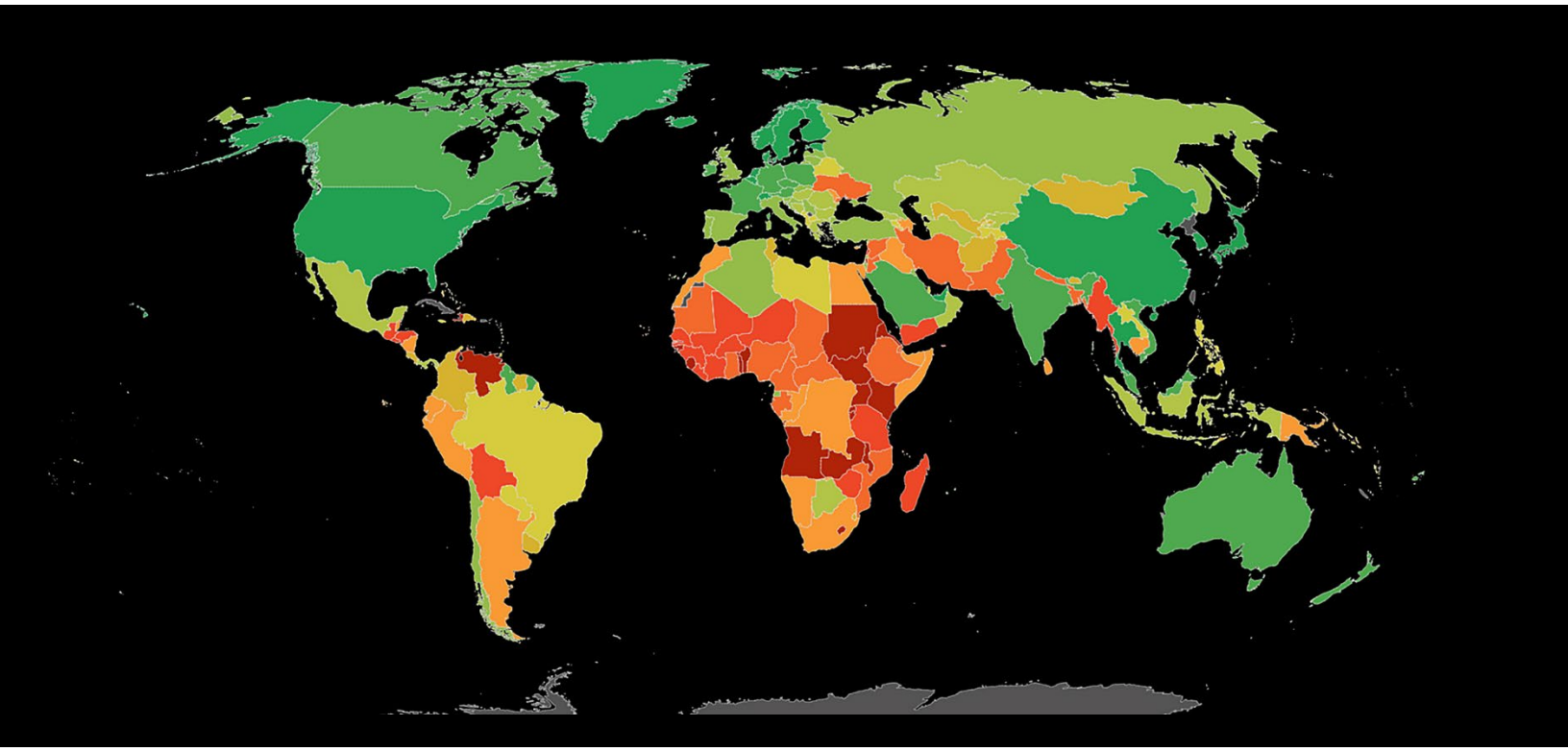
Columbia Climate School
National Center for Disaster Preparedness

Center on Global Energy Policy at Columbia | SIPA



Technical Methodology

Climate Finance (CliF) Vulnerability Index

May 2025

Recommended Citation

Climate Finance (CliF) Vulnerability Index. (2025). *Technical Methodology.* National Center for Disaster Preparedness, Center for Global Energy Policy, Columbia University.

The Climate Finance (CliF) Vulnerability Index was led by:

- Jeff Schlegelmilch (Principal Investigator)
- Gautam Jain (Co-investigator)
- Andrew Kamau (Co-investigator)
- Andrew Kruczkiewicz (Co-investigator)
- Geneva List (Project Manager)
- Thalia Balkaran (Post-Doctoral Researcher)

Contribution support from:

- Zain Alabweh
- Sean Boylan
- Amy Campbell
- Lauren Esposito
- Emily Heard
- Devshri Lala
- Nitin Magima
- Max Mauerman

Funding Acknowledgement:
This index was developed with the financial support of The Rockefeller Foundation.

COLUMBIA CLIMATE SCHOOL
NATIONAL CENTER FOR DISASTER PREPAREDNESS

Center on
Global Energy Policy
at COLUMBIA | SIPA

475 Riverside Drive, Suite 401, New York, NY 10115-0095
ncdp@columbia.edu | https://ncdp.columbia.edu/

TABLE OF CONTENTS

INTRODUCTION 1
BACKGROUND 2
CLIMATE CHANGE AND DISASTERS 2
CLIMATE FINANCE AND CONCESSIONAL FINANCING 3
THE ADAPTATION FINANCE GAP 3
GOVERNANCE 4
OBJECTIVES OF THE CLIF VULNERABILITY INDEX 4
CLIF VULNERABILITY INDEX USE CASES 5
METHODOLOGY 6
CONCEPTUAL FRAMEWORK 6
EXISTING INDEX AND INDICATOR ASSESSMENT CRITERIA 7
CLIF VULNERABILITY INDEX INDICES AND INDICATORS 8
CLIMATE RISK: DISASTERS AND CLIMATE CHANGE 9
FINANCIAL VULNERABILITY 11
SUPPLEMENTARY GOVERNANCE INDEX 13
CALCULATIONS 19
CLIMATE RISK 19
MISSING VALUES 19
FINANCIAL VULNERABILITY 20
CLIF VULNERABILITY INDEX FINAL VALUE 23
SUPPLEMENTARY GOVERNANCE INDEX 23
LIMITATIONS AND INTERPRETATIONS 26
CONCLUSION 27
ACKNOWLEDGEMENTS 27
BIBLIOGRAPHY 28
APPENDIX I. CLIF VULNERABILITY INDEX DETAILED VARIABLE TABLE 31
APPENDIX II. CLIF VULNERABILITY INDEX GEOGRAPHIC AREAS MISSING DATA 40

List of Tables

Table 1: Final Selected Variables 8
Table 2: Financial Vulnerability Variable 12
Table 3: Supplementary Governance Index 14
Table 4: Financial Vulnerability Domain Dimensions and Component Variables 20
Table 5: Final Variable Table 31
Table 6: Financial Sophistication Source List 34

TABLE OF FIGURES

Figure 1: Areas of Inquiry and Anticipated End-User Questions for Determining Climate Adaptation Finance Strategies 6
Figure 2: The Inform Risk Model 10

Introduction

The Climate Finance (CliF) Vulnerability Index is designed to provide a comprehensive understanding of climate vulnerability for nation states to improve the targeting and provision of climate change adaptation financing. In particular, the CliF Vulnerability Index aims to enhance the efficacy of concessional climate loans, grants, and investments to help ensure sufficient capital is directed towards vulnerable regions to provide equitable opportunities to increase resilience in the face of a changing climate.

The CliF Vulnerability Index takes a data-informed approach, presenting both a high-level and detailed representation of a country's climate and financial vulnerability. The index is structured to illustrate climate risk exposure at present and under future climate scenarios, along with variables representing access to financing. In addition to climate and financial vulnerability, the dashboard provides an overview of governance considerations that may impact lending modalities or conditions.

It is acknowledged that more evidence is needed to direct adaptation finance to the most climate-vulnerable countries. This index helps to further the understanding of climate vulnerability by highlighting the compounding effects of high climate risk and low access to capital while demarcating very high risk to help guide climate adaptation funding to those most in need, as well as to inform more effective adaptation and financing strategies.

Background

Climate Change and Disasters

Climate change is recognized as one of the biggest threats of our time. Securing adequate climate adaptation financing is critical to protect livelihoods in the face of an already changing climate. Climate-induced disasters are increasing in frequency and severity and disproportionately affect regions with limited financial resources to adapt. The effects of climate change impact human health, economies, infrastructure, and ecosystems, with future projections showing an escalation of negative impacts.

The Intergovernmental Panel on Climate Change (IPCC) reports that human-induced global warming has caused an increase of 1.1°C above pre-industrial levels between 2011 and 2020, contributing to more severe weather patterns and disasters (Lee et al. 2023). The human and economic costs of climate change are steep. It is anticipated that by 2050, climate change will result in over 14.5 million additional deaths and $12.5 trillion in global economic losses, with $1.1 trillion of that burden falling on healthcare systems (World Economic Forum 2024). Floods alone could cause up to 8.5 million deaths and billions of dollars in losses. Rising temperatures result in productivity losses, projected to cost around $7.1 trillion due to health and environmental stress from heatwaves. Countries with economies reliant on agriculture, tourism, and coastal resources, especially in developing regions, are at heightened risk (Abbass et al., 2022). Low-income countries, particularly in Africa, Southeast Asia, and the Pacific, experience more severe weather events, health crises, and infrastructural damage that is compounded by limited access to resources (World Economic Forum, 2024).

Rising sea levels from melting polar ice disproportionately affect low-lying coastal regions and Small Island Developing States. Sea levels are projected to rise by 0.43 to 0.84 meters by 2100 relative to 1986-2005 levels, resulting in land loss, coastal erosion, and increased flooding, especially for Small Island Developing States, where populations, infrastructure, and assets are concentrated in vulnerable coastal zones (Martyr-Koller et al., 2021). Sea level rise is impacting human migration as well. In the Pacific Islands, communities are being forced to migrate, losing both their homes and cultural heritage (Martyr-Koller et al., 2021).

Climate change is also contributing to health crises. Heatwaves, floods, and other extreme events increase the incidence of respiratory and cardiovascular diseases. Instances of vector-borne diseases like malaria and dengue in vulnerable countries in the tropics and subtropics are also rising, worsening the countries' health burden and limiting their economic development (World Economic Forum, 2024). The World Economic Forum anticipates that by 2050, up to 500 million people could be at risk of vector-borne diseases, which are driven in part by direct and indirect impacts of climate change. Many countries are now experiencing the compounded effects of climate-related disasters. Tropical cyclones, wildfires, and droughts have intensified, and the frequency of billion-dollar natural disasters is increasing annually.

Despite this heightened risk, adaptation is out of reach for many countries. High borrowing costs and limited access to finance keep many nations trapped in a cycle of climate disaster response and recovery without truly making headway toward climate mitigation and adaptation. The cost of inaction is high, with loss of life, economic destabilization, and rates of widespread displacement increasing as global temperatures rise.

Despite this heightened risk, adaptation is out of reach for many countries. High borrowing costs and limited access to finance keep many nations trapped in a cycle of climate disaster response and recovery without truly making headway toward climate mitigation and adaptation. The cost of inaction is high, with loss of life, economic destabilization, and rates of widespread displacement increasing as global temperatures rise.

Climate Finance and Concessional Financing

Concessional climate finance is essential to improve climate change mitigation and adaptation, particularly for countries lacking the resources to transition towards greener economies and to take adaptive measures and build resiliency. Concessional financing comprises a range of below-market-rate products, from major financial institutions such as development banks and multilateral funds, to accelerate a climate or development objective (World Bank, 2021). It can provide financial means to fund critical adaptation projects that address urgent climate vulnerabilities (i.e., extreme weather events). In addition, concessional financing can leverage private capital by de-risking investments that would otherwise be too uncertain, reducing the cost of capital. Concessional financing provides easier access to capital with low or no interest rates, grace periods for repayment, and longer payback timelines. However, the concessional finance landscape is highly constrained, and it is difficult to get finance at below-market-rate terms. A considerable portion of adaptation finance is provided by multilateral development banks (MDBs) and bilateral donors in the form of loans (62%), including non-concessional loans with standard interest rates and repayment terms (UNEP, 2024). Concessional finance is often limited by the availability of funds from international donors, multilateral development banks (MDBs), and philanthropic sources; targeting high-risk and low-return investment projects in developing countries is less attractive to private investors. Climate resilience is about long-termism, and this often acts in tension with investor timelines.

The Adaptation Finance Gap

According to the United Nations Environment Programme (2024), a large adaptation financing gap exists: adaptation finance needs are estimated at USD 215 to US$387 billion/year, yet international public adaptation financing amounted to only USD 27.5 billion in 2022, despite this value being a historical high. International public finance prioritizes mitigation at 53% (2018–2022 average), with adaptation and cross-cutting activities at only 34% and 13% (UNEP, 2024).

Broader estimates of climate financing have reported slightly higher financing figures for adaptation, although still outpaced by investments towards mitigation. The Organisation for Economic Cooperation and Development estimated that global climate financing, from developed countries to developing countries when considering multilateral, bilateral, export credits, and mobilized private flows, reached USD 115.9 billion in 2022 (OECD, 2024) of which adaptation accounted for 28% (USD 32.4 billion) but with mitigation amounting to 60% of the financing (USD 69.9 billion).

With increasing frequency and intensity of extreme climate events, addressing the adaptation financing gap is critical to reduce vulnerability for the most at-risk nations.

Governance

Governance plays a crucial role in developing and implementing comprehensive strategies (e.g., plans, regulations, infrastructural development) to address the complex challenges posed by climate change and mitigate its potential to exacerbate hostility, conflicts, and instability (Bracking & Leffel, 2021; Browne, 2022). Climate vulnerability can worsen political instability by straining resources (e.g., increasing scarcity of water and arable land), deepening societal divisions, and fueling migration-driven conflicts. Evidence shows that countries that lack institutions, economic ability, civil voice, and social capital, which can present itself as a lack of trust in the State, are less able to withstand the impacts of climate change and are at higher risk of political instability and conflict. These compounding impacts of weak governance increase a country's overall vulnerability to disaster risk and climate change.

Similarly, the level and appropriateness of governance structures dictate the associated safeguards and considerations that accompany climate finance grants and loans to ensure that money is being spent efficiently and effectively, with guarantees of transparency, accountability, and without corruption (Calliari et al., 2022). Further, sufficiently structured, yet appropriately flexible, governance allows for proper monitoring and evaluation of their effectiveness at a level of granularity to allow for attribution of sub-elements. Which in turn will afford the opportunity for governance shifts when necessary, given changes in the global climate and socioeconomic landscape. However, striking the balance along a spectrum of 'strict yet flexible' will be country and context specific; therefore, processes to assess the extent to which it can be done must be conducted while identifying the most useful pathways for leveraging and accessing Climate Finance and Concessional Financing (Lawrence & Kharas, 2025).

Objectives of the CliF Vulnerability Index

The CliF Vulnerability Index aims to highlight climate vulnerability as a function of both climate risk and access to financing. In particular, by adding a financial vulnerability component, it intends to heighten the climate vulnerability of countries that may otherwise 'slip through the cracks' due to a higher income threshold and perceived ability to adapt (e.g., such as those countries that are wealthier but face a high debt burden). The CliF Vulnerability Index, therefore, provides a tool for climate finance, aimed at closing the gap between risk assessment and funding allocations, ensuring that investments reach the countries that need them the most, especially those at risk of falling behind due to financial inaccessibility.

CliF Vulnerability Index Use Cases

The CliF Vulnerability Index is intended to support decision-making for concessional finance and direct investments in climate adaptation and hazard mitigation. The Index, by identifying countries that are both vulnerable to climate risk and lack access to finance to mitigate these risks, aims to help identify the countries to target for grants and concessional loans or other similar financial mechanisms (e.g., guarantees).

Potential users of this climate vulnerability index are global and regional financial institutions and foreign aid agencies that allocate climate adaptation funding. Additionally, organizations responsible for overseeing global climate agreements, such as the UNFCCC's Adaptation Committee, can integrate this index into their frameworks for monitoring adaptation finance and informing indicators like the Global Goal on Adaptation.

Another key user group for this Index is policymakers, government agencies, and nongovernmental organizations in climate-vulnerable regions. These stakeholders can use the index to identify priority areas for adaptation investments, strengthen their applications for international climate financing, and guide local and national planning for disaster risk reduction. Similarly, organizations can reference the CliF Vulnerability Index to ensure equitable allocation of adaptation funds, monitor progress toward multidimensional resilience goals, and advocate for increased support for vulnerable communities.

The CliF Vulnerability Index builds on previous work by integrating multiple composite indices (see Methodology) to provide a comprehensive, multidimensional assessment of climate vulnerability within the global concessional climate financing architecture. Unlike traditional risk or vulnerability assessments, it incorporates financial indicators to help policymakers and financial institutions direct funding where it is most needed, ensuring that climate-vulnerable countries have better access to concessional finance. It also provides a Supplementary Governance Index to help further assess governance vulnerabilities that can both exacerbate climate risk and impact decisions on the most appropriate funding mechanism. By directly linking vulnerability assessments with financial accessibility, the CliF Vulnerability Index fills a critical gap in guiding climate finance toward enhancing resilience in the most affected regions.

Methodology

Conceptual Framework

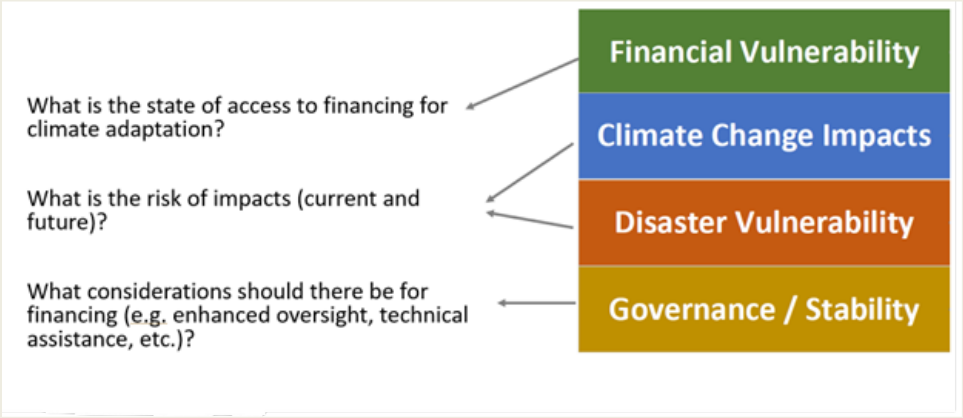
To develop the CliF Vulnerability Index, the team completed a comprehensive literature review on topics covering climate change adaptation, disasters, climate finance, construction of indices, financial vulnerability, and governance, focusing on both global and local contexts. Simultaneously, the team embarked on a data collation process, examining existing variables and indices across four key areas: Financial Vulnerability, Climate change Impacts, Disaster Vulnerability (past impacts), and Governance/Stability.

This was done to support three fundamental questions anticipated for financing climate adaptation:

- What is the state of access to financing for climate adaptation?
- What is the risk of impacts (current and future)?
- What considerations should there be for financing (e.g., enhanced oversight, technical assistance, etc.)?

These questions were mapped to the data explored as a precursor to the organization of data for the index, to be optimized for the use cases described above (see Figure 1 below for the relationships of data categories with end-user use-case questions).

Figure 1: Areas of Inquiry and Anticipated End-User Questions for Determining Climate Adaptation Finance Strategies



Existing Index and Indicator Assessment Criteria

The team reviewed existing indices and indicators to explore elements of focus and to identify the set of criteria necessary to construct a globally representative Index. The variables/indices considered suitable for testing the CliF Vulnerability Index were required to adhere to the following core criteria:

1. Appropriateness of the variable (Does it measure what we want to understand?), with consideration for:
    - Precision
    - Novelty/insight creation
    - Limitations and biases
    - Noise (irrelevant measures embedded)
    - Unintentional Redundancy[1]
    - Unnecessary duplication
    - Unintentional weighting due to the overlap of the same data/sector covered

2. Availability of the data, including:
    - Country representation: Minimum 175 countries
    - Refresh-rate (*update frequency*): Minimum yearly
    - Years of data availability: Range of years
    - Continuity: ongoing/future commitment to publish data
    - Accessibility: Open access, free or low-cost, publicly available
    - Transparency of sources

[1] Some redundancy was intended to serve as *de facto* weighting for the index. For example, certain financial capacities are included in the financial and hazard indices as they impact access to capital and the capacity to cope. In cases such as these, these compounding effects are captured through intentional redundancies in variables across integrated dataset.

CliF Vulnerability Index Indices and Indicators

After thoroughly reviewing the literature and existing indices and indicators, the team decided to develop the CliF Vulnerability Index with two key domains: Climate Risk and Financial Vulnerability. Climate Risk incorporates disasters and climate change composite variables, while Financial Vulnerability includes composite variables representing Debt sustainability, Financial Integration, and Financial Sophistication. The final selection of variables is listed in Table 1, with additional details regarding variable selection in Appendix I.

In addition to the core Climate Risk and Financial Vulnerability components of the CliF Vulnerability Index, a Supplementary Governance Index—consisting of composite indices—has been provided as an additional indicator to consider alongside the CliF Vulnerability Index.

Table 1: Final Selected Variables

Domain	Data Source
Climate Risk	
Baseline Disaster Risk	INFORM Risk
Change in Risk (Optimistic/Pessimistic scenarios for 2050 / 2080)	INFORM Climate Change
Financial Vulnerability	
Debt sustainability	Multiple: World Bank, International Monetary Fund, UN Trade and Development
Financial Integration	Multiple: World Bank, International Monetary Fund, International Financial Institutions
Financial Sophistication	Multiple (see Appendix I)
Supplementary Governance Index	
Government Effectiveness	World Bank Worldwide Governance Indicators
Rule of Law	World Bank Worldwide Governance Indicators
Regulatory quality	World Bank Worldwide Governance Indicators
Political Stability and Absence of Violence/ Terrorism	World Bank Worldwide Governance Indicators
Voice and accountability	World Bank Worldwide Governance Indicators
Control of Corruption	World Bank Worldwide Governance Indicators
Security Threats	Fund For Peace Fragile States Index
Factionalized Elites	Fund For Peace Fragile States Index

Climate Risk: Disasters and Climate Change

Data for the Disaster Domain comes from the INFORM Risk Index, and data for the Climate Change Domain comes from the INFORM Climate Change Index (European Commission: Joint Research Centre, n.d.). INFORM, led by the Joint Research Center of the European Commission, is a multi-stakeholder forum that develops a suite of quantitative analysis products to support decision-making in humanitarian crises and disaster prevention, preparedness, and response. Together, data from these two INFORM indices constitute the final Climate Risk component of the CliF Vulnerability Index (see Calculations).

Disasters

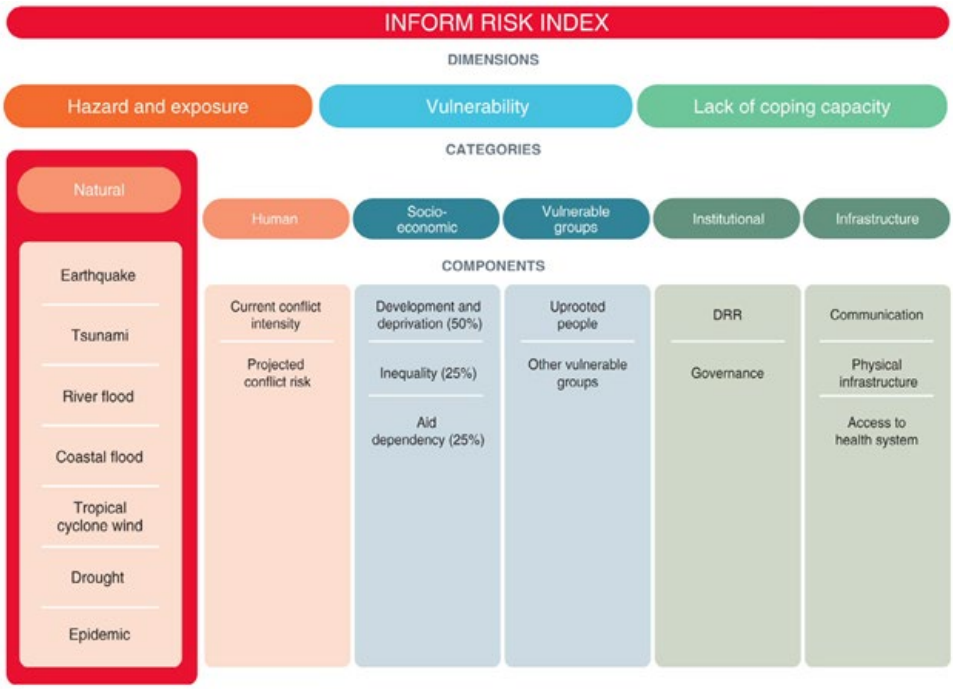
The INFORM Risk Index is a composite indicator based on geophysical and socio-economic variables informed by the scientific literature that contribute to risk, disasters, and humanitarian crises (European Commission: Joint Research Centre, 2017; European Commission: Joint Research Centre, n.d.). INFORM assigns a score and ranking to each country based on three dimensions of risk: Hazard and Exposure (events that could occur and exposure to them); Vulnerability (the susceptibility of communities to those hazards); and, Lack of Coping Capacity (lack of resources available that can alleviate the impact) (Poljanšek et al., 2022).

Each of the three dimensions of risk has two categories, with each of those categories containing a number of components represented by specific indicators (Figure 2). The CliF Vulnerability Index uses the INFORM Risk final value (2025) as one of the composite indicators to construct the final Index (see Calculations). In addition, the CliF Vulnerability Index dashboard interface illustrates the INFORM Risk Hazard and Exposure, Vulnerability, and Lack of Coping Capacity indicators to allow users to further explore the disaster context of a selected country.

CliF Vulnerability Index Criteria: INFORM Risk

- Country representation: Global coverage, 191 countries
- Refresh rate: Yearly
- Years of data availability: 2015 to present
- Continuity: Ongoing
- Accessibility: Open source, free, publicly available
- Transparency of data sources: Reliable academic institutions and international organizations

Figure 2: The Inform Risk Model



Source: European Commission: Joint Research Centre, 2024, https://drmkc.jrc.ec.europa.eu/inform-index

Climate Change

The INFORM Climate Change Index is part of the INFORM suite of products developed in collaboration between the Joint Research Centre of the European Commission and the Euro-Mediterranean Center on Climate Change (European Commission: Joint Research Centre, n.d.$_c$). INFORM Climate Change uses information from INFORM Risk and incorporates socioeconomic and climate projections to predict change in risk as a result of climate change (Poljanšek et al., 2022).

For INFORM Climate Change, the Hazard and Exposure dimension is updated with hazard and exposure projections based on plausible greenhouse gas emission scenarios using Representative Concentration Pathways and Shared Socio-economic Pathways (SSPs) for 2050 and 2080 (Poljanšek et al., 2022). The projections take into account changes to climate-related hazards, including river floods, drought, coastal floods, and epidemics (malaria and dengue), along with the distribution of exposed populations. Population projections based on SSPs are incorporated to assess exposure to non-climate natural hazards, such as earthquakes and tsunamis, and non-modeled hazards like tropical cyclone winds.

INFORM Climate Change results are shown according to the following categories:

- Baseline Current Risk: INFORM Climate Change Risk Index
- Mid-century (2050) crisis risk:
    - Pessimistic climate and socio-economic scenario
    - Optimistic climate and socio-economic scenario
- End-of-century (2080) crisis risk:
    - Pessimistic climate and socio-economic scenario
    - Optimistic climate and socio-economic scenario

For the Pessimistic and Optimistic scenarios for 2050 and 2080, INFORM Climate Change provides the: 'INFORM Climate Change Risk Index' based on the updated hazard and exposure projections; 'Change in Risk' reflecting the difference between the current and future risk values; and, the 'Vulnerability Gap', which is the level of vulnerability reduction or coping capacity increase needed for a country to preserve its current level of risk (Poljanšek et al., 2022).

The CliF Vulnerability Index used the INFORM Climate Change 'Change in Risk' value as one of the composite indicators to construct the final Index (see Calculations). The Index includes the final value for both pessimistic and optimistic scenarios for 2050 and 2080.

CliF Vulnerability Index Criteria: INFORM Climate Change

- Country representation: Global coverage, 191 countries
- Refresh rate: 2022 release only
- Years of data availability: 2022 (projections for 2050, 2080)
- Continuity: Operational with future updates intended
- Accessibility: Open source, free, publicly available
- Transparency of data sources: Reliable academic institutions and international organizations

Financial Vulnerability

The Financial Vulnerability domain aims to rank countries based on the difficulty they face in accessing finance, and are thus most in need of financial support in the form of grants and concessional loans. A country may score worse than another on climate vulnerability and disaster resilience metrics, but if it has easier access to finance for climate adaptation, then its need for financial support may be less dire than that of the other country, which may lack similar access. The Financial Vulnerability domain ranks countries such that on one extreme are those that have easy access to markets and are able to borrow or raise funds in other ways and on the other extreme are those that do not and are therefore dependent on support from multilateral development banks, regional development banks, philanthropies, and other donors.

The Financial Vulnerability domain of the CliF Vulnerability Index is a composite indicator consisting of three broad dimensions—Debt Sustainability, Financial Integration, and Financial Sophistication—comprising 22 variables in total between the three (Table 2). The complete details of each chosen variable can be found in Appendix I.

Table 2: Financial Vulnerability Variable

Risk Dimensions	CliF Vulnerability Index Financial Vulnerability	Financial Integration	Financial Sophistication
Components	1. Total Debt/GDP 2. External Debt/GDP 3. Debt/Exports 4. Debt Service/ Exports 5. Debt/Budget Revenue 6. Real interest rate-growth differential 7. Short-term debt/ External Debt 8. Short-term debt/Reserves 9. Debt Service/ Revenue	1. Trade/Global Trade 2. Current Account/GDP 3. Foreign Direct Investment/GDP 4. Portfolio Equity Inflows/GDP 5. Portfolio Debt Inflows/GDP 6. Foreign Claims of Banks 7. Trade Credit/GDP 8. Membership in IFIs/ Total IFIs	1. Domestic Credit to Private Sector/GDP 2. Number of New Listed Companies/Global 3. Market Cap/GDP 4. Market Cap/ Global Market Cap 5. Turnover ratio of Stock Exchanges/ Global

Debt Sustainability

A critical challenge for many countries is the existing debt burdens that hinder their fiscal capacity to address the impacts of climate change and disasters. Indeed, many low-income countries are trapped in a vicious cycle of climate vulnerability and fragility (Jaramillo et al., 2023), whereby climate shocks weaken their capacity to react to the next disaster and so on. Climate vulnerabilities and fiscal risks are correlated (Chamon et al., 2022): over half of the 54 most severely indebted developing countries are also among the most vulnerable to climate change (UNDP, 2021). Vulnerable countries face high borrowing costs, limiting their ability to finance climate adaptation (Bernhofen et al., 2024).

This variable identifies the cost and burden of borrowing by creating a metric to demonstrate the level of indebtedness of the country, which in turn can indicate how expensive it is for a country to borrow or whether it's possible for it to borrow in the first place. The level of indebtedness influences a country's ability to secure financing. Countries with higher debt burdens face steeper borrowing costs due to less favorable debt dynamics, making it more challenging to secure funds affordably. Therefore, when allocating grants, priority should be given to countries struggling to access financial markets or those facing prohibitively high borrowing costs.

The variables selected to represent the Debt Sustainability report different measures that demonstrate a country's debt relative to the economic activity in the country. The Debt Sustainability indicator is made up of eight composite variables and one simple variable that come from the International Monetary Fund, the World Bank, and the UN Trade and Development.

Financial Integration

The efficiency with which financial markets help distribute resources within an economy is an important differentiator between a developed and a developing country (Park, 1999). For a financial market to be efficient, both deep domestic markets and international financial integration are necessary.

The Financial Integration variable measures the latter: a country's ability to access financing is the degree to which it is integrated into the global financial system to attract international investments into the domestic market. The Financial Sophication variable measures the former as described in the next section.

Financial Integration is measured based on cross-border financial transactions and positions (Lane & Milesi-Ferretti, 2003 & 2017; Schindler, 2009). This is captured by a country's trade flows, capital flows, and membership in international financial institutions (IFIs). The six composite and two simple variables come from the International Monetary Fund, the World Bank, and IFIs.

Financial Sophistication

As mentioned earlier, Financial Sophistication measures the level of development of the domestic capital markets and the financial infrastructure of a country. A more developed capital market system with a proper financial architecture enables a country to better raise capital, thus increasing the ability to access financing. Deep and liquid capital markets help provide long-term capital that companies and the sovereign need to invest for climate action (Schellhase et al., 2014).

Finance Sophistication is represented by variables reflecting private sector activity, including private sector credit, market capitalization of the equity market, and stock exchange liquidity. The five composite variables for this measure come from the World Bank and several sources that report on stock exchanges and equity market indexes (See Appendix I, Tables 2 & 3).

Supplementary Governance Index

Governance encompasses the structures, policies, and processes through which public decisions are made and implemented. In the context of climate change, governance determines a state's ability to mitigate and adapt to environmental challenges effectively. This includes ensuring institutional coherence, mobilizing resources, and fostering public participation. While the notion of governance is incorporated into the CliF Vulnerability Index value via a component in INFORM Risk's Lack of Coping Capacity Institutional category, the CliF Vulnerability Index Supplementary Governance Index presented below is not integrated into the CliF Vulnerability Index final value. Rather, the CliF Vulnerability Index provides this Supplementary Governance Index to qualify parameters around financing, facilitating additional vulnerability analyses, alongside the core index domains of Climate Risk and Financial Vulnerability. The Supplementary Governance Index enables a more targeted assessment of the potential impact of adaptation financing to reduce vulnerability.

A total of eight variables were chosen for the Supplementary Governance Index (Table 3). Full details of each chosen variable can be found in Appendix I. With the exception of the Indicators 'Security Threats' and 'Factionalized Elites', which come from the Fund for Peace Fragile States Index (Fund for Peace, n.d.), the other six indicators come from the World Bank's Worldwide Governance Indicators (WGI) dataset (World Bank, 2024).

Table 3: Supplementary Governance Index

Risk	CliF Vulnerability Index Supplementary Governance Index
Components	1. Government Effectiveness 2. Rule of Law 3. Regulatory Quality 4. Political Stability and Absence of Violence/Terrorism 5. Voice and Accountability 6. Control of Corruption 7. Security Threats 8. Factionalized Elites

CliF Vulnerability Index Criteria: Supplementary Governance Index

- World Bank Worldwide Governance Indicators dataset
  - Country representation: more than 200
  - Refresh rate: Every 2 years until 2002, then yearly
  - Years of data availability: 1996 to 2023
  - Continuity: Ongoing
  - Accessibility: Open source, free, publicly available
  - Transparency of data sources: NGO's, international organizations, private firms, and over 30 think tanks
- The Fund for Peace Fragile State Index dataset
  - Country representation: 179 countries
  - Refresh rate: Yearly
  - Years of data availability: 2006 to 2024
  - Continuity: Ongoing
  - Accessibility: Open source, free, publicly available
  - Transparency of data sources: commercial content aggregator of global media data, quantitative dataset from international and multilateral statistical agencies, and social science researchers and reviewers.

Good governance is a critical aspect of development; it aids in building human capital, economic growth, and enhancing social cohesion (World Bank, 2024). The selected governance indicators and their relevance to addressing climate change in vulnerable regions, including considerations for absorbing and spending climate adaptation financing, are outlined below.

Government Effectiveness

Government effectiveness ensures that public services are responsive and that policy implementation is timely and efficient. It is critical for implementing climate change adaptation strategies, ensuring that public services and policies are independent of political pressure and that the quality of policy formulation and implementation is high. Effective governance can also better coordinate responses across different sectors and levels of administration, improving the ability of the State to manage, adapt to, and recover from shocks peacefully and build resilience against climate and fragility risks.

- **World Bank WGI Definition**: Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
    - The estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.

Rule of Law

The Rule of Law is essential for building resilience to climate emergencies. It ensures that legal frameworks and institutions are strong, transparent, and fair, which is crucial when responding to crises. With a solid Rule of Law, emergency measures like resource rationing, evacuation orders, and restrictions on harmful activities can be implemented quickly and effectively. It also holds everyone accountable, ensuring that efforts during emergencies are fair and achieve their goals. The Rule of Law reduces inequalities and helps prevent conflicts over scarce resources. When disputes arise—whether over land, water, or emergency aid—legal systems provide a peaceful way to resolve them, keeping communities stable and cohesive. It also strengthens governance. Clear legal mandates help government agencies, local authorities, and NGOs work together seamlessly during emergencies. People are more likely to trust and comply with emergency measures when they see a functioning legal system.

- **World Bank WGI Definition**: 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.
    - The estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.

Regulatory Quality

By establishing clear, transparent, and well-enforced regulations, governments can create an environment that attracts investment, promotes innovation, and drives the transition to more sustainable economic models. Research has shown that countries with better regulatory quality tend to attract more foreign direct investment and have higher levels of private sector development.

- Reducing policy uncertainty, which is a major barrier to investment
- Creating a level playing field for businesses, encouraging fair competition and innovation
- Improving the overall business environment, making it more attractive for both domestic and foreign investors
- **World Bank WGI Definition:** 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
    - The estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.

Public Stability and Absence of Violence/Terrorism

Political Stability and the Absence of Violence/Terrorism measures are crucial for effective climate change mitigation. They enable governments to implement consistent policies, foster international cooperation, and build economic resilience. Conversely, political instability and violence can severely undermine climate efforts, as seen in regions like Syria, the Sahel, and the DRC (Anderson, 2024; Debuysscher & Cecchi, 2022; Levy, 2017). Addressing political stability is, therefore, an essential component of comprehensive climate action strategies. Political instability diverts resources from climate action to security, damages vital infrastructure, causes population displacement, increases environmental stress, and weakens regulatory institutions. These factors collectively undermine climate resilience efforts, creating a vicious cycle where environmental degradation and conflict reinforce each other, hampering sustainable development and adaptation strategies (United Nations, 2021).

- **World Bank WGI Definition:** Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.
    - The estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.

Voice and Accountability

The lack of Voice and Accountability severely impedes climate change adaptation. When citizens can't freely participate in governance or express concerns, climate policies often fail to address the needs of the most vulnerable. Media censorship and restricted information flow hinder informed public debate and allow the unchecked spread of misinformation. Weakened civil society, through intimidation of activists and limitations on NGOs, further reduces effective advocacy. Examples include increased Amazon deforestation in Brazil, suppression of climate protesters in authoritarian states, violations of Indigenous land rights, and corruption in adaptation projects. This creates a cycle where those most affected by climate change have the least influence, exacerbating vulnerabilities and hampering adaptive capacity.

- **World Bank WGI Definition:** 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.
    - The estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.

Control of Corruption

Control of corruption is essential for preventing the diversion of funds intended for climate adaptation and disaster response. In several countries, a weak rule of law has allowed for the misappropriation of climate finance, leaving vulnerable communities underprepared for climate-related disasters and more exposed to risk.

- **World Bank WGI Definition:** 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.
    - The estimate gives the country's score on the aggregate indicator in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.

Security Threats

A high Security Threat Index significantly impairs a country's ability to adapt to adverse climate change effects. Persistent security threats divert crucial resources and attention from climate adaptation efforts to immediate safety concerns. They disrupt the implementation of long-term climate strategies, damage critical infrastructure needed for resilience, and hinder the development of adaptive capacities. Conflict often leads to population displacement, exacerbating environmental pressures in new areas. Moreover, security issues weaken institutions responsible for environmental management and climate policy. The resulting instability discourages investment in sustainable practices and technologies. Ultimately, countries facing severe security threats struggle to allocate sufficient resources, maintain consistent policies, and build the robust institutions necessary for effective climate change adaptation. Ultimately, climate change acts as a "threat multiplier," exacerbating existing vulnerabilities and creating new security challenges across various regions and sectors.

- **The Fund for Peace Fragile States Definition**: The Security Threats indicator (listed as Security Apparatus in the Fragile States Index) considers the security threats to a state, such as bombings, attacks, battle-related deaths, rebel movements, mutinies, coups, or terrorism. The Security Apparatus also takes into account serious criminal factors, such as organized crime and homicides, and the perceived trust of citizens in domestic security.
    - The estimate gives the country's score between 0 and 10

Factionalized Elites

The Fractionalized Elites, measuring power struggles among ruling elites, severely hamper climate change adaptation efforts. It leads to policy gridlock, inconsistent governance, and resource misallocation as competing factions prioritize short-term gains over long-term strategies. Corruption increases, weakening environmental institutions. International cooperation suffers due to internal conflicts. Public trust erodes when elites focus on power struggles rather than climate issues. Political instability can cause brain drain, losing crucial expertise for adaptation planning. These factors collectively undermine a country's ability to implement cohesive, long-term climate adaptation measures, leaving it more vulnerable to environmental threats and less prepared to face the challenges of climate change.

- **The Fund for Peace Fragile States Index Definition:** The Factionalized Elites indicator considers the fragmentation of state institutions along ethnic, class, clan, racial, or religious lines, as well as brinksmanship and gridlock between ruling elites. It also factors the use of nationalistic political rhetoric by ruling elites, often in terms of nationalism, xenophobia, communal irredentism (e.g., a "greater Serbia"), or communal solidarity (e.g., "ethnic cleansing" or "defending the faith").
    - The estimate gives the country's score between 0 and 10.

Calculations

Climate Risk

The Climate Risk value was obtained by combining the INFORM Risk final value (2025) with the INFORM Climate Change (2022) 'Change in Risk' value for both pessimistic and optimistic scenarios in 2050 and 2080. In order for the variables to be on the same scale, the 'INFORM Risk' final value is multiplied by 10, and the INFORM Climate Change 'Change in Risk' value is multiplied by 100. These two values are then added together and divided by 2 to produce the raw CliF Vulnerability Index Climate risk value. This single measure of vulnerability provides a cleaner assessment of present and future vulnerability.

$$IFCA\ Climate\ Risk\ Value = \frac{(INFORM\ Risk\ x\ 10) + (INFORM\ Change\ in\ Risk\ x\ 100)}{2}$$

This value is then normalized on a scale of 0-100.

INFORM Climate Change 'Change in Risk' is provided for Pessimistic 2050/2080 and Optimistic 2050/2080. The above calculation is repeated for each of the scenarios and timeframes.

Missing Values

The data used in this Index from INFORM Risk and INFORM Climate Change do not contain missing values. Subcomponent values that may be missing from these indices' subcomponents are addressed in their respective methodology approaches.

Range, Normalizations, and Distributions

- Uniform scale from 0 to 100 (normalized after the addition of scaled variables).
- Original INFORM Risk 2025 value ranged from 0.7 to 8.9.
- Original INFORM 'Change in Risk' value ranged from:
  - -0.2 to 0.9 for Pessimistic 2050
  - -0.3 to 0.7 for Optimistic 2050
  - -0.2 to 1.2 for Pessimistic 2080
  - -0.4 to 0.8 for Optimistic 2080

Weighting

- Equal weighting (50/50)

Financial Vulnerability

The Financial Vulnerability value is a composite variable developed specifically for the CliF Vulnerability Index, consisting of the three dimensions: *Debt Sustainability, Financial Integration,* and *Financial Sophistication*.

To begin, component data were pulled for each country and each particular year, and cleaned to adhere to the country naming conventions. Selected variables were then transformed to a log scale to improve the distribution of the data (see Table 4). Each variable within the three dimensions was then normalized across the countries on a scale of 0-100. To ensure the variables were aligned in directionality, data were inverted (reversed scale/revised direction alignment) for all of the Financial Integration and Financial Sophistication dimensions (the higher the score, the worse the characteristics). Overall, a higher score in the CliF Vulnerability Index indicates greater weakness in the specific financial metric. The original directionality was kept for the variables underlying Debt Sustainability.

Table 4: Financial Vulnerability Domain Dimensions and Component Variables

Debt Sustainability	Financial Integration	Financial Sophistication
Components: 1. Total Debt/GDP (log) 2. External Debt/GDP (log) 3. Debt/Exports (log) 4. Debt Service/Exports 5. Debt/Budget Revenue (log) 6. Interest rate-growth differential 7. Short-term debt/External Debt (log) 8. Short-term debt/Reserves (log) 9. Debt Service/Revenue	Components (inverted): 1. Trade/Global Trade (log) 2. Current Account/GDP 3. FDI/GDP (log) 4. Portfolio Equity Inflows/GDP 5. Portfolio Debt Inflows/GDP 6. Foreign Claims of Banks 7. Trade Credit/GDP (log) 8. Membership in IFIs/Total IFIs (log)	Components (inverted): 1. Domestic Credit to Private Sector/GDP 2. Number of New Listed Companies/Global (log) 3. Market Cap of New Companies/GDP (log) 4. Market Cap /Global Market Cap (log) 5. Turnover Ratio of Stock Exchanges/ Global (log)

Similar calculations were completed for each of the three dimensions (Debt Sustainability, Financial Integration, Financial Sophistication). To develop a composite score for each dimension, a simple average of the scores of the underlying variables was taken after accounting for any missing data and eliminating it from the denominator for each country in that particular year (i.e., calculating a simple average but only of variables with data).

$$Debt\ Sustainability = \frac{TDG + EDG + DR + DSE + DBR + IR + SDE + STR + DS}{Total\ number\ of\ variables\ with\ data}$$

Where,

TDG = Total Debt/GDP (log)
EDG = External Debt/GDP (log)
DE = Debt/Exports (log)
DSE = Debt Service/Exports
DBR = Debt/Budget Revenue (log)
IR = Interest rate-growth differential
SDE = Short-term debt/External Debt (log)
STR = Short-term debt/Reserves (log)
DS = Debt Service/Revenue

$$Financial\ Integration = \frac{GT + CA + FDI + PE + PD + FC + TC + IFI}{Total\ number\ of\ variables\ with\ data}$$

Where,

GT = Trade/Global Trade *(log, inverted)*
CA = Current Account/GDP *(inverted)*
FDI = FDI/GDP (log, inverted)
PE = Portfolio Equity Inflows/GDP *(inverted)*
PD = Portfolio Debt Inflows/GDP *(inverted)*
FC = Foreign Claims of Banks *(inverted)*
TC = Trade Credit/GDP *(log, inverted)*
IFI = Membership in IFIs/Total IFIs *(log, inverted)*

$$Financial\ Sophistication = \frac{DC + LC + MN + MG + SE}{Total\ number\ of\ variables\ with\ data}$$

Where,

DC = Domestic Credit to Private Sector/GDP *(inverted)*
LC = Number of New Listed Companies/Global *(log, inverted)*
MN = Market Cap of New Companies/GDP *(log, inverted)*
MG = Market Cap /Global Market Cap *(log, inverted)*
SE = Turnover Ratio of Stock Exchanges/ Global *(log, inverted)*

To create the final Financial Vulnerability Index value, we take a weighted average of the three dimensions described below. The final value of each dimension is multiplied by the total number of components for that dimension, irrespective of how many variables the data was available for that particular country in that particular year. We then take a weighted average of the 3 dimensions to get the composite Financial vulnerability score. The Financial Vulnerability score is computed as follows:

$$Financial\ Vulnerability = \frac{(Debt\ Sustainability\ x\ 9)\ +\ (Financial\ Integration\ x\ 8)\ +\ (Financial\ Sophistication\ x\ 5)}{22}$$

The Final Vulnerability score is then normalized on a scale of 0-100 to get the index value. This normalization allows a comparable scale to match the Climate Risk variable. For visualization purposes only, a normalization function is also performed on each of the three dimensions. The dimension-level normalization does not feed into the final Financial Vulnerability Index.

Missing Values

Some variables had data with information that only went up to 2020 or 2021, for example. To ensure that there were fewer missing data and that the most recent information in terms of data was carried forward, the last known data for countries was carried forward to fill in data for the most recent years (e.g., for 2024). Alternatively, for the following variables (Number of New Listed Companies, Turnover Ratio of Stock Exchanges, and Membership in IFIs/Total IFIs) where current information was obtained (2024), information was backfilled up to the year 2000.

A value of 0 is meaningful, if data is missing, it is blank

Range, Normalization, and Distributions

With all information collected and filled in for the variables from 2000 to 2024, in order to ensure consistency across variables, a linear min-max normalization was carried out to allow values to fall between 0 and 100. For some variables, however, where the distribution was skewed with extreme outliers, we used a log distribution. Table 4 shows which variables received a log transformation.

Direct Adjustment

Data were inverted (reversed scale/revised direction alignment) for all of the Financial Integration and Financial Sophistication dimensions.

Weighting

- When calculating the average for each country, if there was data missing for component variables, re-weighting was done, and the average of the remaining categories was taken.
- A weighted average of the three dimensions was used for the final financial vulnerability value for each country.

CliF Vulnerability Index Final Value

A simple average is taken of the final normalized Climate Risk Value and the final normalized Financial Vulnerability Value to create the final score for the CliF Vulnerability Index as follows:

CliF Vulnerability Index = (Climate Risk value x 50%) + (Financial Vulnerability value x 50%)

These scores can then help rank the countries relative to each other. CliF Vulnerability Index scores and rankings are provided for the overall Index, as well as the Climate Risk component and the Financial Vulnerability component. Higher scores indicate greater Climate Risk and Financial Vulnerability.

Final Country Selection

The CliF Vulnerability Index uses the country list from the INFORM Index (191 countries), including its naming conventions. During the data cleaning process, country names across variables were harmonized to match the INFORM index naming conventions. Due to extremely limited data for the Financial Vulnerability component of the Index, three countries were dropped: Cuba, North Korea, and Liechtenstein. INFORM does not produce data for several additional countries, which are also not included in the CliF Vulnerability Index (see Appendix II).

Supplementary Governance Index

The Supplementary Governance Index is developed by combining the six variable components from the World Bank Worldwide Governance Indicators and the two variable components from the Fund for Peace Fragile States Index (see below). First, the data were cleaned to adhere to the country naming conventions. Each variable component was then normalized on a scale of 0-100. To ensure the variables aligned in directionality (reversed scale/revised direction alignment), data were inverted from the World Bank Worldwide Governance Indicators, as a higher value in the CliF Vulnerability Index indicates a less optimal outcome (see explanation below).

World Bank Worldwide Governance Indicators

1. Government Effectiveness
2. Rule of Law
3. Regulatory Quality
4. Political Stability and Absence of Violence/Terrorism
5. Voice and Accountability
6. Control of Corruption

The Fund for Peace Fragile States Index

7. Security Threats
8. Factionalized Elites

To develop the final governance score, we took the sum of all variables and divided it by the total count of variables that contained data for that particular country in that particular year (i.e., calculating an average but only comprised of variables with data). To obtain the equal weighting, variables with missing data would not receive a count towards the denominator. For example, if a country is not missing data for any of the variables for a given year, the summed value would be divided by 8 (full variable set). If two of the variables contained missing data, the available variable components would be summed and divided by only 6 (2 variables missing from the full variable set of 8). The final Supplementary Governance Index is not normalized across countries..

$$Supplementary\ Governance\ Index = \frac{GE\ +\ RL\ +\ RQ\ +\ PS\ +\ VA\ +CC\ +\ ST\ +\ FE}{Total\ number\ of\ variables\ with\ data}$$

Where,

GE = Government Effectiveness *(normalized, inverted)*
RL = Rule of Law (normalized, inverted)
RQ = Regulatory Quality *(normalized, inverted)*
PS = Political Stability and Absence of Violence/Terrorism *(normalized, inverted)*
VA = Voice and Accountability *(normalized, inverted)*
CC = Control of Corruption *(normalized, inverted)*
ST = Security Threats *(normalized)*
FE = Factionalized Elites *(normalized)*

Missing Values

- Missing values are left empty in the historical governance dataset.
- Data is only available until 2022 for the World Bank Worldwide Governance Indicators dataset. While data is available in 2023 for the Fund for Peace Fragile States Index, the Supplementary Governance Index only goes up to 2022 as the most recent complete year.

Range, Normalization, and Distributions

The Worldwide Governance Indicators (WGI) range from approximately -2.5 (weak governance) to 2.5 (strong governance). To ensure that all variables fell on a scale of 0 to 100, a min-max normalization was carried out, where:

- 0 represents the weakest governance (highest vulnerability)
- 100 represents the strongest governance (lowest vulnerability)

Direction Adjustment

Since higher governance scores (-2.5 to 2.5) indicate better governance, normalized values will be reversed post-normalization to align with the vulnerability assessment. This reversal ensures that higher normalized values reflect higher vulnerability. The normalized governance score is calculated as:

Adjusted Governance Score (WGI) = 100 - Normalized Value

The Fund for Peace Fragile States Index indicators range from 0 to 10. The 'Security Threats' range from 0 (low threats) to 10 (high threats). Higher values indicate higher vulnerability due to increased security threats. The 'Factionalized Elites' range from 0 (low factionalization) to 10 (high factionalization). Higher values indicate higher vulnerability due to greater factionalization. Values for both variables are normalized to a 0–100 scale without adjustment, as the direction aligns with with weaker governance measures (higher values = weaker governance/higher vulnerability).

Weighting

- Equal weighting across the variables for which data is available.

Limitations and Interpretations

While the CliF Vulnerability Index presents a multidimensional framework for assessing climate vulnerability and financial accessibility, several limitations must be considered when interpreting its results. First, data availability remains a constraint. Some hazards are not effectively modeled for very small island developing states due to resolution limitations in the underlying climate models. Approaches that look across multiple hazards can effectively assess the overall burden that a country has across all hazards, but can also obscure catastrophic hazards of countries that are severely exposed to one or few hazards, but not at all to others. Highlighting countries with very high risk graphically is a partial attempt at reconciling these competing lenses.

It should also be noted that forward-looking climate risk models are improving in fidelity, but are still functioning with some degree of uncertainty. Any forecast model is inherently limited in its ability to predict the future with certainty, and as such, climate risk trends and general scales of risk can be considered with confidence based on the latest scientific understanding, but precise numerical outputs can obscure the underlying uncertainty and ongoing evolution of these forecast models. Weighting with prospective modelling and retrospective data is an attempt to reconcile gaps in forecasting with historical information that is more fully captured, albeit without consideration for future conditions.

Additionally, data omissions can affect rankings in the dataset that feed into this index. This includes omitting data that is missing in the INFORM methodologies, as well as forward- and backfilling techniques employed in Financial Vulnerability to extend data coverage. In limited instances, this may introduce temporal or other inconsistencies.

Importantly, the use of global composite indices also involves trade-offs: while they enhance comparability, they can oversimplify complex, context-specific dynamics and realities on the ground, which is critical for effective adaptation investment. As well, both climate risk and financial landscapes can rapidly evolve, with potential for non-linear cascading and compound climate and social risks that can exacerbate vulnerability.

Lastly, while the CliF Vulnerability Index provides a valuable snapshot, its continued utility will depend on regular updates to remain responsive to shifting global conditions and evolving adaptation needs. Data latency should also be considered, as rapidly evolving sub-national, national, and global events can create new dynamics not captured in the original source data for this index.

Conclusion

The Climate Finance (CliF) Vulnerability Index represents a critical step forward in aligning global adaptation finance flows with the multidimensional needs of climate-vulnerable countries. By integrating both physical climate risk and financial vulnerability into a single, methodologically rigorous framework, the CliF Vulnerability Index offers a more equitable and targeted approach to concessional climate financing. Its innovative design accounts for present and projected climate risks, financial constraints, and supplementary governance factors that influence a country's ability to access and effectively use adaptation resources.

This approach not only enhances transparency and accountability in financial decision-support inputs but also serves as a practical tool for donors, development banks, and policy institutions seeking to prioritize funding where it is most impactful. Moreover, the inclusion of the Supplementary Governance Index provides a layered understanding of institutional resilience, which can guide the tailoring of financial instruments, such as grants, technical assistance, or concessional loans, to local contexts.

As a living tool, the CliF Vulnerability Index will benefit from regular updates, stakeholder feedback, and integration with emerging datasets to stay responsive to a rapidly evolving climate and financial landscape. Future work may include deeper subnational analysis, expanded use in fragile or conflict-affected states, and refinement of data sources to increase granularity and predictive power.

Ultimately, the CliF Vulnerability Index aims to catalyze a more just, effective, and forward-looking system of climate finance — one that not only identifies need but helps unlock transformative resilience-building opportunities for the world's most at-risk populations.

Acknowledgements

The CliF Vulnerability Index project team gratefully acknowledges the Joint Research Center of the European Commission, whose consultation during the development of our index methodology significantly deepened our understanding of the INFORM Risk and INFORM Climate Change indices. These insights informed the evolution of the CliF Vulnerability Index, with the INFORM indices ultimately serving as a key pillar. We also extend our sincere thanks to the climate finance specialists whose feedback and perspectives helped shape the final framing of the CliF Vulnerability Index. Financial support for the project was provided by The Rockefeller Foundation.

Bibliography

The content of this document, including all data and hyperlinks, is current up to April 2025. Hyperlinks will not be maintained after the publication date, but are available in full length for the reader's reference.

Abbass, K., Qasim, M. Z., Song, H., Murshed, M., Mahmood, H., & Younis, I. (2022). A review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environmental Science and Pollution Research*, *29*(28), 42539-42559

Anderson, K. (14 January 2024). *Does climate change make conflict more likely?*. Greenly. https://greenly.earth/en-us/blog/ecology-news/does-climate-change-make-conflict-more-likely

Bernhofen, M.V., Burke, M., Puranasamriddhi, A., Ranger, N., & Shrimali, G. (2024). Integrating Physical Climate Risks and Adaptation into Sovereign Credit Ratings: Implications for financial stability and fiscal policy at the sovereign-bank nexus. Oxford: Smith School of Enterprise and the Environment and Environmental Change Institute, University of Oxford. https://www.eci.ox.ac.uk/node/1342

Bracking, S., & Leffel, B. (2021). Climate finance governance: Fit for purpose?. *Wiley Interdisciplinary Reviews: Climate Change*, 12(4), e709.

Browne, K. E. (2022). Rethinking governance in international climate finance: Structural change and alternative approaches. *Wiley Interdisciplinary Reviews: Climate Change*, 13(5), e795.

Calliari, E., Castellari, S., Davis, M., Linnerooth-Bayer, J., Martin, J., Mysiak, J., & Zandersen, M. (2022). Building climate resilience through nature-based solutions in Europe: A review of enabling knowledge, finance and governance frameworks. *Climate Risk Management*, *37*, 100450.

Chamon M., Klok E., Thakoor V., & Zettelmeyer J. (2022). Debt-for-Climate Swaps: Analysis, Design, and Implementation. International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2022/08/11/Debt-for-Climate-Swaps-Analysis-Design-and-Implementation-522184

Debuysscher J., & Cecchi, R. (24 March 2022). *Climate change increases social-political and geopolitical risks in the medium to long term*. Credendo. https://credendo.com/en/knowledge-hub/climate-change-increases-social-political-and-geopolitical-risks-medium-long-term

The Fund for Peace. (n..d.). *Fragile States Index*. https://fragilestatesindex.org/

European Commission: Joint Research Centre. (n.d.$_a$). INFORM. https://drmkc.jrc.ec.europa.eu/inform-index

European Commission: Joint Research Centre. (n.d.$_b$). INFORM Risk. https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk

European Commission: Joint Research Centre. (n.d.$_c$). INFORM Climate Change. https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Climate-Change

Bibliography

European Commission: Joint Research Centre, Marin-Ferrer, M., Poljanšek, K., & Vernaccini, L. (2017). Index for risk management - INFORM: concept and methodology, version 2017, Publications Office. https://data.europa.eu/doi/10.2760/094023

Jaramillo, L., Cebotari, A., Diallo, Y., Gupta, R., Koshima, Y., Kularatne, C., Lee, D. J. D., Rehman, S., Tintchev, K., & Yang, F. (2023). Climate challenges in fragile and conflict-affected states (IMF Staff Climate Note 2023/001). International Monetary Fund. https://www.imf.org/en/Publications/staff-climate-notes/Issues/2023/08/24/Climate-Challenges-in-Fragile-and-Conflict-Affected-States-537797

Lane, P. R., & Milesi-Ferretti, G. M. (2003). International Financial Integration. (IMF Staff Papers, Vol. 50). International Monetary Fund. https://www.imf.org/external/pubs/ft/staffp/2002/00-00/pdf/lane.pdf

Lane, P. R., & Milesi-Ferretti, G. M. (2017). International Financial Integration in the Aftermath of the Global Financial Crisis. (IMF Working Paper 2017/115). International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2017/05/10/International-Financial-Integration-in-the-Aftermath-of-the-Global-Financial-Crisis-44906

Lawrence, R., & Kharas, H. (2025). Technology, Policy, Jobs; Multilateralism: Geopolitics, Governance, and the Global Commons. In *Navigating Challenges for Sustainable Growth: Insights from the Indian G20 Presidency* (pp. 81-93). Singapore: Springer Nature Singapore.

Lee, H., Calvin, K., Dasgupta, D., Krinner, G., Mukherji, A., Thorne, P., & Park, Y. (2023). IPCC, 2023: Climate Change 2023: Synthesis Report, Summary for Policymakers. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.

Levy, B. S., Sidel, V. W., & Patz, J. A. (2017). Climate change and collective violence. Annual review of public health, 38(1), 241-257.

Martyr-Koller, R., Thomas, A., Schleussner, C. F., Nauels, A., & Lissner, T. (2021). Loss and damage implications of sea-level rise on Small Island Developing States. Current Opinion in Environmental Sustainability, 50, 245-259.

Organisation for Economic Co-operation and Development (OECD). (2024), Climate Finance Provided and Mobilised by Developed Countries in 2013-2022, Climate Finance and the USD 100 Billion Goal, OECD Publishing, Paris. https://doi.org/10.1787/19150727-en

Park, Y. S. (1999). Characters and Measurement Indicators of International Financial Integration in Developing Countries, George Washington University, Washington, D.C. https://www.semanticscholar.org/paper/CHARACTERS-AND-MEASUREMENT-INDICATORS-OF-FINANCIAL-Park/aeaa058f5eb231f1866f715d3663fd1ce64de14f.

Poljansek, K., Marzi, S., Galimberti, L., Dalla Valle, D., Pal, J., Essenfelder, A.H., Mysiak, J., Corbane, C. (2022). INFORM Climate Change Risk Index: Concept and Methodology, Publications Office of the European Union, Luxembourg, doi:10.2760/822072, JRC129896.

Bibliography

Schellhase, J., Sau, M., & Prabha, A. (2014). *Capital Markets in Developing Countries: The State of Play.* Center for Financial Markets, Milken Institute, https://milkeninstitute.org/sites/default/files/reports-pdf/Capital-Markets-in-Developing-Countries2.pdf

Schindler, M. (2009). Measuring Financial Integration: A New Data Set. (IMF Staff Papers, Vol. 56, No. 1). International Monetary Fund. https://www.elibrary.imf.org/view/journals/024/2009/001/article-A008-en.xml

United Nations. (9 December 2021). People and countries impacted by climate change are also vulnerable to terrorist recruitment and violence, speakers tell Security Council in open debate | Meetings coverage security council. https://press.un.org/en/2021/sc14728.doc.htm

United Nations Development Programme (UNDP). (2021). Climate Finance For Sustaining Peace: Making Climate Finance Work For Conflict-Affected and Fragile Contexts. Retrieved from https://www.undp.org/publications/climate-finance-sustaining-peace-making-climate-finance-work-conflict-affected-and-fragile-contexts

United Nations Environment Programme (UNEP). (2024). Adaptation Gap Report 2024: Come hell and high water—As fires and floods hit the poor hardest, it is time for the world to step up adaptation actions. Nairobi. https://doi.org/10.59117/20.500.11822/46497

World Bank Group. (27 September 2021). *Climate Explainer: Concessional Finance*. World Bank. https://www.worldbank.org/en/news/feature/2021/09/16/what-you-need-to-know-about-concessional-finance-for-climate-action

World Bank. (2024). Worldwide Governance Indicators, 2024 Update. https://www.worldbank.org/en/publication/worldwide-governance-indicators.

World Economic Forum. (2024). Quantifying the Impact of Climate Change on Human Health: Insight Report. https://www.weforum.org/publications/quantifying-the-impact-of-climate-change-on-human-health/.

Appendix I. CliF Vulnerability Index Detailed Variable Table

Table 5: Final Variable Table

Components	Sub-variables	Source	Link to Data
Climate Risk			
1. Climate Risk	INFORM Risk: Final Value	Disaster Risk Management Knowledge Centre, European Commission	https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Results-and-data/moduleId/1782/id/469/controller/Admin/action/Results
	INFORM Climate Change: Change in Risk	Disaster Risk Management Knowledge Centre, European Commission	https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Climate-Change/Results-and-data
Financial Vulnerability		**Debt Sustainability**	
1. Total Debt/GDP	General Government Gross Debt (% GDP)	International Monetary Fund	https://www.imf.org/en/Publications/WEO/weo-database/2023/April
2. External Debt/GDP	Public Sector External Debt (USD)	The World Bank	https://databank.worldbank.org/source/joint-external-debt-hub#
	Gross domestic product, current prices (USD)	International Monetary Fund	https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD
3. Debt /Exports	General Government Gross Debt (%GDP)	International Monetary Fund	https://www.imf.org/en/Publications/WEO/weo-database/2023/April
	Gross domestic product, current prices (USD)	International Monetary Fund	https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD
	Exports (USD)	International Monetary Fund	https://data.imf.org/regular.aspx?key=61013712
4. Debt Service/Exports	Debt service on external debt (%GDP)	International Monetary Fund	https://www.imf.org/external/datamapper/ie@FPP/USA/FRA/JPN/GBR/SWE/ESP/ITA/ZAF/IND; https://unctad.org/publication/world-of-debt https://unctad.org/publication/world-of-debtIMF up until 2009 and UNCTAD for the years 2010-2023
	Gross domestic product, current prices (USD)	International Monetary Fund	https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD
	Exports (USD)	International Monetary Fund	https://data.imf.org/regular.aspx?key=61013712
5. Debt/ Budget Revenue	General Government Gross Debt (%GDP)	International Monetary Fund	https://www.imf.org/en/Publications/WEO/weo-database/2023/April
	Government revenue (% GDP)	International Monetary Fund	https://www.imf.org/en/Publications/WEO/weo-database/2023/April
6. Interest rate-growth differential	Real interest rate (%)	International Monetary Fund	Inflation, average consumer prices - https://www.imf.org/en/Publications/WEO/weo-database/2024/April. Interest Rates - until 2023 - https://data.imf.org/regular.aspx?key=61545855) Combined with - https://tradingeconomics.com/country-list/interest-rate?continent=world for 2024
	GDP growth (annual %)	The World Bank	https://databank.worldbank.org/metadataglossary/world-development-indicators/series/DT.DOD.DSTC.ZS

Appendix I. CliF Vulnerability Index Detailed Variable Table

Components	Sub-variables	Source	Link to Data
7. Short-term debt/External Debt	Short-term Public External Debt (USD)	The World Bank	https://databank.worldbank.org/source/joint-external-debt-hub#
	Public Sector External Debt (USD)	The World Bank	https://databank.worldbank.org/source/joint-external-debt-hub#
8. Short-term debt/Reserves	Short-term Public External Debt (USD)	The World Bank	https://databank.worldbank.org/source/joint-external-debt-hub#
	International Reserves (USD)	The World Bank	https://databank.worldbank.org/source/joint-external-debt-hub#
9. Debt Service/Revenue	Public Debt Interests Payment as a share of revenues	UN Trade and Development	https://unctad.org/publication/world-of-debt
Financial Integration			
1. Trade /Global Trade	Exports by Areas and Co (USD)	International Monetary Fund	https://data.imf.org/regular.aspx?key=61013712
	Imports by Areas and Co (USD)	International Monetary Fund	https://data.imf.org/regular.aspx?key=61013712
2. Current Account/GDP	Current account balance (% of GDP)	International Monetary Fund	https://www.imf.org/en/Publications/WEO/weo-database/2023/October/
3. Foreign Direct Investment/GDP	FDI (% GDP)	The World Bank	https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS
4. Portfolio Equity Inflows/GDP	Portfolio Equity Inflows (USD)	International Monetary Fund	https://data.imf.org/regular.aspx?key=62805741
	GDP (USD)	International Monetary Fund	https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD
5. Portfolio Debt Inflows/GDP	Portfolio Debt Inflows (USD)	International Monetary Fund	https://data.imf.org/regular.aspx?key=62805741
	GDP (USD)	International Monetary Fund	https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD
6. Foreign Claims of Banks	Consolidated foreign claims of BIS reporting banks to GDP (%)	The World Bank	https://databank.worldbank.org/source/global-financial-development/Series/GFDD.OI.14
7. Trade Credit/GDP	Total Trade Credit (USD)	The World Bank	https://databank.worldbank.org/source/joint-external-debt-hub#
	GDP (USD)	International Monetary Fund	https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD
8. Membership in International Finance Institutions (IFI's)/ Total IFIs	Members IFIs		1. International Monetary Fund - https://www.imf.org/external/np/sec/memdir/memdate.htm 2. World Bank - https://www.worldbank.org/en/about/leadership/members 3. Asian Development Bank - https://www.adb.org/who-we-are/about#:~:text=Republic%20of%20Korea,poorest%20regions%20in%20the%20world. 4. The African Development Bank - https://www.afdb.org/en/about-us/corporate-information/members

Appendix I. CliF Vulnerability Index Detailed Variable Table

Components	Sub-variables	Source	Link to Data
			5. Inter-American Development Bank (IDB) - https://www.iadb.org/en/who-we-are/how-we-are-organized 6. European Bank for Reconstruction and Development (EBRD) - https://www.ebrd.com/shareholders-and-board-of-governors.html 7. Caribbean Development Bank (CDB) - https://www.caribank.org/countries-and-members/borrowing-members , https://www.caribank.org/countries-and-members/non-borrowing-members 8. European Investment Bank (EIB) - https://www.eib.org/en/about/governance-and-structure/shareholders/index 9. Islamic Development Bank (IsDB) - https://www.isdb.org/isdb-member-countries 10. Central American Bank for Economic Integration (CABEI) - https://www.bcie.org/en/member-countries 11. The New Development Bank (NDB) - https://www.ndb.int/about-ndb/members/ 12. Asian Infrastructure Investment Bank (AIIB) - https://www.aiib.org/en/about-aiib/governance/members-of-bank/index.html 13. Banco del sur (Bank of the South) - https://en.wikipedia.org/wiki/Bank_of_the_South 14. Global Fund - https://www.theglobalfund.org/media/13679/core_eligiblecountries2024_list_en.pdf 15. World Trade Organization (WTO) - https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm
Financial Sophistication			
1. Domestic Credit to Private Sector/GDP	Private sector credit (GDP%)	The World Bank	https://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS
2. Number of New Listed Companies/Global	Ratio of Number of Listed Companies in Country		Source seen in Table 2 of this Appendix
	Number of Global Listed Companies		
3. Market Cap of New Companies/ GDP	Market Cap of New Companies		Source seen in Table 2 of this Appendix
	GDP (USD)	International Monetary Fund	https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD
4. Market Cap /Global Market Cap (Market Cap Global)	Total Stock Market Cap (USD)		Source seen in Table 2 of this Appendix
	Global Market Cap (USD)		
5. Turnover Ratio of Stock Exchanges/ Global	Stock Exchanges		Source seen in Table 3 of this Appendix
	Global		
Governance			
1. Government Effectiveness		World Bank Worldwide Governance Indicators	https://www.worldbank.org/en/publication/worldwide-governance-indicators

Appendix I. CliF Vulnerability Index Detailed Variable Table

Components	Sub-variables	Source	Link to Data
2. Rule of Law		World Bank Worldwide Governance Indicators	https://www.worldbank.org/en/publication/worldwide-governance-indicators
3. Regulatory Quality		World Bank Worldwide Governance Indicators	https://data.worldbank.org/indicator/RQ.PER.RNK
4. Political Stability and Absence of Violence/Terrorism		World Bank Worldwide Governance Indicators	https://www.worldbank.org/en/publication/worldwide-governance-indicators
5. Voice and Accountability		World Bank Worldwide Governance Indicators	https://www.worldbank.org/en/publication/worldwide-governance-indicators
6. Control of Corruption		World Bank Worldwide Governance Indicators	https://data.worldbank.org/indicator/CC.EST
7. Security Threats (Security Apparatus)		Fund For Peace Fragile States Index	https://fragilestatesindex.org/excel
8. Factionalized Elites		Fund For Peace Fragile States Index	https://fragilestatesindex.org/excel

Table 6: Financial Sophistication Source List

Country	Number of Newly Listed Companies	Market Capitalization	Market Capitalization of New Companies*	Turnover Ratio of Stock Exchanges
Algeria	Algiers Stock Exchange website	CEIC	N/A	CEIC
Angola	Angola Stock Exchange website	Angola Stock Exchange website	N/A	Angola Stock Exchange website
Antigua and Barbuda	Eastern Caribbean Securities Exchange (ECSE)	Eastern Caribbean Securities Exchange (ECSE)	N/A	Eastern Caribbean Securities Exchange (ECSE)
Argentina	The World Federation of Exchanges	Bloomberg Terminal - MERVAL Index	The World Federation of Exchanges	Bloomberg Terminal - MERVAL Index
Armenia	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Australia	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Austria	The World Federation of Exchanges	Bloomberg Terminal - WBI Index	The World Federation of Exchanges	Bloomberg Terminal - WBI Index
Azerbaijan	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Bahrain	The World Federation of Exchanges	Bloomberg Terminal - BHSEASI Index	The World Federation of Exchanges	Bloomberg Terminal - BHSEASI Index
Bangladesh	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	CEIC
Barbados	Barbados Stock Exchange website	Barbados Stock Exchange website	N/A	Barbados Stock Exchange website
Belarus	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Belgium	Market Screener	Bloomberg Terminal - BELSTK Index	N/A	Bloomberg Terminal - BELSTK Index
Benin	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Bhutan	Bhutan Stock Exchange website	Bhutan Stock Exchange website	N/A	Bhutan Stock Exchange website
Bolivia	N/A	FIAB website	N/A	N/A
Bosnia and Herzegovina	N/A	CEIC	N/A	CEIC

Appendix I. CliF Vulnerability Index Detailed Variable Table

Country	Number of Newly Listed Companies	Market Capitalization	Market Capitalization of New Companies*	Turnover Ratio of Stock Exchanges
Botswana	The World Federation of Exchanges	Bloomberg Terminal - BGSMDC Index	The World Federation of Exchanges	Bloomberg Terminal - BGSMDC Index
Brazil	The World Federation of Exchanges	Bloomberg Terminal - BRPRL Index	The World Federation of Exchanges	Bloomberg Terminal - BRPRL Index
Bulgaria	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Burkina Faso	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Cabo Verde	N/A	N/A	N/A	N/A
Cambodia	Cambodia Stock Exchange website	Cambodia Stock Exchange website	N/A	Cambodia Stock Exchange website
Cameroon	N/A	N/A	N/A	N/A
Canada	The World Federation of Exchanges	Bloomberg Terminal - SPTSX Index	The World Federation of Exchanges	Bloomberg Terminal - SPTSX Index
Central African Republic	N/A	BVMAC website	N/A	N/A
Chad	N/A	BVMAC website	N/A	N/A
Chile	The World Federation of Exchanges	Bloomberg Terminal - CLPL Index	The World Federation of Exchanges	Bloomberg Terminal - CLPL Index
China	The World Federation of Exchanges	Bloomberg Terminal - SHCOMP Index	The World Federation of Exchanges	Bloomberg Terminal - SHCOMP Index
Colombia	The World Federation of Exchanges	Bloomberg Terminal - COLCAP Index	The World Federation of Exchanges	Bloomberg Terminal - COLCAP Index
Costa Rica	The World Federation of Exchanges	The World Federation of Exchanges	Monthly/Annually	N/A
Côte d'Ivoire	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Croatia	The World Federation of Exchanges	Bloomberg Terminal - COLCAP Index	The World Federation of Exchanges	Bloomberg Terminal - COLCAP Index
Cyprus	The World Federation of Exchanges	Bloomberg Terminal - CYSMMAPA Index	The World Federation of Exchanges	Bloomberg Terminal - CYSMMAPA Index
Czech Republic	The World Federation of Exchanges	Bloomberg Terminal - PX Index	The World Federation of Exchanges	Bloomberg Terminal - PX Index
Denmark	Nasdaq Copenhagen website	Bloomberg Terminal - KAXCAP Index	N/A	Bloomberg Terminal - KAXCAP Index
Dominica	Eastern Caribbean Securities Exchange (ECSE)	Eastern Caribbean Securities Exchange (ECSE)	N/A	Eastern Caribbean Securities Exchange (ECSE)
Dominican Republic	N/A	BVRD website	N/A	N/A
Ecuador	Stock Exchange Initiative	N/A	N/A	N/A
Egypt	The World Federation of Exchanges	Bloomberg Terminal - EGLSP Index	The World Federation of Exchanges	Bloomberg Terminal - EGLSP Index
El Salvador	N/A	N/A	N/A	N/A
Estonia	Sustainable Stock Exchanges Initiative	Bloomberg Terminal	N/A	Bloomberg Terminal
Eswatini	N/A	N/A	N/A	N/A
Fiji	N/A	N/A	N/A	N/A
Finland	Nasdaq Helsinki website	Bloomberg Terminal - HEX Index	N/A	Bloomberg Terminal - HEX Index
France	Euronext website	Bloomberg Terminal - PAX Index	N/A	Bloomberg Terminal - PAX Index
Gabon	N/A	BVMAC website	N/A	N/A
Georgia	Georgian Stock Exchange website	N/A	N/A	N/A

Appendix I. CliF Vulnerability Index Detailed Variable Table

Country	Number of Newly Listed Companies	Market Capitalization	Market Capitalization of New Companies*	Turnover Ratio of Stock Exchanges
Germany	The World Federation of Exchanges	Bloomberg Terminal - ICEXI Index	The World Federation of Exchanges	Bloomberg Terminal - ICEXI Index
Ghana	Ghana Stock Exchange website	Bloomberg Terminal - GGSECI Index	N/A	Bloomberg Terminal - GGSECI Index
Greece	The World Federation of Exchanges	Bloomberg Terminal - ASE Index	The World Federation of Exchanges	Bloomberg Terminal - ASE Index
Grenada	Eastern Caribbean Securities Exchange (ECSE)	Eastern Caribbean Securities Exchange (ECSE)	N/A	Eastern Caribbean Securities Exchange (ECSE)
Guatemala	N/A	N/A	N/A	N/A
Guinea	N/A	BVMAC website	N/A	N/A
Guinea-Bissau	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Guyana	N/A	N/A	N/A	N/A
Honduras	N/A	N/A	N/A	N/A
Hong Kong SAR	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Hungary	The World Federation of Exchanges	Bloomberg Terminal - BUX Index	The World Federation of Exchanges	Bloomberg Terminal - BUX Index
Iceland	Sustainable Stock Exchanges Initiative	Bloomberg Terminal - BELSTK Index	N/A	Bloomberg Terminal - BELSTK Index
India	The World Federation of Exchanges	Bloomberg Terminal - NSE500 Index	The World Federation of Exchanges	Bloomberg Terminal - NSE500 Index
Indonesia	The World Federation of Exchanges	Bloomberg Terminal - JCI Index	The World Federation of Exchanges	Bloomberg Terminal - JCI Index
Iraq	N/A	N/A	N/A	N/A
Ireland	Sustainable Stock Exchanges Initiative	Bloomberg Terminal - ISEQ Index	N/A	Bloomberg Terminal - ISEQ Index
Islamic Republic of Iran	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Israel	The World Federation of Exchanges	Bloomberg Terminal - TA-125 Index	The World Federation of Exchanges	Bloomberg Terminal - TA-125 Index
Italy	Borsa Italiana website	Bloomberg Terminal - ITLMS Index	N/A	Bloomberg Terminal - ITLMS Index
Jamaica	The World Federation of Exchanges	Bloomberg Terminal - JMSMX Index	The World Federation of Exchanges	Bloomberg Terminal - JMSMX Index
Japan	The World Federation of Exchanges	Bloomberg Terminal - NKY500 Index	The World Federation of Exchanges	Bloomberg Terminal - NKY500 Index
Jordan	The World Federation of Exchanges	Bloomberg Terminal - JOSMGNFF Index	The World Federation of Exchanges	Bloomberg Terminal - JOSMGNFF Index
Kazakhstan	The World Federation of Exchanges	Bloomberg Terminal - KZKAK Index	The World Federation of Exchanges	Bloomberg Terminal - KZKAK Index
Kenya	The World Federation of Exchanges	Bloomberg Terminal - NSEASI Index	The World Federation of Exchanges	Bloomberg Terminal - NSEASI Index
Korea	The World Federation of Exchanges	Bloomberg Terminal - KOSPI Index	The World Federation of Exchanges	Bloomberg Terminal - KOSPI Index
Kuwait	The World Federation of Exchanges	Bloomberg Terminal - KWL Index	The World Federation of Exchanges	Bloomberg Terminal - KWL Index
Kyrgyz Republic	Krygyz Stock Exchange website	N/A	N/A	N/A
Lao P.D.R.	N/A	Bloomberg Terminal - LSXC Index	N/A	Bloomberg Terminal - LSXC Index
Latvia	Sustainable Stock	Bloomberg Terminal -	N/A	Bloomberg Terminal -

Appendix I. CliF Vulnerability Index Detailed Variable Table

Country	Number of Newly Listed Companies	Market Capitalization	Market Capitalization of New Companies*	Turnover Ratio of Stock Exchanges
	Exchanges Initiative	RIGSE Index		RIGSE Index
Lebanon	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Lithuania	Sustainable Stock Exchanges Initiative	Bloomberg Terminal - VILSE Index	N/A	Bloomberg Terminal - VILSE Index
Luxembourg	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Malawi	N/A	N/A	N/A	N/A
Malaysia	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Maldives	N/A	N/A	N/A	N/A
Mali	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Malta	The World Federation of Exchanges	Bloomberg Terminal - MALTEX Index	The World Federation of Exchanges	Bloomberg Terminal - MALTEX Index
Mauritius	The World Federation of Exchanges	Bloomberg Terminal - SEMDEX Index	The World Federation of Exchanges	Bloomberg Terminal - SEMDEX Index
Mexico	The World Federation of Exchanges	Bloomberg Terminal - MXMX Index	The World Federation of Exchanges	Bloomberg Terminal - MXMX Index
Moldova	N/A	N/A	N/A	N/A
Mongolia	Mongolian Stock Exchange website	N/A	N/A	N/A
Montenegro	N/A	N/A	N/A	N/A
Morocco	The World Federation of Exchanges	Bloomberg Terminal - MOSENEW Index	The World Federation of Exchanges	Bloomberg Terminal - MOSENEW Index
Mozambique	N/A	N/A	N/A	N/A
Myanmar	N/A	N/A	N/A	N/A
Namibia	The World Federation of Exchanges	Bloomberg Terminal - FTN098 Index	The World Federation of Exchanges	Bloomberg Terminal - FTN098 Index
Nepal	N/A	N/A	N/A	N/A
Netherlands	The World Federation of Exchanges	Bloomberg Terminal - AEX Index	The World Federation of Exchanges	Bloomberg Terminal - AEX Index
New Zealand	The World Federation of Exchanges	Bloomberg Terminal - NZSE Index	The World Federation of Exchanges	Bloomberg Terminal - NZSE Index
Nicaragua	Sustainable Stock Exchanges Initiative	N/A	N/A	N/A
Niger	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Nigeria	The World Federation of Exchanges	Bloomberg Terminal - NGXINDX Index	The World Federation of Exchanges	Bloomberg Terminal - NGXINDX Index
North Macedonia	Financial Reports website	N/A	N/A	N/A
Norway	Euronext website	Bloomberg Terminal - OSEAX Index	N/A	Bloomberg Terminal - OSEAX Index
Oman	Muscat Stock exchange website	N/A	N/A	N/A
Pakistan	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Panama	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Papua New Guinea	N/A	N/A	N/A	N/A
Paraguay	Sustainable Stock Exchanges Initiative	N/A	N/A	N/A

Appendix I. CliF Vulnerability Index Detailed Variable Table

Country	Number of Newly Listed Companies	Market Capitalization	Market Capitalization of New Companies*	Turnover Ratio of Stock Exchanges
Peru	The World Federation of Exchanges	Bloomberg Terminal - PEL Index	The World Federation of Exchanges	Bloomberg Terminal - PEL Index
Poland	The World Federation of Exchanges	Bloomberg Terminal - WIG Index	The World Federation of Exchanges	Bloomberg Terminal - WIG Index
Portugal	Euronext website	Bloomberg Terminal - BVLX Index	N/A	Bloomberg Terminal - BVLX Index
Qatar	The World Federation of Exchanges	Bloomberg Terminal - QEAS Index	The World Federation of Exchanges	Bloomberg Terminal - QEAS Index
Republic of Congo	N/A	N/A	N/A	N/A
Romania	The World Federation of Exchanges	Bloomberg Terminal - BET Index	The World Federation of Exchanges	Bloomberg Terminal - BET Index
Russia	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Rwanda	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Saudi Arabia	The World Federation of Exchanges	Bloomberg Terminal - SASEIDX Index	The World Federation of Exchanges	Bloomberg Terminal - SASEIDX Index
Senegal	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Serbia	N/A	Bloomberg Terminal - QEAS Index	N/A	Bloomberg Terminal - QEAS Index
Seychelles	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Sierra Leone	N/A	N/A	N/A	N/A
Singapore	The World Federation of Exchanges	Bloomberg Terminal - FSTAS Index	The World Federation of Exchanges	Bloomberg Terminal - FSTAS Index
Slovak Republic	N/A	N/A	N/A	N/A
Slovenia	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
South Africa	The World Federation of Exchanges	Bloomberg Terminal - JALSH Index	The World Federation of Exchanges	Bloomberg Terminal - JALSH Index
Spain	The World Federation of Exchanges	Bloomberg Terminal - MADX Index	The World Federation of Exchanges	Bloomberg Terminal - MADX Index
Sri Lanka	The World Federation of Exchanges	Bloomberg Terminal - CSEALL Index	The World Federation of Exchanges	Bloomberg Terminal - CSEALL Index
St. Kitts and Nevis	Eastern Caribbean Securities Exchange (ECSE)	Eastern Caribbean Securities Exchange (ECSE)	N/A	Eastern Caribbean Securities Exchange (ECSE)
St. Lucia	Eastern Caribbean Securities Exchange (ECSE)	Eastern Caribbean Securities Exchange (ECSE)	N/A	Eastern Caribbean Securities Exchange (ECSE)
St. Vincent and the Grenadines	Eastern Caribbean Securities Exchange (ECSE)	Eastern Caribbean Securities Exchange (ECSE)	N/A	Eastern Caribbean Securities Exchange (ECSE)
Sudan	N/A	N/A	N/A	N/A
Suriname	N/A	N/A	N/A	N/A
Sweden	SSE	Bloomberg Terminal - SAX Index	N/A	Bloomberg Terminal - SAX Index
Switzerland	The World Federation of Exchanges	Bloomberg Terminal - SMI Index	The World Federation of Exchanges	Bloomberg Terminal - SMI Index
Syria	N/A	N/A	N/A	N/A
Taiwan Province of China	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A

Appendix I. CliF Vulnerability Index Detailed Variable Table

Country	Number of Newly Listed Companies	Market Capitalization	Market Capitalization of New Companies*	Turnover Ratio of Stock Exchanges
Tanzania	The World Federation of Exchanges	Bloomberg Terminal - SMI Index	The World Federation of Exchanges	Bloomberg Terminal - SMI Index
Thailand	The World Federation of Exchanges	Bloomberg Terminal - SET Index	The World Federation of Exchanges	Bloomberg Terminal - SET Index
The Bahamas	N/A	N/A	N/A	N/A
The Philippines	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Togo	BRVM website	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Trinidad and Tobago	N/A	N/A	N/A	N/A
Tunisia	The World Federation of Exchanges	Bloomberg Terminal - TUSISE Index	The World Federation of Exchanges	Bloomberg Terminal - TUSISE Index
Turkiye	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Uganda	N/A	N/A	N/A	N/A
Ukraine	N/A	Bloomberg Terminal - PFTS Index	N/A	Bloomberg Terminal - PFTS Index
United Arab Emirates	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
United Kingdom	The World Federation of Exchanges	Bloomberg Terminal - ASX Index	The World Federation of Exchanges	Bloomberg Terminal - ASX Index
United States	The World Federation of Exchanges	Bloomberg Terminal - AGGE Index	The World Federation of Exchanges	Bloomberg Terminal - AGGE Index
Uruguay	SSE	N/A	N/A	N/A
Uzbekistan	N/A	N/A	N/A	N/A
Venezuela	N/A	N/A	N/A	N/A
Vietnam	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Zambia	The World Federation of Exchanges	The World Federation of Exchanges	The World Federation of Exchanges	N/A
Zimbabwe		N/A	N/A	N/A

Appendix II. CliF Vulnerability Index Geographic Areas Missing Data

- Åland Islands
- American Samoa
- Andorra
- Anguilla
- Antarctica
- Aruba
- Bermuda
- British Indian Ocean Territory
- Cayman Islands
- Cook Islands
- Cuba (removed due to limited Financial Vulnerability data)
- Curaçao
- Falkland Islands (Malvinas)
- Faroe Islands
- French Polynesia
- French Southern Territories
- Greenland (linked to Denmark)
- Guam
- Guernsey
- Heard Island and McDonald Islands
- Holy See
- Hong Kong
- Indian Ocean Ter.
- Isle of Man
- Jersey
- Liechtenstein (removed due to limited Financial Vulnerability data)
- Macao
- Monaco
- Montserrat
- New Caledonia
- Niue
- Norfolk Island
- North Cyprus
- North Korea (removed due to limited Financial Vulnerability data)
- Northern Mariana Islands
- Pitcairn

Appendix II. CliF Vulnerability Index Geographic Areas Missing Data

- Puerto Rico
- Siachen Glacier
- Saint Barthélemy
- Saint Helena, Ascension and Tristan da Cunha
- Saint Martin (French part)
- Saint Pierre and Miquelon
- San Marino
- Sint Maarten (Dutch part)
- Somaliland (Linked to Somalia)
- South Georgia and the South Sandwich Islands
- Taiwan, Province of China
- Turks and Caicos Islands
- Virgin Islands (British)
- Virgin Islands (U.S.)
- Wallis and Futuna
- Western Sahara

COLUMBIA CLIMATE SCHOOL
NATIONAL CENTER FOR DISASTER PREPAREDNESS

Center on
Global Energy Policy
at COLUMBIA | SIPA

475 Riverside Drive, Suite 401
New York, NY 10115-0095
ncdp@columbia.edu | https://ncdp.columbia.edu