,80	82	39,80	82	45,59	73	61,56	20	58,90	27	60,24	21
Tonga	60,69	22	55,66	37	26,60	128	49,96	48	32,65	115	56,71	34	46,27	64
Trinidad & Tobago	40,38	79	53,71	43	57,68	30	51,13	42	30,23	122	33,89	109	32,11	122
Tuvalu	68,43	9	73,02	3	27,22	127	59,88	13	23,28	134	49,35	53	38,58	94
Vanuatu	55,20	39	59,09	26	20,58	136	48,18	57	28,58	125	51,99	47	41,95	86

Table A3: Details and ranks of UVI components for non SIDS in 2018

Country	Physical Vulnerability to Climate Change Index (PVCCI)	PVCCI Rank	Economic Vulnerability to External and Natural Shocks Index (EVENSI)	EVENSI Rank	Internal Violence Index (IVI)	IVI Rank	Universal Structural Vulnerability Index (SVI)	SVI Rank	Lack of Non-Structural Resilience Index (LNSRI)	LNSRI Rank	Lack of Structural Resilience Index (LSRI)	LSRI Rank	Lack of Resilience Index (LRI)	LRI Rank
Afghanistan	*55,93*	36	*57,68*	30	*66,08*	13	*60,06*	12	*62,96*	18	*61,56*	20	*62,26*	15
Algeria	*58,04*	29	*58,04*	29	*43,30*	68	*53,58*	28	*57,02*	33	*34,62*	105	*47,17*	59
Angola	*36,13*	99	*43,43*	67	*39,03*	85	*39,64*	104	*68,43*	9	*57,68*	30	*63,28*	13
Argentina	*43,43*	67	*20,58*	136	*34,13*	108	*34,03*	128	*47,28*	57	*36,86*	96	*42,39*	82
Armenia	*24,20*	133	*40,56*	78	*49,49*	52	*39,50*	105	*32,81*	114	*37,70*	92	*35,34*	107
Azerbaijan	*40,77*	77	*46,55*	59	*53,08*	44	*47,07*	66	*44,93*	63	*26,24*	129	*36,79*	102
Bangladesh	*34,13*	108	*35,93*	100	*51,99*	47	*41,47*	95	*58,53*	28	*42,12*	72	*50,99*	47
Benin	*32,81*	114	*32,65*	115	*39,93*	81	*35,30*	121	*44,84*	64	*59,60*	24	*52,74*	43
Bhutan	*19,60*	137	*34,42*	107	*30,82*	121	*28,98*	138	*41,74*	74	*43,14*	69	*42,45*	81
Bolivia	*33,89*	109	*33,04*	113	*38,12*	90	*35,08*	123	*49,35*	53	*42,99*	70	*46,28*	63
Botswana	*58,53*	28	*57,30*	32	*42,55*	71	*53,29*	29	*20,58*	136	*48,55*	54	*37,29*	97
Brazil	*31,58*	118	*19,60*	137	*52,78*	45	*37,27*	113	*43,30*	68	*32,15*	117	*38,14*	95
Brunei Darussalam	*26,24*	129	*49,49*	52	*19,60*	137	*34,26*	126	*26,24*	129	*27,22*	127	*26,73*	134
Burkina Faso	*57,68*	30	*51,99*	47	*40,38*	79	*50,53*	44	*42,12*	72	*66,74*	12	*55,80*	32
Burundi	*36,86*	96	*38,98*	86	*59,93*	23	*46,44*	69	*63,63*	16	*75,22*	1	*69,67*	5
Cambodia	*34,90*	104	*62,96*	18	*32,15*	117	*45,52*	74	*53,97*	42	*39,93*	81	*47,47*	58
Cameroon	*33,20*	112	*26,24*	129	*57,30*	32	*41,13*	98	*59,09*	26	*53,71*	43	*56,46*	30
Central African Republic	*35,27*	103	*38,58*	88	*73,02*	3	*51,85*	37	*66,74*	12	*74,49*	2	*70,72*	2
Chad	*66,74*	12	*66,08*	13	*58,53*	28	*63,89*	4	*64,76*	14	*73,02*	3	*69,02*	6
Chile	*40,56*	78	*41,93*	73	*34,42*	107	*39,11*	107	*19,60*	137	*35,69*	101	*28,79*	132
China	*42,55*	71	*31,34*	119	*33,45*	111	*36,11*	118	*37,92*	91	*25,28*	131	*32,23*	120
Colombia	*25,28*	131	*23,28*	134	*67,40*	11	*43,68*	89	*33,60*	110	*29,24*	124	*31,50*	123
Congo	*31,34*	119	*43,14*	69	*53,97*	42	*43,80*	88	*67,84*	10	*55,20*	39	*61,84*	17
Costa Rica	*39,80*	82	*16,93*	138	*38,58*	88	*33,46*	131	*21,75*	135	*36,58*	97	*30,10*	126
Côte D'Ivoire	*27,67*	126	*35,53*	102	*54,47*	41	*40,80*	100	*44,47*	65	*50,56*	50	*47,61*	56
Democratic Republic of the Congo	*34,62*	105	*40,38*	79	*59,36*	25	*46,02*	72	*71,92*	5	*67,84*	10	*69,91*	4
Djibouti	*64,76*	14	*67,40*	11	*44,47*	65	*59,76*	14	*52,49*	46	*54,47*	41	*53,49*	39
Ecuador	*24,54*	132	*28,58*	125	*47,51*	56	*35,01*	124	*39,32*	84	*41,93*	73	*40,64*	91
Egypt	*59,36*	25	*24,20*	133	*55,38*	38	*48,91*	50	*55,66*	37	*36,13*	99	*46,92*	61
El Salvador	*40,02*	80	*33,45*	111	*64,22*	15	*47,77*	60	*37,26*	94	*44,84*	64	*41,22*	89
Equatorial Guinea	*33,60*	110	*56,40*	35	*36,58*	97	*43,39*	90	*66,08*	13	*44,93*	63	*56,51*	29
Eritrea	*66,08*	13	*57,02*	33	*48,55*	54	*57,66*	19	*73,02*	3	*63,63*	16	*68,49*	7
Ethiopia	*42,12*	72	*39,93*	81	*55,66*	37	*46,43*	70	*59,36*	25	*62,17*	19	*60,78*	20
Gabon	*31,18*	120	*36,13*	99	*40,56*	78	*36,16*	117	*56,71*	34	*41,58*	75	*49,72*	49
Georgia	*16,93*	138	*34,62*	105	*55,20*	39	*38,87*	108	*27,67*	126	*31,34*	119	*29,56*	129

Country	Physical Vulnerability to Climate Change Index (PVCCI)	PVCCI Rank	Economic Vulnerability to External and Natural Shocks Index (EVENSI)	EVENSI Rank	Internal Violence Index (IVI)	IVI Rank	Universal Structural Vulnerability Index (SVI)	SVI Rank	Lack of Non-Structural Resilience Index (LNSRI)	LNSRI Rank	Lack of Structural Resilience Index (LSRI)	LSRI Rank	Lack of Resilience Index (LRI)	LRI Rank
Ghana	*37,26*	94	*33,89*	109	*35,69*	101	*35,64*	119	*41,93*	73	*39,59*	83	*40,78*	90
Guatemala	*33,04*	113	*27,67*	126	*62,96*	18	*44,05*	87	*40,77*	77	*46,25*	60	*43,60*	75
Guinea	*35,93*	100	*37,70*	92	*39,32*	84	*37,68*	111	*62,17*	19	*63,23*	17	*62,70*	14
Honduras	*38,12*	90	*29,75*	123	*64,76*	14	*46,66*	68	*46,75*	58	*39,80*	82	*43,41*	76
India	*50,56*	50	*37,08*	95	*47,69*	55	*45,48*	75	*37,48*	93	*35,53*	102	*36,52*	104
Indonesia	*25,57*	130	*25,57*	130	*40,77*	77	*31,46*	133	*32,38*	116	*33,20*	112	*32,79*	117
Iran (Islamic Republic of)	*56,40*	35	*39,32*	84	*44,84*	64	*47,39*	64	*51,62*	48	*34,90*	104	*44,06*	71
Iraq	*72,31*	4	*66,74*	12	*67,84*	10	*69,00*	1	*60,69*	22	*43,43*	67	*52,77*	42
Jordan	*57,30*	32	*49,35*	53	*46,25*	60	*51,18*	41	*39,80*	82	*40,56*	78	*40,18*	93
Kazakhstan	*54,73*	40	*44,47*	65	*32,38*	116	*44,80*	80	*42,55*	71	*30,82*	121	*37,15*	99
Kenya	*53,08*	44	*30,82*	121	*58,04*	29	*48,77*	52	*43,43*	67	*52,78*	45	*48,33*	54
Kuwait	*45,41*	62	*63,63*	16	*43,14*	69	*51,55*	38	*31,58*	118	*23,28*	134	*27,74*	133
Kyrgyzstan	*43,14*	69	*55,93*	36	*37,92*	91	*46,28*	71	*46,25*	60	*37,48*	93	*42,10*	84
Lao People's Dem Republic	*30,82*	121	*29,24*	124	*34,62*	105	*31,64*	132	*57,45*	31	*44,47*	65	*51,37*	45
Lebanon	*47,51*	56	*41,58*	75	*70,57*	6	*54,67*	25	*58,04*	29	*37,26*	94	*48,77*	53
Lesotho	*35,69*	101	*55,20*	39	*62,17*	19	*52,24*	34	*38,26*	89	*56,40*	35	*48,19*	55
Liberia	*27,22*	127	*69,97*	7	*44,93*	63	*50,52*	45	*63,23*	17	*64,76*	14	*64,00*	11
Libya	*61,13*	21	*64,76*	14	*75,22*	1	*67,30*	3	*69,06*	8	*37,08*	95	*55,43*	34
Madagascar	*58,90*	27	*31,18*	120	*33,89*	109	*43,16*	91	*56,40*	35	*60,69*	22	*58,58*	22
Malawi	*36,28*	98	*43,69*	66	*29,24*	124	*36,88*	115	*53,71*	43	*69,06*	8	*61,86*	16
Malaysia	*20,58*	136	*35,69*	101	*33,20*	112	*30,55*	135	*24,54*	132	*32,81*	114	*28,97*	131
Mali	*61,56*	20	*50,56*	50	*58,90*	27	*57,20*	21	*47,51*	56	*67,40*	11	*58,31*	23
Mauritania	*67,84*	10	*44,84*	64	*42,12*	72	*52,87*	30	*54,47*	41	*57,02*	33	*55,76*	33
Mexico	*53,97*	42	*26,60*	128	*57,45*	31	*48,03*	59	*37,08*	95	*33,04*	113	*35,12*	111
Mongolia	*52,49*	46	*63,23*	17	*31,58*	118	*50,83*	43	*35,69*	101	*33,60*	110	*34,66*	112
Morocco	*54,47*	41	*45,76*	61	*31,18*	120	*44,85*	78	*33,20*	112	*32,65*	115	*32,92*	116
Mozambique	*46,55*	59	*39,59*	83	*37,08*	95	*41,27*	96	*59,93*	23	*68,43*	9	*64,32*	10
Myanmar	*43,30*	68	*31,58*	118	*54,73*	40	*44,23*	86	*58,90*	27	*38,26*	89	*49,66*	50
Namibia	*62,96*	18	*46,75*	58	*45,76*	61	*52,42*	32	*33,89*	109	*47,69*	55	*41,37*	88
Nepal	*38,58*	88	*69,06*	8	*51,24*	49	*54,42*	26	*41,58*	75	*46,55*	59	*44,14*	70
Nicaragua	*38,70*	87	*38,70*	87	*43,43*	67	*40,34*	102	*48,55*	54	*42,55*	71	*45,65*	66
Niger	*67,40*	11	*51,24*	49	*53,71*	43	*57,89*	18	*49,49*	52	*70,57*	6	*60,95*	19
Nigeria	*42,99*	70	*37,92*	91	*69,97*	7	*52,22*	35	*55,38*	38	*51,62*	48	*53,53*	38
Oman	*75,22*	1	*42,55*	71	*37,48*	93	*54,39*	27	*34,42*	107	*24,20*	133	*29,75*	128
Pakistan	*59,09*	26	*53,08*	44	*69,06*	8	*60,77*	10	*50,07*	51	*47,51*	56	*48,81*	52
Panama	*30,23*	122	*24,54*	132	*46,75*	58	*35,12*	122	*31,18*	120	*39,03*	85	*35,32*	108
Paraguay	*33,45*	111	*30,23*	122	*41,58*	75	*35,41*	120	*39,59*	83	*40,77*	77	*40,18*	92
Peru	*37,48*	93	*42,12*	72	*52,49*	46	*44,47*	83	*31,34*	119	*36,28*	98	*33,90*	114

Country	Physical Vulnerability to Climate Change Index (PVCCI)	PVCCI Rank	Economic Vulnerability to External and Natural Shocks Index (EVENSI)	EVENSI Rank	Internal Violence Index (IVI)	IVI Rank	Universal Structural Vulnerability Index (SVI)	SVI Rank	Lack of Non-Structural Resilience Index (LNSRI)	LNSRI Rank	Lack of Structural Resilience Index (LSRI)	LSRI Rank	Lack of Resilience Index (LRI)	LRI Rank
Philippines	*46,25*	60	*43,30*	68	*59,09*	26	*50,02*	47	*36,58*	97	*29,75*	123	*33,34*	115
Qatar	*44,47*	65	*37,48*	93	*30,23*	122	*37,84*	110	*29,24*	124	*19,60*	137	*24,89*	135
Republic of Korea	*26,60*	128	*38,12*	90	*23,28*	134	*30,01*	136	*16,93*	138	*16,93*	138	*16,93*	138
Rwanda	*39,03*	85	*32,38*	116	*42,99*	70	*38,38*	109	*34,90*	104	*66,08*	13	*52,84*	41
Saudi Arabia	*63,23*	17	*34,51*	106	*40,02*	80	*47,58*	62	*36,28*	98	*20,58*	136	*29,49*	130
Senegal	*57,02*	33	*59,36*	25	*49,35*	53	*55,41*	22	*41,13*	76	*53,08*	44	*47,48*	57
Sierra Leone	*34,42*	107	*70,57*	6	*31,34*	119	*48,81*	51	*59,60*	24	*62,96*	18	*61,30*	18
Somalia	*62,17*	19	*75,22*	1	*68,43*	9	*68,81*	2	*69,97*	7	*69,97*	7	*69,97*	3
South Africa	*51,62*	48	*35,27*	103	*56,71*	34	*48,73*	54	*30,82*	121	*40,38*	79	*35,92*	105
South Sudan	*53,71*	43	*58,53*	28	*74,49*	2	*62,88*	5	*75,22*	1	*71,92*	5	*73,59*	1
Sri Lanka	*37,08*	95	*37,26*	94	*55,93*	36	*44,31*	85	*38,98*	86	*31,58*	118	*35,47*	106
Sudan	*71,92*	5	*44,93*	63	*66,74*	12	*62,31*	6	*72,31*	4	*53,97*	42	*63,80*	12
Swaziland	*39,93*	81	*34,13*	108	*43,69*	66	*39,45*	106	*43,69*	66	*58,04*	29	*51,37*	46
Syrian Arab Republic	*55,66*	37	*46,25*	60	*72,31*	4	*59,06*	15	*67,40*	11	*43,69*	66	*56,79*	27
Tajikistan	*32,15*	117	*52,78*	45	*35,53*	102	*41,16*	97	*57,30*	32	*39,32*	84	*49,14*	51
Thailand	*35,53*	102	*39,03*	85	*56,40*	35	*44,60*	81	*29,75*	123	*30,23*	122	*29,99*	127
The Gambia	*59,60*	24	*68,43*	9	*41,13*	76	*57,52*	20	*55,93*	36	*57,30*	32	*56,62*	28
Togo	*37,92*	91	*40,77*	77	*45,41*	62	*41,48*	94	*51,24*	49	*57,45*	31	*54,44*	36
Tunisia	*57,45*	31	*59,60*	24	*46,55*	59	*54,83*	24	*36,86*	96	*26,60*	128	*32,14*	121
Turkey	*38,98*	86	*32,15*	117	*59,60*	24	*45,11*	76	*39,03*	85	*35,27*	103	*37,20*	98
Turkmenistan	*51,24*	49	*61,13*	21	*41,93*	73	*52,03*	36	*54,73*	40	*32,38*	116	*44,97*	68
Uganda	*41,58*	75	*25,28*	131	*51,62*	48	*40,96*	99	*45,76*	61	*61,13*	21	*53,99*	37
United Arab Emirates	*63,63*	16	*54,47*	41	*25,28*	131	*50,51*	46	*24,20*	133	*24,54*	132	*24,37*	136
United Republic of Tanzania	*38,26*	89	*33,20*	112	*37,70*	92	*36,46*	116	*45,41*	62	*59,93*	23	*53,17*	40
Uruguay	*21,75*	135	*27,22*	127	*37,26*	94	*29,45*	137	*32,15*	117	*37,92*	91	*35,15*	109
Uzbekistan	*49,35*	53	*41,13*	76	*36,13*	99	*42,55*	93	*53,08*	44	*27,67*	126	*42,33*	83
Venezuela	*32,65*	115	*41,74*	74	*61,13*	21	*46,71*	67	*70,57*	6	*41,13*	76	*57,76*	25
Viet Nam	*34,51*	106	*55,38*	38	*21,75*	135	*39,71*	103	*38,58*	88	*25,57*	130	*32,73*	118
Yemen	*59,93*	23	*47,28*	57	*71,92*	5	*60,55*	11	*74,49*	2	*55,93*	36	*65,87*	9
Zambia	*39,32*	84	*38,26*	89	*33,04*	113	*36,97*	114	*43,14*	69	*64,22*	15	*54,71*	35
Zimbabwe	*51,99*	47	*52,49*	46	*36,86*	96	*47,67*	61	*57,68*	30	*58,53*	28	*58,11*	24

Table A4: The two aggregating methods and their rank differences for 138 countries in 2018

Country	Structural Vulnerability and Resilience Index (SVRI_1)	SVRI_1 Rank	Universal Vulnerability Index (UVI_1)	UVI_1 Rank	Structural Vulnerability and Resilience Index (SVRI_2)	SVRI_2 Rank	Universal Vulnerability Index (UVI_2)	UVI_2 Rank	Rank difference	Rank difference
	(SVI / (100-LSRI))		(SVI / (100-LRI))		RMS (PVCCI, EVI, IVI, LSRI)		RMS (PVCCI, EVI, IVI, LSRI, LNSRI)		(SVRI_1 – SVRI_2)	(UVI_1 – UVI_2)
Afghanistan	*1,56*	9	*1,59*	8	*60,44*	7	*60,95*	9	2	-1
Algeria	*0,82*	72	*1,01*	39	*49,53*	44	*51,11*	38	28	1
Angola	*0,94*	56	*1,08*	35	*44,84*	80	*50,45*	42	-24	-7
Antigua & Barbuda	*0,74*	89	*0,74*	96	*45,59*	74	*43,54*	94	15	2
Argentina	*0,54*	125	*0,59*	121	*34,76*	126	*37,60*	120	-1	1
Armenia	*0,63*	111	*0,61*	117	*39,06*	114	*37,89*	117	-3	0
Azerbaijan	*0,64*	110	*0,74*	94	*42,82*	95	*43,25*	96	15	-2
Bahamas, The	*0,82*	71	*0,85*	66	*52,71*	29	*49,41*	44	42	22
Bangladesh	*0,72*	94	*0,85*	68	*41,63*	105	*45,52*	73	-11	-5
Barbados	*0,52*	128	*0,55*	124	*34,56*	127	*35,72*	124	1	0
Belize	*0,88*	60	*0,92*	51	*49,17*	49	*48,66*	49	11	2
Benin	*0,87*	63	*0,75*	93	*42,69*	97	*43,13*	97	-34	-4
Bhutan	*0,51*	129	*0,50*	131	*33,09*	132	*34,99*	128	-3	3
Bolivia	*0,62*	114	*0,65*	112	*37,22*	117	*39,94*	113	-3	-1
Botswana	*1,04*	41	*0,85*	64	*52,15*	33	*47,54*	57	8	7
Brazil	*0,55*	124	*0,60*	118	*36,06*	124	*37,62*	119	0	-1
Brunei Darussalam	*0,47*	134	*0,47*	134	*32,64*	133	*31,47*	135	1	-1
Burkina Faso	*1,52*	10	*1,14*	29	*55,03*	22	*52,70*	28	-12	1
Burundi	*1,87*	6	*1,53*	9	*55,06*	21	*56,88*	16	-15	-7
Cambodia	*0,76*	86	*0,87*	61	*44,19*	87	*46,31*	67	-1	-6
Cameroon	*0,89*	59	*0,94*	47	*44,61*	84	*47,86*	56	-25	-9
Cape Verde	*0,75*	87	*0,77*	88	*43,68*	90	*43,54*	93	-3	-5
Central African Republic	*2,03*	4	*1,77*	6	*58,34*	15	*60,11*	10	-11	-4
Chad	*2,37*	1	*2,06*	3	*66,29*	2	*65,99*	3	-1	0
Chile	*0,61*	115	*0,55*	126	*38,28*	115	*35,34*	126	0	0
China	*0,48*	131	*0,53*	128	*33,73*	130	*34,61*	129	1	-1
Colombia	*0,62*	113	*0,64*	115	*40,56*	111	*39,26*	116	2	-1
Comoros	*0,79*	78	*0,77*	87	*41,71*	104	*43,62*	90	-26	-3
Congo	*0,98*	50	*1,15*	27	*46,91*	64	*51,78*	35	-14	-8
Costa Rica	*0,53*	127	*0,48*	132	*34,27*	128	*32,16*	132	-1	0
Côte D'Ivoire	*0,83*	69	*0,78*	82	*43,45*	92	*43,65*	89	-23	-7
Congo DRC	*1,43*	13	*1,53*	10	*52,33*	32	*56,79*	17	-19	-7
Djibouti	*1,31*	19	*1,28*	18	*58,48*	14	*57,33*	14	5	4

Country	Structural Vulnerability and Resilience Index (SVRI_1)	SVRI_1 Rank	Universal Vulnerability Index (UVI_1)	UVI_1 Rank	Structural Vulnerability and Resilience Index (SVRI_2)	SVRI_2 Rank	Universal Vulnerability Index (UVI_2)	UVI_2 Rank	Rank difference	Rank difference
Dominican Republic	*0,49*	130	*0,53*	129	*33,37*	131	*34,50*	130	-1	-1
Ecuador	*0,60*	116	*0,59*	123	*36,86*	119	*37,36*	122	-3	1
Egypt	*0,77*	84	*0,92*	52	*46,05*	70	*48,12*	54	14	-2
El Salvador	*0,87*	65	*0,81*	75	*47,05*	61	*45,26*	76	4	-1
Equatorial Guinea	*0,79*	77	*1,00*	42	*43,78*	88	*49,06*	47	-11	-5
Eritrea	*1,59*	8	*1,83*	4	*59,21*	13	*62,22*	8	-5	-4
Ethiopia	*1,23*	23	*1,18*	24	*50,82*	39	*52,64*	29	-16	-5
Fiji	*0,98*	51	*0,85*	65	*49,05*	52	*46,36*	66	-1	-1
Gabon	*0,62*	112	*0,72*	100	*37,59*	116	*42,11*	103	-4	-3
Georgia	*0,57*	123	*0,55*	125	*37,13*	118	*35,44*	125	5	0
Ghana	*0,59*	119	*0,60*	119	*36,67*	122	*37,78*	118	-3	1
Grenada	*0,79*	76	*0,75*	90	*43,70*	89	*42,98*	98	-13	-8
Guatemala	*0,82*	73	*0,78*	81	*44,61*	83	*43,87*	88	-10	-7
Guinea	*1,02*	45	*1,01*	40	*45,43*	76	*49,24*	46	-31	-6
Guinea-Bissau	*1,47*	11	*1,23*	21	*50,55*	41	*52,84*	26	-30	-5
Guyana	*0,87*	62	*0,84*	69	*47,03*	63	*45,81*	71	-1	-2
Haiti	*1,04*	42	*1,26*	20	*53,17*	28	*55,56*	21	14	-1
Honduras	*0,78*	80	*0,82*	71	*45,04*	79	*45,39*	74	1	-3
India	*0,71*	97	*0,72*	102	*43,21*	93	*42,13*	101	4	1
Indonesia	*0,47*	133	*0,47*	133	*31,91*	134	*32,00*	133	-1	0
Iran	*0,73*	91	*0,85*	67	*44,60*	85	*46,09*	70	6	-3
Iraq	*1,22*	24	*1,46*	13	*63,58*	4	*63,01*	4	20	9
Jamaica	*0,96*	53	*0,93*	50	*54,27*	25	*50,95*	39	28	11
Jordan	*0,86*	66	*0,86*	62	*48,74*	53	*47,09*	60	13	2
Kazakhstan	*0,65*	108	*0,71*	104	*41,75*	103	*41,91*	105	5	-1
Kenya	*1,03*	44	*0,94*	48	*49,81*	43	*48,60*	50	1	-2
Kiribati	*1,35*	16	*1,16*	25	*59,63*	10	*56,00*	20	6	5
Kuwait	*0,67*	104	*0,71*	103	*46,13*	69	*43,61*	91	35	12
Kyrgyzstan	*0,74*	90	*0,80*	79	*44,25*	86	*44,66*	80	4	-1
Lao People's Dem Republic	*0,57*	122	*0,65*	113	*35,29*	125	*40,70*	110	-3	3
Lebanon	*0,87*	64	*1,07*	36	*50,88*	38	*52,39*	31	26	5
Lesotho	*1,20*	25	*1,01*	41	*53,31*	27	*50,66*	40	-2	1
Liberia	*1,43*	12	*1,40*	14	*54,43*	24	*56,30*	18	-12	-4
Libya	*1,07*	37	*1,51*	11	*61,16*	6	*62,82*	6	31	5
Madagascar	*1,10*	34	*1,04*	38	*48,15*	57	*49,91*	43	-23	-5
Malawi	*1,19*	26	*0,97*	45	*47,04*	62	*48,44*	52	-36	-7
Malaysia	*0,45*	136	*0,43*	137	*31,13*	136	*29,93*	137	0	0
Maldives	*0,94*	55	*1,10*	33	*56,23*	19	*55,40*	23	36	10
Mali	*1,75*	7	*1,37*	15	*59,91*	9	*57,64*	13	-2	2

Country	Structural Vulnerability and Resilience Index (SVRI_1)	SVRI_1 Rank	Universal Vulnerability Index (UVI_1)	UVI_1 Rank	Structural Vulnerability and Resilience Index (SVRI_2)	SVRI_2 Rank	Universal Vulnerability Index (UVI_2)	UVI_2 Rank	Rank difference	Rank difference
Marshall Islands	1,28	21	1,10	34	59,62	11	55,52	22	10	12
Mauritania	1,23	22	1,20	22	53,94	26	54,05	25	-4	-3
Mauritius	0,68	102	0,64	114	42,19	101	39,43	114	1	0
Mexico	0,72	93	0,74	97	44,76	82	43,33	95	11	2
Micronesia, Fed States	0,89	58	0,79	80	46,16	68	44,30	84	-10	-4
Mongolia	0,77	85	0,78	84	47,11	60	45,06	77	25	7
Morocco	0,67	106	0,67	110	42,13	102	40,50	112	4	-2
Mozambique	1,31	20	1,16	26	49,48	45	51,74	36	-25	-10
Myanmar	0,72	95	0,88	60	42,81	96	46,48	64	-1	-4
Namibia	1,00	48	0,89	57	51,28	37	48,30	53	11	4
Nepal	1,02	46	0,97	44	52,56	31	50,56	41	15	3
Nicaragua	0,70	98	0,74	95	40,90	109	42,54	99	-11	-4
Niger	1,97	5	1,48	12	61,30	5	59,13	11	0	1
Nigeria	1,08	35	1,12	31	52,07	34	52,75	27	1	4
Oman	0,72	92	0,77	85	48,63	55	46,14	69	37	16
Pakistan	1,16	29	1,19	23	57,74	16	56,29	19	13	4
Palau	0,88	61	0,91	53	48,20	56	48,10	55	5	-2
Panama	0,58	121	0,54	127	36,14	123	35,20	127	-2	0
Papua New Guinea	0,82	70	0,68	107	41,55	106	41,32	107	-36	0
Paraguay	0,60	118	0,59	120	36,82	120	37,39	121	-2	-1
Peru	0,70	99	0,67	109	42,57	98	40,57	111	1	-2
Philippines	0,71	96	0,75	92	45,80	73	44,11	85	23	7
Qatar	0,47	135	0,50	130	34,20	129	33,27	131	6	-1
Republic of Korea	0,36	138	0,36	138	27,34	138	25,60	138	0	0
Rwanda	1,13	32	0,81	74	46,87	65	44,73	79	-33	-5
Samoa	1,08	36	0,85	63	50,04	42	46,38	65	-6	-2
Sao Tome and Principe	0,77	83	0,73	99	40,17	112	43,60	92	-29	7
Saudi Arabia	0,60	117	0,67	108	42,47	100	41,30	108	17	0
Senegal	1,18	28	1,06	37	54,84	23	52,38	32	5	5
Seychelles	0,69	101	0,70	105	42,50	99	41,59	106	2	-1
Sierra Leone	1,32	18	1,26	19	52,70	30	54,15	24	-12	-5
Singapore	0,43	137	0,44	136	30,96	137	30,14	136	0	0
Solomon Islands	1,06	38	0,88	59	49,36	46	46,88	62	-8	-3
Somalia	2,29	2	2,29	2	69,10	1	69,28	1	1	1
South Africa	0,82	74	0,76	89	46,78	67	44,06	86	7	3
South Sudan	2,24	3	2,38	1	65,26	3	67,37	2	0	-1
Sri Lanka	0,65	107	0,69	106	41,50	107	41,01	109	0	-3
St Kitts & Nevis	0,84	68	0,82	72	48,63	54	46,31	68	14	4

Country	Structural Vulnerability and Resilience Index (SVRI_1)	SVRI_1 Rank	Universal Vulnerability Index (UVI_1)	UVI_1 Rank	Structural Vulnerability and Resilience Index (SVRI_2)	SVRI_2 Rank	Universal Vulnerability Index (UVI_2)	UVI_2 Rank	Rank difference	Rank difference
St Lucia	*0,84*	67	*0,77*	86	*49,12*	51	*45,37*	75	16	11
St Vincent & the Grenadines	*1,00*	49	*0,91*	54	*51,47*	36	*48,79*	48	13	6
Sudan	*1,35*	15	*1,72*	7	*60,33*	8	*62,91*	5	7	2
Suriname	*0,79*	79	*0,90*	56	*46,00*	71	*47,44*	58	8	-2
Swaziland	*0,94*	54	*0,81*	76	*44,83*	81	*44,60*	81	-27	-5
Syrian Arab Republic	*1,05*	40	*1,37*	16	*55,62*	20	*58,17*	12	20	4
Tajikistan	*0,68*	103	*0,81*	77	*40,71*	110	*44,52*	82	-7	-5
Thailand	*0,64*	109	*0,64*	116	*41,47*	108	*39,41*	115	1	1
The Gambia	*1,35*	17	*1,33*	17	*57,47*	17	*57,16*	15	0	2
Timor-Leste	*1,11*	33	*1,15*	28	*49,26*	48	*51,95*	34	-15	-6
Togo	*0,97*	52	*0,91*	55	*45,99*	72	*47,09*	59	-20	-4
Tonga	*1,15*	30	*0,93*	49	*51,73*	35	*48,52*	51	-5	-2
Trinidad & Tobago	*0,77*	81	*0,75*	91	*47,41*	59	*44,51*	83	22	8
Tunisia	*0,75*	88	*0,81*	78	*49,31*	47	*47,09*	61	41	17
Turkey	*0,70*	100	*0,72*	101	*42,86*	94	*42,12*	102	6	-1
Turkmenistan	*0,77*	82	*0,95*	46	*47,88*	58	*49,32*	45	24	1
Tuvalu	*1,18*	27	*0,97*	43	*57,43*	18	*52,41*	30	9	13
Uganda	*1,05*	39	*0,89*	58	*46,82*	66	*46,61*	63	-27	-5
United Arab Emirates	*0,67*	105	*0,67*	111	*45,43*	75	*42,05*	104	30	7
United Republic of Tanzania	*0,91*	57	*0,78*	83	*43,53*	91	*43,91*	87	-34	-4
Uruguay	*0,47*	132	*0,45*	135	*31,78*	135	*31,86*	134	-3	1
Uzbekistan	*0,59*	120	*0,74*	98	*39,36*	113	*42,46*	100	7	-2
Vanuatu	*1,00*	47	*0,83*	70	*49,16*	50	*45,79*	72	-3	-2
Venezuela	*0,79*	75	*1,11*	32	*45,38*	77	*51,41*	37	-2	-5
Viet Nam	*0,53*	126	*0,59*	122	*36,69*	121	*37,08*	123	5	-1
Yemen	*1,37*	14	*1,77*	5	*59,43*	12	*62,73*	7	2	-2
Zambia	*1,03*	43	*0,82*	73	*45,35*	78	*44,91*	78	-35	-5
Zimbabwe	*1,15*	31	*1,14*	30	*50,60*	40	*52,10*	33	-9	-3

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