



**STATISTICS**

# **MEASURING FORWARD-LOOKING PHYSICAL AND TRANSITION RISK INDICATORS**

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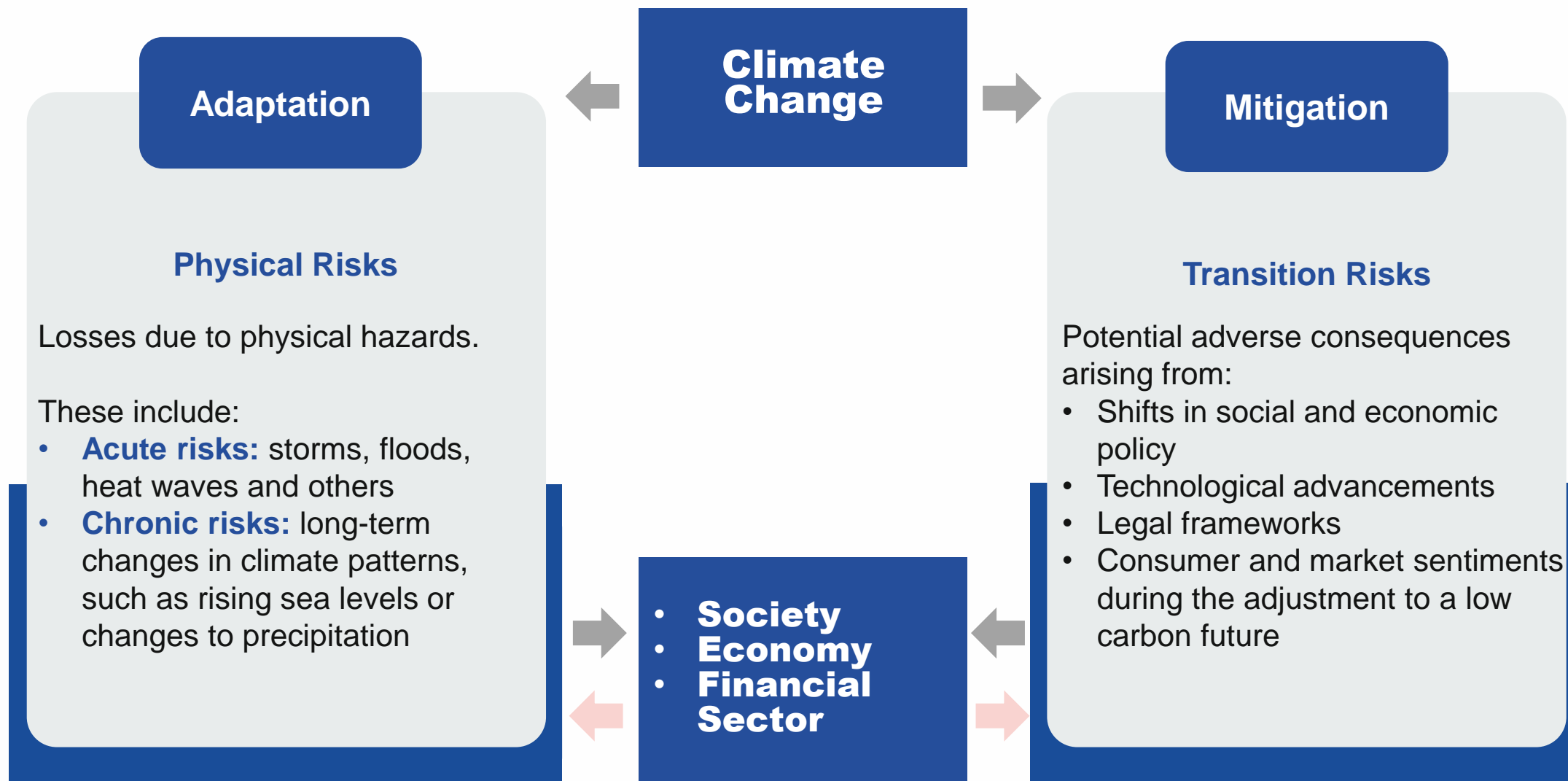


An aerial photograph showing a residential area heavily flooded with brown water. The water has inundated streets and yards, surrounding various buildings with different roof types, including corrugated metal and tiled roofs. There are many green trees and palm trees scattered throughout the area. The overall scene depicts significant flooding in a densely populated neighborhood.

**CLIMATE HAZARDS AND  
CLIMATE POLICIES HAVE  
ECONOMIC AND  
FINANCIAL IMPACT**



# Climate Risks: Physical and Transition Risks



# G20 Data Gaps Initiative (DGI 3): Recommendation 5

■ G20 initiative on measuring *Forward looking Physical and Transition Risk Indicators*

## Coverage



### 1. Physical Events



- Extreme Temperature
- Precipitation
- Drought
- Floods
- Wildfires
- Tropical Cyclones
- Sea Level Rise
- Others

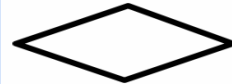


### 2. Transition Events



- Shifts in Economic Policy (carbon taxation, subsidy regime shifts)
- Technological advancements
- Changes in Consumer and Market Sentiment
- Changes to Legal Frameworks

## Measuring Risk



Hazard/ Event + Exposure



+ Vulnerability



Risks to:

Population, GDP, built-up areas (properties, public infrastructure etc.), firms, financial sector



Forward-looking estimates based on climate scenarios

## Definitions

G20

**DATA GAPS INITIATIVE 3**

Concept Note: Data Gaps Initiative (DGI 3) Recommendation 5

Forward-looking Physical and Transition Risk Indicators

(Preliminary Draft)

### I. INTRODUCTION

1. The new [Data Gaps Initiative](#) – DGI 3 – endorsed by the G20 Finance Ministers and Central Bank Governors in November 2022 highlighted the need for robust, comprehensive, and comparable data for the most urgent policy needs. The IMF staff, in close cooperation with the Financial Stability Board (FSB) Secretariat and the Inter-Agency Group on Economic and Financial Statistics (IAG), and in consultation with participating economies, have developed a workplan calling for better data to understand climate change, together with indicators that cover income and wealth, financial innovation and inclusion, access to private and administrative data, and data sharing.

# IMF's Climate Change Indicators Dashboard (CID)

- The CID includes experimental indicators on forward-looking **physical and transition risks**.

**IMF** | CLIMATE CHANGE DASHBOARD | INDICATORS | COUNTRIES | ACCESS DATA | TOOLS | LEARN MORE

## Climate Change Indicators Dashboard

Bridging the data gap on climate change for evidence-based economic decision-making

- Greenhouse Gas (GHG) Emissions**
  - GHG Emissions Accounts
  - National Inventories and Targets
  - CO<sub>2</sub> Emissions Intensities and Multipliers
  - Carbon Footprints from Economic Activity
- Mitigation**
  - Environmental Taxes
  - Environmental Protection Expenditures
  - Fossil Fuel Subsidies
  - Renewable Energy
  - Trade in Low Carbon Technology
  - Forest and Carbon
- Adaptation**
  - Climate-related Disasters Frequency
  - Climate-driven INFORM Risk
- Transition to a Low-Carbon Economy**
  - NEW** NGFS Transition Pathways
  - NEW** NGFS GDP Losses and Benefits
  - Forward-Looking Risks
  - Trade in Low Carbon Technology
  - Renewable Energy
- Climate Finance**
  - Green Debt
  - Carbon Footprint of Bank Loans
- Climate and Weather**
  - Surface Temperature Change
  - Atmospheric CO<sub>2</sub> Concentrations
  - Change in Mean Sea Levels
  - Land Cover Accounts

- For a full set of indicators visit [CID webpage](#).

# Overview of Key Projects for Better Climate Risk Analysis

- **Measuring physical and transition risk indicators under G20 DGI-3**
  - ◆ Ongoing work on building a geospatial platform
  - ◆ Working with several partners
  - ◆ Computing experimental indicators
- **Census of Structures Project: Physical Asset Exposure to Climate Hazards**
  - ◆ Provides an assessment of climate risks, including both fiscal and financial impacts
  - ◆ Vital for climate adaptation policies
- **Portwatch**
  - ◆ Explore climate risks posed to international trade
- Overall, the goal is to help Fund staff and IMF members better integrate climate risk into policy

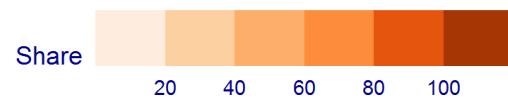
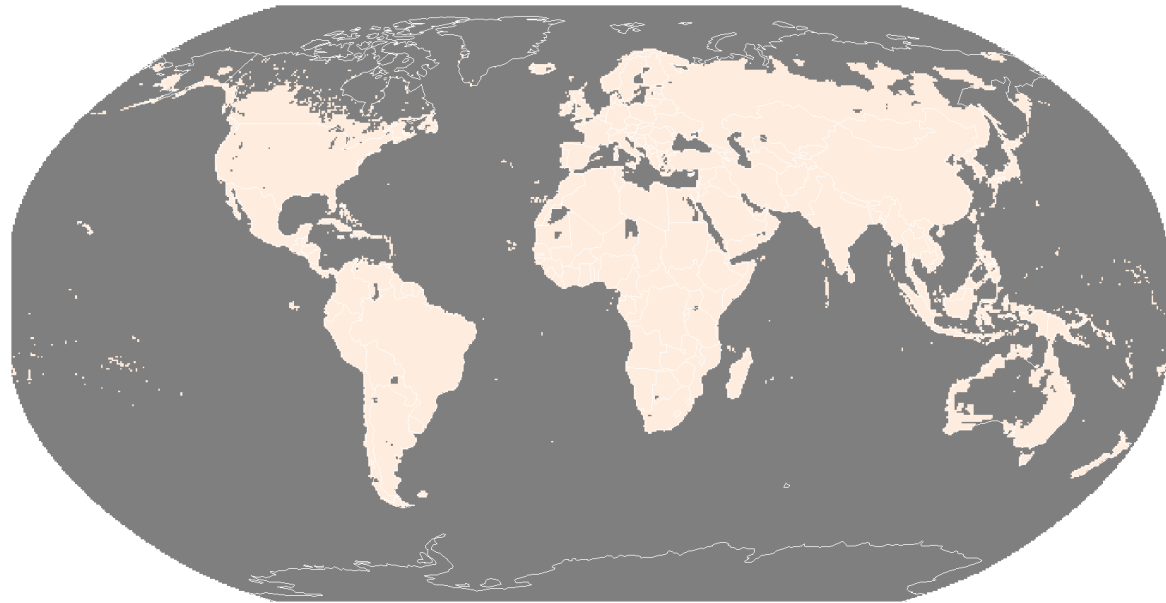




# Exposure to Heat Stress Indicators | People

Share of population (SSP245 projection)

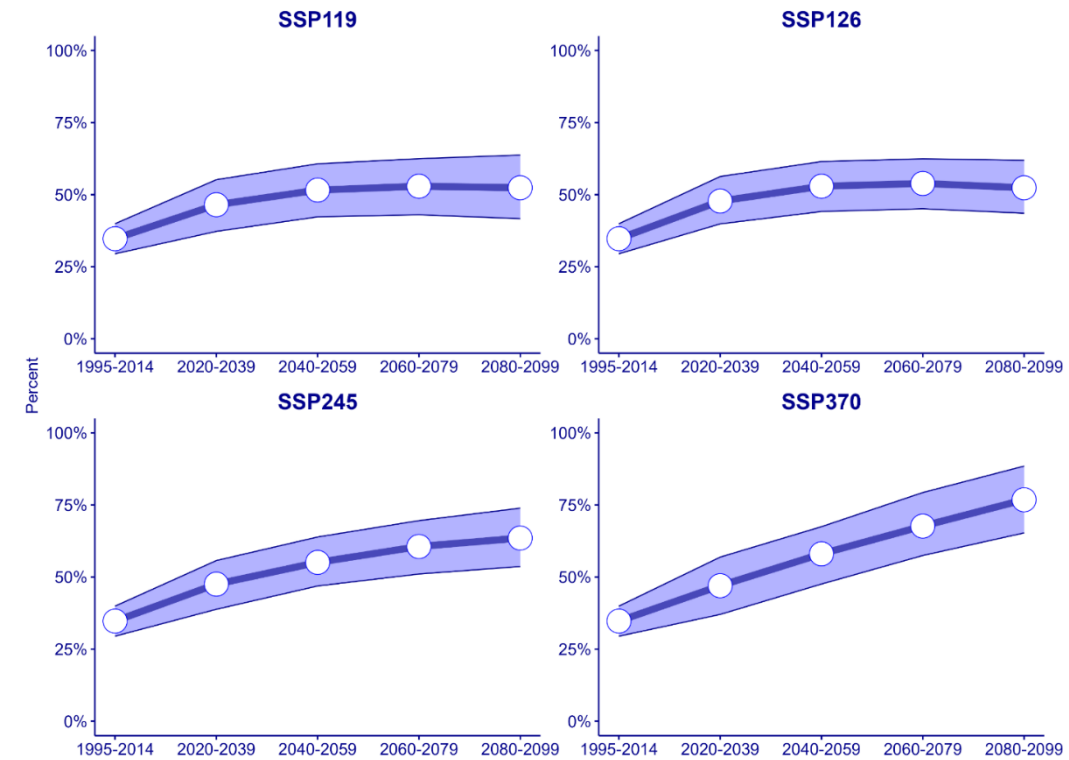
Exposed to at least 10 days with daily maximum temperature  $\geq 35^{\circ}\text{C}$   
2010



IMF Statistics computations using World Bank Climate Change Knowledge Portal gridded climate data

## G20 Countries

Percent of population exposed to at least 10 days with daily maximum temperature  $\geq 35^{\circ}\text{C}$   
CMIP6 Ensemble



Source: IMF Statistics computations using World Bank Climate Change Knowledge Portal gridded climate data.  
Original citation: Eyring, V. et al. (2016): Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, Geosci. Model Dev., 9, 1937-1958.  
DOI: <https://doi.org/10.5194/gmd-9-1937-2016>  
Note: solid line represent median, ribbon shades represent the 10th and 90th percentiles.

# Physical Asset Exposure to Climate Hazards | Buildings

Illustration: Buildings exposure to coastal flooding, historical and 2050

- Some climate hazards are highly localized (e.g. floods), requiring granular geospatial data on assets:
  - Residential and commercial buildings
  - Industrial structures
  - Critical infrastructure
- Such data allow accurate analysis of climate risks to:
  - Financial systems:
    - Banking sector (mortgages)
    - Insurance sector (losses and premiums)
    - Central bank regulation and supervision
  - Government sector (revenue and spending)
  - Overall economy



Note: Buildings exposure to coastal flood. Source: Flood data sourced from Aqueduct Floods (WRI)

- Historical (lightblue) vs. 2050 projection under RCP8.5 (Business as usual) (blue). Flood intensity=100-years return period.
- Fly to destination 1 (New Orleans, USA) and destination 2 (Guayaquil, Ecuador).



# Monitoring Trade Disruptions | PORTWATCH



In partnership with:



- PortWatch has introduced the spillover simulator and climate scenarios tools
- It allows users to explore the risks that climate extremes pose to ports and analyzes the resulting
  - ◆ port downtime
  - ◆ infrastructure damages
  - ◆ trade spillovers
- Present data derived from real time/big data information
- Future projections based on climate scenarios until 2050 by ports are also available

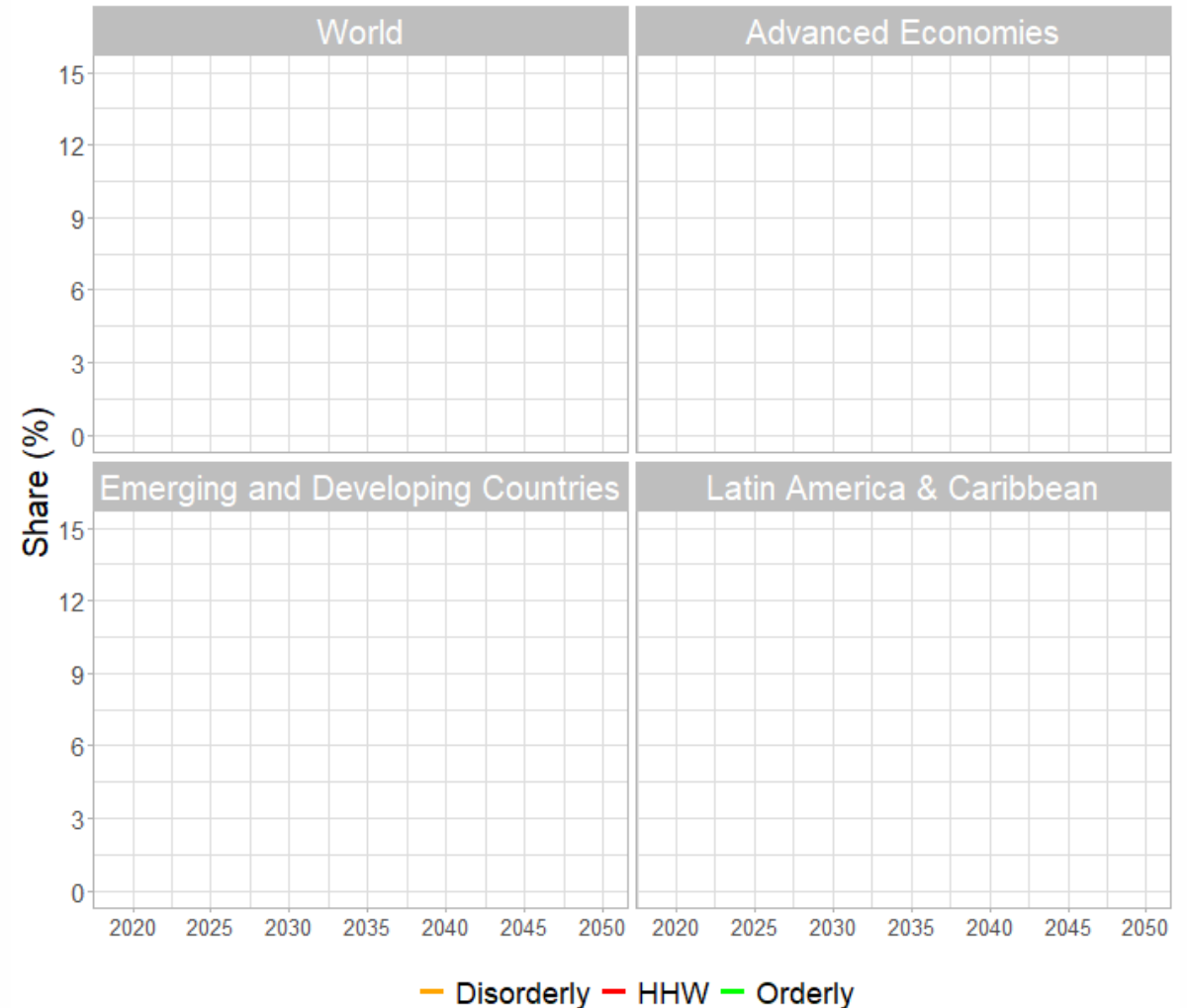
*Figure: 7-day disruption at the port of Singapore*



# Carbon Costs to Revenues: Firms at Risk Indicators

- ✓ Carbon taxes are one of the leading tools being considered to **incentivize a transition to a low-carbon economy**.
- ✓ Carbon Cost to Assets/Revenues indicator gives an indication of **how high these taxes could be in comparison to revenues/assets of the disclosing firms** along the transition to 2050
- ✓ **Direct carbon costs could exceed 5 percent of the revenues** under the disorderly scenario for the Latin America and the Caribbean Region.

Carbon Cost to Revenues (Scope 1 Emissions)



Sources: IMF Climate Change Indicators Dashboard based on ICE Data Services, Orbis (Bureau Van Dijk), Network for Greening the Financial System (NGFS); IMF staff calculations. Coverage includes only disclosing firms (no imputations are made for non-disclosing firms). HHS: Hot House World.

# Global Datasets and Geospatial Tool

## Climate Risk Indicators

Work is in progress to develop a tool that integrates different layers on hazards and exposure to identify the hot spots for risk using global data sets

The Artificial Intelligence for Environment and Sustainability (ARIES) presents a promising platform for integrating data on hazards, exposure and vulnerability

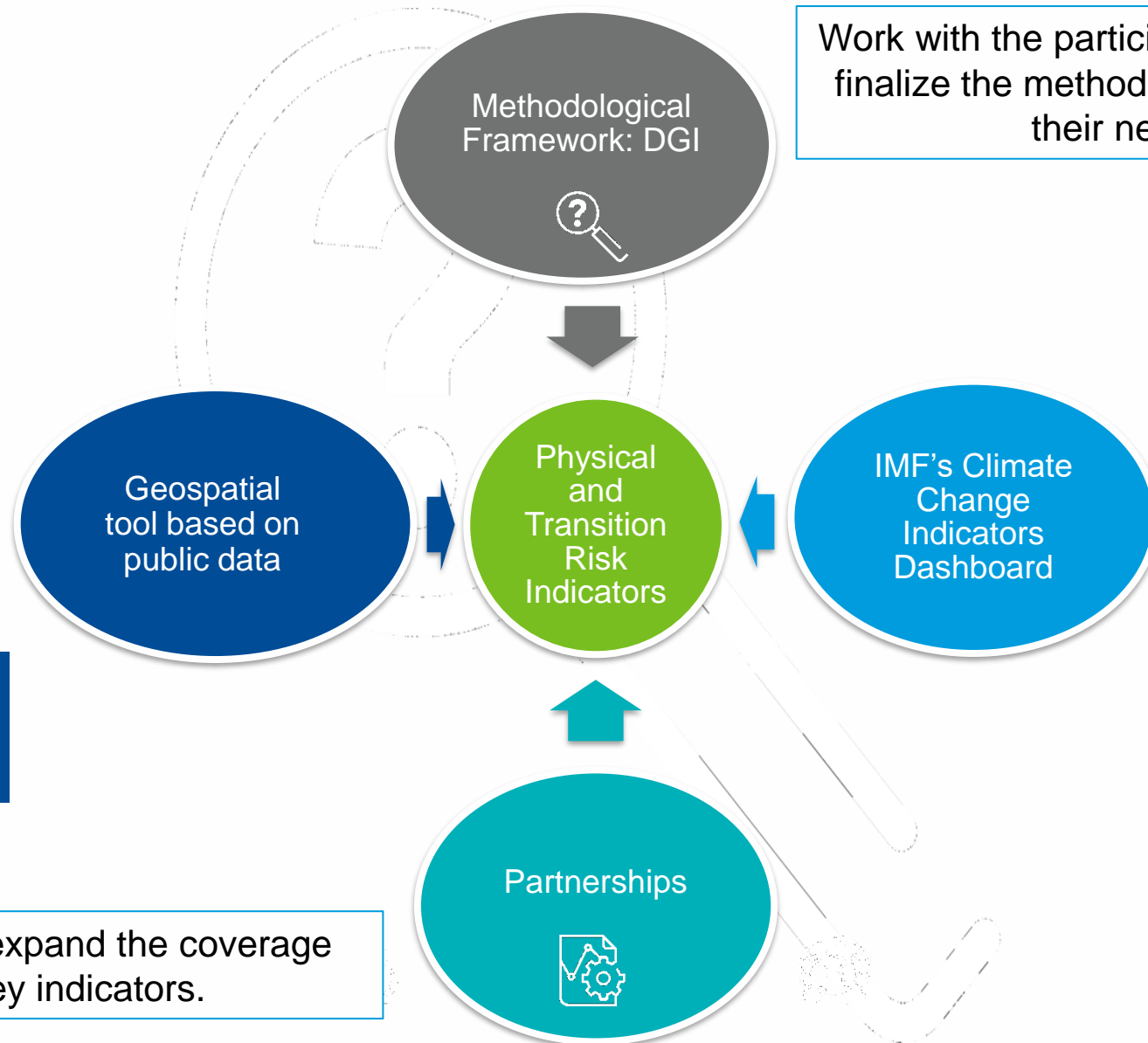
Working with many institutions to develop this information

- World Bank; European Space Agency; Basque Center for Climate Change; UN World Meteorological Organization; others

Support countries to develop its own estimates building on global data sets.



# Next Steps



Work with the participating countries of the DGI to finalize the methodological framework based on their needs assessment



Enhance partnerships and expand the coverage and usefulness of key indicators.



**Thank You!**