RESILIENT ECONOMIES INDEX – METHODOLOGICAL NOTE

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1. Introduction

This methodological note will detail the rationale behind the methodological approach chosen for the development of the Resilient Economies Index. The objective is to ensure that the method behind the results is transparent and easy to follow for external parties.

1.1 Overview

The Resilient Economies Index (REI) evaluates the climate resilience of 54 African countries to climate shocks using an analytical framework based on three complementary pillars, which are equally weighted to produce a compiled Index score:

- **Economic evaluation**, addressed through the Green Economy model (GEM), which quantifies the potential economic impacts of climate hazards on GDP and resilience. It overlays global hazard maps (floods, storms, droughts, landslides) with assets (buildings, roads, power, cropland, population) to measure exposure. These feed into a macro-model of capital, employment, and total factor productivity, considering impacts on agriculture, infrastructure and the macro-economic factors to estimate GDP losses and derive a "Gross Resilient Product" (GRP). To produce a composite Economic Resilience Score, weights were assigned to three components: 37.5% Gross Resilient Product, 37.5% asset resilience, and 25% trade resilience.
- **Policy evaluation**, reviewing each country's climate, development and key sectoral plans (post-2015 or active through at least 2025). Using a standardized 0-10 points system, it evaluates coverage, plan quality, mainstreaming, financing enabling environment, inclusiveness, data use, governance, and accountability. The policy score is produced through equal weighting of ten thematic clusters.
- **Financial evaluation**, addressing resilience across three key dimensions: funding volume, funding quality, and debt sustainability. For volume and quality, a desk-based review of adaptation project portfolios and finance flows from multilateral institutions (e.g. World Bank, AfDB) and private sector sources was conducted. Indicators were scored on a 0-10 scale, often using normal distribution to assess performance relative to the rest of the continent. Debt sustainability used a simplified method based on existing debt sustainability analysis frameworks to gauge the impact of adaptation investments, also percentile-scored, and the three-dimension percentages were averaged to produce each country's overall financial performance.

The first edition of the Index analyses 54 African countries, nearly 400 policy documents, and thousands of project-level financial entries. For the final performance result of each country, each pillar aforementioned will be weighted equally. The following sections detail the methodological underpinnings of each component, the data sources, and the procedures used to calculate the final average score.

2. Index structure and components

The objective of the Index is to evaluate the resilience of economies to climate shocks in a way that is comparable across countries and over time i.e. in potential subsequent editions of the Index. This makes replicability one of the key considerations in the development of the methodology.

A benchmarking of ten existing initiatives enabled the identification of a pattern in evaluating resilience, whereby the evaluation is deployed along two axes: one axis that captures exposure, and one that captures the ability to respond to the exposure. Indeed, resilience is approached in this Index as a combination of how exposed the economy is to climate risks, and how well equipped it is to respond to it. According to AR6 (IPCC, 2023), resilience is the capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure.

Exposure is defined, according to the IPCC Terminology (see AR6, 2023), as: "The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected." For this Index, exposure will be considered through the lens of the potential impact on economies. The focus on the economic dimension is a deliberate feature of this Index, which specifically aims to take economies as its central unit of focus in order to capture impediments to growth and development driven by climate impacts.

The IPCC defines adaptation (see AR6, 2024) as an "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." Based on this definition, the Index considers the ability to manage climate risks along two dimensions: a policy dimension and a financial dimension. These two dimensions were chosen because they met the following two core criteria: firstly, they capture an element that is directly relevant to climate adaptation – instead of incorporating broad, economy-wide factors such as a country's overall political or business climate, the Index focuses specifically on dimensions that directly shape adaptive capacity. This ensures that the indicators reflect levers of change that governments and institutions can actively influence through targeted climate adaptation policies and investments. Secondly, they capture an element where a given country's performance can evolve over time as a result of concrete actions taken by the country. This is important as the Index is conceived as a product that would enable the tracking of the economic, policy and financial performance of countries over time.

The policy component is meant to signal how well the country is acknowledging climate risks; and how well it is preparing to intervene through the planning, prioritizing and mainstreaming of adaptation interventions. This dimension is adaptation-specific as it focuses on adaptation-related policies and interventions, and can reflect improvements over time, for example if the country strengthens its policy framework.

The financial component was deemed important because it indicates the availability and accessibility of dedicated finance that enables a government to translate policy intentions into real-world resilience-enhancing actions. Climate, and specifically adaptation finance, has also long represented a crucial contention point in international climate negotiations, thus highlighting both its importance and its room for improvement. This dimension is adaptation-specific as it focuses on dedicated adaptation finance, and can reflect improvement over time, for example if the country obtains/allocates higher levels of financing.

The compilation of these three core elements – economic, policy, and financial – into a single Index score stems from the objective to provide easily digestible assessment results and showcase countries' characteristics and evolution over time, allowing for understanding both how a country is positioned in a scale from pioneering to foundational resilience and how its performance against themselves is evolving.

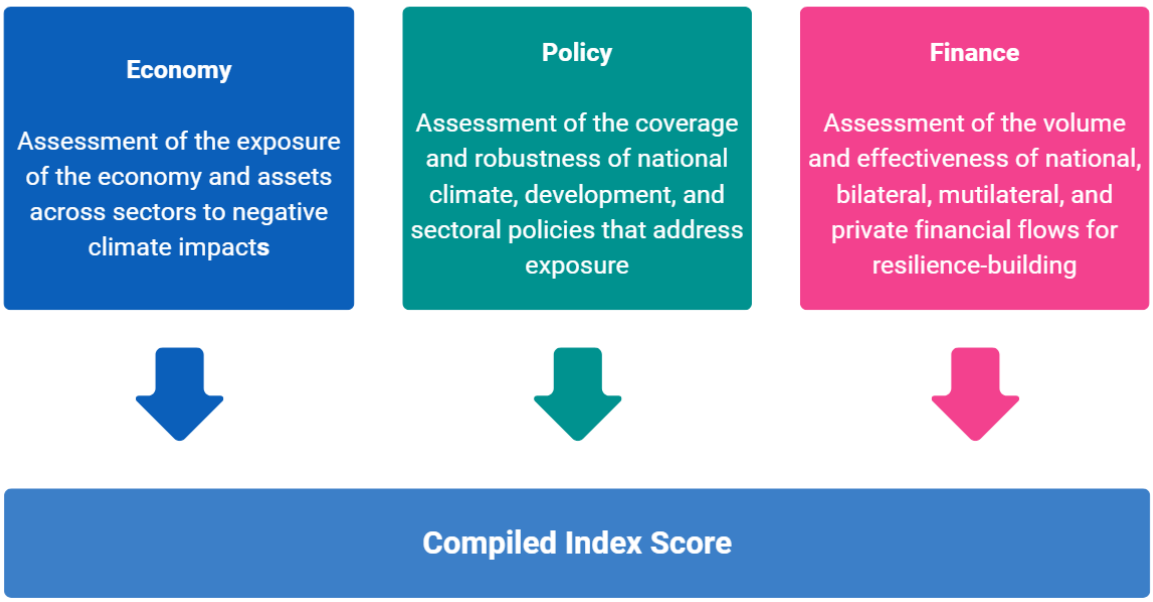

Figure 1: The three pillars of the Resilient Economies Index

3. Economic exposure evaluation

3.1 Summary

The economic resilience score considered exposure through the lens of potential economic impacts. To model this, a macro-economic model was applied. To produce a composite Economic Resilience Score, the following weights were assigned to three components: 37.5% Gross Resilient Product (GRP), 37.5% asset resilience, and 25% trade resilience.

The asset exposure analysis used globally harmonized geospatial datasets, hazard maps, and overlaid with national asset layers, including population, cropland, and roads. For each hazard and return period, the percentage and location of exposed assets are quantified and aggregated into national "asset resilience" indicators.

The system then combines exposure indicators with monthly climate data to estimate impacts on "macroeconomic resilience," encompassing capital, labour productivity, agricultural yields, and infrastructure performance. Two GDP trajectories are generated: one without climate impacts and one under a climate-impact scenario. The difference between them yields the GRP —GDP adjusted for climate losses—by sector.

To account for systemic vulnerabilities, the index also incorporates "trade resilience" for food, water, and energy. Import dependence is converted into resilience scores (accounting for diversity of partners and baseline levels of trade) and adjusted by the Human Development Index (HDI) to capture adaptive capacity.

3.2 The Green Economy Model (GEM)

3.2.1 Overview

The Green Economy Model (GEM) has been widely used by researchers, policymakers, and international organizations to assess the sustainability and environmental performance of economic systems. This modeling approach was designed to assess the wide-ranging impacts of climate change, as well as the multi-dimensional outcomes of climate action and low-carbon development interventions. Its strength lies in providing a structured, evidence-based framework that links economic activity with ecological impact, making it a trusted tool for comparative analyses and policy evaluation. It is particularly relevant in the context of increasing climate change-related extreme weather events and the urgent need for both mitigation and adaptation strategies to address climate change and promote sustainable development.

3.2.2 Description

GEM responds to the limitations of traditional, sector-focused models by providing a comprehensive framework that integrates knowledge across disciplines and stakeholders. The model is intended to capture the full spectrum of outcomes—direct, indirect, and induced—resulting from scenarios of inaction and action (e.g., investments in climate mitigation (reducing emissions) and adaptation (building resilience)). The use of a systemic approach is crucial because the impacts of climate change, as well as the benefits of climate action, emerge across social, economic, and environmental indicators, reflecting both tangible and intangible economic impacts, and affect economic sectors in different ways.

Practically, GEM offers an integrated representation of socio-economic and environmental dynamics by tracking built, social, and human capital coupled with the natural capital that supports them, at the country level (Bassi, 2015; BAPPENAS, 2021; Romeiro, et al., 2020). GEM has been designed to inform policymaking towards sustainable development, linking a top-down and bottom-up approach, and has been applied to more than 50 countries in a customized form.

For the development of this Index, a standardized yet comprehensive version of the model was calibrated to the 54 African countries, with limited customization across countries. Still, since GEM was designed to include all key sectors that are relevant for future development, for instance, in the context of low-carbon and climate resilient development (HMIT, 2021) and green recovery packages (UNEP, 2020), the standardized model offers a systemic view on the repercussions of climate change across the 54 countries considered.

Figure presents the generalized underlying structure of GEM. This diagram shows how the key capitals are interconnected, and contribute to shaping future trends across social, economic, and environmental indicators. Specifically, feedback loops can be identified as reinforcing (R) in all areas, particularly in economic growth and social development. These are enabled by the availability of natural capital, which, if not properly managed, can constrain economic growth (hence the balancing loops (B) identified in the diagram). Climate change generates systemic impacts on physical capital, the employed population and hence on production and value added, as well as on natural capital. These generate subsequent shocks for all economic actors, including the public and private sectors, and households. Policies and investments can be implemented to promote climate mitigation and adaptation, as well as sustainable consumption and production, decoupling economic growth from resource use (also through education and behavioral change), to generate a stronger and more resilient green growth.

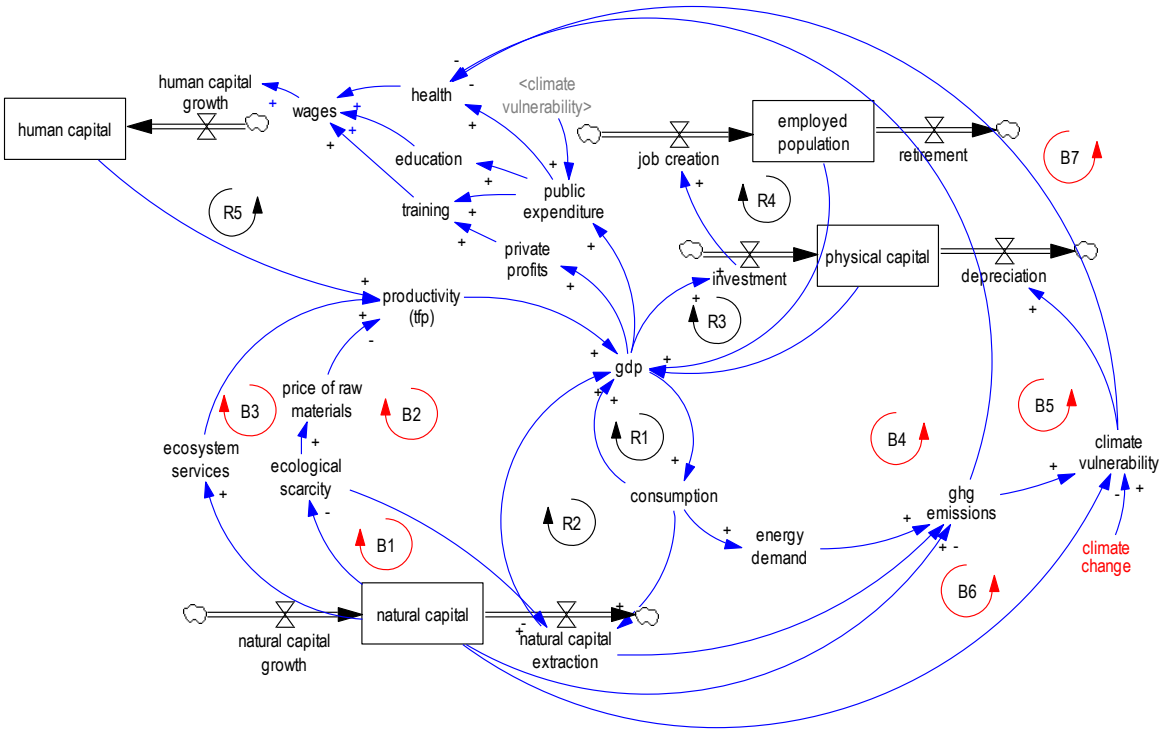

Figure 2: Overview of GEM based on (Bassi, 2015).

GEM is built using the System Dynamics (SD) methodology, serving as a *knowledge integrator*. SD is a form of computer simulation modelling designed to facilitate a comprehensive approach to development planning in the medium to long term (Meadows, 1980; Randers, 1980; Richardson & Pugh, 1981; Forrester, 2002). SD operates by simulating differential equations with "*what if*" scenarios, explicitly representing stocks and flows (critical to estimate climate change impacts on infrastructure, and how such impacts accumulate over time to affect economic productivity, among other indicators), and can integrate optimization and econometrics. The main components of GEM are presented in 3.

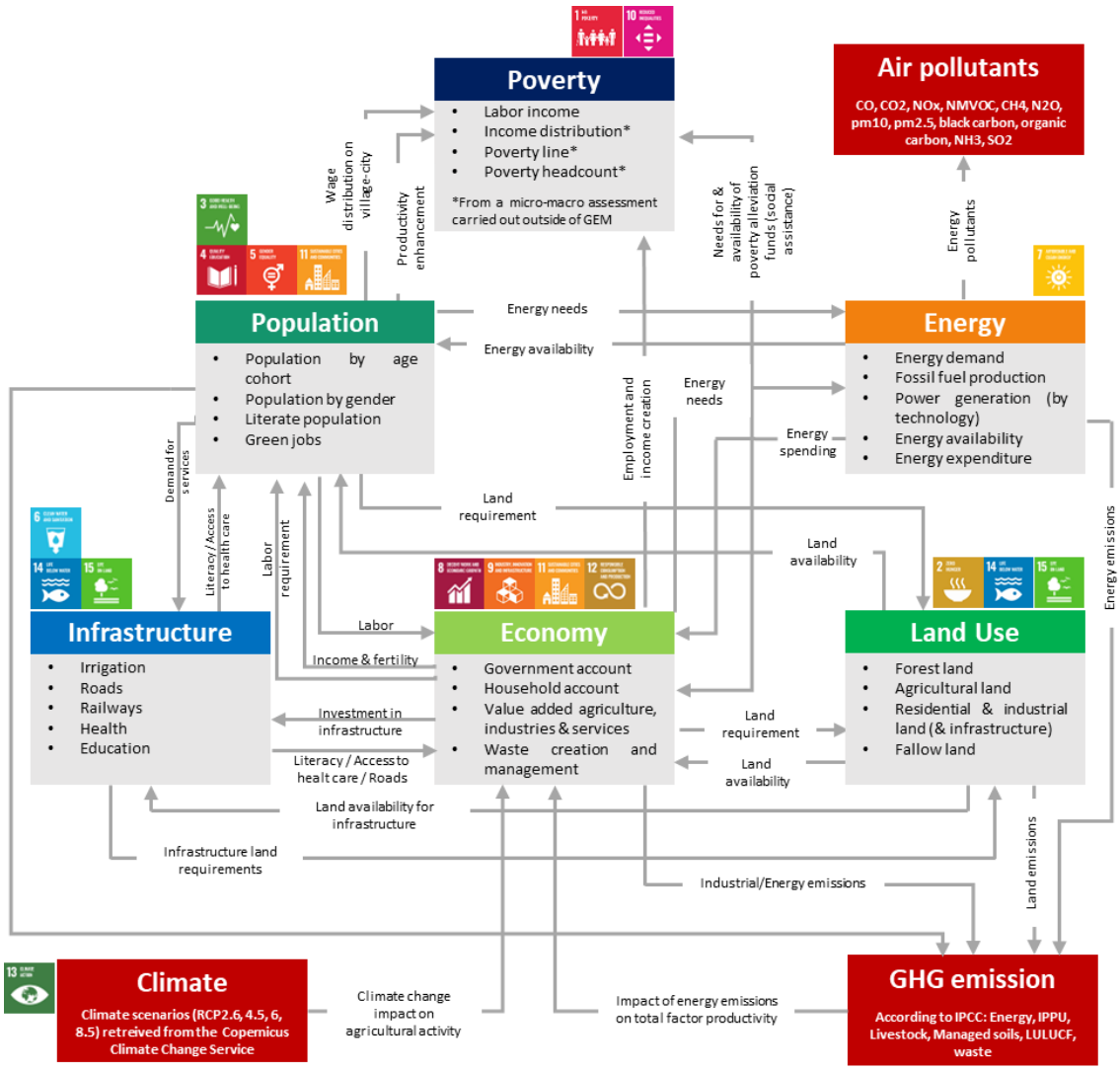

Figure 3: Sub-system diagram presenting the key sectoral components of GEM.

Source: Bassi, A.M. accessed at https://www.ke-srl.com/gem

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3.2.3 Climate impacts on the economy

3.2.3.1 Estimating assets at risk

Extreme weather events pose a growing risk to critical infrastructure, agricultural land (and crop production), and people (and labor productivity), with climate change intensifying the frequency and severity of hazards such as floods, landslides, wildfires, storms, and droughts. This component of the Index aims to assess the exposure and vulnerability of key infrastructure assets, agricultural land, and people to these hazards under different climate scenarios. GEM forecasts population growth, required infrastructure, and assets into the future. Then, by integrating geospatial datasets, including hazard maps, land cover information, and infrastructure layers, it identifies the extent to which these assets

are at risk of different climate hazards. The findings from this analysis provide a robust input to the simulations created with GEM by linking links assets to national-level economic performance.

To conduct the analysis, multiple geospatial datasets were utilized. Hazard maps (see figure 4), either as a composite covering multiple hazards or as individual maps combined for comprehensive risk assessment, serve as the foundation for identifying areas prone to extreme weather impacts. Land cover maps allow for the identification of agricultural and settlement areas that may be exposed to climate risks. Additionally, infrastructure maps include transportation networks such as roads, railways, airports, and ports, as well as buildings in key sectors, including education (schools and universities), healthcare (hospitals and clinics), energy (power plants), and other critical facilities. Power transmission lines were also incorporated into the analysis to assess vulnerability in energy distribution networks, and the economic impacts resulting from power shortages. See Figure 4 as an example.

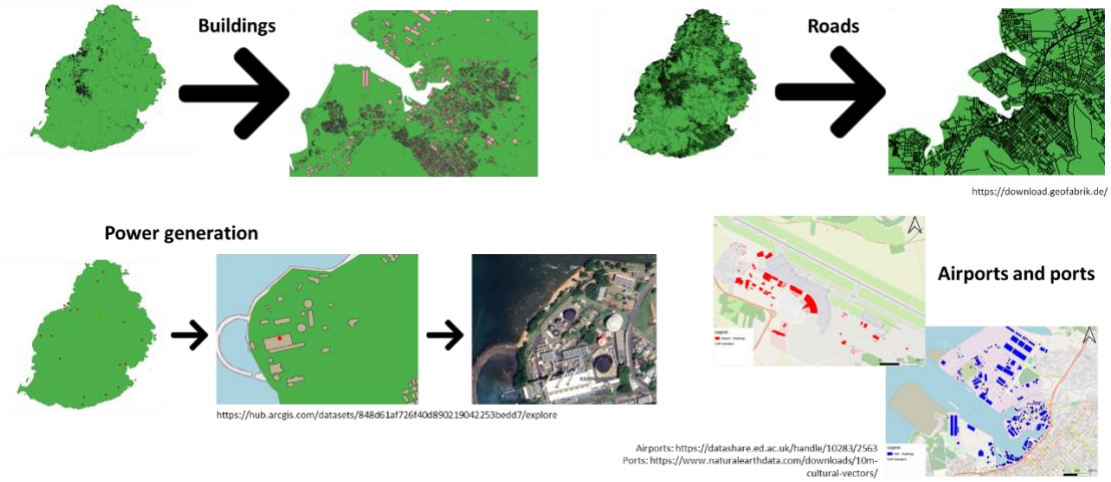

Figure 4: Example of spatial datasets that can be used to estimate the amount of assets at risk

The analysis focuses nationally on infrastructure assets and agricultural land within the country's geographic borders. The outputs include a comprehensive dataset, containing the percentage of infrastructure assets by type and agricultural land at risk. Additionally, country-level maps were produced illustrating the distribution of assets exposed to climate hazards.

The following steps were taken to assess the exposure of critical assets to selected natural hazards under various climate scenarios. The analysis focused specifically on the impacts of river floods, coastal floods, landslides, storms, and droughts, evaluating their effect on populations, buildings, power plants, transmission lines, roads, and cropland. The impacts were evaluated across a range of return periods (10, 25, 100, 250, and 1000 years) and under different climate scenarios. The approach was formulated to provide a replicable and globally consistent framework that can be applied across countries and regions, even beyond Africa.

3.2.3.2. Data Collection and Harmonization

The first step involved collecting and harmonizing geospatial datasets relevant to both hazards and exposed assets. These datasets were sourced from globally recognized databases (references listed in Table 1) to ensure methodological standardization and enable replication in other regions beyond the current study area.

Hazard datasets include spatially explicit maps of river floods, coastal floods, landslides, storms, and droughts. These hazard layers are available for multiple return periods (10, 25, 100, 250, and 1000 years), and under different climate scenarios that reflect present and future climate conditions. See **Error! Reference source not found.**.

Climate Impact	Name of Source
Floods	WRI Flood Aqueduct

Landslides	Global landslide Hazard Map (GRI)
Storm Surges	WRI Aqueduct
Sea level Rise	WRI Aqueduct
Drought	WorldPop

Table 1: Sources used for the climate hazards

Asset datasets include georeferenced layers representing population distribution, building footprints, the location of power plants and transmission lines, road networks, and cropland coverage (see **Error! Reference source not found.**). These have been selected considering global data availability, to allow for the possibility of expanding this model beyond Africa.

Sector	Name of Database
Population	WorldPop
Buildings	OSM Open Buildings
Roads	GRIP Global Roads Database
Power Generation	ResourceWatch The Global Power Plant Database
Transmission Lines	OSM Transmission lines (GEOFABRIK)
Cropland	EU Copernicus landcover fraction
Agriculture Yield	Pre-processed and bias-adjusted yield data from ISIMIP3b simulations of the Agriculture Sector
Livestock	FAO Gridded Livestock Density
Water	HydroATLAS

Table 2: Sources used for the infrastructure, asset, and population georeferenced layers

All datasets are standardized into a consistent spatial resolution and projection system to facilitate accurate spatial overlay and integration.

3.2.3.3 Integration of Hazard and Asset Maps

Once collected, the hazard and asset datasets are integrated using Geographic Information System (GIS) tools. This step involves performing spatial overlays between each hazard layer and each asset layer to identify where and to what extent assets intersect with hazard-prone zones.

For example:

- Road segments intersecting with river or coastal flood zones.
- Buildings located in storm-prone or landslide-prone areas.
- Cropland falling within regions susceptible to drought.
- Power plants and transmission lines exposed to multiple hazard types.

This spatial integration is carried out for each hazard type and return period, enabling an asset-specific risk profile.

Using Mozambique as an example, the spatial analysis reveals that approximately 5–7% of buildings are at risk of riverine flooding over time, with the exact percentage varying depending on the scenario (Figure 5). This estimate is derived from overlaying hazard maps with building footprint data, allowing for a quantification of physical exposure under different flood intensity and frequency projections.

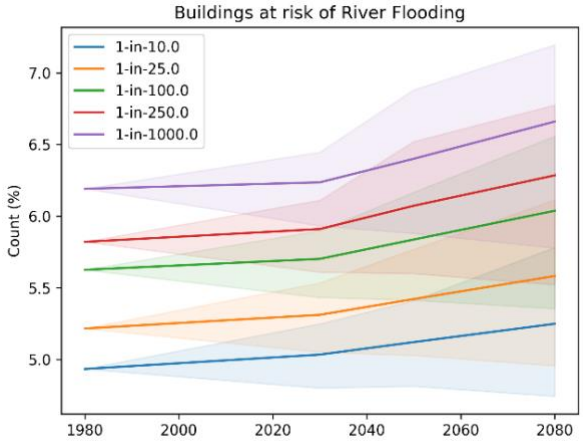

Figure 5: Buildings at risk of river flooding in Mozambique

Overlaying the flood risk data on a geographic map reveals that the highest concentrations of exposed buildings are located near the coast and in the southern regions of Mozambique, with additional areas of risk further downstream along major river systems. These patterns are based on model outputs using a 250-year return period under the historical climate snapshot (Figure 6).

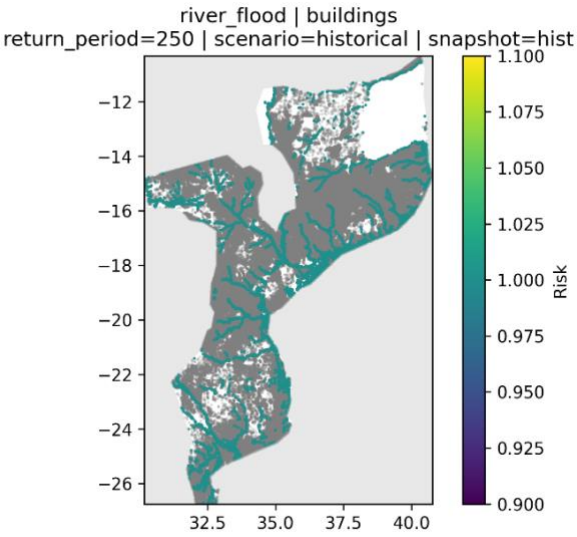

Figure 6: Spatial overlay for river flooding in Mozambique under a 1:250 event in the historical snapshot

Integrating another asset type, such as transmission lines under storm hazard scenarios, indicates that vulnerability is primarily concentrated along the coastal regions (Figure 7). Transmission infrastructure located near the coast appears most exposed to storm-related risks. This pattern, when considered alongside building exposure to river flooding, suggests that Mozambique exhibits heightened vulnerability in its coastal areas from a multi-hazard perspective.

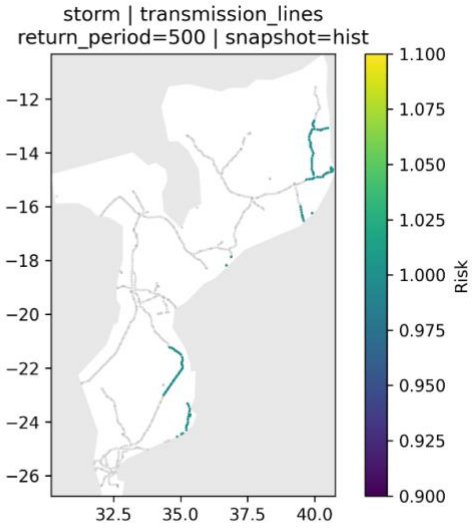

Figure 7: Transmission lines at risk of a 1:500 storm in the historical snapshot

Interestingly, this vulnerability does not extend to roads at risk of coastal flooding. The spatial analysis illustrates that, despite the concentration of building and transmission line exposure along the coast, the road network in these areas shows relatively low levels of risk from coastal flooding (Figure 8). The analysis shows that 21.7 km of road network is at risk, or 0.003% of Mozambique's entire stock of roads. This suggests that the alignment and elevation of road infrastructure may offer some inherent protection, or that these networks are less concentrated in the most flood-prone coastal zones.

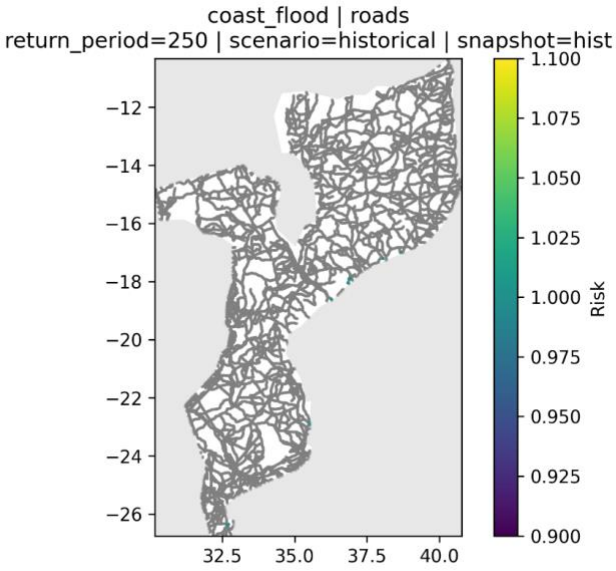

Figure 8: Roads at risk of coastal flooding in the historical snapshot with a return period of 1:250

Building on the assessment of climate hazards and asset vulnerability, the landslide risk analysis further highlights Mozambique's exposure to multiple climate-related threats. While buildings and transmission lines near the coast are primarily vulnerable to river flooding and storm hazards, approximately 5.14% of the population is exposed to landslide risk (Figure 9). Together, these findings illustrate a complex, multi-hazard vulnerability profile for Mozambique, with distinct risks affecting different regions and asset types. This underscores the importance of integrated risk management and adaptation planning that addresses the diverse spatial patterns of exposure across the country.

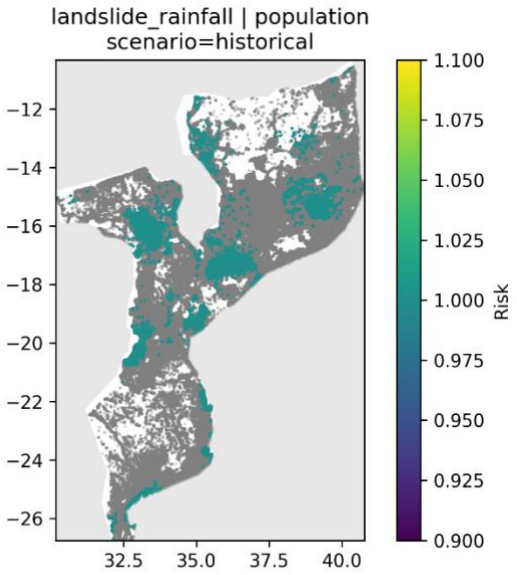

Figure 9: Percentage of Mozambique's resident at risk of landslides

3.2.3.4 Exposure Quantification

The spatial overlays are translated into quantitative exposure metrics to depict the extent to which each asset type is affected by each hazard. Key exposure statistics include:

- Population: Number and percentage of people living in hazard-prone zones, for each hazard type.
- Buildings: Number and percentage of buildings exposed to each hazard type.
- Power infrastructure: Number and percentage of power plants and length of transmission lines affected.
- Transport infrastructure: Kilometers and percentage of road networks within hazard zones.
- Crop land: Area (in hectares) and percentage of cropland exposed to floods, drought, or landslides.

This quantitative analysis is disaggregated by hazard type, return period, and climate scenario, providing a detailed risk matrix. Graphs and maps, in addition to statistics, are also produced for each hazard and asset, and for each country.

3.2.3.5. Generation of Country-Level Exposure Statistics

The quantified exposure metrics are aggregated at the country and sub-national levels to generate standardized summary statistics that can be explored using statistical analysis. These include:

- Total and percentage exposure of each asset type to each hazard.
- Geographic distribution of exposure (e.g., hazard "hotspots").

This step transforms raw geospatial data into actionable indicators that support policy analysis, infrastructure planning, and investment prioritization.

3.2.3.6 Integration into GEM

The exposure indicators serve as direct inputs into GEM to estimate potential economic losses, damage costs, and the benefits of resilience-building interventions (e.g., nature-based solutions, climate-resilient infrastructure) under different climate scenarios.

GEM accepts one input per asset, meaning that asset exposure—such as buildings at risk—are not disaggregated by individual hazards like landslides or floods. Since these hazards often stem from the same underlying driver, such as extreme weather events, their associated hazard data (including return periods, standard deviations, and spatial layers) must be aggregated into a single time series covering the period 1980 to 2080. Another complication for the use of a more disaggregated approach is the required use of climate damage functions by hazard and asset, which is currently not implemented in the model.

The aggregation method varies by country. Where the percentage of buildings at risk is closely aligned and overlapping across hazards—such as landslides, storms, coastal flooding, and river flooding—the time series are averaged point by point into the time series*Figure* . Figures 9 and 10 present an example for buildings at risk of river flooding and landslides, for Botswana and Liberia, respectively. The maps show limited overlap in the areas at risk.

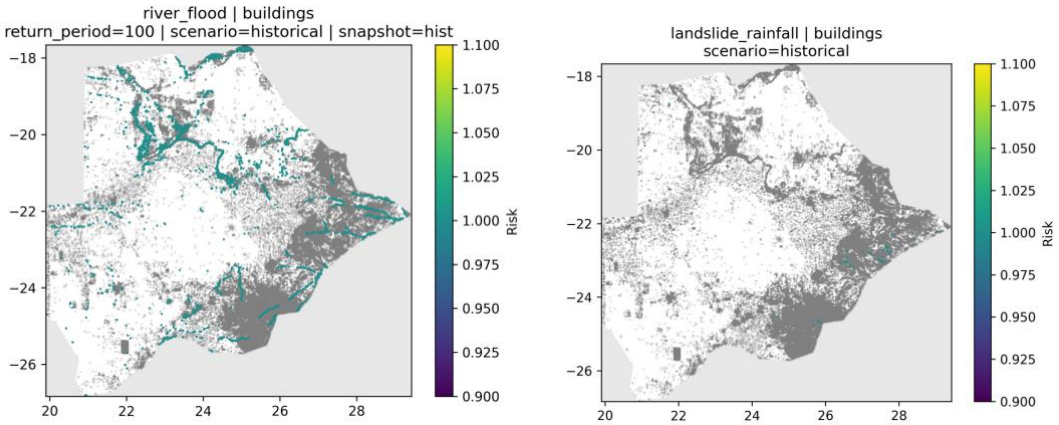

Figure 10: Botswana's buildings at risk of river flooding and landslides under the historical scenario

In cases where there is little overlap or a dominant hazard (possibly due to country-specific conditions, or data gaps in the estimation of assets at risk), a more customized aggregation approach is applied based on national conditions. A documentation file is developed accounting for each decision for each country and asset type to record the specific aggregation taken, ensuring methodological transparency and reproducibility.

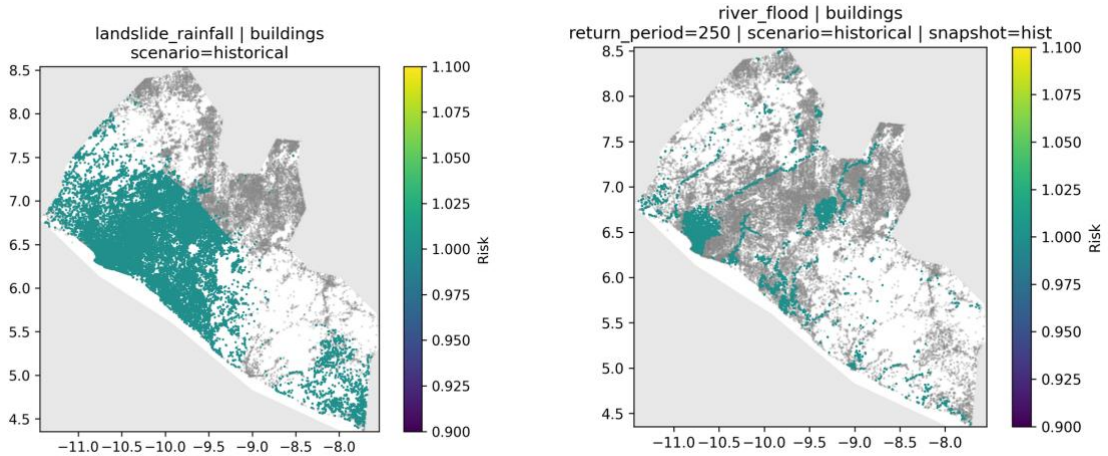

Figure 11: Liberia's buildings at risk of landslide and river flooding under the historical scenario and return period of 1:250

By incorporating a granular view of exposure — disaggregated by asset type, hazard, return period, and climate scenario — the methodology enables robust cost-benefit assessments (i.e., by the possibility

to embed an asset-specific estimation of damage, and an asset-specific analysis of intervention options -and related costs- for reconstruction or climate proofing, into a macroeconomic analysis) and risk-informed decision-making.

Finally, besides the use of GEM results for the creation of the index, the analysis of assets at risk and economic resilience to climate change can support the identification of priority areas for climate adaptation investments, the formulation of national strategies for disaster risk reduction, and enhance preparedness and response mechanisms for climate-related hazards.

3.2.4 Impact on economic productivity and economic activity

GEM uses a supply-side production function, based on (a) capital accumulation, (b) employment, and (c) total factor productivity (TFP). Damage to buildings directly impacts industry and services production (via damage to capital), while other infrastructure assets (e.g., roads, power generation, and distribution) impact TFP and result in the underutilization of capital. Both factors reduce economic activity and hence GDP. Similar impacts emerge for agriculture, where land productivity is directly shocked by extreme weather events and climate conditions, ultimately affecting production and GDP. This allows GEM to produce forecasts of GDP without climate impacts and with climate impacts, and hence estimate "Gross Resilience Product".

Specifically, GEM is equipped with monthly data on precipitation and temperature from the Copernicus Climate Data Store (CDS). These are used to determine the probability of extreme weather events and, together with the estimation of assets at risk, estimate impacts from floods, heat and droughts on people and infrastructure.

presents the climate impacts currently included in the model.

Impacts on infrastructure, land, and population also have direct economic repercussions in GEM:

- Power Generation & Load Factors: Climate change affects the efficiency and capacity of power generation, with impacts on load factors due to extreme weather events and increased variability in weather patterns.
- Roads & Buildings: Infrastructure such as roads and buildings face increased damage from extreme weather, leading to higher repair and maintenance costs and reduced usability over time.
- Industry & Service Capital: Climate impacts result in increased depreciation and loss of capital in the industry and service sectors, affecting overall productivity and economic stability.
- Transmission Networks: The reliability and efficiency of transmission networks are compromised by climate impacts, with increased risk of damage and disruption due to extreme weather events.
- Labor Productivity: Climate change affects labor productivity through health impacts, heat stress, and altered working conditions, reducing overall workforce efficiency and economic output.
- Yield & Livestock: Agricultural yields and livestock productivity are directly impacted by changing climate conditions, such as shifts in precipitation patterns and temperature extremes, leading to variability in food production.

Sector/Impact	Impact	Inputs
Agriculture	Impact of extreme drought on crop yields	• Mean weighted temperature (rural weighted) • 90th percentile of temperature (rural weighted) • Impact of temperature on crop yields
	Impact of heat on crop yields	• Mean weighted temperature (rural) • Threshold for yield impacts
	Effect of extreme wet on crop productivity	• Extreme wet percentile (SPI) • 90th percentile of SPI • Reduction in yield from extreme rain
	Impact of temperature on labor productivity (agriculture)	• Wet Bulb Globe Temperature (rural weighted) • Effect of temperature on labor productivity
Infrastructure	Effect of extreme precipitation on buildings	• Extreme wet percentile (SPI) • 95th percentile of SPI • Share of buildings susceptible to floods
	Flood damages to roads	• Extreme wet percentile (SPI) • 95th percentile of SPI • Elasticity of roads to flood damages
	Flood impacts on power generation capacity	• Extreme wet percentile (SPI) • 99th percentile of SPI
	Wind impacts on power generation capacity	• Mean wind speed (surface weighted) • 95th percentile of mean wind speed
	Flood impacts on transmission lines	• Extreme wet percentile (SPI) • 99th percentile of SPI
	Wind impacts on transmission lines	• Mean wind speed (surface weighted) • 95th percentile of mean wind speed
Macroeconomy	Impact of temperature on labor productivity (industry and services)	• Wet Bulb Globe Temperature (urban weighted) • Effect of temperature on labor productivity
	Effect of floods on industry and services capital	• Extreme wet percentile • Effect of extreme rain on capital

Table 3: Selected climate change damages included in GEM, offering the possibility to link bottom-up and top-down assessments of infrastructure resilience.

Figure 12 presents the approach in graphical form. The starting point is the parametrization of GEM at the country level, for each of the 54 African countries to analyze an important set of indicators to parametrize is the percentage of assets at risk of extreme weather events. As indicated above, this is estimated using spatial maps that offer information on areas characterized by climate hazards and the assets/land/people located in these areas (first and second steps in the image below). Since GEM estimates economic activity using infrastructure assets (for agriculture, industry, and services value added), agricultural land (for agriculture value added), and labor productivity (for industry and services value added), simulations under different climate scenarios generate GDP forecasts to 2050 that explicitly account for climate-related economic losses (third step in Figure 12). The portion of GDP that is not impacted by climate dynamics can be considered “Gross Resilience Product”.

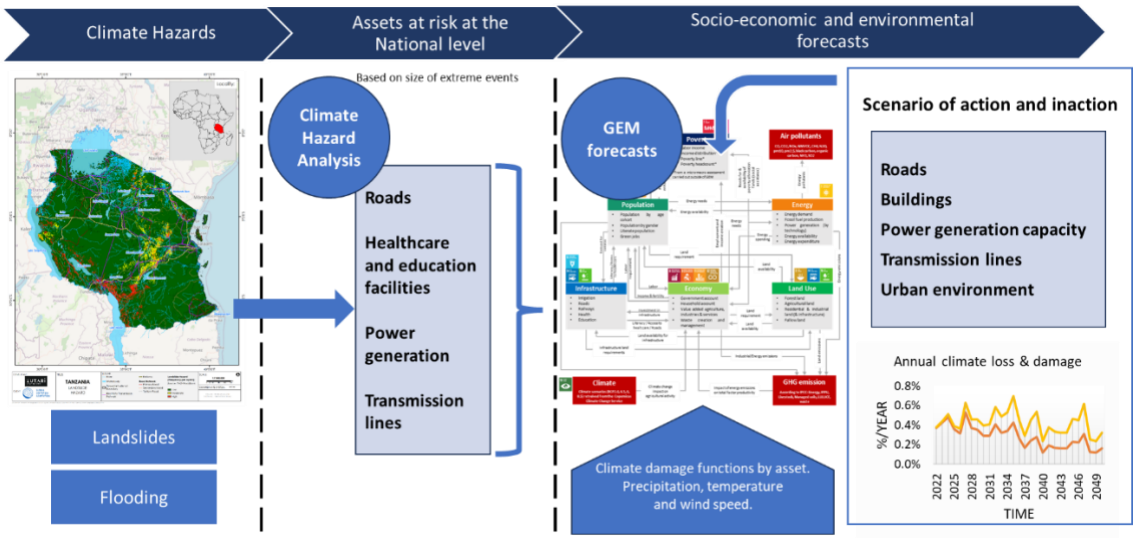

Figure 12: Approach for the estimation of socioeconomic and environmental impacts of climate change, considering bottom-up impacts on several infrastructure assets, land, and people.

3.2.5 Integrating autonomous climate adaptation in the model

The capacity of a country to learn from experience and autonomously adapt to climate change is considered in the model. Specifically, the assumption of autonomous adaptation is grounded in evidence that individuals, communities, and economies adapt based on lived experience, improved knowledge, and access to resources. Such adaptation is typically incremental, involving measures such as changes in agricultural practices, adjustments in infrastructure use, or improved disaster preparedness. However, the capacity to adapt autonomously varies significantly across countries, depending on socioeconomic development and institutional strength.

To capture these differences, the Human Development Index (HDI) was applied as a proxy for adaptive capacity. HDI is a composite measure of health, education, and income. These factors may serve to catalyze or hinder ability for autonomous adaptation. Countries with higher HDI values are expected to have greater access to knowledge, technology, and financial resources, and are therefore assumed to be more capable of achieving higher rates of autonomous adaptation. Conversely, countries with lower HDI values face greater structural constraints that limit their capacity to reduce vulnerability autonomously.

3.2.6 Model Implementation

Autonomous adaptation is represented in the model as a gradual annual improvement in adaptation (i.e., vulnerability reduction) up to a maximum of 10% by 2050, with a minimum value of 1% (based on a literature review of existing models integrating learning rates). The annual rate of improvement is determined by the HDI of each country:

- For countries with low HDI (< 0.55), the annual improvement is set at 0.0382%.
- For countries with very high HDI (> 0.8), the annual improvement is set at 0.382%.
- For countries with HDI values between 0.55 and 0.8, the annual improvement is estimated using linear interpolation between these two thresholds.

This formulation ensures a smooth and continuous relationship between HDI and autonomous adaptation capacity. Practically, this approach ensures that all countries are assumed to make some progress in adapting autonomously, but the pace and effectiveness of adaptation are differentiated by their development status. Over the period to 2050, this results in an endogenous reduction in vulnerability, which is capped at the defined maximum improvement of 10%.

3.3 Index economic component structure and estimation of results

The first subsection elaborates on the method for the estimation of GDP, with and without climate impacts. The second and third subsections present two additional components that are being developed to complement the use of (i) GRP in the estimation of the index score for economic resilience: (ii) asset exposure and vulnerability, or the amount of assets and people at risk, and (iii) trade exposure for food, energy, and water. These additions would reflect the potential damage to infrastructure in the country (item ii), the implications of trade disruptions for national resilience (item iii), and overall repercussions for sectoral value addition at the macroeconomic level (considering the role that infrastructure plays in enabling economic activity). In relation to the Economic Resilience score, the following weights are used: 37.5% for GRP, 37.5% for asset resilience, and 25% for trade resilience. The latter was determined first, based on data for African countries showing both food and energy trade exposure in the range of 25%, as an average across all African countries. The remaining 75% was allocated equally to GRP and asset resilience.

3.3.1 Estimation of Gross Resilient Product (GRP)

To assess exposure and economic vulnerability, historical and future GDP trends (2000 to 2050) are analyzed to construct a counterfactual scenario without climate change; this is required to establish a baseline for comparison with scenarios that include climate impacts. GEM forecasts trends from 2000 to 2050, with the period 2000 - 2024 being used to for model parametrization and validation against historical data. The simulation then continues to 2050, and it is aligned with the IMF World Economic Outlook forecasts until 2029. Practically, future projections are generated until 2050 (or beyond if needed), under two scenarios: one that accounts for climate change impacts (for different SSP scenarios as needed) and one that does not. The model illustrates two trajectories, showing how climate change progressively impacts and lowers GDP, because of impacts on infrastructure, land, and people (from extreme weather events and medium to longer-term climate trends). The computation of the Gross Resilient Product (GRP) is performed by comparing the % reduction in annual GDP in the climate change scenario, when compared to a counterfactual simulation that does not consider climate impacts. The GRP will reflect the GDP adjusted for climate change impacts, representing the economic value that remains resilient under adverse climatic conditions. Conversely, the remaining portion, i.e., the value added foregone as a result of climate change and extreme weather events, will not be considered in the estimation of GRP. GDP and GRP will be estimated for the sectors of agriculture, industry, and services.

The resilience score uses the % reduction in GDP during the period 2025 – 2050 (i.e., GRP is the % of GDP that is not impacted by climate change). The following indicators are produced:

- Loss as % of GDP 2025–2050 (used to estimate the GRP score)
  - ✓ Measures the average economic loss from climate change during 2025–2050, expressed as a percentage of GDP.
- Average annual loss of GDP between (i) 2000 and 2050 and (ii) 2025 and 2050 (percentage)
  - ✓ Estimates the average yearly reduction in GDP (in percentage terms) attributed to climate change impacts over the 50-year, and 25-year period.
- Cumulative and average annual GDP loss (USD) 2000-2050 and 2025-2050
  - ✓ The total estimated GDP loss in USD over the entire 2000–2050 period, and the 2025 – 2050 period, due to climate change.
- Average GDP without climate impacts (USD) 2000 - 2050 and 2025 – 2050
  - ✓ Represents the hypothetical average GDP over the period 2000–2050, and 2025 - 2050 if climate change had no impact.
- Ratio (cumulative GDP loss vs average annual GDP) 2000 – 2050 and 2025 – 2050
  - ✓ Shows how significant the total loss is relative to the average annual GDP across 2000–2050, and 2025 - 2050.

- GDP per capita loss in 2050
  - ✓ Estimates the reduction in GDP per person in the year 2050 due to climate-related impacts.
- Percentage Difference in GDP in 2050
  - ✓ Shows how much lower GDP is projected to be in 2050 due to climate impacts, compared to a no-climate-impact scenario.

GEM is used to compute the economic impact of climate change on GDP and GRP. The exposure of assets and reliance on trade are data-based and are also presented in data matrices, with the addition of images and maps for the former. Comparative charts are generated to visualize the results and country rankings.

3.3.2 Estimation of assets, agricultural land, and population at risk

The results of the work presented above (i.e., estimation of assets, population, and agriculture at risk, under different climate hazards) are used for the estimation of an aggregate index of climate exposure. An average value is estimated across assets, land, and population at risk for different climate hazards. On the other hand, within the same asset, the largest exposure is considered (e.g., if 10% of buildings are exposed to landslides, but 15% of buildings are exposed to floods, the latter value will be considered for buildings). An average is then calculated across assets to estimate a single value for the average exposure of assets, agricultural land, and population at the country level.

The value for the index considers "asset resilience", i.e., the share of assets that is not at risk of climate impacts. The score is proportional to this share, and ranges from 0 to 100 (i.e., if 25% of assets are at risk, this means that 75% of the assets are resilient, and hence the score will be 75 out of 100).

It is important to note here that the model does not analyze critical infrastructure nodes and potential related cascading effects. A multi-hazard, multi-asset approach is applied rather than looking at individual nodes.

3.3.3 Food trade

3.3.3.1 Method

The food trade exposure indicator measures a country's reliance on a concentrated set of trade partners and commodities, serving as a proxy for vulnerability or resilience to external shocks in food systems. To translate this raw trade concentration metrics into a standardized resilience score for the climate resilience index, a specific formula is applied that considers (i) a minimum value for essential trade, and (ii) the HDI score. The former reflects the impossibility for countries with minimal imports to have a diversified set of importing countries and commodities. The latter reflects the capacity of countries with high HDI to limit risks related to trade vulnerability.

Concentration measures how dependent a country is on a small number of trading partners or commodities. A highly concentrated country relies heavily on one or a few suppliers, making it more vulnerable to supply disruptions, while a diversified country spreads its imports across many partners and is therefore more resilient. Concentration was quantified using the Herfindahl-Hirschman Index (HHI), which sums the squares of the share of each supplier in total imports. A higher HHI indicates greater concentration, while a lower HHI indicates more diversification.

Concentration is estimated for trading partners and commodities, with equal weight. The score was then adjusted by considering a reduction of vulnerability for countries with a small share of cereals trade in GDP. A half quintile was estimated, below which the impact of food trade vulnerability was reduced by 50%.

Finally, the effect of HDI was added, indicating that, if a country has a high HDI score, it may be able to better cope with trade shocks in relation to food (e.g. higher affordability, but also stronger infrastructure network for improved accessibility). The HDI is chosen as a proxy for affordability (economic component), knowledge (education component), and access to services (life expectancy

component). High HDI performance may depict a higher degree of development, which allows the country to better cope with trade risks. HDI data are also available for all countries, making so that data gaps can be minimized. It is therefore assumed that a high HDI reduces the impact of import vulnerability, as follows:

- Full weight (100%) of the food trade vulnerability is given to HDI values below 0.55. These are considered lower-performing scores, and the full impact of trade vulnerability is considered in the estimation of the score.
- Reduced weight (10%) of the food trade vulnerability is applied to HDI values at or above 0.8. These represent countries with a high HDI score, and the impact of trade exposure is intentionally minimized.
- For HDI values between 0.55 and 0.8, the weight decreases linearly from 100% to 10%. This ensures a smooth transition in weighting, without abrupt jumps or breaks. The linear reduction allows to gradually scale down the importance of for trade vulnerability as countries approach high HDI scores.

Data inputs

Cereal import value by exporting country (HS10). Net imported value of cereals, by exporting country.
Cereal import value by commodity, for barley, maize (corn), millet, oats, rice, rye, sorghum, wheat.

Source

UN Comtrade database: https://comtradeplus.un.org/ with data gaps filled using ITC TradeMap (https://www.trademap.org/Index.aspx) for cereal import value by exporting country.
FAOStat: https://www.fao.org/faostat/en/#data/TCL , crops and livestock products.

3.3.4 Water stress, including water imports

3.3.4.1 Method

The level of water stress is used to account for pressures on water availability. This indicator represents the ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after taking into account environmental water requirements. The main sectors, as defined by the International Standard Industrial Classification (ISIC), include agriculture; forestry and fishing; manufacturing; the electricity industry; and services. This indicator is also commonly referred to as water withdrawal intensity.

To integrate this measure into the model, the water stress values are transformed into a normalized score for trade resilience in relation to water stress, ranging between 0 and 1, using the following formulation:

Water Score = (100-IF(water stress > 100, 100, water stress))/100

This formulation performs three functions:

- Capping values: If the level of water stress exceeds 100, it is capped at 100 to prevent unrealistic values from distorting results.
- Inversion of scale: The indicator is inverted so that higher levels of water stress result in lower scores. In this way, the score reflects trade resilience in relation to water availability: greater water stress corresponds to lower resilience.
- Normalization: By dividing by 100, the score is expressed on a 0–1 scale, facilitating integration with other resilience-related indicators in the model.

To interpret the results, the following examples can be considered:

- A country with no water stress (value = 0) receives a score of 1, indicating no constraints from water availability on trade resilience.
- A country with moderate water stress (value = 50) receives a score of 0.5, reflecting reduced resilience.
- A country with extreme water stress (value ≥ 100) receives a score of 0, reflecting severe limitations on resilience.
- This approach ensures that the level of water stress is consistently applied as a determinant of trade resilience in the model. By translating the raw stress values into a standardized and bounded score, the model accounts for the role of water availability as a fundamental factor influencing the resilience of trade to climate and resource-related shocks.

Data for the year 2021 are used.

Data inputs

Level of water stress: freshwater withdrawal as a proportion of available freshwater resources. This indicator represents the ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after taking into account environmental water requirements. Main sectors, as defined by ISIC standards, include agriculture; forestry and fishing; manufacturing; electricity industry; and services. This indicator is also known as water withdrawal intensity.

Source
AQUASTAT, developed and maintained by the FAO:
- https://www.fao.org/aquastat/en/
- https://data.worldbank.org/indicator/ER.H2O.FWST.ZS

3.3.5 Electricity trade

3.3.5.1 Method

The electricity trade exposure indicator measures each country's dependence on net imports of electricity relative to its domestic generation. This indicator reflects a country's vulnerability or resilience to external shocks in electricity supply. A scoring formula is applied to convert this raw metric into a standardized resilience score, rewarding self-sufficiency and penalizing high import dependence:

Electricity Score = max(0, min(100, 100 +
*(- net electricity imports / domestic electricity generation) *100))*

The rationale for the use of this formulation is as follows:

- Ratio of electricity imports vs domestic electricity generation: Net imports are taken with a negative sign, making so that net exporters receive a positive value while net importers receive a negative value. Net imports are then compared with domestic generation, and the resulting ratio is multiplied by 100. This way, for net importers, if electricity imports are the same amount as domestic generation, the resulting value is -100.
- Score Transformation: The accepted values are between 0 (max function) and 100 (min function), where low reliance on import or net export receive the highest score. High reliance on imports instead results in a low score.

The following two examples can be considered:

- Low reliance on imported electricity: electricity imported is 10% of domestic generation

Score=max(0,min(100, 100+(-10))=90
This reflects high resilience due to low import dependence. In the case of net export, the score would be capped at 100.

- High reliance on imported electricity: electricity imported is 90% of domestic generation

Score=max(0,min(100, 100+(-90))=10
This reflects low resilience due to high import dependence (i.e. close to half of domestic electricity consumption is imported). If electricity imports are higher than domestic generation, the score would be floored at 0.

Data inputs

Electricity imports minus exports, measured in terawatt-hours.
Net electricity imports are calculated as electricity imports minus exports. Countries with positive values are net importers of electricity; negative values are net exporters.
Total electricity generated in each country or region, measured in terawatt-hours.

Source

Ember (2025) – with major processing by Our World in Data. "Net electricity imports – Ember" [dataset]. Ember, "Yearly Electricity Data Europe"; Ember, "Yearly Electricity Data" [original data]. Retrieved June 28, 2025 from https://archive.ourworldindata.org/20250624-125417/grapher/net-electricity-imports.html (archived on June 24, 2025).
Ember (2025); Energy Institute - Statistical Review of World Energy (2024) – with major processing by Our World in Data. "Total electricity generation" [dataset]. Ember, "Yearly Electricity Data Europe"; Ember, "Yearly Electricity Data"; Energy Institute, "Statistical Review of World Energy" [original data]. Retrieved June 28, 2025 from https://archive.ourworldindata.org/20250624-125417/grapher/electricity-generation.html (archived on June 24, 2025).
Estimation of debt sustainability with adaptation loans

4. Policy evaluation

4.1 Summary:

The objective of the policy evaluation is to assess how well each country's policy and planning framework is equipped to address climate impacts. This is achieved through a review of existing climate, development, and sectoral plans, examining both the existence of key instruments and their suitability for addressing climate risks. The analysis focuses primarily on normative policy rather than its implementation, with some indicators developed to serve as proxies for understanding how implementable adaptation goals are.

To assess this, an evaluation framework was developed delving into the ten critical dimensions of policy robustness: plan coverage, results orientation, responsiveness, actionability, development integration, financing articulation, inclusiveness, data production, governance, and accountability. Each dimension includes a set of sub-indicators (see Table X) designed to capture the range and depth of policy content. Each question was scored from 0 to 10 points, and results were clustered under the ten dimensions, weighted equally, and normalized to produce the final overall policy performance score. A dedicated evaluation grid was developed to assess each country's policy set using a structured scoring system. The evaluation was conducted by a team of five members who met biweekly to address issues related to data, interpretation, and indicator consistency.

Through a systematic review, the team identified 494 available policy documents, of which more than 374 met the selection criteria and were analyzed using the policy framework. The review encompassed national climate strategies—such as NDCs, NAPs, LT-LEDS, and other climate-focused policies—as well as national development and sectoral plans in the key adaptation priority sectors for Africa identified in GCA's *State and Trends in Adaptation 2023* report: agriculture, water, health, forestry, infrastructure, and the blue economy. National communications and strategies focused on other agendas (e.g., disaster risk reduction, sustainable development, and biodiversity) were excluded to maintain focus on

adaptation, given time and scope constraints. Further details on the methodology are provided in the following section.

4.2 Explanation

The objective of the policy evaluation is to assess how well the country's policy and planning framework is equipped to address climate impacts. This is done through a systematic assessment of existing policy documents and national plans, examining both the presence of key plans and their suitability for addressing climate risks. The analysis focuses primarily on normative policy rather than implementation. However, the indicators under the *actionability* thematic cluster were designed to capture, to some extent, the clarity and enabling conditions necessary for translating goals into concrete actions.

4.3 Background

Since 2021, GCA has been developing a policy evaluation framework, grounded in a systematic literature review and the insights of GCA experts, to identify best practices for designing climate policies with higher chances of success. The framework has been refined through continuous evaluations of climate plans, helping to define its limits and provide greater detail on the elements that constitute a policy.

Extracts of the framework were applied in chapters of the *State and Trends Report Series* (2023 and 2025), with further refinements leading to the identification of sub-indicators that capture the depth and quality of climate policies. The team also incorporated additional indicators to extend the analysis of progress on adaptation within development and sectoral planning, completing the framework for this analysis.

4.4 Inclusion and exclusion criteria

The term "plan" is used broadly to encompass a wide range of government planning instruments that set out national priorities and a vision for near- to medium-term sectoral outcomes. These include documents labelled as policies, strategies, roadmaps, visions, or action plans. They may be legally binding—with specific enforcement mechanisms—or non-binding.

Two categories can be distinguished based on the scope of the plans considered:

- **Climate plans:** this category encompasses planning instruments specifically dedicated to addressing climate change. It includes strategies mandated under the UNFCCC, namely National Adaptation Plans, Sectoral National Adaptation Plans, Nationally Determined Contributions, and Long-Term Low-Emissions Development Strategies, as well as any additional national plans developed by individual countries National Communications under the UNFCCC were not analysed due to their wide variability in scope and coverage, particularly regarding adaptation, and because they do not constitute formal commitments to action. However, they were included in the corpus as a reference point for the overall policy framework assessment (see below for more details). National Adaptation Programmes of Action (NAPAs) were also excluded from this analysis. These documents, developed under the LDC Work Program, apply only to 35 African countries and 44 countries worldwide, limiting their general relevance. With an average adoption date of 2007, these documents reflect a pre-Paris Agreement climate governance context characterized by different approaches and priorities. Given their dated nature and reduced relevance to current governance, priorities, and planning instruments, NAPAs were considered to have been supplanted by NAPs under the Paris regime. The analysis, therefore, focuses on NAPs or the adaptation component of

the NDCs rather than on NAPAs. Finally, Disaster Risk Reduction (DRR), Sustainable Development, and Biodiversity plans related to UNFCCC processes were excluded from the analysis to keep the focus on adaptation commitments and due to time constraints. Future editions of the Index may incorporate these areas, recognizing their critical links to the adaptation agenda.

- **Development and sectoral plans:** This category covers other government planning instruments examined in this analysis to determine whether adaptation action measures are limited to climate-specific strategies or have been effectively mainstreamed across key sectors of the national economy. It includes economy-wide medium- or long-term development plans. The selection of the key sectors for sectoral plans was drawn from the GCA's 2023 States and Trends Report, which identifies the most prominently featured sectors in African UNFCCC strategies (STA23, p. 105). Based on that analysis, the sectors considered here include agriculture and livestock, water, health, infrastructure, coastal/blue economy, and forestry plans. Biodiversity, although prominent, was excluded from this review because these plans align more closely with the Convention on Biological Diversity. Including biodiversity would risk overlap with the climate plan category and introduce different standards. Similarly, plans oriented primarily towards other international agreements (e.g., REDD+ strategies, CBD submissions, and DRR plans) were excluded. Assessing these would require evaluating the interaction between different international policy platforms, which is beyond the scope of this analysis. Accordingly, this analysis focuses on sectoral plans developed through a purely national, rather than internationally oriented, planning process.

To further define the scope of sectoral plans considered, only those with a timeframe extending at least to 2025 were included in the analysis. When the timeframe was unclear, plans were included only if their creation date was no earlier than 2015—a reasonable threshold given the adoption of the Paris Agreement that year and the start of a new international climate regime.

The exclusion criterion was applied differently for climate and development plans. Both climate plans scheduled for an update (e.g., 2015 NDCs) and the most recent national development plans were included, even if their validity had expired. This reflects the understanding that these instruments are updated in continuity—unlike sectoral plans. Moreover, many countries integrate sectoral priorities within their development plans rather than producing standalone sectoral reports.

4.5 Document retrieval strategy

Climate policy documents were collected through online searches using the UNFCCC official portal, while development plans were retrieved using standard search engine searches and accessing government official sites. Searches were conducted in national languages when possible. The team is fluent in English, French, Spanish, and Portuguese, and uses online translation services for Arabic as needed.

A total of 494 plans/strategies were identified across 54 countries, from which 374 met the established criteria and 120 did not. The excluded documents include 35 NAPAs, 53 National Communications, 21 National Adaptation Communications, and 11 unavailable plans. The exclusion number does not include plans and strategies predating 2015, those related to other agendas, or those outside the UNFCCC framework. Among the 385 analysed documents, 144 were climate policies and 230 were development or sectoral plans (Figure 13). However, some policies may not have been captured due to limitations in accessing them.

The team set August 15th as the cut-off date for identifying new documents to ensure sufficient time for data interpretation, communication materials, and knowledge products. Any climate, development, or sectoral plans published after the cutting date will be incorporated into the scores of a subsequent Index edition.

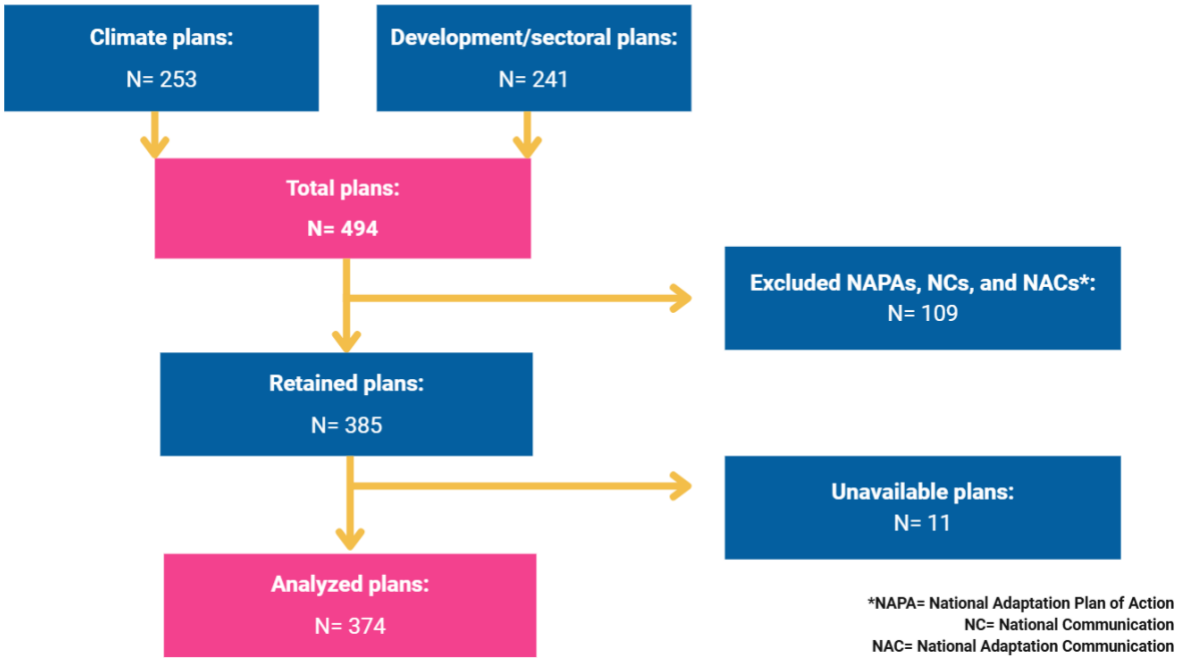

Figure 13. Inclusion/ Exclusion Diagram

4.6 Evaluation framework, synthesis and scoring

To assess each country's policy set, a dedicated evaluation grid was developed using a structured scoring system. Five team members evaluated the policies. Biweekly meetings to discuss any issues related to the interpretation of the questions were held, and the rationale was adjusted as needed based on findings across the documents to enhance clarity and consistency and ensure inter-coder reliability.

To ensure accuracy, each country and its associated documents were cross-checked by a different team member. In cases of uncertainty, these were brought to the larger team meetings for collective discussion and resolution.

For each evaluated document, the team highlighted the information relevant to every indicator and recorded both the rationale and page number in a dedicated spreadsheet. This structured approach ensures replicability, allows for future corrections if an indicator was later found to have been misinterpreted or overlooked, and enables multiple reviewers to analyze the material in a standardized manner.

After their initial formulation, the framework was continually refined and clarified through periodic joint reviews among the researchers to identify and address any ambiguities or misinterpretations in the guidelines. To further promote consistency, all questions were rated on the same scale from 0 to 10 to eliminate discrepancies in the point system across different questions. Evaluation questions with more possible answers offered a broader range of possible scores between 0 and 10 (e.g., a binary question allowed only 0 and 10, while a question with five possible answers allowed 0, 2.5, 5, 7.5, 10).

The evaluation questions were designed to capture different aspects of the policy set and grouped into three categories: policy coverage, individual policy quality, and policy frameworks. These were developed in consultation between the GCA Programs, Research, and Policy teams to ensure that the

evaluation framework was grounded in practitioners' experience with these policies and their deployment on the ground. The complete list of questions for this study can be found below:

4.7 Policy coverage

This set of questions aims to assess whether the country has a comprehensive policy set to plan for adaptation action. The following elements are covered:

Questions	Rationale	Rating	Rating justification
Is adaptation addressed in the country's strategies submitted to the UNFCCC (either through a dedicated NAP and/or through a dedicated section of the NDC)?	The UNFCCC is the core international platform for climate action, and mandated planning instruments under this convention are a key element of a robust policy set. The NAP is given more value due to its dedicated focus on adaptation; however, in absence of a NAP, addressing adaptation in the NDC is a good first step.	10	The country has submitted a NAP
		5	The country has not submitted a NAP, but the NDC includes a clear adaptation component
		0	The country has not submitted a NAP and the NDC does not include a clear adaptation component
Is adaptation addressed in other key national planning tools (e.g. development plan)?	Adaptation action is more likely to be effectively deployed if it is not siloed in climate plans, but rather mainstreamed into the country's entire policy apparatus, across different sectors. The performance of plans on the question related to "acknowledging adaptation" (see development plans section below) is used as the reference point to assess this question in a standardized manner.	10	The National Development Plan scored at least 6.6 on "acknowledgment of adaptation", and there is the presence of at least two sectoral development or climate plans for different sectors with at least 6.6 on "acknowledgment of adaptation".
		5	The National Development Plan scored at least 6.6 on "acknowledgment of adaptation", but there is no presence of at least two sectoral development or climate plans for different sectors with at least 6.6 on "acknowledgment of adaptation".
		0	The National Development plan does not score at least 6.6 on "acknowledgment of adaptation".
Does the country have a complementary implementation plan to support the deployment of its UNFCCC submitted strategies (e.g. NAP/NDC implementation plan)?	The existence of a NAP/NDC implementation plan, while not mandatory, provides a signal of the translation of the NAP/NDC into implementable actions	10	The country has a NAP/NDC implementation plan or equivalent
		0	The country does not have a NAP/NDC implementation plan or equivalent
Does the country have sub-national and/or sectoral adaptation plans?	This question aims to reflect a quantitative element in the assessment by rewarding countries that have gone beyond economy-wide national plans	10	Evidence that the country has both sub-national and sectoral climate plan(s)
		6.6	Evidence that the country has sub-national or sectoral climate plan(s)
		3.3	Evidence that either a sub-national plan or a sectoral plan is under development
		0	Evidence of neither

Table 4. Questions Policy Coverage

4.8 Policy content

This set of questions aims to serve as a proxy for assessing the characteristics of the different relevant policies in terms of the scope and actionability of adaptation measures.

4.8.1 Climate plans:

The set of questions for the climate plans aims to provide an in-depth exploration of the adaptation measures put forward in the country's climate plans. The evaluation is conducted individually for each of the plans and follows the following guiding questions:

Questions	Rationale	Rating	Rating justification
How long has the strategic document been in place for?	This question aims to capture the likelihood that the plan's foreseen actions are already being implemented and positive effects being felt. A more recent plan will have less chance of already having impact. This question also rewards continuity, acknowledging when a plan builds on previous versions of the same planning instrument.	10	The strategic document was adopted 2+ years ago, or it is a second/updated version of a previously existing strategic document
		6.6	The strategic document was adopted 1-2 years ago, and is the first of its kind (no continuity)
		3.3	The strategic document was adopted less than 1 year ago, and is the first of its kind (no continuity)
		0	The strategic document is out of date and hasn't been renewed
Does the strategic document articulate sectoral priorities for adaptation action?	Sectoral priorities indicate a structured approach to adaptation action that facilitates the prioritization and implementation of the proposed measures. Quantitative targets offer an easier way to track progress and evaluate effectiveness, while reflecting a more robust and actionable planning process.	10	The strategic document outlines clear quantitative sectoral priorities for adaptation action – to qualify for this score, the target may be formulated quantitatively (e.g. achieve x% of progress by a certain date) or feature clear indicators to measure progress/success
		5	The strategic document outlines qualitative sectoral priorities for adaptation action
		0	The strategic document doesn't outline clear sectoral priorities for adaptation action or does not have sectoral priorities.
Do the sectors addressed respond to a vulnerability/impact analysis?	This question aims to identify whether the country has been able to inform its sectoral prioritization and decision-making with dedicated and sector-specific climate vulnerability analysis; more points are to be awarded if the country is able to deploy a nationally produced analysis that is grounded in national and local data, as opposed to an analysis with a lower level of granularity which relies on information about regional or continental trends. If no such analysis is deployed, the intention to develop one would earn partial points.	10	There is evidence of a climate vulnerability analysis drawing on local and national sources to examine long-term trends, impacts and vulnerabilities. This would be for example if a country is citing vulnerability studies conducted by one of its own ministries or agencies.
		6.6	There is evidence of a climate vulnerability analysis drawing on regional or international sources, or of a previously existing climate vulnerability analysis not described in the document but used as a reference. This would be for example if a country is only referencing the World Bank, International Panel on Climate Change, or making statements about the vulnerability of certain sectors without clear reference points.
		3.3	The strategic document signals intent to assess trends, impacts and vulnerability

		0	There is no evidence of an existing or intended assessment of vulnerability
Are the sectoral goals time-bound?	A clear timeline for the implementation of the sectoral goals signals a greater traceability of progress as well as existing reflections on the deployment of the actions required. The question distinguishes between vague timeframes (e.g. short- vs. long-term), and specific and dedicated timeframes that indicate how the goals (and their sub-actions) will be cascaded throughout the plan's implementation periods. Year-by-year budgeting for the goals is also considered a timeframe as it indicates the flow of deployment.	10	A specific timeframe is articulated for all the goals, e.g. a timeframe is defined, activities or goals are spelt out for each year, etc.
		5	A specific timeframe is articulated for some of the goals OR goals are divided between short- and long-term goals without a more specific timeframe
		0	No timeframe is articulated for the goals beyond the overarching timeframe of the strategic document
Do the sectoral goals have clear ownership? (i.e. a body is designated to be responsible for the achievement of the goal by goal or sector)	A clear designation of the responsible authority for the implementation of the sectoral goals signals a greater traceability of progress, as well as existing reflections on the deployment of the actions required, decreasing the chance of missing or overlapping mandates.	10	The goals are clearly affiliated with a responsible government body
		5	Some of the goals are clearly affiliated with a responsible government body
		0	No clear affiliation of the goals with a responsible government body
Do the sectoral priorities articulate key projects/programs in a way that facilitates financing?	The inclusion of concrete priority projects or programs in the strategy is an effective way to facilitate the channelling of funds from external partners, which is a critical element to move from planning to implementation. The definition of "projects" or "programs" taken in this assessment is broad, with the key criterion being that the actions to be undertaken are formulated in such a way as to being easily turned into a standalone project, i.e. that there is a clear structure of sub-components to the proposed intervention, if not explicitly framed as a standalone project; this can include targets, timeframes, sub-activities, and other such elements. The formulation of financial needs affords a better rating as it is a key facilitating element for external partners' involvement.	10	Key projects and programs are articulated for each sector and investment levels are specified
		8	Key projects and programs are articulated for some sectors and investment levels are specified
		6	Key projects and programs are articulated for each sector, but investment levels are not specified
		4	Investment levels for goals are specified but not allocated in the form of clearly defined projects/program
		2	Key projects and programs are articulated for some sectors, but investment levels are not specified
		0	No key projects/programs are articulated
Are the institutional arrangements well defined?	A clear institutional structure is critical for accountability in deploying the plan. The involvement of different ministries and levels of government further signals a "whole-of-government" approach that is rewarded as it breaks away from a siloed approach. The involvement of local-level government is likewise positively valued as it may enhances the ability to translate mandated action at the national level into implementation at the local level	10	Detailed institutional arrangements are planned or in place with clear set roles and multiple ministries/levels of government involved or clear reference is made to a dedicated climate legislation in which these institutional arrangements are clearly outlined
		6.6	General information is provided on roles at the federal level or there is only mention of the institution responsible for the coordination of the climate strategy/plan and international reporting (UNFCCC Focal Point)
		3.3	The intent of developing institutional arrangements is expressed
		0	There are no institutional arrangements mentioned

Does the strategic document lay out a monitoring and evaluation plan?	The existence of a monitoring system demonstrates that the plan is subject to accountability mechanisms, which enhances the potential for its successful implementation and future iteration of adaptation plans.	10	The document describes a M&E system in place and operational for adaptation
		6.6	The document describes a basic plan for monitoring progress toward the objectives outlined
		3.3	The intent of developing a M&E system is expressed
		0	There are no M&E arrangements mentioned
Does the document provide evidence of existing dedicated climate legislation and/or mandate the adoption of adaptation-related legislation/regulation to support its implementation?	Explicit intention to revise the regulatory/legal framework is an indicator of mainstreaming adaptation action across government action and of enabling implementation; evidence of an existing climate bill or other similar relevant legislation is another such indicator. The existence of both demonstrates particularly strong mainstreaming at the legislative/regulatory level.	10	The strategy provides evidence of existing dedicated climate legislation (e.g. climate bill) AND foresees the development of additional dedicated adaptation-related legislation/regulation
		5	The strategy provides evidence of existing dedicated climate legislation (e.g. climate bill) OR foresees the development of additional dedicated legislation/regulation
		0	The development of dedicated legislation and/or regulation is not foreseen in the strategy and no existing legislation is evidenced
Was the strategy developed involving relevant stakeholders and vulnerable groups?	Involving relevant stakeholders in the development of a strategy or plan enhances its effectiveness, equity, and political buy-in. Inter-ministerial consultations are essential to ensure policy coherence across sectors, align adaptation efforts with national development priorities, and prevent conflicting objectives. Engaging NGOs brings valuable implementation experience and technical expertise, while also strengthening the link between policy and on-the-ground realities. Meaningful consultation with vulnerable populations ensures that the strategy is responsive to those most at risk, helping to address context-specific needs.	10	The strategy documents a consultation process involving relevant government stakeholders (e.g., public hearings, stakeholder workshops, national dialogues) as well as involving at least one of any vulnerable groups (woman, children, the elderly, individuals with disabilities, ethnic and racial minorities) or local community actors (chiefs, tribe leaders, religious leaders, etc).
		6.6	The strategy documents a consultation process involving relevant government stakeholders (e.g., public hearings, stakeholder workshops, national dialogues) as well as NGOs.
		3.3	The strategy documents a consultation process involving relevant government stakeholders (e.g., interdepartmental consultations and consultation with other administrative levels).
		0	The strategy does not document any consultation process with relevant stakeholders or vulnerable groups.
Does the strategy explicitly target relevant stakeholders and vulnerable groups in dedicated adaptation activities?	The formulation of actions that are targeted at specific vulnerable groups as part of the plan further evidence the level of inclusivity of the proposed policies as well as its integration of concerns pertaining to specific vulnerabilities.	10	The strategy prescribes specific adaptation actions targeted at enhancing the resilience of vulnerable groups within at least one key adaptation sector (e.g., gender mainstreaming, education, awareness, or targeted support to vulnerable populations).
		5	The strategy acknowledges the importance of giving particular consideration to group(s) identified as vulnerable (e.g., persons with disabilities, youth, indigenous Peoples, people in poverty, women and girls), but does not outline concrete actions towards this objective.
		0	The strategy does not document any involvement of relevant stakeholders or

			vulnerable groups in planned adaptation activities.
Is the adaptation-specific financial need for the implementation of the plan formulated?	Implementation hinges on financial mobilization which can be more easily channelled the more clearly the needs are defined.	10	Yes, and it is clearly divided between conditional and unconditional arrangements (as applicable if the plan was not submitted as under the UNFCCC, this division cannot be required, therefore the country may receive the full points simply for stating the financial need)
		5	Yes, but it does not distinguish between conditional and unconditional arrangements (as only applicable to UNFCCC strategies)
		0	No, the adaptation-specific financial need is not mentioned in the document
Is the adaptation financial need formulated in line with the expected scope of adaptation finance needs for the African continent?	The financing need formulated should be commensurate with the needs of the country. While no country-by-country estimate of financing needs based on modelling was able to be conducted, the following substitute was used: taking the STA23 upper-end estimate of financial needs (106 billion/year) and determining the share for each country based on their GDP and population size (using the most recent World Bank Data as reference), which provides a range that the formulated financing need should reasonably fall within.	10	The financing need formulated matches or exceeds the STA23 estimate of financial needs for the continent and the proportion of the GDP/population that the country represents
		5	The financing need formulated represents at least 80% of the STA23 estimate of financial needs for the continent and the proportion of the GDP/population that the country represents
		0	The financing need formulated represents less than 80% of the STA23 estimate of financial needs for the continent and the proportion of the GDP/population that the country represents

Table 5. Questions Policy Content

The following elements should be considered regarding the analysis of climate policies:

- Plans that have an evident intended complementarity (e.g., a NAP and a NAP implementation plan) scored jointly rather than as two standalone documents. The rationale for this decision is as follows: when assessed separately, both plans may have missing elements and therefore perform poorly for particular indicators; however, these elements may be intentionally omitted from one plan and addressed in the complementary plan.

- If a country has both an NAP and an NDC, both are assessed; however, only the better-performing one is considered in the scoring. This approach acknowledges the country's efforts across UNFCCC strategies and rewards the stronger policy effort. It also ensures countries are not penalized for focusing adaptation efforts in one document when a dedicated NAP is present, for example. If considering both documents results in a higher score, both are included.

4.8.2 Development/sectoral plans:

The evaluation of development and sectoral plans seeks to establish the extent to which adaptation considerations are mainstreamed within these plans. The evaluation is conducted individually for each plan and follows the following guiding questions:

Questions	Rationale	Rating	Rating justification
Does the document acknowledge the need	While the document does not have adaptation as a primary goal, this is the	10	The need for climate adaptation is acknowledged and specific

for climate adaptation within the context of the document's purpose?	main criterion to establish whether adaptation is being considered at all, in a very general manner, or through the inclusion of dedicated adaptation-related objectives or priority actions.		quantified/qualitative goals relating to adaptation action are outlined
		6.6	The need for climate adaptation is acknowledged with broad objectives
		3.3	Climate change impacts are broadly acknowledged, but no specific action is mandated
		0	Climate change is not mentioned or acknowledged in the document
Are the adaptation-related goals time-bound?	A clear timeline for the implementation of the sectoral goals signals a greater traceability of progress as well as existing reflections on the deployment of the actions required. The question distinguishes between vague timeframes (e.g. short- vs. long-term), and specific and dedicated timeframes that indicate how the goals (and their sub-actions) will be cascaded throughout the plan's implementation periods. Year-by-year budgeting for the goals is also considered a timeframe as it indicates the flow of deployment.	10	Yes, a specific timeframe is articulated for all the goals
		5	A specific timeframe is articulated for some of the goals OR goals are divided between short- and long-term goals without a more specific timeframe
		0	No timeframe is articulated for the goals beyond the overarching timeframe of the strategic document
Do the adaptation-related goals have clear ownership? (i.e. a body is designated to be responsible for the achievement of the goal by goal or sector)	A clear designation of the responsible authority for the implementation of the sectoral goals signals a greater traceability of progress as well as existing reflections on the deployment of the actions required. In the case of a sectoral plan that falls under the purview of one ministry, this could be the explicit mention of the leading department and/or a listing of key involved actors.	10	Yes, the goals are clearly affiliated with a responsible government body
		5	Some of the goals are clearly affiliated with a responsible government body
		0	No clear affiliation of the goals with a responsible government body
Do the adaptation-related priorities articulate key projects/programs in a way that facilitates financing?	The inclusion of concrete adaptation-related priority projects or programs in the strategy is an effective way to facilitate the channelling of funds from external partners, which is a critical element to move from planning to implementation. The definition of "projects" or "programs" taken in this assessment is broad, with the key criterion being that the actions to be undertaken are formulated in such a way as to being easily turned into a standalone project, i.e. that there is a clear structure of sub-components to the proposed intervention, if not explicitly framed as a standalone project. The formulation of financial needs affords a better rating as it is a key facilitating element for external partners' involvement.	10	Key projects and programs are articulated, and investment levels are specified
		6.6	Key projects and programs are articulated but investment levels are not specified
		3.3	Investment levels for goals are specified but not allocated in the form of clearly defined projects/program
		0	No adaptation-related projects or programs are outlined

Table 6. Questions Development/ sectoral plans

4.9 Policy frameworks

The evaluation of the policy framework aims to assess some key elements that are deemed relevant to secure the implementation of the plans. It covers the following elements:

Questions	Rationale	Rating	Rating justification
Are the strategies informed by nationally and regionally produced climate data?	The availability of robust national climate data bases that can be mobilized to inform adaptation action represents an important factor that would positively influence implementation by ensuring that the measures deployed are responsive to the latest data. UNFCCC-submitted documents are used as the principal reference point, though other climate strategies can be considered where relevant.	10	UNFCCC-submitted strategies (and communications) or equivalent documentation, indicate the existence and use of both nationally and regionally produced climate data
		7.5	UNFCCC-submitted strategies (and communications) or equivalent documentation, indicate the existence and use of only nationally produced climate data
		5	UNFCCC-submitted strategies (and communications) or equivalent documentation, indicate the existence and use of only regionally produced climate data
		2.5	UNFCCC-submitted strategies (and communications) or equivalent documentation do not indicate the existence and use of nationally or regionally produced climate data, but indicate the intention to develop capabilities to produce such data; or capacities to measure are critically insufficient (less than 50% active or deemed functional)
		0	UNFCCC-submitted strategies (and communications) or equivalent documentation do not indicate the existence and use of nationally or regionally produced climate data (e.g. the analyses produced rely on regional data, or on data produced and collected by external actors)
Are climate data limitation addressed with concrete actions?	Responding to gaps and challenges in climate data collection demonstrates commitment to the continuous refining of the understanding of the impacts of climate change and the integration of this information into national policymaking.	10	Climate data limitations are acknowledged in at least one of the UNFCCC-submitted strategies (and communications) or equivalent documentation, and targeted improvements with concrete action points are described
		6.6	Climate data limitations are acknowledged in at least one of the UNFCCC-submitted strategies (and communications) or equivalent documentation, and generic mentions of improvements are made
		3.3	Climate data limitations are acknowledged in at least one of the UNFCCC-submitted strategies (and communications) or equivalent documentation, but there is no mention of a plan to address them; or actions related to improving climate data are mentioned without a rationale explaining what the current gaps are
		0	Climate data limitations are not addressed in the UNFCCC-submitted strategies (and communications) or equivalent documentation
Does the country have a green taxonomy and/or a climate risk disclosure	The existence of such frameworks facilitates the channelling of investments towards climate action	10	The country has set up a green taxonomy AND a climate risk disclosure framework.

framework for investments in place?	by providing clear investment identification approaches and by reflecting climate risk into investment portfolios. A green taxonomy provides a clear classification system for environmentally sustainable activities, helping align public and private investment with climate and sustainability goals. A climate risk disclosure framework enhances transparency, helping institutions, investors, and regulators understand the financial implications of climate-related risks and opportunities.	6.6	The country has set up a green taxonomy OR a climate risk disclosure framework.
		3.3	The country has expressed plans to set up a green taxonomy and/or a climate risk disclosure framework.
		0	The country does not have an identifiable green taxonomy and/or a climate risk disclosure framework in place.
Does the country have relevant building codes in place?	This question pertains to adaptive infrastructure as relates to energy efficiency and public health (in terms of heat stress protection, for example). It is evaluated based on data by the IEA (see IEA 2024).	10	The country has mandatory building codes in place according to the IEA and/or relevant building codes in place and/or in development highlighted as particularly relevant by the IEA.
		6.6	The country has relevant voluntary building codes in place according to the IEA.
		3.3	The country is developing relevant building codes according to the IEA.
		0	The country does not have identified relevant building codes in place according to the IEA.

Table 7. Questions Policy Framework

4.10 Overall scoring and evaluation outcome

The number of points obtained by the country are tallied at the end of the assessment of the policy set. Because each country may have a different number of plans within its policy set, the evaluation tallies the maximum number of points the country could obtain and compares it to the number of points obtained.

Once all the points have been collected, the scoring is performed by clustering the results obtained for each question into 10 different thematic areas:

Policy Coverage	
C.NAP	Does the country have a National Adaptation Plan (NAP) submitted to the UNFCCC, and/or an equivalent national strategy?
C.NDC	Does the country's Nationally Determined Contribution (NDC) explicitly cover adaptation?
C.DP	Is adaptation addressed in other key national planning tools (e.g. development plan)?
C.IMP	Does the country have a NAP implementation plan?
C.NUM	How many climate and development plans of relevance were identified?
QC.TIM	How long has the strategic document been in place for?
Policy Robustness	
QC.SP	Does the strategic document articulate sectoral priorities for adaptation action?
QC.SPa	Are the sectoral goals time-bound?

QC.SPb	Do the sectoral goals have clear ownership? (i.e. a body is designated to be responsible for the achievement of the goal by goal or sector)
QC.VA	Do the sectors addressed respond to a vulnerability/impact analysis?
QC.FNa	Is the financial need formulated in line with the expected scope of adaptation finance needs for the continent?
QC.PP	Do the sectoral priorities articulate key projects/programs in a way that facilitates financing?
QD.SP	Does the document acknowledge the need for climate adaptation within the context of the document's purpose?
QD.SPa	Are the adaptation-related goals time-bound?
QD.SPb	Do the adaptation-related goals have clear ownership? (i.e. a body is designated to be responsible for the achievement of the goal by goal or sector)
QD.PP	Do the adaptation-related priorities articulate key projects/programs in a way that facilitates financing?
Enabling Environment	
QC.FN	Is the adaptation-specific financial need for the implementation of the plan formulated?
F.GT	Does the country have a green taxonomy and/or a climate risk disclosure framework for investments in place?
QC.LC	Was the strategy developed involving relevant stakeholders and vulnerable groups?
QC.LCa	Does the strategy explicitly address the active participation of relevant stakeholders and vulnerable groups in the adaptation activities?
F.CD	Are the strategies informed by nationally produced climate data?
F.CDa	Are climate data limitations addressed with concrete actions?
QC.IA	Are the institutional arrangements well defined?
QC.LR	Does the document mandate the adoption of legislation and/or regulation to support its implementation?
F.BC	Does the country have relevant building codes in place?
QC.MEL	Does the strategic document lay out a monitoring, evaluation and learning (MEL) plan?

Table 8.

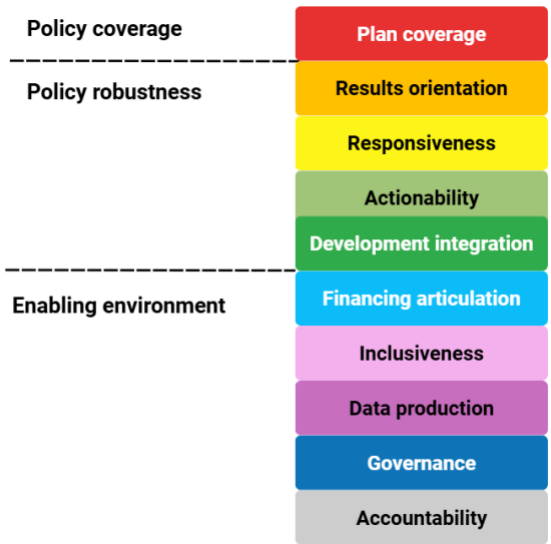

Table 9. Policy Evaluation Indicators Cluster List

The questions were grouped into thematically coherent clusters. In cases where a question could fit multiple themes, its impact on the final score and the level of granularity were considered when

deciding on placement. Performance for each theme was assessed against the maximum number of points a country could obtain, which varies depending on the number of plans included in the policy set. A final score for each country was then calculated by equally weighting the results across the ten themes, following standard practice in other indexes to minimize subjectivity in assigning heavier weights.

The ratio between the points obtained and the maximum possible points serves as the basis to establish in which category a country lies. Countries are assessed using a normal distribution that determines the placement of countries within five performance categories—Pioneering, Robust, Consolidating, Emerging, and Foundational Resilience—reflecting different stages of progress in mainstreaming adaptation. Further granularity is shown by the light and bright shades representing Tier 1/ Tier 2 within said category.

The categories are:

- **Pioneering:** Countries demonstrating exemplary progress in mainstreaming adaptation within a given category.
- **Robust:** Countries that have made commendable strides and are firmly on the path toward resilience.
- **Consolidating:** Countries showing clear evidence of strengthening adaptation efforts.
- **Emerging** Countries are advancing adaptation mainstreaming, but with gaps remaining.
- **Foundational:** Countries are at the early stages of establishing the building blocks for resilience.

It is important to note that no category represents full achievement; even pioneering countries face gaps that require continued action.

Pioneer	Robust	Consolidating	Emerging	Foundational
Tier 1	Tier 1	Tier 1	Tier 1	Tier 1
Tier 2	Tier 2	Tier 2	Tier 2	Tier 2

Table 10. Resilient Economies categories and tier structure

4.11 Limitations:

- The scores for the policy pillar of the index are based on the content of normative policy documents—that is, how detailed, robust, and well-articulated adaptation strategies are—rather than on evidence of their actual implementation.
- Not all identified policy documents were accessible to the team, which may have affected the category placement accuracy for certain countries.
- The formulation of climate plans can influence their scoring performance. If a country chooses to omit relevant information in a given plan—despite it being addressed in another document—it may not be captured by the evaluation, potentially impacting the overall score.
- Countries might include adaptation considerations within the excluded international and national plans, for instance, biodiversity, disaster risk reduction, and sustainability.

4.12 Mitigation Strategies:

- To complement the assessment of normative policies, the index included additional indicators related to implementation. These cover the presence of adaptation-related laws and regulations, the existence of actionable projects and programs, and the degree of policy progression over time.

- The team is maintaining a list of inaccessible policy documents and will leverage the GCA's network to obtain these materials where possible for future editions of the Index.
- The highest-scoring climate plans are prioritized in the evaluation, based on the assumption that their higher scores reflect the presence of key indicators that may have been omitted or insufficiently addressed in other plans.
- A future edition of the Index might consider adding indicators that reflect the achievement countries have regarding mainstreaming adaptation into other international agendas, such as biodiversity, disaster risk reduction, and sustainability.

4.13 Future considerations:

As the index continues to evolve, we envision the policy framework expanding to incorporate additional indicators that more effectively capture the progression and mainstreaming of adaptation considerations into climate and development policies over time.

One proposed enhancement is to allocate additional points to countries that demonstrate improvements in indicator scores across successive policy documents. This approach aims to capture upward trends in scores, signaling strengthened efforts to mainstream climate adaptation across various levels of government.

Further points may also be awarded when policy goals evolve from broad or vague statements to SMART targets—Specific, Measurable, Achievable, Relevant, and Time-bound. This shift reflects a more mature, results-oriented approach to adaptation planning and can be assessed through the indicators already embedded in the current framework.

Finally, indicators capturing the inclusion of climate adaptation and resilience in climate and development plans—particularly on biodiversity, disaster risk reduction, and sustainability—could be considered to reflect the full planning landscape of countries and the links across agendas.

5. Financial evaluation

5.1 Summary

The objective of the financial evaluation is to assess the country's ability to attract/mobilize the required levels of financing to implement resilience-building measures. The methodology deployed in this analysis builds on the approach developed for the Climate Adaptation Compacts by the GCA in 2023 and is complemented by a debt sustainability component.

This financial evaluation assessed financial resilience across three key dimensions: funding volume, funding quality, and debt sustainability. For both funding volume and funding quality, a desk-based analysis was performed on major adaptation project portfolios and its respective finance flow from multilateral financing institutions database including the World Bank, African Development Bank, and private financiers. An evaluation framework was developed to assess the funding volume and quality with its own set of sub-indicators aimed at providing a range that reflects the different performance level of each country. Each question could earn 0 to 10 points. Total points earned were clustered within the two dimensions, then calculated as a percentile score over the maximum score possible. On the other hand, the debt sustainability analysis was based on a simplified methodology of that applied by International Monetary Fund (IMF) which evaluated the financial implications of climate adaptation investments on a country's debt sustainability, using a percentile scoring system. The percentage scores for each of the three dimensions were then averaged to produce the final overall financial performance score.

5.2 Funding volume and funding quality

A desk-based analysis was conducted to assess both the volume and quality of funding across major adaptation project portfolios, drawing on finance flow data from multilateral institutions such as the World Bank and African Development Bank, as well as from private financiers. The following sections provide a more detailed description of the specific pathways undertaken.

5.2.1 Data collection

5.2.1.1 Multilateral financing: portfolio compilation

A database of active adaptation projects was developed using a bottom-up approach by reviewing the portfolios of multilateral financing institutions and compiling data on the relevant projects. The following institutions were considered:

- World Bank
- African Development Bank
- International Fund for Agricultural Development
- Adaptation Fund
- European Investment Bank
- Green Climate Fund
- Global Environmental Facility
- United Nations Development Programme

The Islamic Development Bank was also considered; however their online portal does not provide the opportunity to consult details on country projects, which led to its exclusion.

Table 11 presents the taxonomy used to determine which projects were included in the compilation of project portfolios for the financial component of the Resilient Economies Index. The various potential project sectors are presented with additional details on the types of interventions and keywords to consider. While it is not exhaustive, this framework is intended to serve as clear guide for analysts to determine whether a project falls within the scope of the study. The list of keywords was developed iteratively through the review of an initial set of country portfolios, allowing for the identification of recurring patterns and commonly used terms.

In addition, the following guiding principles were applied:

- Multilateral financing institutions may have tags placed on projects that mark the project as having relevance for climate adaptation. For example, the World Bank's "Environment and Resource Management" tag, the Global Environment Facility "climate change" tag, or the Green Climate Fund "adaptation" tag. These can be good references in case of doubt, though they should not represent exclusive filters.
- General key words that would indicate relevance of a project include words such as: adaptation, adaptive, resilience, restoration.

Sector	Main relevant interventions/keywords
Agriculture and food security	Climate-smart agriculture, regenerative practices, climate-smart agricultural technologies, climate-resilient seeds, crop diversification, participatory agriculture, resilient food systems, agroecology, livelihoods resilience, sustainable value-chains, sustainable livestock management, soil restoration/rehabilitation, food security
Water services and sanitation	Water supply, sanitation, irrigation, stormwater management, storm drainage, water basin adaptation, water harvesting, water valorisation, water security

Infrastructure and urban adaptation	Climate-resilient infrastructure, climate-proofing infrastructure, urban greening/cooling, resilient cities, nature-positive cities/neighbourhoods,
Management of land, ecosystems, natural resources (incl. forestry, drought management, biodiversity management, etc.)*	Land-use planning, land/forest/ecosystem restoration, drought management, biodiversity management, ecosystem management, sustainable forest management, sustainable natural resources management
Blue economy and coastal protection	Coastline management, coastal protection, sea-level rise, coastal flooding management, mangrove planting/restoration, sustainable blue economy, sustainable aquaculture, sustainable management of marine environment
Health	Vector-borne diseases management, heat stress management, resilient health systems
Community-centred approaches	Adaptive capacity of communities, community resilience,
Employment, innovation and green growth	Green innovation centres, adaptation jobs, eco-entrepreneurs support, rural entrepreneurship, green growth
Planning, capacity-building, research	Capacity building for adaptation planning, adaptation trainings, adaptation research centres, general community capacity building and education on climate adaptation and resilience
Finance and inclusion	Green financing facilities (specifically for climate-resilient projects), green economy plans (integrating climate resilience), financing for agricultural funds, innovative finance, social and economic inclusion (integrating climate resilience), resilient safety nets
Disaster-risk reduction	Disaster resilience, disaster recovery, disaster risk management, early warning systems
Grid modernization (as a dual-benefit sector)	Grid modernization, transmission lines modernization, electricity grid reinforcement, solar electrification, off-grid electricity access
Other	Generically framed programs that don't fit in any of the above but have a clear adaptive purpose and focus

Table 11.
*Restoration projects with an explicit, primary carbon sinking goal should be considered as a dual-benefit project.

Additionally, the compiled portfolio also included projects that the GCA has contributed to as part of its Africa Adaptation Acceleration Program, as adaptation has been mainstreamed in those projects.

Furthermore, the portfolio distinguished between adaptation and "dual-benefit" projects. Dual-benefit projects are defined as projects that have a principal mitigation focus, but also deliver positive adaptation outcomes. These are assembled separately as they are not afforded the same weight in the calculations (see below).

The portfolio spreadsheet included the following information for each project:

- Project title
- Financial contributor(s) (wherever available, the breakdown of the different contributors is reflected to ensure distinction between contributors and in particular national contributors, so as to avoid overestimating the contribution of international partners)
- Contribution amount
- Currency
- Type of contributor (multilateral, bilateral, national, TBC, missing financing)
- Type of contribution (loan, grant, equity, cash, in-kind, etc.)
- Project duration
- Sector (see the above table for the overview of the possible sector – one principal theme will be selected per project)

To minimize risks of overestimating the value of the portfolio as adaptation funding, the following guidelines were applied:

- Wherever the information was available, only the portion of the funding which is dedicated to adaptation was accounted for (e.g. if a % of the funding is stated to be dedicated to adaptation, or accounted as adaptation finance)

- Where projects cover multiple countries, the breakdown of funding between countries will be reflected where available. In the absence of such information, the value of the project was estimated by dividing the total finance by the number of beneficiary countries.

By isolating of national funding components, this analysis also serves as the basis for estimating the national funding volume (see more detailed in the dedicated section below).

5.2.1.2 Bilateral financing: OECD Rio Markers data

To complement the analysis of the multilateral portfolios, data from the OECD Rio Markers tracker was collected. The information was downloaded from the dedicated OECD data platform and included the 2022 and 2023 data for contributions that have received an adaptation marker rating of either "principal" (2) or "significant" (1). This data was compiled for each year by contributor.

5.2.1.3 National financing

The estimation of domestic adaptation investment for African countries combined information on (i) regional adaptation investment, (ii) domestic, project-level climate finance (collected using the method described above) and (iii) domestic estimates of investments from autonomous adaptation. Items ii and iii add up to the regional estimates of domestic climate adaptation investment offered by the Climate Policy Initiative (CPI). The methodology followed a stepwise approach that linked regional totals, country-level data and modelled estimates.

The starting point of the analysis was the availability of CPI data on climate adaptation finance (CPI, 2025). This data provided the total value of adaptation finance by African region, together with a breakdown of funding sources. This data showed that the contribution of domestic sources—both public and private—is 29.48%. This calculation allows an estimation of the dollar value of domestic investment in adaptation by region, consistent with the CPI dataset.

The next step consisted of the allocation of regional totals to individual countries. For this purpose, the national data collected during the project mapping exercise described above was used as a starting point. When aggregated, however, the sum of project-level data by region was found to be smaller than the corresponding CPI-based estimates of domestic investment. This mismatch implies that a portion of domestic investment remains unaccounted for in the project-level dataset. To reconcile the two, the difference between the regional CPI-based estimates and the country project totals was estimated as additional, or residual investment.

This additional investment was distributed across countries on the basis of their potential for autonomous adaptation, as represented in the Green Economy Model (GEM). The allocation of this potential is linked to socio-economic development levels, as proxied by the Human Development Index (HDI). Countries with an HDI below 0.55 (or "low-HDI" countries) are assumed to be capable of mobilizing only limited additional resources for adaptation. By contrast, countries with an HDI above 0.8 ("high HDI" countries) are assumed to have the capacity to mobilize the largest share of additional resources, in line with the objective of achieving up to 10% resilience by 2050. For all other countries, the allocation falls between these two extremes. In practice, the countries within a given region that show the highest potential for autonomous adaptation are assigned a larger part of the investment gap existing between the CPI estimates and the project-level data. It results that the regional total investment is decomposed into project-level finance and autonomous adaptation finance, and the latter is distributed across countries according to their relative share of autonomous adaptation potential within the region.

This approach ensures that the total investment by region, and for Africa as a whole, remains consistent with CPI values for domestic sources.

In order to facilitate comparison across countries, the total domestic investment by country is standardized into a score that reflects the deviation from the overall mean. The standardized score is then used to assign each country to one of five performance categories: countries with scores greater

than or equal to 1 are classified as *pioneers*; those with scores between 0.5 and 1 as *robust*; those with scores greater than –0.5 as *consolidating*; those with scores between –1 and –0.5 as *emerging*; and those with scores lower than –1 as *foundational*.

This procedure produces a distribution of adaptation investment that is both consistent with regional finance data and reflective of country-level circumstances. It ensures that reported totals match CPI values at the regional level, while still accounting for national variation in project-level finance and the potential for autonomous adaptation.

5.2.1.4 Private sector data

The IJ Global Investors platform was used as the reference source to identify relevant private sector investments in adaptation. The platform allows filtering for investments in fields of potential relevance (transport, water, healthcare, agriculture, etc.). Investments are then individual reviewed for adaptation relevance based on the information provided on the platform and complementary research as needed, as the platform does not provide adaptation tagging. Relevant projects were identified and integrated into the project mapping, to be considered in the evaluation.

5.2.2 Calculations and estimates of funding volume

Once the country portfolio was compiled, the following calculations were done to take stock of the current financial mobilization:

- The yearly multilateral contribution was estimated by dividing the value of the multilateral contributions by the average project duration. The "dual-benefit" was included with a 70% discount so as not to overestimate the adaptation contribution. The discount rate matches the OECD practice (see below).
- The yearly bilateral contribution was estimated as the average of the 2022 and 2023 contributions as collected from the OECD, with the contributions with a "significant" adaptation component being subjected to a 70% discount. This discount rate corresponds to the stricter end of the OECD practice when reporting this type of contributions to the UNFCCC.
- The yearly national contribution is integrated based on the value obtained in the estimation process described above.
- These yearly contributions are then compared to the financing needs formulated in a national reference document (where available the NAP, or the NDC – if multiple options are available, the more ambitious plan was considered unless otherwise justified. Where countries did not clearly formulate an overall adaptation finance requirement, opportunities for an estimate are examined on a case-by-case basis, for example by extrapolating from provided costing information for individual actions. If no estimation was possible based on the available documents, the average of the GCA estimate based on STA23 continental needs was used). For example, if the NAP financing period is for 10 years, then the yearly contribution estimated is multiplied by ten. This allows an assessment of whether the country can be considered "on track" in terms of financial mobilisation if current trends continue. The gap and the scale-up needs are quantified accordingly.

In addition to this main calculation, several other elements were calculated based on the collected information:

- Share of debt vs. grants in the portfolio
- Share of financing coming from each financial institution
- Share of financing allocated to each theme

5.2.3 Evaluation framework and scoring

The financial analysis described above is mobilized to conduct the evaluation of the country's performance in terms of financial mobilization, assessing both elements of quantity and quality of funding. In alignment with the policy scoring system, a scale of 0-10 points is used for all questions.

5.2.4 Funding volume

The adequacy of the current volume of financing is evaluated using the following criteria:

Questions	Rationale	Rating	Rating justification
How does the country's international public financial mobilization compared to other countries in Africa (adjusted for GDP/per capita and assessed based on normal distribution)	This indicator is used to measure how the country is positioned compared to other countries on the continent. The international public finance data (multilateral and bilateral) collected during the project mapping is used as a basis, then adjusted for GDP/capita to generate a normal distribution. Scores are allocated depending on where the country is positioned along the normal distribution.	0-10	Individual rating based on normal distribution calculation

5.2.5 Funding quality

The quality of the available funding is evaluated using the following criteria:

Questions	Rationale	Rating	Rating justification
Are the needs articulated in the reference document (NAP/NDC) appropriately ambitious compared to the prospective adaptation needs of the country?	This criterion is used to assess whether the country's targeted mobilization (see above reference for possible sources) is commensurate with an external assessment of their prospective needs. Prospective needs are assessed by taking the STA23 estimate of financial needs and determining the share for each country based on their GDP and population side, which provides a range that the formulated financing need should reasonably fall within. The performance is assessed in relation to that of other countries on the continent, using normal distribution. Scores are allocated depending on where the country is positioned along the normal distribution.	0-10	Individual rating based on normal distribution calculation
Does the funding cover all the key sectors that are identified as national priorities/vulnerability areas?	It is important not only that there is sufficient funding, but also that this funding is allocated in all areas that the country has said it wants to prioritize.	10	All sectors are covered
		5	One or two sectors are missing or poorly covered (<3% of total funding)
		0	More than two sectors are missing (<3% of total funding)
How concentrated is the funding between sectors?	Funding should be distributed across relevant sectors rather than concentrated in a few, as this concentration implies gaps in other, more neglected priority areas. This is based on the classification of projects from the project mapping.	10	≤30% of total funding is allocated to the top 2 sectors combined
		5	31–50% of total funding is allocated to the top 2 sectors combined
		0	>50% of total funding is allocated to the top 2 sectors combined

Questions	Rationale	Rating	Rating justification
How does the country's private sector financial mobilization compared to other countries in Africa? (adjusted for GDP/per capita and assessed based on normal distribution)	This indicator is used to measure how the country is positioned compared to other countries on the continent. The private finance data (domestic and international) collected during the project mapping is used as a basis, then adjusted for GDP/capita to generate a normal distribution. Scores are allocated depending on where the country is positioned along the normal distribution.	0-10	Individual rating based on normal distribution calculation

5.2.6 Debt sustainability

The Debt Sustainability Analysis was based on work done by the International Monetary Fund (IMF) (https://www.imf.org/en/Publications/DSA) but was implemented using a simplified approach.

The analysis performed employs a comparative approach, evaluating a country's debt sustainability under two distinct scenarios:

- Business As Usual (BAU) Scenario: This serves as the baseline, representing a country's current debt situation and sustainability indicators without considering additional investments in climate adaptation.
- Adaptation Scenario: This scenario integrates the financial impact of climate adaptation loans into the debt calculations, allowing for an assessment of how investments in climate adaptation may influence the country's debt burden and sustainability.

The analysis hinges on five key debt sustainability indicators: (i) external debt to GDP (%), (ii) external debt to exports (%), (iii) debt to GDP (%), (iv) debt service to revenue (%), (v) debt service to exports (%).

No.	Indicator	Description
1	External debt to GDP (%)	Assesses the overall burden of external debt relative to the size of the economy, indicating solvency risk and the country's ability to generate resources to repay external obligations.
2	External debt to Exports (%)	Evaluates the country's capacity to service external debt through foreign exchange earned from exports, highlighting vulnerability to external shocks or export declines.
3	Debt to GDP (%)	Indicates the government's indebtedness relative to the size of the economy, and is a central measure of fiscal sustainability and solvency risk.
4	Debt Service to Revenue (%)	Assesses the pressure debt servicing puts on government finances and the potential crowding out of other expenditures, reflecting fiscal liquidity risk.
5	Debt Service to Exports (%)	Indicates the adequacy of export earnings to meet debt obligations, and is a key indicator of external liquidity and vulnerability to balance of payments crises.

For both the BAU and Adaptation scenarios, the values of these five indicators are calculated for each country. These calculated indicator values are then compared against one another, for the estimation (a) the percent change for each indicator when adaptation loans are considered, and for (b) an aggregate assessment using predefined thresholds to determine an overall "Risk level" (e.g., Low, Moderate, High, In distress). The latter is developed for comparison with the IMF DSA and may not be applicable to a broader set of countries, especially when considering higher per capita income levels.

The methodology used involves:

- Data Collection: gathering financial and economic data, including GDP, GNI, exports, public revenue, and various debt figures (related to total and external debt). This data forms the basis for calculating the debt sustainability indicators.
- Scenario Modeling: developing two distinct scenarios (BAU and Adaptation) to project debt dynamics. The Adaptation scenario specifically incorporates the value and service requirements of climate adaptation loans.
- Indicator Calculation: computing the five key debt sustainability indicators for each country under both scenarios.
- Risk Assessment: assigning a "Risk level" to each country based on how its calculated indicator values compare to established thresholds. Breaching these thresholds contributes to a higher risk assessment.
- Comparative Analysis: directly comparing the debt sustainability outcomes (indicator values and risk levels) between the BAU and Adaptation scenarios. This allows for an understanding of the incremental impact of climate adaptation investments on a country's debt sustainability.

The output provides a clear comparison of the risk levels and indicator values between the two scenarios, helping to evaluate the financial implications of climate adaptation investments on a country's debt sustainability.

5.3 Overall scoring and evaluation outcome

The number of points obtained by the country in the analysis of funding volume and funding adequacy are tallied at the end of the financial assessment and compared to the maximum possible amount of points. The performance is assessed in each of the three categories: volume, adequacy, and debt sustainability. The final score is then compiled out of the performance for each category, by weighing each of the three categories equally.

This serves as the basis to attribute a final “rating” to the country’s financial performance. The performance categories are built using normal distribution. The following categories are considered:

Pioneer	Robust	Consolidating	Emerging	Foundational
Tier 1	Tier 1	Tier 1	Tier 1	Tier 1
Tier 2	Tier 2	Tier 2	Tier 2	Tier 2

5.4 Limitations

- The project-based approach is likely to present gaps, in particular with regards to national financing, as this would not consider measures that are directly integrated into the government’s own budget, rather than allocated to external projects.
- Each multilateral institution has its own way of tagging and tracking projects for adaptation finance, limiting comparability and presenting a risk of overestimating funding when such granular distinctions are not made available.
- Thematic tracking was only possible for the project mapping, not the OECD DAC data, as there was no scope to examine each OECD contribution individually for thematic tagging.
- Private sector data is not systematically tracked by any available platform, rendering data collection challenging. Services which provide private sector finance tracking have not yet prioritized adaptation tagging, particularly for Africa. The private sector analysis potential therefore remains limited in this Index.

5.5 Mitigation strategies

- The methodology devised to estimate national investment, while only providing an estimate, takes a step towards complementing the project-based approach. It also builds on other existing assessments.
- Efforts were made to only consider the adaptation-relevant portion of the funding wherever available.
- Partial cross-checking has been conducted to minimize the risk of discrepancy between researchers when including/excluding project data and ensuring consistency of understanding of the methodology.
- The integration of private sector data, however partial, was made possible by the identification of a relevant data service.

5.6 Future considerations

In an update/subsequent edition of the Index, the following elements could be considered:

- An additional exercise could be conducted to complement the thematic analysis of the project mapping with a thematic analysis of the OECD DAC data.
- Further/updated platforms for private sector data could be explored to complement existing resources.

6. Index score compilation

The scoring for each component of the Index was compiled individually based on the sub-components and method described above. The final country performance was then calculated by combining the scores for each of the Index pillars, weighing each of the three pillars equally.

The scores are not displayed as a one-by-one ranking of countries by performance – rather, performance clusters are created and each country is distributed in one of the clusters. The assignment of countries to performance clusters is done using normal distribution, allowing each country's performance to be positioned in comparison to the other countries evaluated. The following categories are considered:

Pioneer	Robust	Consolidating	Emerging	Foundational
Tier 1	Tier 1	Tier 1	Tier 1	Tier 1
Tier 2	Tier 2	Tier 2	Tier 2	Tier 2

7. Analysis

The analysis was conducted based on the results and focuses on the identifying trends both within each pillar (e.g. the relative performance of one theme compared to another), and between the pillars (e.g. to understand whether a good performance in one pillar correlates with a good performance in another one). Team members individually assessed the dataset to identify trends, which were then pooled to the most significant and relevant patterns. Once identified, these trends were elaborated and described to distil key messages for policymakers. Country case studies were used to illustrate the identified trends.

External datasets were used to test patterns of performance in different categories of countries. The following data references were mobilized:

- For GDP, population size, and income groups: World Bank data
- For frequency of extreme weather events: EM-DAT
- For LDC and SIDS membership: Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States

The overall Index performance was assessed using normal distribution to build out the five performance categories:

Pioneering Resilience: Countries demonstrating exemplary progress in mainstreaming adaptation within a given category.
Robust Resilience: Countries that have made commendable strides and are firmly on the path toward resilience.
Consolidating Resilience: Countries showing clear evidence of strengthening adaptation efforts.
Emerging Resilience: Countries are advancing adaptation mainstreaming, but with gaps remaining.
Foundational Resilience: Countries are at the early stages of establishing the building blocks for resilience.

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