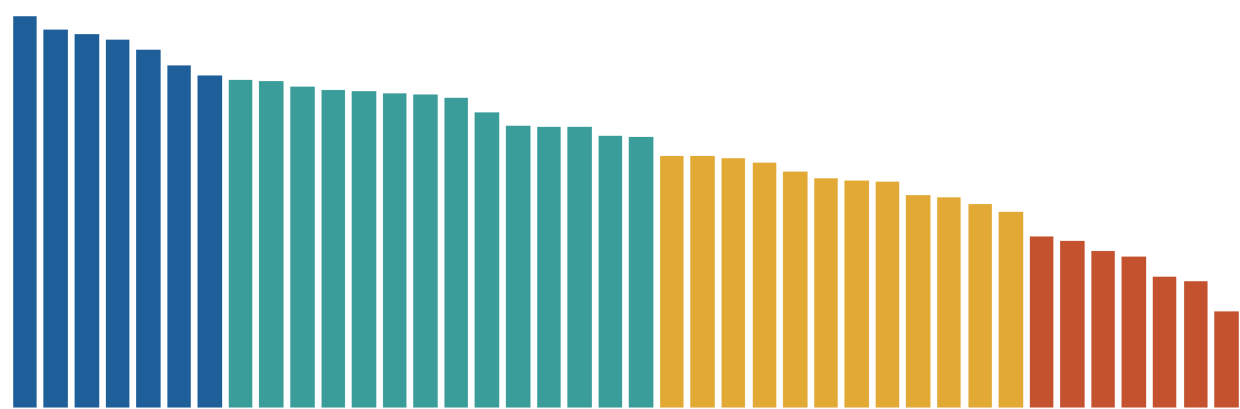


The Polycrisis Risk Reduction Index

A Comparative Assessment of National Resilience, Adaptive Capacity,
and Risk Mitigation Potential Through 2100



Baseline PCRRRI scores for 40 countries, ordered from most to least resilient and colored by tier

Version 1.0 · Data retrieved 9 October 2026

40 countries · 18 indicators · 6 pillars · 4 scenarios to 2100

Built on open data: [World Bank](#) · [IPCC AR6](#) · [UNEP](#) · [WEF](#)

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About this Report

Scope. This report introduces the Polycrisis Risk Reduction Index (PCRRRI), a composite measure of national capacity to reduce, absorb and adapt to compound global risk, and applies it to 40 countries holding about three-quarters of humanity. It also projects the index to 2100 under four stylized pathways and derives a country-level Risk Reduction Potential (RRP).

Data and reproducibility. All baseline inputs are open indicators retrieved from the [World Bank Indicators API](#) on 9 October 2026; they are listed in Table 2 and Appendix B. Every transformation (winsorization, log transforms, min–max scaling, aggregation) and every scenario equation and parameter is documented in Section 4, so that the results can be reproduced and challenged.

Evidence base. Contextual statements about the state of the Earth system, geopolitics, health, food and demography draw on the sources hyperlinked in the text and listed in the References. Where secondary summaries of a primary source were used, the link points to that summary.

Status of the scenario results. The scenario engine is a structured, stylized thought experiment anchored to IPCC AR6 warming outcomes. Its capacity targets, convergence rates, damage function and hazard multipliers are judgmental. Outputs should be read as relative comparisons conditional on stated assumptions. They are not forecasts, and they are not investment, legal or policy advice.

Reading guide. Readers short of time should read the Executive Summary and Sections 5, 7 and 8. Methodologists should read Sections 4 and 6 and the appendices.

Executive Summary

Since 2022 the word *polycrisis* has moved from academic niche to boardroom shorthand, popularized by [Adam Tooze \(2022\)](#) and given a causal definition by the [Cascade Institute](#) as a situation in which crises in multiple global systems become causally entangled and degrade humanity's prospects more than the sum of their parts ([Lawrence et al., 2024](#)). The evidence of entanglement is now hard to ignore: the 2023–2025 period was the first three-year span averaging more than 1.5 °C above pre-industrial levels ([Copernicus, 2026](#)); seven of nine planetary boundaries are assessed as transgressed ([Stockholm Resilience Centre, 2025](#)); and the [World Economic Forum's 2026 survey](#) ranks geoeconomic confrontation first for the next two years and environmental risks first for the next ten.

What is missing is a way to compare countries on the one question that matters when many risks arrive together: **how much capacity does each society have to reduce, absorb and adapt to compound risk, and how much could that capacity change over this century?** This report introduces the **Polycrisis Risk Reduction Index (PCRRI)**, a transparent 0–100 composite built from 18 publicly available indicators in six pillars, and applies it to 40 countries that together hold 6.1 billion people, about three-quarters of humanity. A stylized scenario engine anchored to IPCC AR6 warming pathways then projects the index to 2100 and derives a **Risk Reduction Potential (RRP)**: the number of index points a country gains by moving from a fragmented, high-emissions world to a cooperative, low-emissions one.

Table ES1. Headline results by pathway, 2100

Pathway	Warming 2100 (°C)	Pop.-weighted PCRRI (5–95%)	Countries at or above 55	Countries below 30	Tier IV population share
2025 baseline	1.5	47.0	21	3	17.8%
SSP1-2.6 Sustainability	1.8	70.3 (65.3–75.0)	40	0	0%
SSP2-4.5 Middle road	2.8	51.3 (45.3–56.5)	23	0	12.1%
SSP3-7.0 Regional rivalry	3.8	29.7 (19.4–36.2)	6	10	81.3%
SSP5-8.5 Fossil-fueled growth	4.7	42.0 (25.0–50.0)	17	5	47.9%

Source: author calculations. Population-weighted over the 40-country sample at 2025 populations. Ranges are 5th–95th percentiles across 1,500 parameter draws. 2100 warming values are stylized extensions of IPCC AR6 end-century estimates.

Key findings

- **Resilience is concentrated where few people live.** PCRRI runs from 82.5 (Switzerland) to 20.3 (Pakistan). The seven Tier I countries hold 1.7% of the sample population; Tiers III and IV together hold 80.1%. The population-weighted mean (47.0) sits well below the simple mean (55.3).
- **The weakest pillars are the ones that matter most for coordination.** Population-weighted scores are lowest for governance (37.6), economic and technological capacity (39.9) and mitigation and stewardship (37.8).
- **A resilience–responsibility paradox.** United States, Canada, South Korea and Australia combine above-average resilience with per-capita CO₂ emissions above 10 tonnes. PCRRI and per-capita emissions are positively but loosely related (Spearman $\rho = 0.52$), and the mitigation pillar is slightly negatively correlated with the capacity pillars.
- **Rankings are robust; scenario outcomes are not.** Across 5,000 random weighting schemes the mean Spearman correlation with the baseline ranking is 0.983 (minimum 0.852). By contrast, the 2100 population-weighted PCRRI ranges from 70.3 under the sustainability scenario to 29.7 under regional rivalry.

- **Where people live in 2100 depends on the pathway.** The share of sample population in the Fragile tier (Tier IV) is 0% under SSP1-2.6, 12.1% under SSP2-4.5, 47.9% under SSP5-8.5 and 81.3% under SSP3-7.0.
- **Growth without decarbonization borrows from the future.** The fossil-fueled scenario tracks the middle road until about 2051, then falls below it as climate damage compounds; by 2100 it is 9.3 points lower.
- **The largest returns to action are in the least resilient countries.** Mean RRP is 35.2 points, rising from 23.2 in Tier I to 51.5 in Tier IV. About 59% of the gain comes from building capacity, 28% from avoided climate damage and 13% from avoided systemic shocks.

The policy implication is a two-track strategy. For the high-capacity, high-footprint countries, the priority is to decarbonize faster and to finance capacity elsewhere, because their own resilience is only as durable as the global pathway. For lower-capacity countries, the highest-return investments are in governance, state capability and human capital, which are the foundations on which every other adaptation measure depends. The model is a structured way to explore trade-offs, not a forecast. Section 10 sets out its limitations plainly, and the full data and method are reproducible from the sources cited.

1 Introduction

1.1 Why a risk reduction index?

Most global risk assessments ask what might go wrong. Far fewer ask which societies are best placed to prevent, absorb or recover from several things going wrong at once. The distinction is practical. A drought, a banking shock and a contested election are manageable in isolation by a state with deep fiscal buffers, trusted institutions and diversified energy and food supply. The same three events, arriving together in a country with none of those buffers, can compound into a lasting setback. The scholarly literature on polycrisis argues that the second pattern, not the first, is the defining feature of the present moment ([Lawrence et al., 2024](#); [Homer-Dixon et al., 2021](#)).

Existing indices answer parts of the question well. The [ND-GAIN Country Index](#) measures climate vulnerability and readiness; the [INFORM Risk Index](#) estimates the risk of humanitarian crises; the [WorldRiskIndex](#) concentrates on disaster risk from natural hazards. None is designed to be forward-looking to 2100, to include a country's own contribution to global risk, or to quantify the value of cooperative versus fragmented global pathways. The PCRRRI is designed to do those three things, while remaining simple enough to audit.

1.2 Research questions

1. **Baseline.** How do 40 major economies compare today on their capacity to reduce and absorb compound global risk?
2. **Robustness.** How sensitive is that comparison to indicator choice, weighting and aggregation?
3. **Pathways.** How might capacity and exposure evolve to 2100 under four stylized pathways anchored to IPCC AR6 warming outcomes?
4. **Leverage.** Where is the gain from a cooperative, low-emissions pathway largest, and through which channels does it arrive?

1.3 Contribution and structure

The report makes four contributions. It proposes a six-pillar framework that treats mitigation behavior as part of resilience rather than separate from it. It builds the index entirely from open data, retrieved from the [World Bank Indicators API](#) on 9 October 2026. It subjects the index to a systematic uncertainty analysis. And it introduces the Risk Reduction Potential as a single, country-level measure of what is at stake in the choice between global pathways.

Section 2 sets out the conceptual foundations. Section 3 summarizes the evidence on the state of the polycrisis. Section 4 describes the method. Sections 5 and 6 report baseline results and robustness tests. Sections 7 and 8 project the index to 2100 and derive the Risk Reduction Potential. Section 9 draws policy implications, Section 10 states limitations and a research agenda, and Section 11 concludes. Appendices provide country-level results and input data.

2 Conceptual Foundations

2.1 What is a polycrisis?

The term has a long pedigree: French philosopher Edgar Morin and Anne-Brigitte Kern used it in the late 1990s to describe intertwined planetary problems, and it was revived in policy circles in the 2010s. It reached a wide audience when historian [Adam Tooze \(2022\)](#) used it to describe a world in which shocks "interact so that the whole is even more overwhelming than the sum of the parts." The Cascade Institute then gave the concept analytical teeth. [Lawrence et al. \(2024\)](#) define a global polycrisis as one in which crises in multiple global systems become causally entangled in ways that significantly degrade humanity's prospects, and identify the mechanisms of entanglement: common stressors that hit several systems at once, feedbacks that carry damage from one system to another, and fast-moving trigger events that interact with slow-moving underlying conditions.

Three implications follow for measurement. First, resilience to a polycrisis is not the sum of resilience to individual hazards, because shocks are correlated; buffers that are only useful against one risk are less valuable than those that work against many. Second, slow variables such as governance quality, human capital and energy structure condition how a country responds to fast shocks, so they deserve heavy weight. Third, because entanglement is global, a country's resilience depends partly on what other countries do, which is why this report treats the global emissions pathway as an explicit driver.

2.2 Resilience, adaptive capacity and vulnerability

The PCRRI builds on a mature literature. [Holling \(1973\)](#) defined ecological resilience as the capacity of a system to absorb disturbance and persist; [Folke et al. \(2010\)](#) extended this to social-ecological systems and stressed adaptability and transformability alongside persistence. In the climate field, [Adger \(2006\)](#) framed vulnerability as a function of exposure, sensitivity and adaptive capacity. [Cutter et al. \(2008\)](#) proposed baseline indicators of community resilience spanning ecological, social, economic, institutional, infrastructural and community dimensions, and [Briguglio et al. \(2009\)](#) separated economic vulnerability (a structural property) from economic resilience (a policy-induced capacity). The PCRRI follows these conventions: its first three pillars measure adaptive capacity, its fourth measures buffers, its fifth measures contribution and its sixth measures structural exposure.

2.3 Existing indices and the gap this report addresses

Table 1 positions the PCRRI against the most relevant existing frameworks. The comparison is intended as orientation, not criticism; each tool is well suited to its own purpose.

Table 1. The PCRRRI in relation to existing frameworks

Framework	Focus	Typical use	What the PCRRRI adds
ND-GAIN Country Index	Climate vulnerability and readiness to adapt, by country	Climate adaptation finance and planning	Multi-risk scope; own emissions contribution; projection to 2100
INFORM Risk Index	Risk of humanitarian crisis and disaster: hazard and exposure, vulnerability, lack of coping capacity	Humanitarian preparedness and early warning	Long-run capacity dynamics; global-pathway dependence
WorldRiskIndex	Disaster risk from natural hazards: exposure, vulnerability, coping and adaptation	Disaster risk reduction	Non-hazard stressors (governance shocks, resource security, mitigation)
WEF Global Risks Report	Expert perception of the most severe global risks over 2 and 10 years	Strategic horizon scanning	A measured, country-level capacity score rather than perceptions
Planetary boundaries	Global biophysical limits for nine Earth-system processes	Global sustainability assessment	Translates global limits into country-level capacity and responsibility

Descriptions summarize each framework's published purpose; see linked sources for definitions and current editions.

2.4 Design principles

- **Capacity over hazard.** The index scores what a society can do, not what might hit it. Hazard enters only through the scenario engine.
- **Open data and replicability.** Every input is a public indicator with a stable identifier; every transformation is documented.
- **Responsibility is part of resilience.** Because polycrisis risk is globally produced, countries that lower emissions and protect carbon sinks reduce risk for everyone, including themselves.
- **Honest uncertainty.** Weightings and scenario parameters are varied systematically, and results are reported with ranges.
- **Parsimony.** Six pillars and 18 indicators are the minimum needed to span the concept without creating a black box.

3 The State of the Polycrisis, 2026

This section summarizes the evidence base against which the index is designed. It is selective rather than exhaustive: the aim is to show that the risks are real, interacting and unevenly distributed, which is the premise of a capacity-based index.

3.1 Earth-system stress

The Earth-system picture has deteriorated on several fronts. [Rockström et al. \(2009\)](#) proposed nine planetary boundaries; [Richardson et al. \(2023\)](#) assessed six as transgressed, and the [2025 Planetary Health Check](#) concluded that seven of nine are now breached, with ocean acidification newly added. Only stratospheric ozone and aerosol loading remain within the safe operating space (Figure 1). On temperature, [Copernicus](#) reports that 2025 was the third-warmest year on record at about 1.47 °C above pre-industrial levels, after 2024's roughly 1.6 °C, and that 2023–2025 was the first three-year period to average above 1.5 °C.

Figure 1. Planetary boundaries: status in the 2025 assessment



Source: Stockholm Resilience Centre / PIK, [Planetary Health Check 2025](#). Classification as reported; author's graphic.

Tipping points add non-linear risk. [Armstrong McKay et al. \(2022\)](#) assessed that several climate tipping elements, including ice sheets and warm-water coral reefs, may already lie within their threshold uncertainty range at roughly 1.5 °C of warming, with more becoming likely at higher levels. The [2025 Global Tipping Points Report](#) concluded that warm-water coral reefs have already passed their thermal tipping point. Policy remains off the pace needed: the [UNEP Emissions Gap Report 2025](#) projects warming of about 2.3–2.5 °C if current national pledges are fully implemented and about 2.8 °C under current policies.

3.2 Biosphere and resource limits

The WWF's [Living Planet Report 2024](#) found an average 73% decline in monitored vertebrate population sizes between 1970 and 2020, a measure of abundance trends rather than a count of animals; the [IPBES Global Assessment](#) estimated that around one million species face extinction. In resource terms, Global Footprint Network placed [Earth Overshoot Day 2025](#) on 24 July, the earliest on record, implying that humanity uses about 1.8 Earths' worth of regenerative capacity annually. The

[Global Commission on the Economics of Water](#) warned in 2024 that nearly three billion people and more than half of global food production are in areas where total water storage is projected to decline.

3.3 Geoeconomic and security risk

The [Global Risks Report 2026](#), based on a survey of more than 1,300 leaders and experts, places geoeconomic confrontation at the top of the two-year outlook, with state-based armed conflict close behind, while environmental risks dominate the ten-year view ([WEF, 2026](#)). The nuclear dimension has re-emerged: the [SIPRI Yearbook 2025](#) estimates a global inventory of 12,241 warheads in January 2025, about 9,614 of them in military stockpiles, and describes a new arms race taking shape as arms-control regimes weaken.

3.4 Health, food and demography

The Global Research on Antimicrobial Resistance project forecast in 2024 that bacterial antimicrobial resistance would directly cause more than 39 million deaths between 2025 and 2050 ([Oxford/GRAM summary](#)). On food, the FAO estimated that [8.2% of people faced hunger in 2024](#), while the 2026 edition reports that [roughly 645 million people, 7.8%, did so in 2025](#); progress is real but fragile and unevenly distributed. Demographic change is a slow variable with large consequences: the UN's [World Population Prospects 2024](#) projects that world population will peak at about 10.3 billion in the mid-2080s, with the largest increases concentrated in sub-Saharan Africa and the sharpest ageing in East Asia and Europe. The range of long-run outcomes is wide: the population scenarios of [KC and Lutz \(2017\)](#) underlying the SSPs, since updated, span from about 6.9 billion (SSP1) to 12.6 billion (SSP3) by 2100.

3.5 Technology and information

Adverse outcomes of artificial intelligence moved from 30th place in the Forum's two-year ranking to 5th place in the ten-year ranking, the largest rise in severity of any risk ([WEF, 2026](#)). Misinformation and societal polarization rank among the leading near-term concerns. The channel from information disorder to the polycrisis runs through governance: a society that cannot agree on facts finds it harder to build the coalitions that adaptation and mitigation require. This is one reason the PCRRRI weights governance and social cohesion heavily.

3.6 How the risks entangle

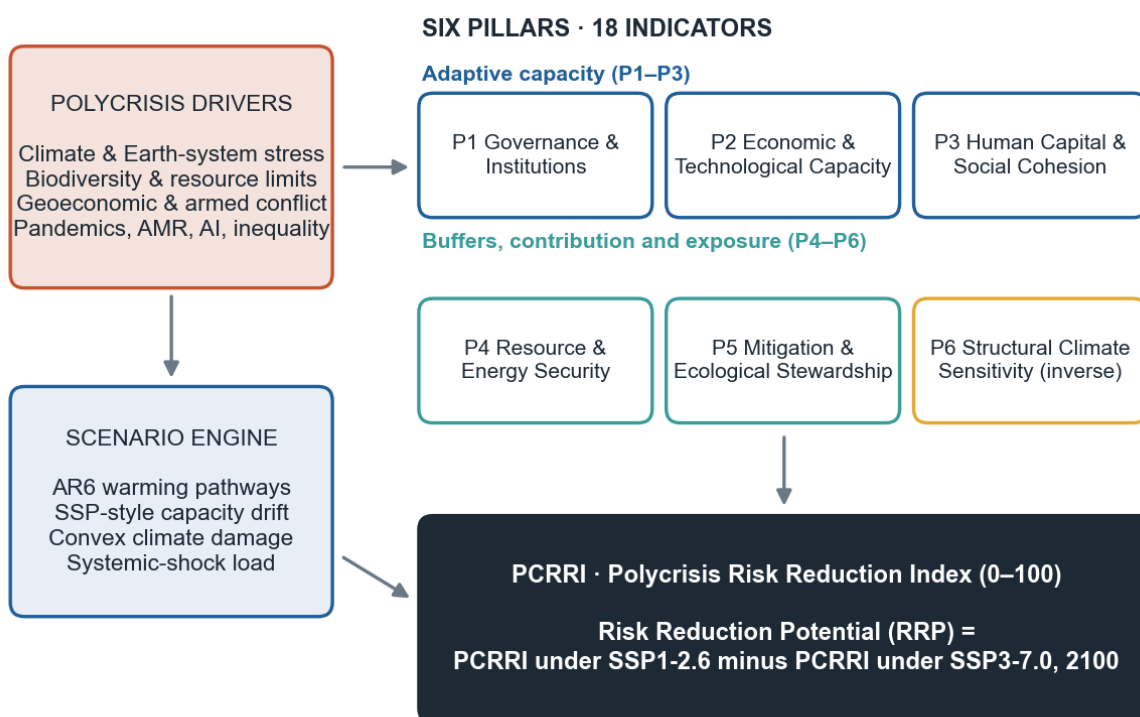
Entanglement is visible in three recurrent patterns. First, **common stressors**: extreme heat simultaneously cuts labor productivity, crop yields and power-grid reliability, so a single weather event hits health, food and energy systems at once. A study of the human climate niche by [Xu et al. \(2020\)](#) suggested that under high-emissions, high-population assumptions up to roughly a third of humanity could face mean annual temperatures above 29 °C by 2070, conditions currently found in only a small fraction of the land surface. Second, **feedbacks**: food price spikes feed political instability, which weakens the institutions needed to respond, which raises vulnerability to the next shock. Third, **trigger and condition interactions**: [Kemp et al. \(2022\)](#) argue that scientific assessment has under-examined the tail scenarios in which these interactions produce catastrophic outcomes. These patterns motivate the pillar structure in Section 4 and the shock-load term in the scenario engine.

4 Methodology

4.1 Sample and data

The sample comprises 40 countries chosen to span all regions and income levels and to include every G20 member state (the European Union and African Union participate as blocs and are not included), plus major emerging economies and several highly climate-exposed states. Together they hold 6.15 billion people (2025), about 75% of the world population. All inputs come from the [World Bank Indicators API](#), principally the [World Development Indicators](#), the [Worldwide Governance Indicators](#) and the [Human Capital Index](#). For each indicator the most recent non-empty value was used, retrieved on 9 October 2026; reference years range from 2015 to 2025 and are listed in the data notes in Appendix B. Where a country lacks an indicator (the Gini coefficient for Singapore, New Zealand and Saudi Arabia, and R&D intensity for Bangladesh), the pillar score is computed from the remaining indicators in that pillar.

Figure 2. Conceptual structure of the PCRRRI and scenario engine



Source: author. Pillars P1–P3 measure adaptive capacity; P4–P6 measure buffers, contribution and structural exposure.

4.2 Pillars and indicators

Each pillar combines two to four indicators (Table 2). Indicators were chosen to be available for all sample countries, to have clear directionality, and to span the concept without heavy redundancy.

Table 2. Pillars, indicators and sources

Pillar	Indicator	World Bank code	Dir.	Weight
P1 Governance & Institutions	Government effectiveness	WGI GE.EST	+	1/3

Pillar	Indicator	World Bank code	Dir.	Weight
	Rule of law	WGI.RL.EST	+	1/3
	Political stability / absence of violence	WGI.PV.EST	+	1/3
P2 Economic & Technological Capacity	GDP per capita, PPP (log)	NY.GDP.PCAP.PP.KD	+	0.6
	R&D expenditure, % of GDP	GB.XPD.RSDV.GD.ZS	+	0.4
P3 Human Capital & Social Cohesion	Human Capital Index	HD.HCI.OVRL	+	1/4
	Life expectancy at birth	SP.DYN.LE00.IN	+	1/4
	Income inequality (Gini)	SI.POV.GINI	–	1/4
	Demographic balance: [fertility – 2.1]	SP.DYN.TFRT.IN	–	1/4
P4 Resource & Energy Security	Net energy imports, % of use (capped)	EG.IMP.CON.S.ZS	–	1/4
	Food imports, % of merchandise imports	TM.VAL.FOOD.ZS.UN	–	1/4
	Renewable freshwater per capita (log)	ER.H2O.INTR.PC	+	1/4
	Freshwater withdrawal, % of resources (capped)	ER.H2O.FWST.ZS	–	1/4
P5 Mitigation & Ecological Stewardship	CO ₂ emissions per capita (log)	EN.GHG.CO2.PC.CE.AR5	–	1/3
	Renewable share of electricity output	EG.ELC.RNEW.ZS	+	1/3
	Forest area, % of land	AG.LND.FRST.ZS	+	1/3
P6 Structural Climate Sensitivity (inverse)	Population in low-elevation coastal zone (log)	EN.POP.EL5M.ZS	–	1/2
	Agriculture, % of GDP	NV.AGR.TOTL.ZS	–	1/2

Source: [World Bank Indicators API](#). Direction: + higher is better, – lower is better. Weights are within-pillar; pillars are equally weighted in the baseline.

Two points on interpretation. The food-import indicator is a coarse proxy for import dependence, and net energy imports are capped at –100% and +150% to prevent a few extreme net exporters (for example Norway at roughly –730%) and Singapore from dominating the scale. Pillar P6 is deliberately inverted so that higher scores mean *lower* structural sensitivity, keeping every pillar on a "higher is better" footing. P6 is the thinnest pillar: it has only two indicators, and future versions should add heat-exposure and water-stress hazard data.

4.3 Normalization and aggregation

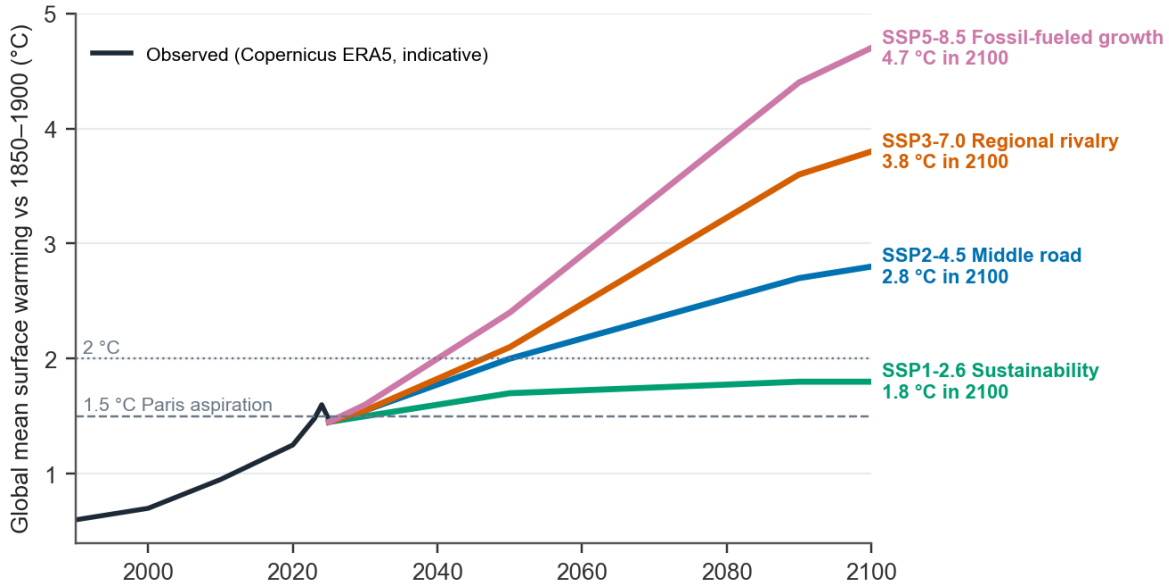
Following the OECD–JRC [Handbook on Constructing Composite Indicators](#), each indicator is winsorized at the 5th and 95th percentiles of the sample and rescaled to 0–100 by min–max normalization, so that a score of 100 means "at or above the sample's 95th percentile on the favorable end." Skewed variables (GDP per capita, freshwater per capita, emissions per capita and coastal exposure) are log-transformed first. Indicators are averaged within pillars using the weights in Table 2, and the six pillars are averaged with equal weights to give the PCRRI. Equal weighting is a transparent default; Section 6 tests alternatives. Countries are assigned to tiers by fixed thresholds applied to the rounded score: Tier I Robust (70 or above), Tier II Resilient (55 to 69.9), Tier III Strained (40 to 54.9) and Tier IV Fragile (below 40).

4.4 The scenario engine

The scenario engine projects the index from 2025 to 2100 under four pathways that borrow the labels and narrative logic of the Shared Socioeconomic Pathways ([O'Neill et al., 2017](#); [Riahi et al., 2017](#)) and

pair each with the IPCC AR6 warming outcome for the corresponding scenario ([IPCC AR6 WGI SPM](#)). The AR6 best estimates for 2081–2100 are 1.8 °C (SSP1-2.6), 2.7 °C (SSP2-4.5), 3.6 °C (SSP3-7.0) and 4.4 °C (SSP5-8.5), and for 2041–2060 are 1.7, 2.0, 2.1 and 2.4 °C respectively. Figure 3 shows the stylized trajectories; values for 2100 extend the AR6 end-century mean slightly and are illustrative.

Figure 3. Global warming trajectories used in the scenario engine



Source: observations are indicative values from [Copernicus ERA5](#); projections interpolate [IPCC AR6](#) best estimates for 2041–2060 and 2081–2100. 2100 values are a stylized extension.

The model has three components. **(1) Capacity drift.** Pillars P1–P5 move toward scenario-specific targets at scenario-specific rates, capturing development convergence in SSP1 and SSP5, slow drift in SSP2 and erosion in SSP3. **(2) Climate damage.** A convex deduction, scaled by a country's structural sensitivity, regional hazard multiplier and adaptive capacity, is subtracted from the index as warming rises above its 2025 level. **(3) Systemic-shock load.** A scenario-dependent penalty, larger where governance and social cohesion are weak, represents non-climate shocks (conflict, pandemics, financial and information crises), highest in the fragmented SSP3 world.

$$\begin{aligned}
 x_p(t) &= T_p + [x_p(2025) - T_p] \cdot \exp(-k_p \cdot t) \quad \text{for pillars } p = 1 \dots 5 \\
 D_c(t) &= D_{\max} \cdot S_c \cdot \max[f(\Delta T_t) - f(\Delta T_{2025}), 0] \cdot [1 - \alpha \cdot A_c(t) / 100] \\
 f(\Delta T) &= ((\Delta T - 1.2) / 3.0)^{1.5} \quad S_c = H_c \cdot [0.5 + 0.5 \cdot (1 - x_6 / 100)] \\
 \Sigma_c(t) &= 10 \cdot \sigma_s \cdot ((t - 2025) / 75)^{0.8} \cdot [1 - (x_1 + x_3) / 200] \\
 PCRRRI_c(t) &= \text{mean}(x_1, \dots, x_5, x_6) - D_c(t) - \Sigma_c(t), \text{ bounded to } [0, 100]
 \end{aligned}$$

Here A_c is the mean of the three capacity pillars, H_c is a regional hazard multiplier between 0.6 and 1.6 informed by the regional risk assessments in [IPCC AR6 WGII](#) (Appendix B), $D_{\max} = 28$ points and $\alpha = 0.65$ are calibration constants, and σ_s is the shock load of scenario s . Table 3 lists scenario parameters. The functional form is convex in warming, consistent with the empirical literature on non-linear temperature–income relationships ([Burke et al., 2015](#)), but the calibration is judgmental. We deliberately do not anchor it to the headline macroeconomic loss estimate of [Kotz et al. \(2024\)](#), which has since been withdrawn by its authors for revision and resubmission.

Table 3. Scenario parameters

Scenario	Warming 2050 / 2100 (°C)	Capacity targets P1–P5	Convergence rate k (per yr)	Shock load σ
SSP1-2.6 Sustainability	1.7 / 1.8	85, 85, 88, 80, 85	0.015–0.020	0.0
SSP2-4.5 Middle road	2.0 / 2.8	75, 80, 80, 70, 70	0.008	0.4
SSP3-7.0 Regional rivalry	2.1 / 3.8	45, 55, 55, 45, 45	0.006–0.010	1.0
SSP5-8.5 Fossil-fueled growth	2.4 / 4.7	70, 95, 80, 55, 30	0.010–0.025	0.6

Source: author. Warming anchors from IPCC AR6; targets and rates are stylized assumptions expressing each narrative. 2100 warming values are an extension of AR6 end-century means.

4.5 Uncertainty analysis

Two Monte Carlo experiments quantify uncertainty. The first draws 5,000 random pillar weightings from a Dirichlet distribution centered on equal weights and records each country's rank distribution. The second draws 1,500 parameter sets for the scenario engine, varying the damage scale (log-normal, 35% standard deviation), the damage exponent (uniform 1.2–2.0), the warming threshold (1.0–1.4 °C), adaptation effectiveness (0.40–0.85), the capacity convergence rate ($\pm 25\%$), the shock scale ($\pm 30\%$) and each country's hazard multiplier ($\pm 10\%$). Scenario results are reported as medians or baseline values with 5th–95th percentile ranges.

4.6 What the PCRRRI is not

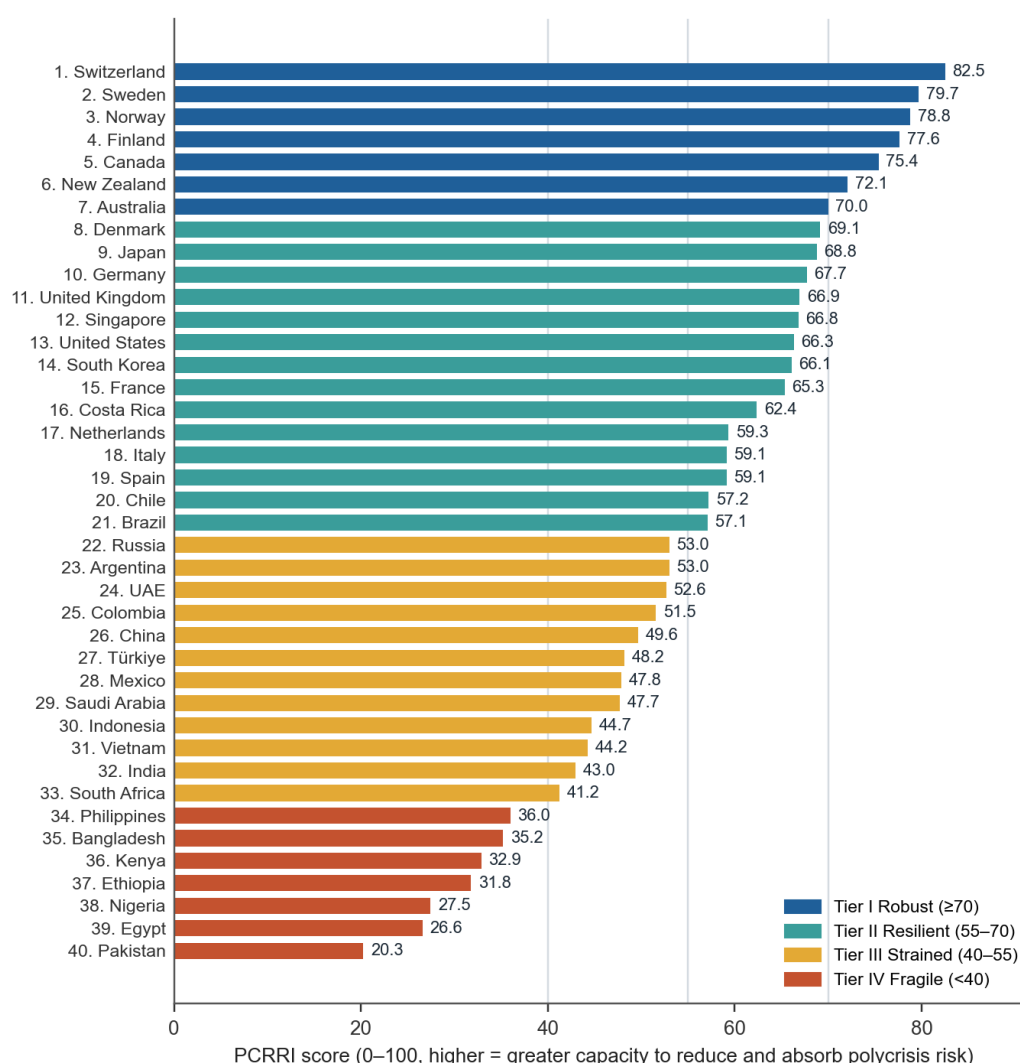
The index is not a forecast, a measure of national performance or a ranking of countries' worth. It measures *capacity* to reduce and absorb compound risk using a defensible, open set of proxies. The scenario engine is a structured thought experiment: it makes assumptions explicit so they can be challenged and varied. It is not calibrated to reproduce any particular integrated assessment model.

5 Baseline Results

5.1 The overall ranking

Figure 4 ranks all 40 countries. Switzerland leads with 82.5, followed by Sweden (79.7), Norway (78.8), Finland (77.6) and Canada (75.4). The lowest scores belong to Pakistan (20.3), Egypt (26.6) and Nigeria (27.5). The unweighted mean is 55.3 and the median 57.1; weighting by population pulls the mean down to 47.0, because the most populous countries (China, India, Indonesia, Pakistan, Nigeria and Brazil among them) sit outside Tier I. The Spearman rank correlation between PCRRI and population is -0.64.

Figure 4. PCRRI ranking, 40 countries, 2025 baseline



Source: author calculations from World Bank data (retrieved 9 October 2026). Tier thresholds applied to the rounded score.

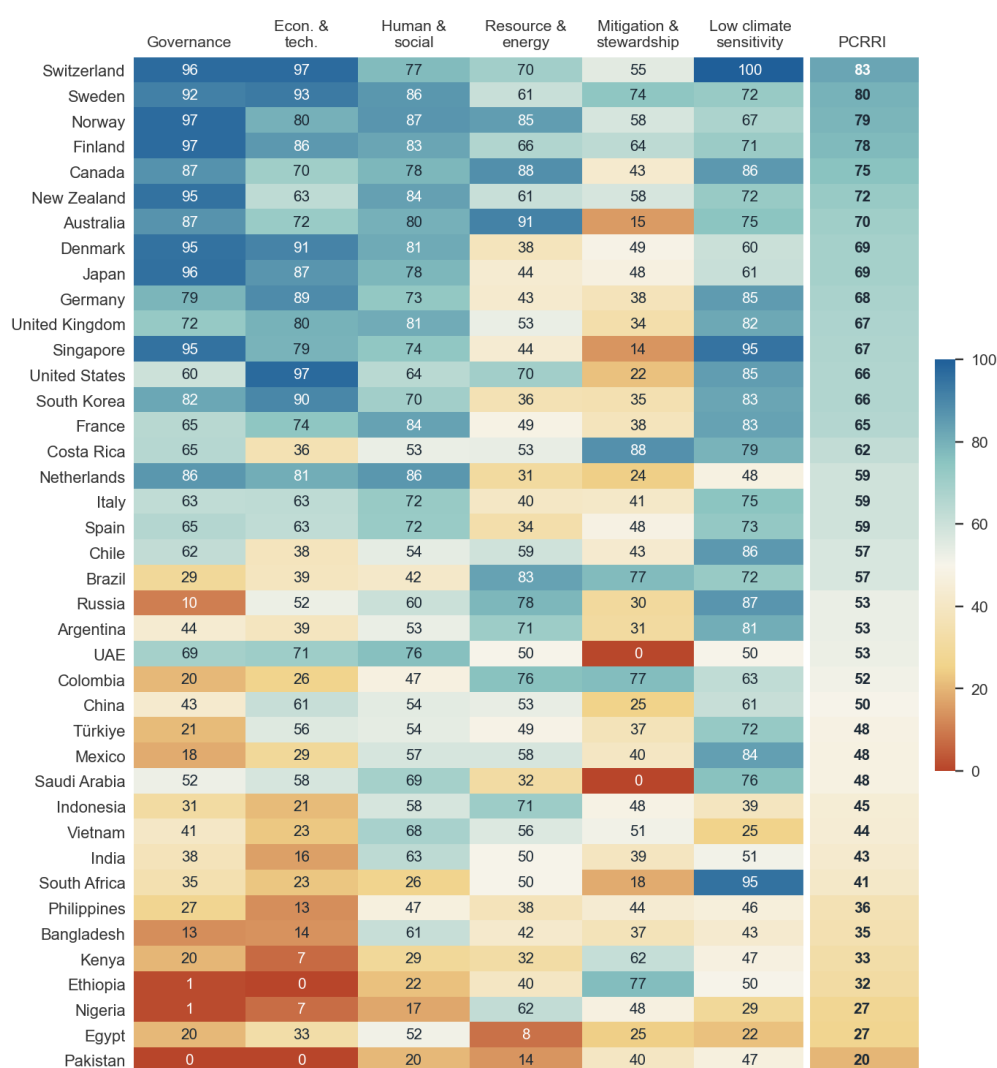
The tier structure is stark. Tier I (Switzerland, Sweden, Norway, Finland, Canada, New Zealand and Australia) comprises 7 countries holding 0.11 billion people, or 1.7% of the sample. Tier II has 14 countries and 1.11 billion people (18.1%), including the United States, Germany, Japan, France and Brazil. Tier III has 12 countries and 3.83 billion people (62.3%), including China, India, Indonesia,

Russia and Mexico. Tier IV has 7 countries and 1.1 billion people (17.8%): Philippines, Bangladesh, Kenya, Ethiopia, Nigeria, Egypt and Pakistan. Roughly four in five people in the sample live in Tier III or IV.

5.2 Pillar patterns

Figure 5 shows the pillar scores behind each total. Three patterns stand out. First, the capacity pillars (P1–P3) move together: the pairwise correlations are 0.86 (governance–economic), 0.84 (governance–human) and 0.82 (economic–human), which is why countries tend to be strong or weak across the board. Second, the buffer and contribution pillars behave differently. Resource and energy security is only weakly related to capacity (correlations around 0.2), and mitigation is slightly *negatively* related to capacity (-0.2 with economic capacity). Third, the pillars with the largest population-weighted deficits are governance (37.6), economic and technological capacity (39.9) and mitigation (37.8), against 55.6 for human capital and 58.5 for low structural sensitivity.

Figure 5. Pillar scores by country (0–100)



Source: author calculations. Countries ordered by PCRRRI. Column "Low climate sensitivity" is the inverted P6.

Table 4. Mean pillar scores by tier

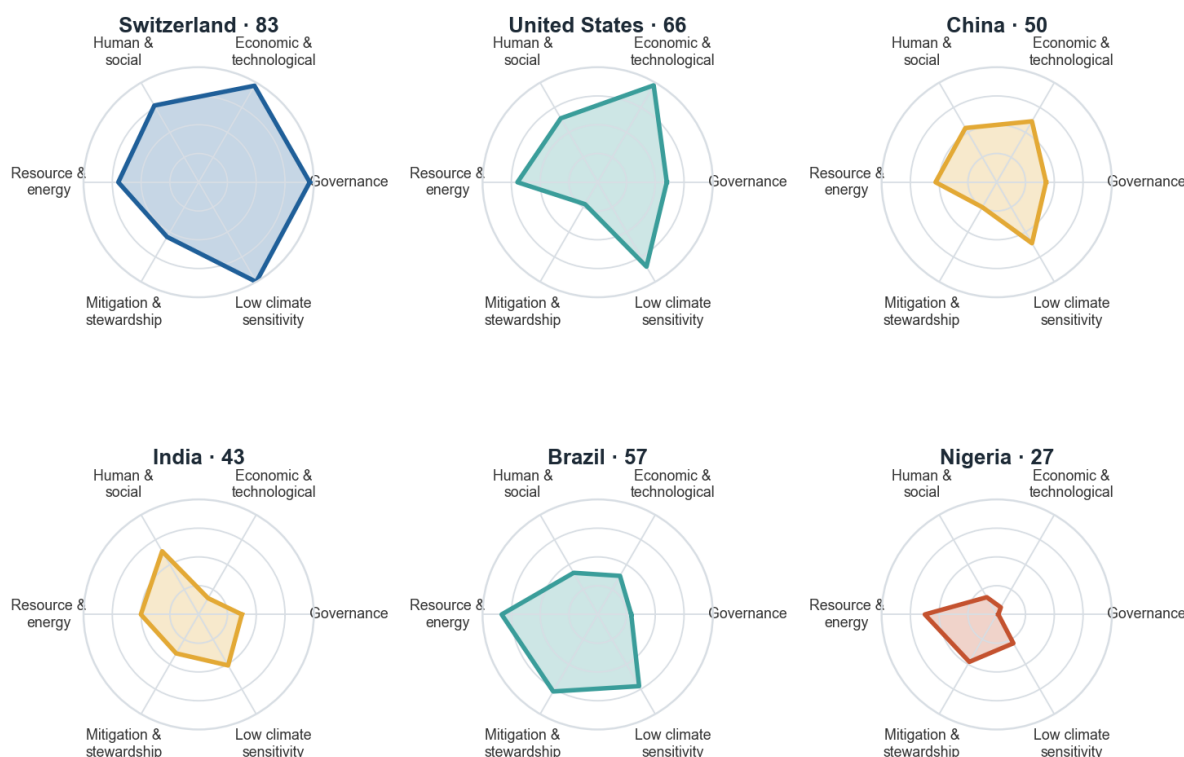
Tier	n	P1 Gov.	P2 Econ.	P3 Human	P4 Resource	P5 Mitig.	P6 Low sens.	PCRRI
Tier I Robust	7	93	80	82	75	52	78	76.6
Tier II Resilient	14	72	72	70	48	43	76	63.7
Tier III Strained	12	35	40	57	58	33	65	48.1
Tier IV Fragile	7	12	11	36	34	47	41	30.0

Source: author calculations. Simple (unweighted) means of pillar scores within each tier.

Table 4 shows what separates the tiers. The gap between Tier I and Tier IV is largest in governance (93 versus 12) and economic and technological capacity (80 versus 11). It is smallest, and non-monotonic, for mitigation: Tier IV countries score 47, nearly as high as Tier I (52) and above Tiers II (43) and III (33), because low per-capita emissions and high renewable shares (hydropower in Ethiopia, for example) outweigh their other disadvantages. Tier III has the strongest resource-security score of any tier after Tier I, reflecting large domestic energy and land endowments in countries such as Russia, Colombia and Indonesia.

5.3 Six archetypes

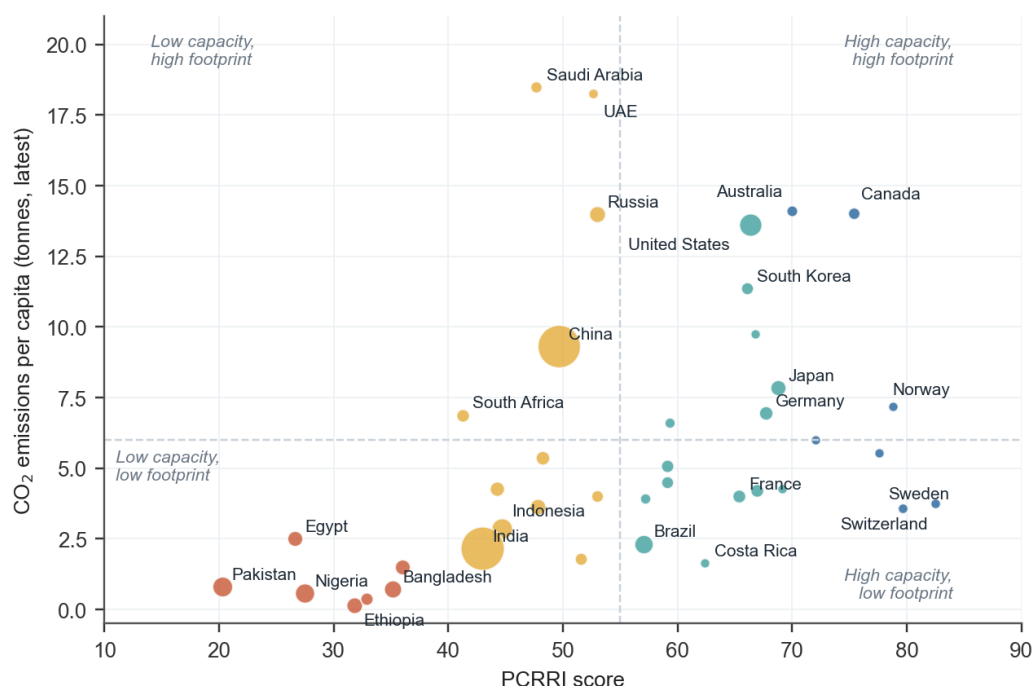
Figure 6 compares pillar profiles for six countries that illustrate distinct archetypes. Switzerland is a high-capacity, low-exposure *fortress*. The United States has the world's strongest economic and technological base in the sample but only moderate governance and social-cohesion scores and weak mitigation: a *capable but divided* profile. China is a *balanced middle* with notable deficits in governance and mitigation. India shows the *capacity gap* pattern: acceptable human-capital and resource scores, but low economic and technological capacity. Brazil is a *natural-capital* profile, with excellent resource and mitigation scores offset by weak governance and economic capacity. Nigeria illustrates the *compounded deficit*: low scores on most pillars, partly offset by resource endowments.

Figure 6. Pillar profiles for six archetypal countries

Source: author calculations. Axis range 0–100; score after the country name is the PCRRRI. Colors indicate tier.

5.4 Resilience and responsibility

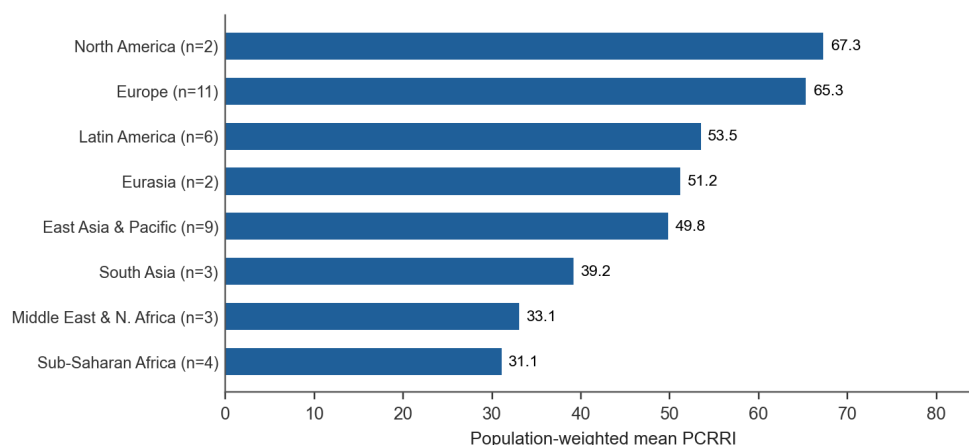
Figure 7 plots PCRRRI against per-capita CO₂ emissions. The relationship is positive but loose (Spearman $\rho = 0.52$): richer, better-governed countries tend to emit more per person, but there are exceptions in both directions. United States, Canada, South Korea and Australia combine a PCRRRI above 55 with emissions above 10 tonnes per person, so their resilience is bought partly with a footprint that raises risk for everyone. Costa Rica and the Nordic countries combine high or moderate resilience with low-to-moderate emissions, showing that the two goals are compatible. Many Tier IV countries sit in the low-capacity, low-footprint corner: they contribute little to the problem but have the least capacity to absorb it.

Figure 7. Resilience versus responsibility: PCRRl and per-capita CO₂ emissions

Source: author calculations; emissions from World Bank (EN.GHG.CO2.PC.CE.AR5), latest year. Bubble area is proportional to population; colors indicate tier.

5.5 Regional patterns

Population-weighted regional scores (Figure 8) range from 67.3 for North America and 65.3 for Europe to 33.1 for the Middle East and North Africa and 31.1 for sub-Saharan Africa. South Asia (39.2) combines large populations with weak economic and technological capacity. Eurasia (51.2) pairs strong resource security with low governance scores. Region averages mask substantial within-region variation, particularly in East Asia and Pacific, which spans Singapore and Japan at one end and the Philippines at the other.

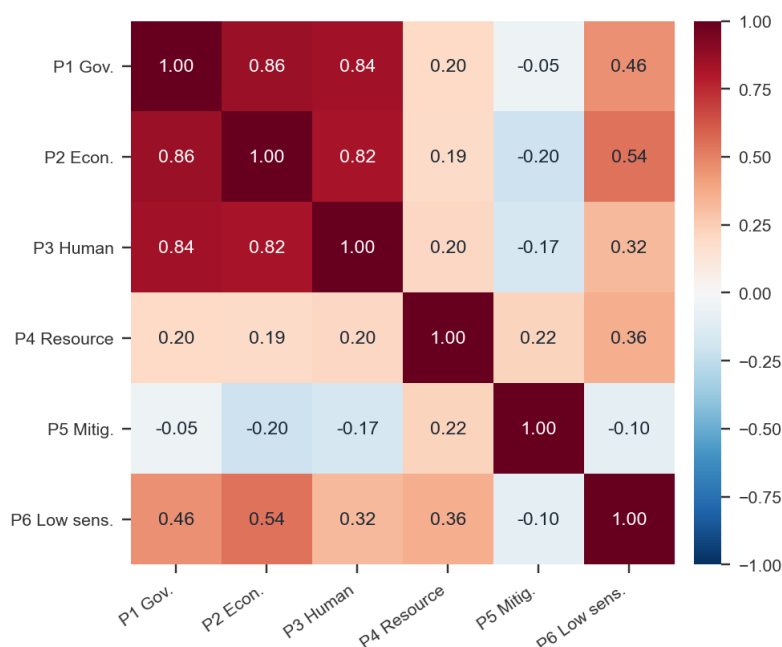
Figure 8. Population-weighted mean PCRRl by region

Source: author calculations; weights are 2025 populations. n is the number of sample countries in each region.

5.6 Interdependence of pillars

Figure 9 shows the correlation matrix of the six pillars. The block structure confirms that P1–P3 form a coherent capacity cluster, that structural low sensitivity (P6) is moderately associated with capacity (as richer countries tend to have lower agricultural dependence), and that P4 and P5 are largely independent of the capacity block. This independence matters for policy: raising capacity does not by itself reduce emissions or improve resource security, and conversely low-emissions countries are not necessarily resilient. The index therefore carries information that a single development measure such as GDP per capita does not, even though the rank correlation between the two is high ($\rho = 0.83$).

Figure 9. Correlation matrix of pillar scores (Pearson)



Source: author calculations, $n = 40$.

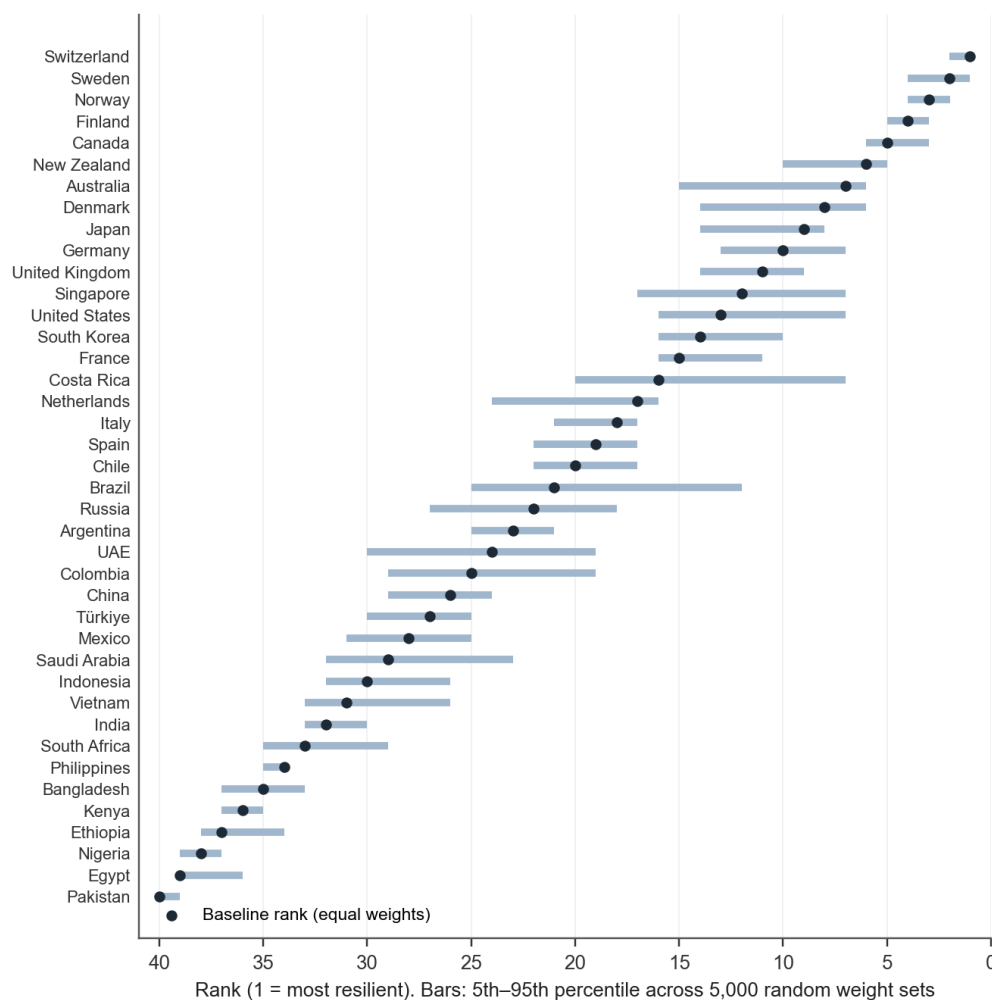
6 Robustness

A composite index is only as credible as its stability to defensible methodological choices ([OECD/JRC, 2008](#)). Two tests were run. The first perturbs the weights; the second changes aggregation, normalization or pillar composition.

6.1 Weighting uncertainty

Across 5,000 random weight sets, the mean Spearman correlation with the equal-weight ranking is 0.983 and the worst case is 0.852. The average width of a country's 5th–95th percentile rank interval is 5.7 positions out of 40 (Figure 10). Extremes are stable: Switzerland ranks between 1 and 4, and Pakistan between 39 and 40. Uncertainty is greatest for countries with unbalanced profiles, notably Costa Rica (rank 7–20), Brazil (rank 12–25), UAE (rank 19–30), Singapore (rank 7–17), whose position depends on how much weight is given to their strong or weak pillars.

Figure 10. Rank uncertainty under 5,000 random weightings

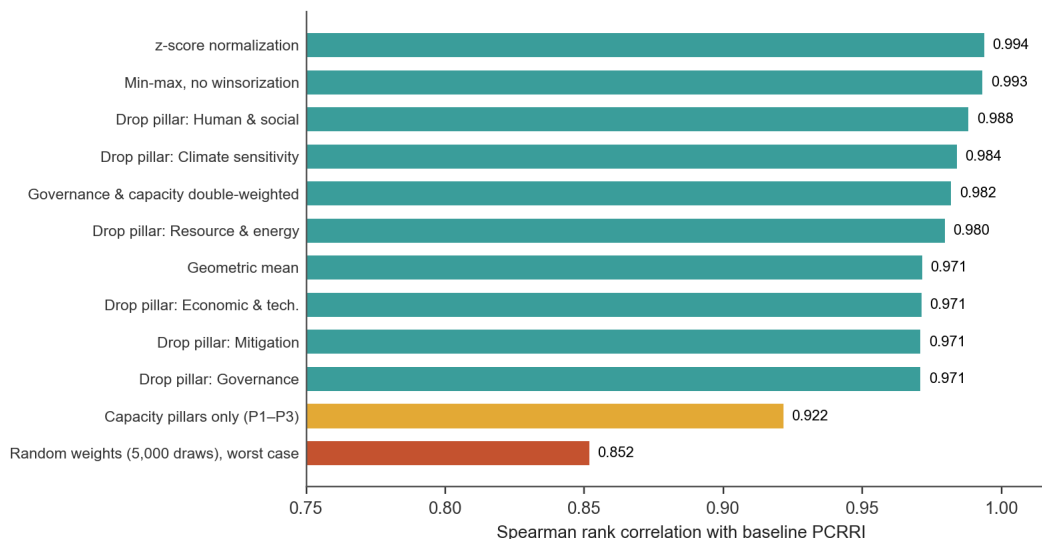


Source: author calculations. Dirichlet weights centered on equal weights; bars show 5th–95th percentile ranks.

6.2 Alternative specifications

Figure 11 reports rank correlations for alternative specifications. Geometric aggregation, z-score normalization, the removal of winsorization, a double weighting of the capacity pillars and the removal of any single pillar all produce rankings with Spearman correlations of at least 0.971 against the baseline. The one specification that departs materially is the capacity-only index (P1–P3), with a correlation of 0.922: dropping the buffer, mitigation and exposure pillars would change the ranking of resource-rich and low-emissions countries most. This is the empirical case for a multi-pillar design.

Figure 11. Rank correlation of alternative specifications with the baseline index



Source: author calculations. Colors: green ≥ 0.95 , amber 0.90–0.95, red < 0.90 .

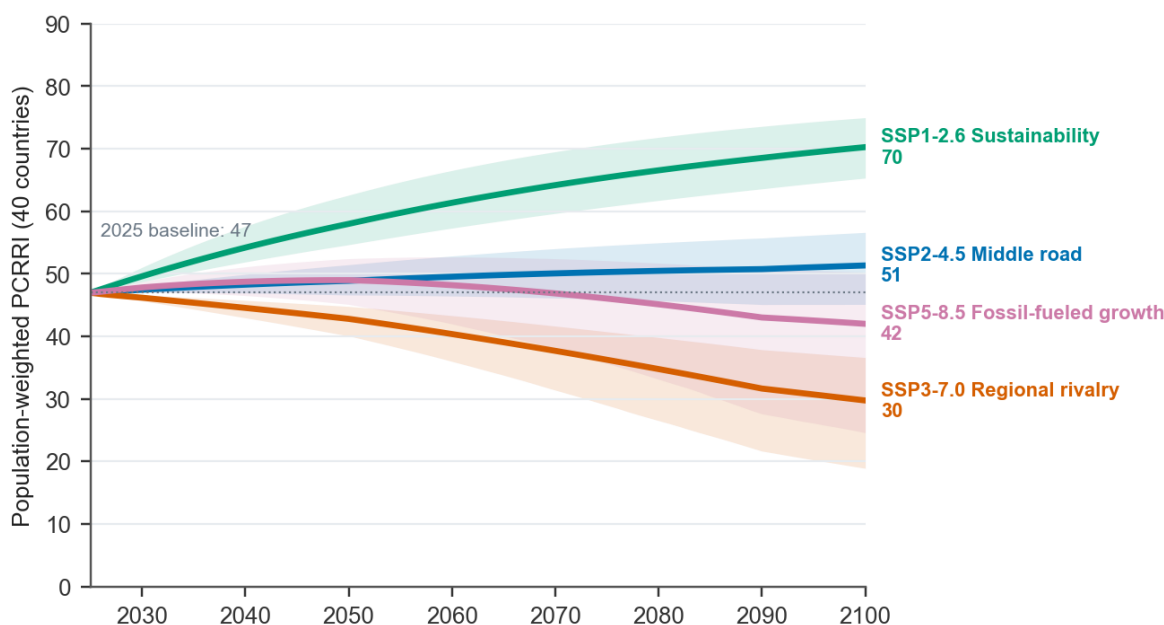
One structural caveat deserves emphasis. The hazard multipliers used in the scenario engine (Section 4.4) are negatively correlated with the baseline index (Spearman $\rho = -0.9$) because low-capacity countries disproportionately lie in regions where AR6 reports high climate risk. That correlation is a feature of the world, not an artifact, but it means that scenario results compound disadvantage: the countries least able to adapt are also the most exposed. It also means scenario outcomes depend on a judgmental layer (Appendix B) that users should challenge.

7 Pathways to 2100

7.1 Aggregate trajectories

Figure 12 shows the population-weighted PCRRI of the 40-country sample under the four pathways, with 5th–95th percentile bands from the parameter Monte Carlo. All trajectories start at 47.0, the 2025 population-weighted baseline. By 2100 the sustainability pathway (SSP1-2.6) reaches 70.3 (range 65.3–75.0); the middle road ends at 51.3 (45.3–56.5); the fossil-fueled pathway falls to 42.0 (25.0–50.0); and regional rivalry (SSP3-7.0) falls to 29.7 (19.4–36.2). The ranges of SSP2 and SSP5 overlap, so the model cannot cleanly separate them; the ranges of SSP1 and SSP3 do not overlap at all.

Figure 12. Population-weighted PCRRI trajectories, 2025–2100



Source: author calculations. Lines: baseline parameters. Shaded bands: 5th–95th percentile across 1,500 parameter draws. Populations held at 2025 levels.

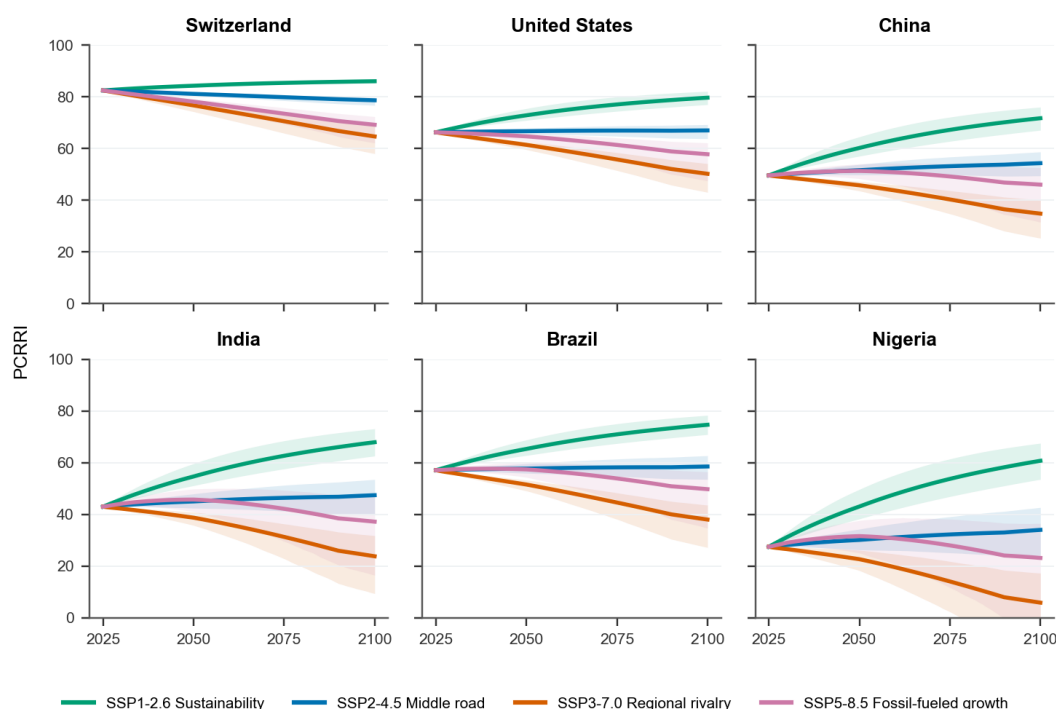
The fossil-fueled pathway is the most instructive. It outperforms the middle road in the early decades because rapid economic and technological gains lift capacity pillars, and the two trajectories cross around 2051. After that, accelerating climate damage (the population-weighted deduction reaches 15.9 points by 2100 versus 5.5 under the middle road) and the erosion of the energy-security and mitigation pillars outweigh the gains. The narrative is one of *growth that borrows against the future*, and it echoes the finding of integrated assessments that high-growth, high-emissions worlds carry the largest long-run adaptation challenges ([Riahi et al., 2017](#)).

7.2 Country trajectories

Figure 13 shows trajectories for the six archetypal countries. Three features recur. The spread between scenarios widens through the century for every country, but it is far wider for lower-capacity countries: Nigeria's 2100 score runs from 6 under SSP3 to 61 under SSP1, while Switzerland's runs from 65 to 86. Only 6 of the 40 countries remain at or above 55, the Tier II threshold, under SSP3-7.0. And in the rivalry scenario, 7 countries (Philippines, Bangladesh, Pakistan, Egypt, Nigeria, Ethiopia and Kenya)

fall below a score of 20, a zone we interpret as functional failure of the capacity to absorb compound shocks.

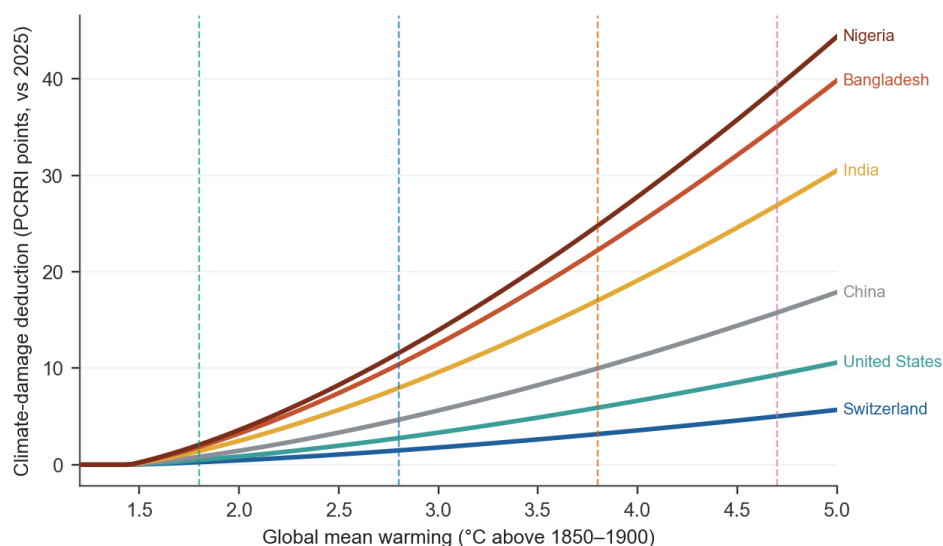
Figure 13. PCRRRI trajectories for six countries under four pathways



Source: author calculations. Bands: 5th–95th percentile across 1,500 parameter draws.

7.3 Climate damage and adaptive capacity

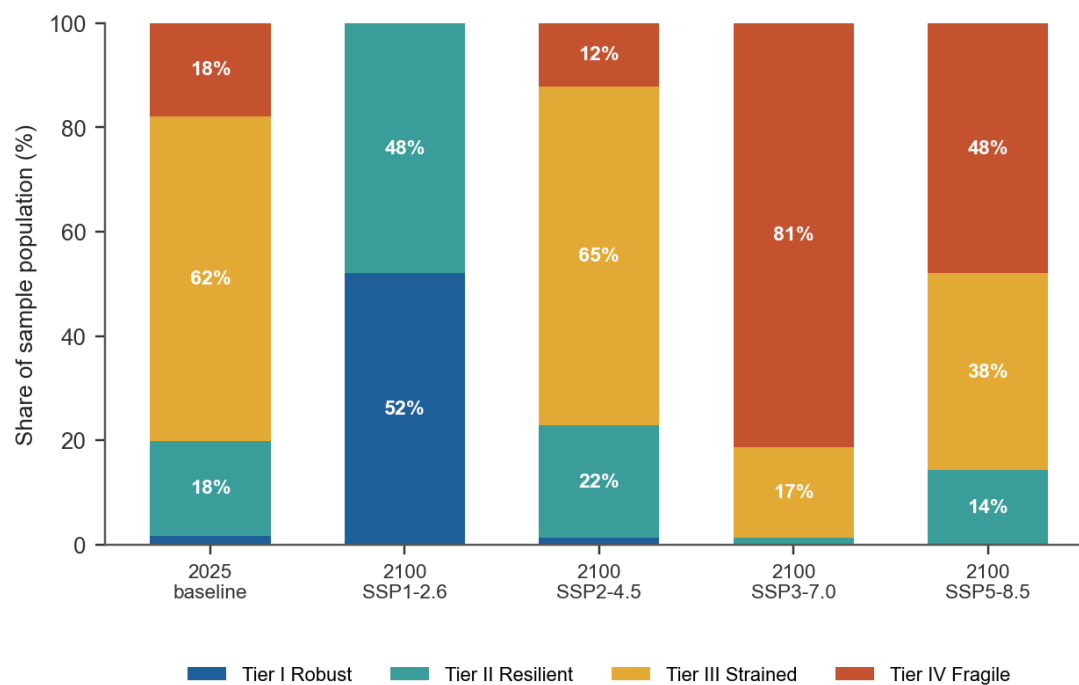
Figure 14 isolates the climate-damage term for six countries as a function of global warming. The same warming level produces very different deductions: at the 2100 level of SSP3-7.0 the deduction runs from 4.0 points in Switzerland to 21.7 points in Nigeria, a factor of roughly five. Two forces drive this spread: sensitivity and hazard (which are higher in low-latitude, agriculture-dependent and coastal economies) and adaptive capacity (which reduces damage by up to 65% in the best-resourced countries). The convexity of the curves means that each additional degree costs more than the last, so the benefit of limiting warming is largest at the margin of the high-end scenarios.

Figure 14. Climate-damage deduction as a function of global warming

Source: author calculations. Dashed vertical lines mark 2100 warming under SSP1-2.6, SSP2-4.5, SSP3-7.0 and SSP5-8.5 (left to right). Deduction measured relative to 2025.

7.4 Where people end up

Figure 15 translates scores into tiers and weights by 2025 population. Under SSP1-2.6, no country falls below Tier II and 52.1% of sample population lives in Tier I countries. Under the middle road, the distribution looks much as today: 64.9% in Tier III and 12.1% in Tier IV. Under SSP5-8.5, 47.9% of people live in Tier IV countries, and under SSP3-7.0 that figure is 81.3%, with nobody in Tier I. The calculation holds populations at 2025 levels, which understates the exposure of fast-growing countries: UN projections ([WPP 2024](#)) imply that the share of humanity in lower-capacity countries will rise, not fall, under most pathways.

Figure 15. Share of sample population by tier: 2025 baseline and 2100 scenarios

Source: author calculations. Populations held at 2025 levels; tiers assigned by the 2025 thresholds applied to each scenario's 2100 score.

Appendix A, Table A2 reports 2025 and 2100 scores for every country under each scenario, with the 5th–95th percentile range for SSP2-4.5.

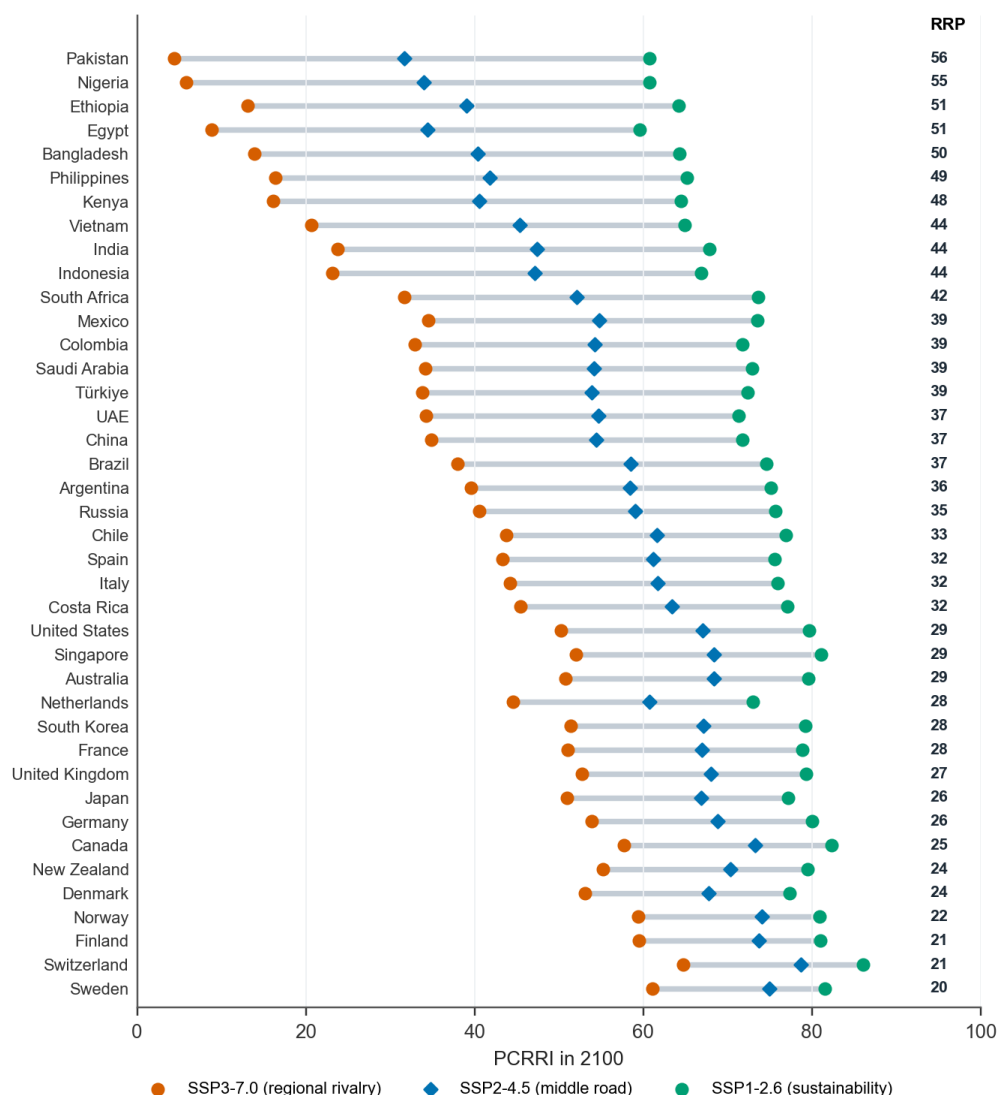
8 Risk Reduction Potential

8.1 Definition

The **Risk Reduction Potential (RRP)** of a country is the difference between its 2100 PCRRRI under SSP1-2.6 and under SSP3-7.0. It is a measure of the *swing* between a cooperative, low-emissions future and a fragmented, high-emissions one, i.e., the stakes of the global pathway for that country. A high RRP does not mean a country is resilient; it means its outcome is highly sensitive to what the world does. Because the two scenarios differ in capacity drift, warming and shock load, the RRP can be decomposed into three channels: **capacity gains** (the difference in the five capacity pillars), **avoided climate damage** and **avoided systemic-shock penalty**.

8.2 Results

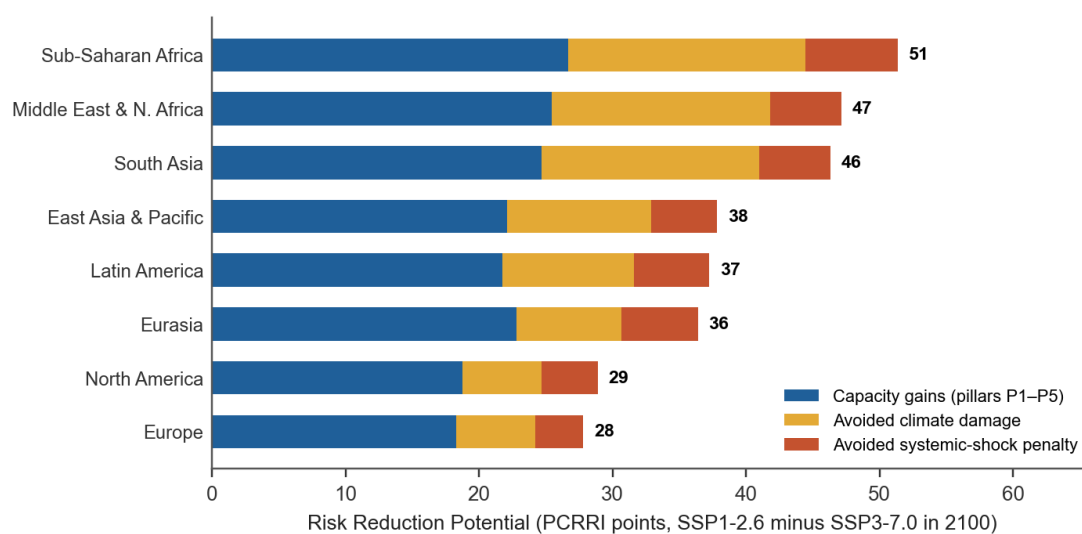
The mean RRP is 35.2 points, or 40.5 when weighted by population. The largest values are Pakistan (56.3), Nigeria (54.9), Ethiopia (51.0), Egypt (50.7), Bangladesh (50.4); the smallest are Sweden (20.4), Switzerland (21.4), Finland (21.5), Norway (21.5) (Figure 16, Table 5). By tier, mean RRP rises from 23.2 in Tier I to 29.4 in Tier II, 39.5 in Tier III and 51.5 in Tier IV. The ordering is almost the inverse of the baseline ranking: the countries that would benefit most from a cooperative pathway are those that currently have the least capacity, and are also those with the smallest historical responsibility for emissions.

Figure 16. Country PCRRi in 2100 under three pathways, ordered by Risk Reduction Potential

Source: author calculations. RRP (right-hand column) is the PCRRi under SSP1-2.6 minus that under SSP3-7.0.

8.3 Decomposition

On average, 59% of the RRP (20.8 points) comes from capacity gains, 28% (9.8 points) from avoided climate damage and 13% (4.5 points) from avoided systemic shocks. The shares differ by region (Figure 17). In sub-Saharan Africa, avoided climate damage contributes about a third of the total swing; in Europe and North America it contributes about a fifth. The implication is that **the capacity channel is the largest single contributor in every region, at roughly half or more of the total, even where climate exposure is highest.** Mitigation matters, but capacity building is at least as important.

Figure 17. Risk Reduction Potential by region and channel

Source: author calculations. Population-weighted means within region.

Table 5. Risk Reduction Potential: ten largest and five smallest

RRP rank	Country	2025	2100 SSP3	2100 SSP1	RRP	Capacity	Climate	Shock
1	Pakistan	20.3	4.4	60.7	56.3	29.4	19.8	7.2
2	Nigeria	27.5	5.8	60.7	54.9	27.2	20.4	7.2
3	Ethiopia	31.8	13.1	64.2	51.0	26.0	18.0	7.1
4	Egypt	26.6	8.9	59.6	50.7	26.3	18.7	5.8
5	Bangladesh	35.2	13.9	64.3	50.4	25.3	19.4	5.7
6	Philippines	36.0	16.4	65.2	48.8	25.2	17.9	5.7
7	Kenya	32.9	16.1	64.5	48.3	25.8	16.2	6.4
8	Vietnam	44.2	20.7	64.9	44.2	22.0	17.5	4.7
9	India	43.0	23.8	67.9	44.1	23.8	15.3	5.0
10	Indonesia	44.7	23.1	66.9	43.7	22.8	15.6	5.3
36	Denmark	69.1	53.1	77.3	24.3	16.1	5.2	2.9
37	Norway	78.8	59.4	80.9	21.5	14.5	4.3	2.7
38	Finland	77.6	59.5	81.0	21.5	14.5	4.2	2.8
39	Switzerland	82.5	64.7	86.1	21.4	14.7	3.7	3.0
40	Sweden	79.7	61.1	81.5	20.4	13.5	4.1	2.9

Source: author calculations. Capacity, Climate and Shock columns decompose the RRP into capacity gains, avoided climate damage and avoided systemic-shock penalty.

9 Policy Implications

The results suggest four propositions for policy. They are offered as implications of a stylized model, to be tested against country-specific evidence, not as prescriptions.

9.1 Four propositions

- 1. Build the foundations first.** Governance, state capability and human capital (P1–P3) are the foundations on which other adaptation depends, and they are where lower-tier countries score lowest. They also account for the largest component of RRP. International finance for adaptation should therefore be paired with support for fiscal management, public administration and education, consistent with the [Sendai Framework](#) emphasis on governance and the [Sustainable Development Goals](#).
- 2. Decouple resilience from footprint.** The countries that combine high resilience with high per-capita emissions have the most to contribute to global risk reduction and, because their own resilience is conditional on the global pathway, the most to gain. Faster decarbonization is both responsibility and self-interest, in line with the temperature goals of the [Paris Agreement](#).
- 3. Treat resource security as a separate objective.** Because P4 is nearly independent of capacity, wealth does not buy energy, food and water security automatically. Diversifying supply, reducing import dependence and managing water demand are distinct policy lines that need explicit attention, especially in Europe and East Asia where net energy imports are high.
- 4. Invest where the swing is greatest.** The RRP is largest where capacity is lowest. Directing climate and development finance toward the Tier III and IV countries with the largest swing offers the highest marginal return in global risk reduction, and is also the area where donor-country self-interest and humanitarian logic converge.

9.2 Priority matrix by tier

Table 6. Strategic priorities by tier

Tier	Typical profile	Priority levers	Global role
I Robust	Strong governance and capacity; mixed mitigation; moderate resource security	Deepen decarbonization (notably in Canada and Australia); protect institutional trust; sustain research and open trade	Finance and technology provider; norm-setter
II Resilient	High capacity, but gaps in resource security or mitigation, or governance fragility	Diversify energy and food supply; strengthen social cohesion and political stability; cut per-capita emissions	Largest source of mitigation potential in absolute terms
III Strained	Large populations; low governance or economic capacity; strong resource endowments	State capability, tax base and R&D; accelerate renewable deployment; manage water and heat risk	Pivot countries for the global pathway
IV Fragile	Low capacity across pillars; high climate hazard; low per-capita emissions	Core institutions, health and education, climate-resilient agriculture and infrastructure; concessional adaptation finance	Greatest beneficiaries of cooperation; smallest contributors to emissions

Source: author synthesis of the results in Sections 5–8.

9.3 Implications for global institutions

Because entanglement is global, so is the response. The results make the case for treating the global emissions pathway, and the capacity of the weakest links, as public goods. Practical implications include: tying adaptation finance explicitly to capacity indicators rather than to hazard alone; monitoring *composite* capacity, as the PCRRI attempts, alongside single-hazard risk indices in

multilateral surveillance; and building shared early-warning capacity for compound events. At the national level, risk assessments should be required to examine joint scenarios, such as simultaneous heat, drought and financial stress, not only individual hazards.

10 Limitations and Research Agenda

10.1 Limitations

- **Proxy indicators.** Every indicator is a proxy. Food-import share is a crude measure of food dependence; the coastal-exposure and agriculture-share indicators are the only two inputs to P6; and no indicator captures geopolitical exposure directly (for example nuclear status or proximity to conflict), beyond what the WGI political-stability measure reflects.
- **Data vintage and quality.** Reference years range from 2015 (coastal exposure) to 2025; the Gini series are sparse; WGI scores are perception-based. Missing values are handled by within-pillar averaging, which is simple but not neutral.
- **Sample.** Forty countries are not the world. Small island states and fragile states, among the most exposed, are under-represented, and population shares refer to the sample.
- **Scenario calibration.** Capacity targets, convergence rates, the damage function and the hazard multipliers are judgmental. The Monte Carlo explores parametric uncertainty but not structural uncertainty (for example tipping-point behavior, which the model does not include and which would worsen high-warming outcomes).
- **Static population and trade.** Populations are held at 2025 levels, and no country-to-country transmission (trade, migration, financial contagion) is modeled, although entanglement is the essence of polycrisis.
- **Not a forecast.** Scenario outputs are conditional on narrative assumptions and should be interpreted as relative comparisons.

10.2 Research agenda

1. Extend the sample to all countries for which the 18 indicators are available, and add small island and fragile states.
2. Replace the judgmental hazard layer with gridded hazard and exposure data (heat, flood, drought, sea-level rise) aggregated to population.
3. Add network effects: trade, finance and migration channels, and compound-event correlation.
4. Calibrate the scenario engine against integrated assessment output from the [SSP database](#) and test with alternative damage functions as peer-reviewed estimates are updated.
5. Introduce dynamic population and age structure using the Wittgenstein Centre and UN projections.
6. Validate the index against realized outcomes, for example mortality and recovery times after compound events.

11 Conclusion

The polycrisis is not a single threat but a pattern of entangled stresses, and the capacity to withstand it is distributed very unequally. In a sample of 40 countries holding three-quarters of humanity, the most resilient societies are few and small, and about four in five people live in countries scoring in the Strained or Fragile tiers. The foundations of resilience, governance, institutional capacity and human capital, are mutually reinforcing, but they are only weakly linked to resource security and negatively linked to mitigation. Prosperity alone therefore does not deliver either a low footprint or a secure resource base.

Looking to 2100, the pathway the world follows matters more than any single country's position in today's ranking. Under cooperative, low-emissions pathways the model's population-weighted index rises by roughly half again; under the fossil-fueled pathway it falls by about a tenth and under regional rivalry by more than a third; and the swing is largest for the countries with the least capacity today. The conclusion is at once sobering and constructive: the distribution of risk is a product of choices as well as of geography, and the same investments that lower the global risk also raise resilience where it is lowest.

The PCRRI is a first step. It is deliberately simple, open and testable, so that others can challenge its assumptions, extend its coverage and improve its calibration. We invite exactly that.

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Appendix A Country Results

Table A1. Baseline PCRRI and pillar scores, 2025

#	Country	P1	P2	P3	P4	P5	P6	PCRRI	Tier	Rank 5–95%
1	Switzerland	96	97	77	70	55	100	82.5	I	1–2
2	Sweden	92	93	86	61	74	72	79.7	I	1–4
3	Norway	97	80	87	85	58	67	78.8	I	2–4
4	Finland	97	86	83	66	64	71	77.6	I	3–5
5	Canada	87	70	78	88	43	86	75.4	I	3–6
6	New Zealand	95	63	84	61	58	72	72.1	I	5–10
7	Australia	87	72	80	91	15	75	70.0	I	6–15
8	Denmark	95	91	81	38	49	60	69.1	II	6–14
9	Japan	96	87	78	44	48	61	68.8	II	8–14
10	Germany	79	89	73	43	38	85	67.7	II	7–13
11	United Kingdom	72	80	81	53	34	82	66.9	II	9–14
12	Singapore	95	79	74	44	14	95	66.8	II	7–17
13	United States	60	97	64	70	22	85	66.3	II	7–16
14	South Korea	82	90	70	36	35	83	66.1	II	10–16
15	France	65	74	84	49	38	83	65.3	II	11–16
16	Costa Rica	65	36	53	53	88	79	62.4	II	7–20
17	Netherlands	86	81	86	31	24	48	59.3	II	16–24
18	Italy	63	63	72	40	41	75	59.1	II	17–21
19	Spain	65	63	72	34	48	73	59.1	II	17–22
20	Chile	62	38	54	59	43	86	57.2	II	17–22
21	Brazil	29	39	42	83	77	72	57.1	II	12–25
22	Russia	10	52	60	78	30	87	53.0	III	18–27
23	Argentina	44	39	53	71	31	81	53.0	III	21–25
24	UAE	69	71	76	50	0	50	52.6	III	19–30
25	Colombia	20	26	47	76	77	63	51.5	III	19–29
26	China	43	61	54	53	25	61	49.6	III	24–29
27	Türkiye	21	56	54	49	37	72	48.2	III	25–30
28	Mexico	18	29	57	58	40	84	47.8	III	25–31
29	Saudi Arabia	52	58	69	32	0	76	47.7	III	23–32
30	Indonesia	31	21	58	71	48	39	44.7	III	26–32
31	Vietnam	41	23	68	56	51	25	44.2	III	26–33
32	India	38	16	63	50	39	51	43.0	III	30–33
33	South Africa	35	23	26	50	18	95	41.2	III	29–35
34	Philippines	27	13	47	38	44	46	36.0	IV	34–35
35	Bangladesh	13	14	61	42	37	43	35.2	IV	33–37
36	Kenya	20	7	29	32	62	47	32.9	IV	35–37
37	Ethiopia	1	0	22	40	77	50	31.8	IV	34–38
38	Nigeria	1	7	17	62	48	29	27.5	IV	37–39
39	Egypt	20	33	52	8	25	22	26.6	IV	36–39
40	Pakistan	0	0	20	14	40	47	20.3	IV	39–40

Source: author calculations. P1 Governance, P2 Economic & technological, P3 Human & social, P4 Resource & energy, P5 Mitigation & stewardship, P6 Low structural climate sensitivity. Rank 5–95% is the percentile range of rank under 5,000 random weightings.

Table A2. PCRRi under four pathways, 2050 and 2100

Country	2025	SSP2 2050	SSP1 2100	SSP2 2100 (5–95%)	SSP3 2100	SSP5 2100	RRP
Switzerland	82.5	81.2	86.1	78.7 (77–80)	64.7	69.2	21.4
Sweden	79.7	78.0	81.5	74.9 (73–76)	61.1	64.5	20.4
Norway	78.8	77.1	80.9	74.0 (72–75)	59.4	64.6	21.5
Finland	77.6	76.3	81.0	73.7 (72–75)	59.5	64.1	21.5
Canada	75.4	74.7	82.3	73.2 (71–74)	57.7	65.3	24.6
New Zealand	72.1	71.6	79.5	70.3 (68–72)	55.2	61.9	24.3
Australia	70.0	69.6	79.6	68.3 (65–70)	50.8	58.8	28.8
Denmark	69.1	68.8	77.3	67.7 (65–69)	53.1	57.6	24.3
Japan	68.8	68.3	77.2	66.9 (64–69)	51.0	55.7	26.2
Germany	67.7	68.3	80.0	68.8 (66–71)	53.9	60.7	26.1
United Kingdom	66.9	67.5	79.3	68.1 (66–70)	52.7	60.3	26.6
Singapore	66.8	67.7	81.1	68.4 (65–71)	52.0	59.6	29.1
United States	66.3	66.8	79.7	67.0 (64–69)	50.3	57.8	29.4
South Korea	66.1	66.7	79.3	67.2 (64–69)	51.4	57.8	27.8
France	65.3	66.1	78.8	66.9 (64–69)	51.0	58.8	27.8
Costa Rica	62.4	62.9	77.1	63.4 (60–66)	45.5	55.4	31.6
Netherlands	59.3	60.2	73.0	60.7 (57–63)	44.6	51.0	28.4
Italy	59.1	60.4	75.9	61.7 (58–65)	44.2	52.9	31.7
Spain	59.1	60.2	75.5	61.2 (57–65)	43.3	51.3	32.2
Chile	57.2	59.1	76.9	61.6 (58–65)	43.7	56.0	33.2
Brazil	57.1	57.7	74.6	58.5 (54–63)	38.0	49.7	36.7
Russia	53.0	55.4	75.7	59.1 (55–63)	40.5	54.0	35.1
Argentina	53.0	55.2	75.1	58.5 (54–63)	39.6	53.1	35.5
UAE	52.6	53.9	71.3	54.7 (49–59)	34.2	42.6	37.1
Colombia	51.5	52.7	71.7	54.3 (49–59)	32.9	45.7	38.8
China	49.6	51.7	71.8	54.4 (49–59)	34.9	46.1	36.9
Türkiye	48.2	50.5	72.3	53.9 (48–59)	33.8	45.7	38.5
Mexico	47.8	50.7	73.6	54.8 (49–60)	34.5	48.8	39.0
Saudi Arabia	47.7	50.5	72.9	54.2 (49–59)	34.1	45.4	38.8
Indonesia	44.7	45.9	66.9	47.1 (40–53)	23.1	36.1	43.7
Vietnam	44.2	45.0	64.9	45.3 (37–51)	20.7	31.8	44.2
India	43.0	45.0	67.9	47.4 (40–53)	23.8	37.2	44.1
South Africa	41.2	45.6	73.6	52.1 (46–59)	31.7	49.0	42.0
Philippines	36.0	38.5	65.2	41.8 (33–49)	16.4	30.8	48.8
Bangladesh	35.2	37.5	64.3	40.4 (31–48)	13.9	28.0	50.4
Kenya	32.9	36.0	64.5	40.6 (32–48)	16.1	32.0	48.3
Ethiopia	31.8	34.7	64.2	39.1 (30–47)	13.1	29.7	51.0
Nigeria	27.5	30.1	60.7	34.0 (24–43)	5.8	23.1	54.9
Egypt	26.6	30.0	59.6	34.4 (25–43)	8.9	21.9	50.7
Pakistan	20.3	24.9	60.7	31.7 (22–42)	4.4	22.8	56.3

Source: author calculations. SSP1 = SSP1-2.6, SSP2 = SSP2-4.5, SSP3 = SSP3-7.0, SSP5 = SSP5-8.5. RRP = SSP1 minus SSP3 in 2100. Range for SSP2 from 1,500 Monte Carlo draws.

Appendix B Input Data

Table B1. Indicator values used (latest available)

Country	Region	GDP pc PPP	GE	RL	PV	HCI	Life exp.	Gini	TFR	CO ₂ pc	Ren. el. %	Haz. mult.
Switzerland	Europe	85,732	1.97	1.74	1.12	0.76	84.4	33.5	1.29	3.7	68	0.7
Sweden	Europe	63,362	1.82	1.74	0.85	0.80	84.1	29.3	1.43	3.6	67	0.6
Norway	Europe	95,173	1.84	1.94	1.08	0.77	83.2	26.5	1.45	7.2	99	0.6
Finland	Europe	55,735	1.94	2.01	0.96	0.80	82.3	27.4	1.25	5.5	53	0.6
Canada	North America	57,990	1.76	1.48	0.81	0.80	82.1	31.5	1.25	14.0	67	0.7
New Zealand	East Asia & Pacific	48,233	1.87	1.66	1.18	0.78	82.0	n/a	1.57	6.0	81	0.7
Australia	East Asia & Pacific	60,194	1.75	1.46	0.78	0.77	83.1	33.8	1.48	14.1	27	1.0
Denmark	Europe	72,723	1.96	2.01	0.79	0.76	82.3	29.9	1.47	4.3	79	0.7
Japan	East Asia & Pacific	48,283	2.04	1.54	1.26	0.80	84.0	32.3	1.15	7.8	21	0.9
Germany	Europe	62,824	1.49	1.60	0.21	0.75	80.8	33.7	1.36	6.9	40	0.7
United Kingdom	Europe	53,993	1.23	1.27	0.29	0.78	81.4	32.4	1.55	4.2	40	0.7
Singapore	East Asia & Pacific	139,593	2.09	1.49	1.33	0.88	83.3	n/a	0.97	9.8	4	1.1
United States	North America	76,931	1.19	0.79	-0.30	0.70	78.9	41.8	1.63	13.6	20	0.9
South Korea	East Asia & Pacific	55,697	1.50	1.20	0.92	0.80	83.6	32.9	0.75	11.4	7	0.9
France	Europe	55,125	1.21	0.97	-0.09	0.76	83.0	31.8	1.61	4.0	23	0.8
Costa Rica	Latin America	28,443	0.41	0.60	1.22	0.63	81.0	45.5	1.32	1.6	99	1.0
Netherlands	Europe	71,378	1.74	1.67	0.53	0.79	82.0	25.7	1.43	6.6	33	0.8
Italy	Europe	53,606	0.92	0.59	0.46	0.73	84.0	34.3	1.18	5.1	41	1.0
Spain	Europe	49,318	1.13	0.87	0.18	0.73	83.9	33.4	1.10	4.5	47	1.1
Chile	Latin America	30,863	1.04	0.68	0.17	0.65	81.4	43.0	1.14	3.9	48	0.9
Brazil	Latin America	20,025	-0.04	-0.49	-0.38	0.55	76.0	50.3	1.61	2.3	77	1.1
Russia	Eurasia	42,358	-0.50	-1.27	-0.94	0.68	73.4	33.0	1.42	14.0	19	0.8
Argentina	Latin America	27,847	0.28	-0.10	0.16	0.60	77.5	42.4	1.50	4.0	26	0.9
UAE	Middle East & N. Africa	69,702	1.13	0.54	0.83	0.67	83.1	26.4	1.21	18.3	4	1.3
Colombia	Latin America	18,779	-0.09	-0.63	-0.95	0.60	77.9	54.4	1.63	1.8	76	1.1
China	East Asia & Pacific	25,067	0.62	-0.43	0.02	0.65	78.0	36.0	1.01	9.3	28	1.0
Türkiye	Eurasia	37,301	0.03	-0.81	-0.88	0.65	77.4	43.7	1.48	5.4	35	1.1
Mexico	Latin America	21,912	-0.18	-1.17	-0.61	0.61	75.3	42.6	1.89	3.6	23	1.1
Saudi Arabia	Middle East & N. Africa	63,051	0.74	0.27	0.02	0.58	79.0	n/a	2.31	18.5	0	1.3
Indonesia	East Asia & Pacific	15,091	0.26	-0.25	-0.74	0.54	71.3	34.4	2.12	2.9	15	1.3
Vietnam	East Asia & Pacific	15,457	0.18	-0.17	0.12	0.69	74.7	36.1	1.90	4.3	41	1.4
India	South Asia	10,039	0.50	-0.13	-0.61	0.49	72.2	23.0	1.96	2.2	19	1.4
South Africa	Sub-Saharan Africa	13,592	-0.02	0.04	-0.38	0.43	66.3	54.1	2.21	6.9	6	1.1
Philippines	East Asia & Pacific	10,748	0.19	-0.47	-0.84	0.52	69.9	39.3	1.89	1.5	23	1.5
Bangladesh	South Asia	8,677	-0.44	-0.91	-0.94	0.46	74.9	30.9	2.14	0.7	2	1.6
Kenya	Sub-Saharan Africa	5,995	-0.09	-0.47	-1.12	0.55	63.8	38.5	3.17	0.4	78	1.3
Ethiopia	Sub-Saharan Africa	3,095	-0.62	-0.94	-1.85	0.38	67.6	31.1	3.91	0.1	95	1.4
Nigeria	Sub-Saharan Africa	8,145	-0.91	-0.95	-1.74	0.36	54.6	33.9	4.38	0.6	22	1.4
Egypt	Middle East & N. Africa	17,265	-0.11	-0.69	-0.89	0.49	71.8	28.5	2.73	2.5	12	1.4
Pakistan	South Asia	5,617	-0.61	-1.07	-1.95	0.41	67.8	33.5	3.55	0.8	28	1.5

Source: World Bank Indicators API (retrieved 9 October 2026). GE, RL, PV: WGI government effectiveness, rule of law, political stability (–2.5 to 2.5). HCI: Human Capital Index. TFR: total fertility rate. CO₂ pc in tonnes. Haz. mult.: regional hazard multiplier used in the scenario engine, a judgmental layer informed by IPCC AR6 WGII regional assessments.

Table B2. Indicator values used (continued)

Country	Net energy imports %	Food imports %	Freshwater m ³ pc	Water withdrawal %	R&D % GDP	Forest %	Low-elev. coastal pop %	Agric. % GDP	Pop. (m)
Switzerland	48	4.1	4,603	6	3.22	32.0	0.0	0.6	9.1
Sweden	28	11.7	16,306	4	3.60	68.6	5.1	1.5	10.6
Norway	-729	11.0	70,000	2	1.85	33.2	7.2	1.6	5.6
Finland	34	9.1	19,258	7	3.09	74.2	4.6	2.6	5.6
Canada	-95	9.5	73,170	4	1.79	42.0	1.4	1.9	41.7
New Zealand	35	12.9	64,349	8	1.55	38.9	3.3	4.0	5.3
Australia	-211	6.5	18,909	5	1.86	17.4	3.6	2.3	27.6
Denmark	45	13.6	1,016	25	3.05	16.0	12.6	1.2	6.0
Japan	87	9.8	3,437	37	3.44	68.3	12.4	1.0	123.4
Germany	70	9.6	1,286	35	3.15	32.8	2.0	0.9	83.5
United Kingdom	48	9.8	2,144	14	2.68	13.5	2.7	0.6	69.5
Singapore	294	3.5	106	33	1.81	21.8	0.7	0.0	6.1
United States	-10	6.7	8,437	28	3.45	33.8	2.0	0.9	341.8
South Korea	83	6.5	1,255	85	4.94	64.4	2.1	1.5	51.7
France	42	11.5	2,933	21	2.18	32.9	2.1	1.4	68.7
Costa Rica	59	13.2	22,236	6	0.34	59.1	2.0	3.4	5.2
Netherlands	88	14.4	621	17	2.27	11.0	53.7	1.7	18.1
Italy	79	12.0	3,093	30	1.38	31.8	3.8	2.1	58.9
Spain	78	12.9	2,327	43	1.49	38.2	4.0	2.7	49.4
Chile	62	11.5	45,262	9	0.39	24.5	1.0	3.5	19.9
Brazil	-11	5.5	26,918	1	1.19	58.5	2.2	6.1	212.8
Russia	-71	10.9	29,895	4	0.94	50.8	1.0	3.1	143.5
Argentina	-14	7.8	6,431	10	0.60	17.1	1.0	5.5	45.9
UAE	-140	5.0	15	1510	1.49	4.6	26.7	0.8	11.5
Colombia	-147	13.9	41,459	4	0.29	53.7	2.3	9.9	53.4
China	24	8.0	1,992	42	2.58	24.0	4.9	6.7	1406.6
Türkiye	70	7.0	2,671	48	1.42	29.5	2.6	5.2	85.9
Mexico	27	6.3	3,180	45	0.25	34.2	1.1	3.9	131.9
Saudi Arabia	-151	12.3	75	974	0.64	1.3	3.2	2.6	37.0
Indonesia	-93	10.2	7,240	30	0.28	50.7	8.8	13.1	285.7
Vietnam	48	8.8	3,606	18	0.41	47.1	29.7	11.6	101.6
India	36	5.0	1,014	66	0.65	24.4	1.9	16.2	1463.9
South Africa	-14	7.2	718	68	0.61	18.8	0.2	2.8	64.7
Philippines	58	14.8	4,203	28	0.28	24.8	10.5	8.6	116.8
Bangladesh	48	13.0	620	6	n/a	14.4	8.4	11.4	175.7
Kenya	22	16.6	382	33	0.81	6.6	0.4	23.2	57.5
Ethiopia	10	13.8	973	32	0.27	23.8	0.0	32.8	135.5
Nigeria	-83	12.3	990	10	0.28	18.9	3.5	23.0	237.5
Egypt	26	19.1	9	141	1.02	0.0	16.3	16.6	118.4
Pakistan	30	14.0	226	110	0.16	4.1	0.4	23.0	255.2

Source: World Bank Indicators API. Net energy imports are shown uncapped here (negative = net exporter) and capped at -100% and +150% in the index. Water withdrawal is freshwater withdrawal as a share of internal resources (can exceed 100%). Reference years: WGI 2025; life expectancy, TFR, CO₂, forest, energy imports 2024; GDP 2025 (UAE 2024); HCI 2020; freshwater resources and withdrawal 2022; coastal exposure 2015; renewable electricity 2021; R&D 2017–2024; Gini 2018–2025; food imports 2018–2025; agriculture share 2021–2025.

Hazard multipliers. The regional hazard multiplier Hc (0.6 to 1.6) scales climate damage in the scenario engine. Values were assigned by region and country from the qualitative regional risk assessments in IPCC AR6 WGII, giving higher values to low-latitude, monsoon-dependent, arid and small-delta settings (for example Bangladesh 1.6, Philippines 1.5, Pakistan 1.5, India 1.4, Nigeria 1.4, Egypt 1.4) and lower values to cooler high-latitude settings (for example Norway, Sweden and Finland 0.6). They are listed in Table B1 and are the most judgmental input to the scenario results.