H HEURISTICS

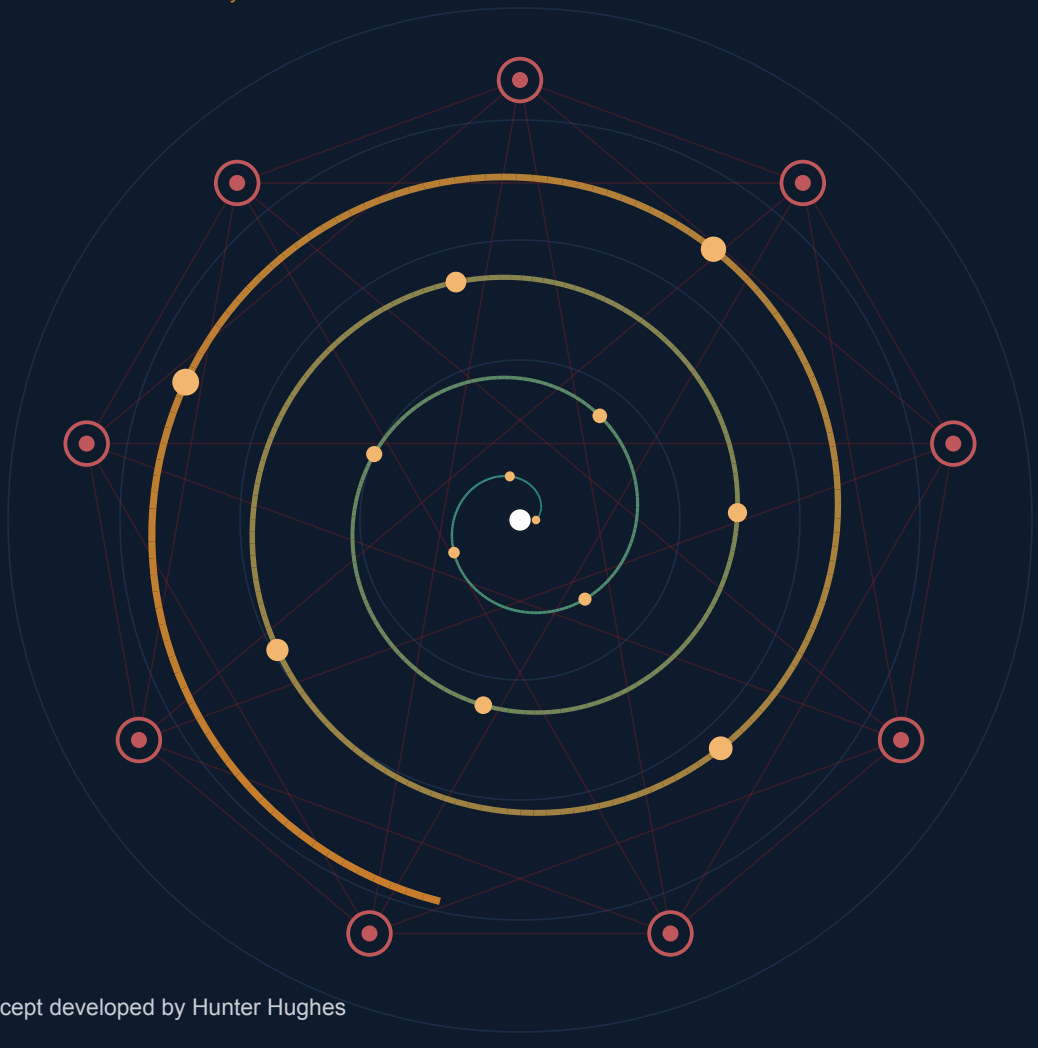
RESEARCH REPORT · NOVEMBER 2026

Polycrisis Resilience

The H Heuristics Framework

How economic convergence, technological diffusion, clean transition, adaptation and human development can reduce vulnerability to interconnected global crises

Withstand · Adapt · Recover · Reduce vulnerability



Hunter Hughes

Founder, H Heuristics · A concept developed by Hunter Hughes

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About This Report

This report sets out the **H Heuristics Polycrisis Resilience Framework**, a development-oriented framework developed by Hunter Hughes, Founder of H Heuristics. It examines how economic convergence, technological diffusion, the clean transition, climate adaptation and human development can reduce vulnerability to interconnected global crises.

It is the third report in the Polycrisis Resilience series. The founding report defined the concept and its six properties. The second examined one mechanism, the clean transition, in depth. This report states the framework as a whole: its definition, its central proposition, its structure of means and ends, its view of the Global South and of time, and its seven core objectives. It then does something the earlier reports did not: it **tests the central proposition against data** for 194 countries.

What the report contributes

- **A complete statement of the framework**: definitions, central proposition, eight development capabilities, nine vulnerability domains, a development cycle, three planning periods and seven core objectives (Chapters 1 to 3).
- **A map of how vulnerabilities reinforce one another**, with a test of whether foundational deficits cluster in the same countries (Chapters 4 to 6).
- **An empirical test of the central proposition** using a Development Capability Index built from the framework's eight priorities, set against thirteen measures of vulnerability (Chapters 7 to 9).
- **A Global South assessment and a timetable**: where each income group stands on the framework's priorities, and when gaps close at recent rates of progress (Chapters 10 and 11).
- **An implementation and measurement agenda**, with critiques and open research questions (Chapters 12 to 15).

Data and methods in brief

The empirical chapters use public data only: the World Bank's World Development Indicators and Worldwide Governance Indicators (downloaded through the World Bank API in November 2026), and the EM-DAT international disaster database as published by Our World in Data. All calculations are by H Heuristics. Country-level “latest” values are the most recent observation from 2019 onward; “2000” values are the nearest observation within two years of 2000. Methods are described where each result appears, and the analysis scripts are kept with the report so every number can be reproduced.

Reading the evidence

The analysis is **cross-country and correlational**. It shows how vulnerability varies with development capability across countries and over time; it does not by itself prove that raising a given capability will cause a given fall in vulnerability. Where the published literature offers stronger causal evidence, the report says so and cites it.

Figures 1, 3 and 8 are conceptual diagrams by H Heuristics. Every other figure reports data from the cited sources, processed by H Heuristics.

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Executive Summary

The framework in one paragraph

Polycrisis Resilience is the capacity of individuals, communities, societies, economies, institutions and interconnected systems to withstand, adapt to, recover from and reduce vulnerability to multiple interacting and compounding crises. The H Heuristics framework approaches that capacity primarily through the **advancement of development capabilities**. Its central proposition is that improving the underlying economic, technological, environmental and institutional conditions of societies can progressively reduce their vulnerability to compounding global risks. It treats development not only as a route to higher incomes but as a fundamental mechanism for making people, societies and systems less vulnerable to the global polycrisis.

−0.90
correlation between development capability and child mortality across 190 countries

6.7×
climate-disaster death rate in the least-capable fifth of countries versus the most capable

3.8 → 1.2
billion people in countries with four or more of seven foundational deficits, 2000 to today

+0.86
correlation between development capability and CO_2 per person: the pressure development creates

Principal findings

- **The central proposition holds strongly for direct human harm.** A Development Capability Index built from the framework's eight Global South priorities correlates at −0.85 to −0.90 with child mortality, lack of sanitation, undernourishment and poverty, and at −0.55 to −0.66 with the death rate and the share of people affected by climate-related disasters. The least-capable fifth of countries holds 15% of the world's population but recorded 34% of climate-disaster deaths in 2010–2024 (Chapter 7).
- **Vulnerabilities cluster, which is why a single-hazard approach falls short.** Seven foundational deficits (electricity, clean cooking, water, sanitation, child mortality, undernourishment and government effectiveness) co-occur far more than chance would predict. Forty-six of 160 countries have four or more of them, against about 20 if they were independent; the average pairwise correlation is 0.65 (Chapter 5).
- **Development has dismantled deficit stacks at scale, but not everywhere.** The population living in countries with four or more deficits fell from 3.8 billion (67%) in 2000 to 1.2 billion (16.5%) today. Thirteen countries, including China, India, Indonesia and Viet Nam, went from four or more deficits to one or none. But all 40 countries that carry four or more deficits today already carried them in 2000, and 29 still carry six or seven (Chapter 6).
- **Development does not buy everything.** Development capability is unrelated to growth volatility (correlation −0.07) and to the share of growth gains erased by contraction years (−0.02). Pandemic life-expectancy losses were largest in upper-middle capability countries, and CO_2 per person rises steeply with capability (+0.86). The framework therefore pairs development with buffers, adaptive capacity and a clean transition (Chapter 8).
- **Convergence has stalled where vulnerability is greatest.** Since 2015, GDP per person in low-income countries has grown 0.55% a year, against 1.53% in high-income countries; in Sub-Saharan Africa it has slightly fallen. Lower-middle and upper-middle income countries continue to converge (Chapter 10).
- **At recent rates, the foundations will not be finished in this century's first period.** Lower-middle-income countries reach universal electricity, basic water and widespread internet use around 2031 and clean cooking around 2037. Low-income countries reach universal electricity around 2057 and do not reach universal clean cooking or basic sanitation this century; undernourishment has been rising since 2015 (Chapter 11).

What the framework asks of policy

The framework's priorities follow from these findings. First, **finish the foundations** in the 40 countries where deficits stack, because that is where development buys the most resilience per dollar. Second, **pair development with protection**: fiscal buffers, adaptive social protection, early warning and health-system surge capacity, which development alone does not supply. Third, **make development clean**, because a development path that raises emissions in step with capability builds the next layer of the polycrisis while dismantling the current one. Fourth, **measure what matters**: the reduction of vulnerability, not only the growth of output. The seven core objectives in Chapter 12 translate these priorities into trackable indicators.

PART I · THE FRAMEWORK

1. A Development-Oriented Answer to the Polycrisis

IN BRIEF

- Humanity's major risks increasingly interact; the interactions, more than any single crisis, now shape outcomes.
- Most responses are organized hazard by hazard. The H Heuristics framework instead targets the underlying conditions that make societies vulnerable to all of them.
- Those conditions are, to a large degree, development conditions: income, infrastructure, services, technology and institutions.

1.1 The problem the framework addresses

A **polycrisis** occurs when multiple crises interact in ways that amplify their combined consequences. The term was introduced by Edgar Morin and Anne Brigitte Kern in the 1990s and returned to wide use after 2022, when the economic historian Adam Tooze applied it to the overlapping shocks of pandemic, war, inflation and climate extremes (Morin and Kern, 1999; Tooze, 2022). The World Economic Forum's *Global Risks Report 2023* made it a central frame, and researchers at the Cascade Institute have since described a global polycrisis as one in which crises in several global systems become causally entangled in ways that significantly degrade humanity's prospects (World Economic Forum, 2023; Lawrence et al., 2024).

The evidence that risks interact is now extensive. Climate change raises the frequency of droughts and floods, which depress harvests and incomes; lower incomes reduce the capacity to adapt and leave more people exposed to the next hazard. Air pollution, linked to about 7.9 million deaths a year, burdens health systems that are also strained by heat and infectious disease (Health Effects Institute, 2025). Some 3.4 billion people live in countries that spend more on interest payments than on either health or education, which constrains investment in exactly the systems that would reduce future losses (UNCTAD, 2025). Seven of the nine planetary boundaries are assessed as transgressed (Potsdam Institute for Climate Impact Research, 2025). Each is a serious problem on its own. Together they form a system in which shocks travel from one domain to another.

1.2 Why a development-oriented framework

Much of the response to this system is organized by hazard: a flood program here, a heat plan there, a debt initiative elsewhere. Those responses are necessary, but they address symptoms one at a time and leave untouched the conditions that make the same populations vulnerable to all of them. The Intergovernmental Panel on Climate Change notes that between 2010 and 2020 human mortality from floods, droughts and storms was about fifteen times higher in highly vulnerable regions than in regions with very low vulnerability, and that roughly 3.3 to 3.6 billion people live in contexts highly vulnerable to climate change (IPCC, 2022). The hazard was not fifteen times larger. The vulnerability was.

Vulnerability, in turn, is shaped above all by development conditions: whether people have income and savings, reliable power and water, clean air in their homes, health services and nutrition, digital connection, and institutions that can plan, warn, protect and rebuild. A long empirical literature finds that richer and better-governed countries suffer far fewer deaths from comparable natural hazards, even though they do not experience fewer hazards (Kahn, 2005; Toya and Skidmore, 2007). Global flood and climate mortality rates have fallen several-fold since the 1980s as incomes, infrastructure and warning systems have improved (Jongman et

al., 2015; Formetta and Feyen, 2019). Education, especially of women, is among the strongest predictors of lower disaster deaths (Lutz, Muttarak and Striessnig, 2014).

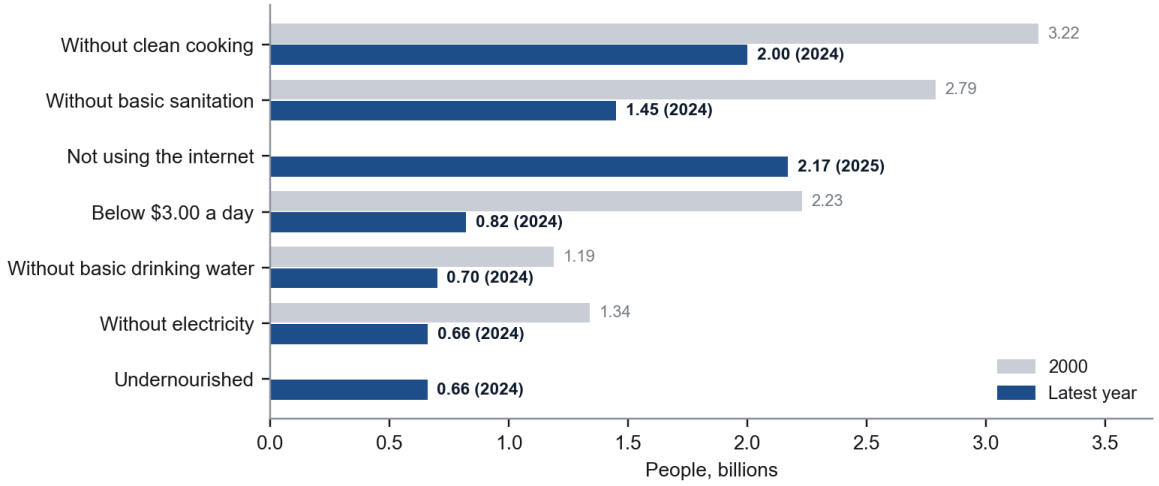
THE FRAMEWORK'S STARTING POINT

If vulnerability is produced by the underlying conditions of societies, the most durable way to reduce vulnerability to many interacting crises at once is to improve those conditions. Development, in this view, is a resilience strategy.

1.3 The scale of the foundational gaps

Those underlying conditions remain unmet for billions of people. **Figure 1** shows the number of people lacking seven basic capabilities in 2000 and in the most recent year. Progress has been large: the number of people without electricity has roughly halved, from 1.34 billion to 0.66 billion, and the number below the $3.00-a-day poverty line has fallen from about 2.2 billion to 0.82 billion. But two billion people still cook with polluting fuels, 1.45 billion lack basic sanitation, 2.17 billion do not use the internet, and about 660 million are undernourished, a number that has risen since its low point in 2017.

Figure 1. People lacking foundational capabilities, 2000 and latest year (billions)



Source: H Heuristics calculation from World Bank World Development Indicators (EG.ELC.ACCS.ZS, EG.CFT.ACCS.ZS, SH.H2O.BASW.ZS, SH.STA.BASS.ZS, IT.NET.USER.ZS, SI.POV.DDAY, SN.ITK.DEFC.ZS) and world population (SP.POP.TOTL). Internet use and undernourishment have no comparable 2000 world estimate in this series.

1.4 What this report adds

The framework's proposition is plausible and widely shared in development economics, but it is rarely stated as a resilience framework and rarely tested across the full range of vulnerabilities it claims to address. This report does both. It builds an index of the eight development capabilities the framework emphasizes, and asks, domain by domain, whether vulnerability falls as capability rises. The answer is mostly yes, often strongly, but not always, and the exceptions turn out to be as instructive as the rule. They explain why the framework is broader than "grow first": why it insists on a clean transition, on adaptation, on institutions and on buffers alongside income growth.

PART I · THE FRAMEWORK

2. Defining Polycrisis Resilience

IN BRIEF

- Polycrisis Resilience is defined as a capacity: to withstand, adapt to, recover from and reduce vulnerability to multiple interacting and compounding crises.
- The H Heuristics framework is a specific, development-oriented approach to building that capacity.
- What distinguishes it from adjacent concepts is its object (interacting crises, not single hazards) and its means (development capabilities, not only emergency response).

2.1 The general definition

Polycrisis Resilience

General definition

Polycrisis Resilience is the capacity of individuals, communities, societies, economies, institutions, and interconnected systems to withstand, adapt to, recover from, and reduce vulnerability to multiple interacting and compounding crises.

It concerns the ability to maintain essential functions, manage systemic disruptions, adapt to changing conditions, and strengthen long-term stability in an environment characterized by interconnected global risks.

Unlike resilience approaches that address individual hazards in isolation, Polycrisis Resilience recognizes that crises frequently interact, reinforce one another, and generate cascading effects across economic, environmental, social, technological, and political systems.

2.2 The H Heuristics framework

The H Heuristics Polycrisis Resilience Framework

Developed by Hunter Hughes · H Heuristics

The H Heuristics Polycrisis Resilience Framework is a development-oriented framework that examines how economic convergence, technological diffusion, clean transition, climate adaptation, and human development can reduce vulnerability to interconnected global crises.

The framework approaches Polycrisis Resilience primarily through the advancement of development capabilities. Its central proposition is that **improving the underlying economic, technological, environmental, and institutional conditions of societies can progressively reduce their vulnerability to compounding global risks.**

It views development not simply as a means of improving economic performance, but as a fundamental mechanism for making societies, populations, and systems less vulnerable to the global polycrisis.

Stated most compactly, in the framework's **core definition**, Polycrisis Resilience is the ability to reduce vulnerability to interconnected and compounding crises by strengthening the systems, institutions, infrastructure, technologies and capabilities that support long-term human and societal development.

2.3 The four verbs

The definition contains four verbs, each pointing to a different phase of a crisis and a different kind of capability.

- **Withstand**: absorb a shock while keeping essential functions running. Reliable power, robust infrastructure, food reserves and household savings are capacities to withstand.
- **Adapt to**: adjust practices, systems and locations as conditions change. Diversified livelihoods, education, climate services and flexible institutions are capacities to adapt.
- **Recover from**: restore and improve after disruption. Fiscal space, insurance, social protection and reconstruction capacity determine how quickly and how fully a society recovers.
- **Reduce vulnerability**: lower exposure and susceptibility before the next shock arrives. This is the verb that most distinguishes the H Heuristics framework, and the one on which development acts most directly.

The first three verbs follow standard usage in disaster-risk research. The United Nations Office for Disaster Risk Reduction defines resilience in terms of a system's ability to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner (UNDRR, 2017). The fourth verb makes the framework **preventative**: its main interest is in changing the conditions that determine how much harm a shock can do, not only in the response once harm has begun.

2.4 How the concept relates to its neighbors

Table 1 places Polycrisis Resilience alongside six adjacent concepts. Each contributes something the framework uses; none combines its object (interacting crises) with its primary means (development capabilities).

Table 1. Polycrisis Resilience and adjacent concepts

Concept	Main object	Main means	What the framework takes from it
Disaster risk reduction	Natural and technological hazards	Risk assessment, early warning, preparedness, building codes	The risk equation (hazard, exposure, vulnerability) and the language of resilience
Climate adaptation	Climate impacts	Adjustments in infrastructure, agriculture, health and settlement	Forward-looking planning under a changing baseline
Sustainable development	Human well-being within environmental limits	The Sustainable Development Goals and national strategies	Breadth of goals; the link between environment and welfare
Economic resilience	Macroeconomic shocks	Buffers, diversification, countercyclical policy	The role of fiscal and financial space
Socio-ecological resilience	Coupled human and natural systems	Diversity, redundancy, adaptive governance	Thresholds, feedbacks and the idea of adaptive capacity (Holling, 1973; Folke, 2006)
Polycrisis studies	Entanglement of global crises	Diagnosis of causal mechanisms	The focus on interaction and cascades (Lawrence et al., 2024)
Polycrisis Resilience (H Heuristics)	Vulnerability to interacting and compounding crises	Development capabilities: convergence, technology diffusion, clean transition, adaptation, human development, institutions	Combines the above around one objective: reducing vulnerability across domains at once

Source: H Heuristics.

2.5 A note on the term

“Resilience” and “polycrisis” each have long literatures, and the combination appears informally in policy writing. The H Heuristics usage gives it a specific definition, a specific framework and a measurement program. It is presented here as the H Heuristics concept and framework, offered for testing and use by others, rather than as a claim that no one has combined the words before.

PART I · THE FRAMEWORK

3. The Central Proposition and How It Works

IN BRIEF

- The framework's central proposition is that better underlying conditions progressively reduce vulnerability to compounding risks.
- Development acts on vulnerability through four channels: lower exposure, lower susceptibility, greater coping capacity and faster recovery.
- The framework organizes eight development capabilities (its means) against nine domains of vulnerability (its ends).

3.1 The proposition

CENTRAL PROPOSITION

Improving the underlying economic, technological, environmental and institutional conditions of societies can progressively reduce their vulnerability to compounding global risks.

Three words in the proposition carry particular weight. **Underlying** means that the framework works on conditions rather than on specific events: it asks what determines how much harm any crisis can do, not how to respond to a particular one. **Progressively** means that the effect is cumulative and gradual: each gain in capability lowers vulnerability a little, and gains compound over decades. **Compounding** means that the risks interact, so that reducing one vulnerability often reduces others.

3.2 Vulnerability and its parts

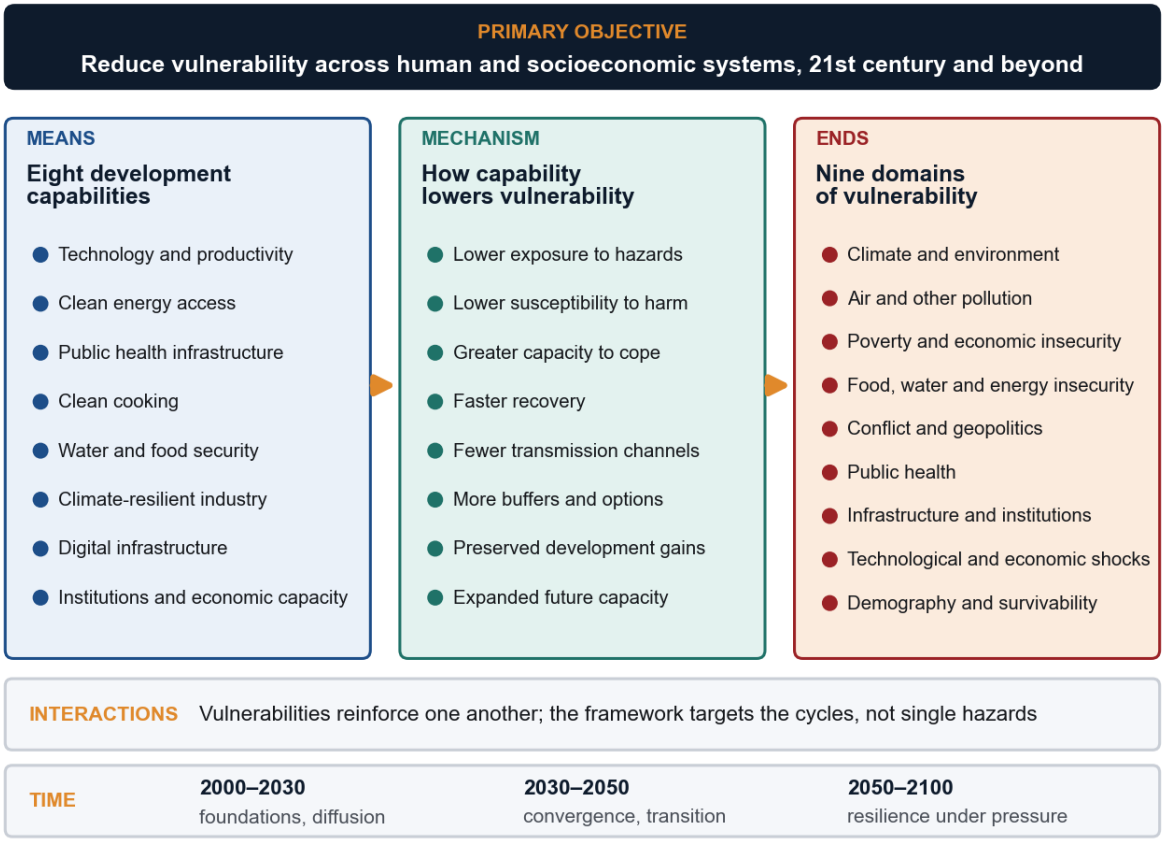
The framework uses vulnerability in the sense of the IPCC: the propensity or predisposition to be adversely affected, encompassing sensitivity or susceptibility to harm and a lack of capacity to cope and adapt (IPCC, 2022). Combined with hazard and exposure, it determines risk. This decomposition matters because development acts on several parts at once.

- **Exposure.** Development can reduce exposure by enabling safer housing and settlement, protective infrastructure and diversified livelihoods less tied to climate-sensitive activities. It can also raise exposure, as when cities grow into floodplains; the framework treats safe urbanization as part of development, not a separate concern.
- **Susceptibility.** Better nutrition, health, sanitation, clean household energy and education reduce the harm that a given shock does to a given person.
- **Capacity to cope and adapt.** Income, savings, insurance, social protection, information and effective institutions determine whether a shock becomes a disaster.
- **Recovery.** Fiscal space, functioning markets and administrative capacity determine whether losses are temporary or permanent.

3.3 Means and ends

Figure 2 sets out the framework's architecture. On the left are its **means**: the eight development capabilities that H Heuristics emphasizes for the Global South. In the middle are the **mechanisms** through which capability lowers vulnerability. On the right are the **ends**: nine domains of vulnerability that the framework seeks to reduce through the 21st century and beyond. Two cross-cutting bands complete the picture: the interactions among vulnerabilities, and the time horizon over which priorities shift.

Figure 2. The architecture of the H Heuristics Polycrisis Resilience Framework



Source: H Heuristics. Conceptual diagram.

3.4 From capability to vulnerability: the channels

Table 2 traces each of the eight capabilities to the vulnerabilities it most directly reduces, with an example from the evidence base. The table shows why the framework emphasizes these eight in particular: each acts on several domains at once, which is the property that makes an investment valuable under polycrisis conditions.

Table 2. The eight development capabilities and the vulnerabilities they reduce

Capability	Main vulnerability channels	Illustrative evidence
Technology and productivity	Income and savings; capacity to invest in adaptation; diversification away from climate-sensitive work	Adoption lags for new technologies have shortened, but differences in how intensively technologies are used explain much of the income gap (Comin and Mestieri, 2018)

Capability	Main vulnerability channels	Illustrative evidence
Clean energy access	Health services, cold chains, water pumping, cooling, livelihoods; energy-price and import exposure	666 million people still lacked electricity in 2023, most in Sub-Saharan Africa (IEA et al., 2025)
Public health infrastructure	Susceptibility to disease, heat and pollution; surge capacity in crises	Child mortality falls steeply with health capability (Chapter 7)
Clean cooking	Household air pollution; time burdens on women; forest degradation	Household air pollution is among the largest environmental health risks in low-income countries (Health Effects Institute, 2025)
Water and food security	Hunger, waterborne disease, drought losses, migration pressure	Undernourishment rose after 2017 even as other deficits fell (Chapter 11)
Climate-resilient industrialization	Jobs, fiscal base and export diversification; reduced dependence on climate-sensitive agriculture	Manufacturing has historically driven productivity convergence, but deindustrialization now starts at lower incomes (Rodrik, 2013, 2016)
Digital infrastructure	Early warning, targeted payments, information, remote services	Digital payment systems sped up emergency transfers during 2020 where they already existed (H Heuristics series)
Institutional and economic capacity	Planning, regulation, enforcement, social protection, fiscal space	Better governance and higher income predict fewer disaster deaths (Kahn, 2005; Toya and Skidmore, 2007)

Source: H Heuristics, drawing on the cited literature.

PART II · THE STRUCTURE OF VULNERABILITY

4. Nine Domains of Vulnerability

IN BRIEF

- The framework's primary objective is to reduce vulnerability across human and socioeconomic systems throughout the 21st century and beyond.
- It identifies nine domains of exposure and susceptibility, from climate change to demographic and geographic survivability risks.
- Each domain can be measured; the framework's test is whether development lowers all nine together.

4.1 The primary objective

The primary objective of Polycrisis Resilience is to reduce vulnerability across human and socioeconomic systems throughout the 21st century and beyond. That includes reducing exposure and susceptibility to nine broad domains of risk. Rather than addressing each challenge independently, the framework considers how vulnerabilities interact and reinforce one another.

Table 3. The nine domains of vulnerability, with example measures

Domain	What it covers	Example measure used in this report	Latest scale
1. Climate change and environmental degradation	Floods, droughts, storms, heat, ecosystem loss	Climate-disaster deaths and people affected per capita (EM-DAT)	3.3–3.6 bn people in highly vulnerable contexts (IPCC, 2022)
2. Air pollution and other pollution	Ambient and household air pollution, water and soil contamination	Population-weighted PM2.5 exposure	About 7.9 m deaths a year (HEI, 2025)
3. Poverty, inequality and economic insecurity	Low income, lack of savings and protection	Poverty rate at $3.00 a day	0.82 bn people below $3.00 a day (2024)
4. Food, water and energy insecurity	Hunger, unsafe water, lack of modern energy	Undernourishment; access to water and electricity	0.66 bn undernourished; 0.66 bn without electricity
5. Conflict, instability and geopolitical disruption	Armed conflict, state fragility, trade and supply shocks	WGI political stability estimate	Concentrated in the lowest-capability fifth (Chapter 7)
6. Public health vulnerabilities	Disease burden, weak health systems, pandemic exposure	Under-five mortality; pandemic life-expectancy loss	Under-five mortality 37 per 1,000 worldwide (2024)
7. Infrastructure and institutional weaknesses	Unreliable services, weak administration	Basic sanitation; government effectiveness	1.45 bn lack basic sanitation
8. Technological and economic disruptions	Output shocks, debt stress, automation, new digital dependencies	Growth volatility; interest burden	3.4 bn live where interest exceeds health or education spending (UNCTAD, 2025)
9. Demographic pressures and geographic survivability	Rapid population growth, ageing, settlement in high-hazard zones	Population growth; heat and flood exposure	1.81 bn people exposed to severe flood risk (Rentschler et al., 2022)

Source: H Heuristics; latest-scale figures from World Bank WDI unless otherwise cited.

4.2 Why nine domains, and why together

The nine domains are not a complete taxonomy of global risk. Some risks that matter greatly, such as nuclear war or an engineered pandemic, sit largely outside what development can address. The nine are chosen because they share two properties: they shape the everyday conditions under which billions of people live, and they respond, at least in part, to changes in development conditions. That is what makes them the natural object of a development-oriented framework.

Grouping them also makes a methodological point. If each domain were reduced by a separate program with a separate budget, success in one would tell us nothing about the others. The framework predicts something stronger: that a common set of underlying improvements lowers vulnerability in many domains at once. Chapter 7 tests that prediction directly.

4.3 Domains that development can worsen

One caution belongs at the start. Development can also add to vulnerability. Industrialization has historically raised emissions and local pollution; urbanization can concentrate people in hazard zones; digitalization creates new dependencies and cyber risks; ageing, the eventual result of falling fertility, raises the vulnerability of populations to heat and disease. The framework does not assume these effects away. It addresses them explicitly through two of its core objectives, advancing the clean transition and improving adaptive capacity, and Chapter 8 measures how large they are.

PART II · THE STRUCTURE OF VULNERABILITY

5. Reinforcing Cycles of Vulnerability

IN BRIEF

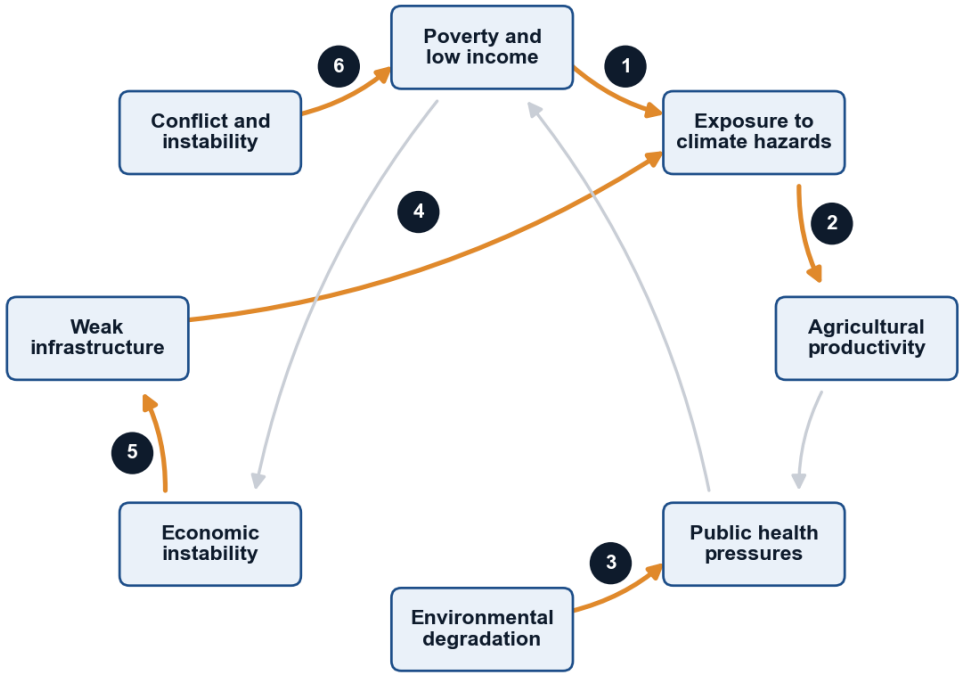
- Vulnerability is often produced by several interacting weaknesses, which form reinforcing cycles.
- In the data, seven foundational deficits co-occur far more than chance would predict: 46 countries carry four or more, against about 20 if they were independent.
- Because deficits cluster, the framework seeks to interrupt cycles through simultaneous improvements across several development dimensions.

5.1 Six links

Polycrisis Resilience recognizes that vulnerability is often produced by multiple interacting weaknesses. The framework highlights six links, shown as the numbered arrows in **Figure 3**.

- **Poverty can increase exposure to climate hazards.** Poorer households are more likely to live on floodplains, unstable slopes and informal settlements. Of the 1.81 billion people exposed to severe flood risk worldwide, about 89% live in low- and middle-income countries (Rentschler, Salhab and Jafino, 2022).
- **Climate change can undermine agricultural productivity.** Higher temperatures reduce growth in poor countries markedly more than in rich ones; one estimate finds a 1°C warmer year lowers growth by about 1.3 percentage points in poor countries, with little effect in rich ones (Dell, Jones and Olken, 2012).
- **Environmental degradation can intensify public health pressures.** Polluted air and water raise the burden of respiratory, cardiovascular and diarrhoeal disease, which then weakens labour and learning.
- **Weak infrastructure can amplify the consequences of extreme weather.** Power, water and transport disruptions turn hazards into disasters; the World Bank estimates infrastructure disruptions cost households and firms in low- and middle-income countries at least $390 billion a year (Hallegatte, Rentschler and Rozenberg, 2019).
- **Economic instability can reduce the capacity to invest in adaptation.** High debt service and volatile revenues crowd out spending on infrastructure, health and protection, as Chapter 8 discusses.
- **Conflict can undermine development and reverse previous gains.** Climate anomalies raise the risk of conflict (Hsiang, Burke and Miguel, 2013), and conflict in turn destroys assets, displaces people and erodes institutions.

Figure 3. Reinforcing cycles of vulnerability



Orange, numbered: the six links named in the framework. Grey: closing links that turn them into loops.

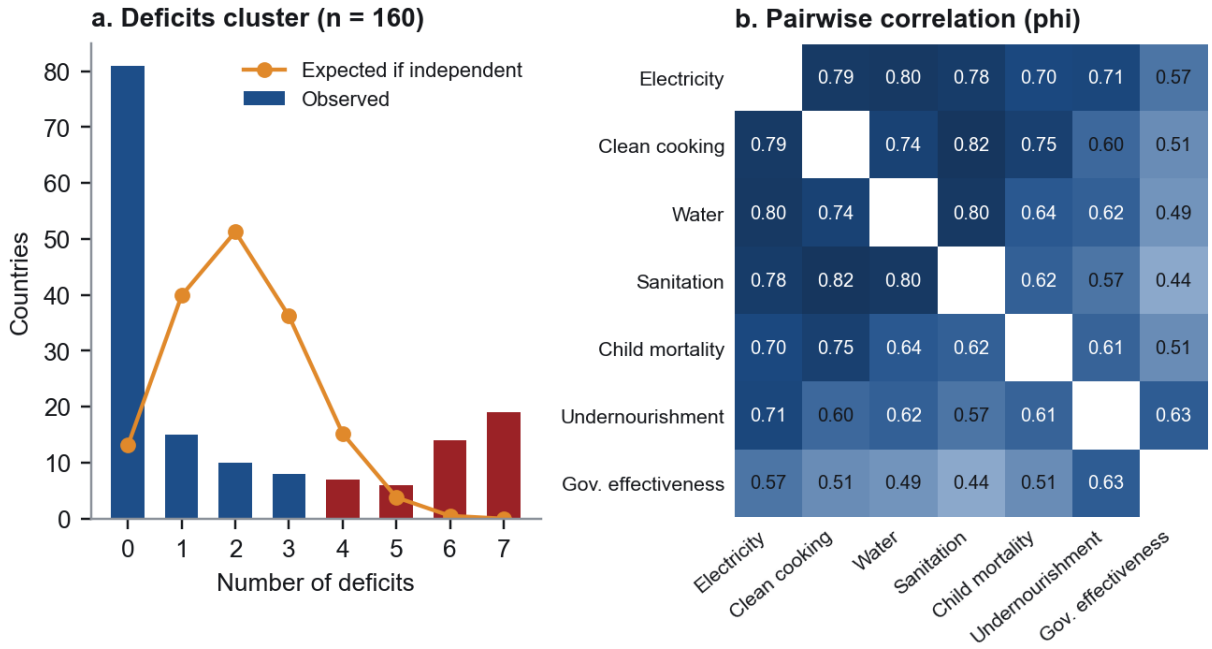
Source: H Heuristics. Conceptual diagram of the six links named by the framework, with closing links (grey) that turn them into loops.

5.2 Do vulnerabilities actually cluster?

If the cycles are real, foundational deficits should appear together in the same countries more often than chance would predict. To test this, H Heuristics defined seven foundational deficits with thresholds chosen to mark serious shortfalls rather than the last mile of progress: electricity access below 90%, clean cooking below 50%, basic drinking water below 80%, basic sanitation below 50%, under-five mortality above 25 per 1,000 births (the Sustainable Development Goal threshold), undernourishment at or above 10%, and a government effectiveness score below −0.5 on the Worldwide Governance Indicators scale.

Figure 4 compares the observed distribution of deficits across 160 countries with full data against the distribution expected if each deficit occurred independently at its observed frequency. The difference is stark. If deficits were independent, about 13 countries would have none and about 20 would have four or more. In fact 81 have none and 46 have four or more, and 19 have all seven, a number that independence would put at essentially zero. Every pair of deficits is positively correlated, with an average correlation of 0.65; the strongest links are among the infrastructure deficits (electricity, water, sanitation and clean cooking, 0.74 to 0.82), and the weakest still exceed 0.4.

Figure 4. Foundational deficits cluster in the same countries



Source: H Heuristics calculation from World Bank WDI and WGI, latest year 2019–2024; 160 countries with data on all seven deficits. Expected counts assume independence at each deficit's observed prevalence. Phi is the correlation between binary deficit indicators.

5.3 What clustering implies

Clustering has three implications for the framework. First, it confirms that vulnerability is a **joint condition**: the countries that lack electricity are, overwhelmingly, the same countries that lack water, sanitation, clean cooking and effective government. Second, it means that **single-sector strategies face a binding constraint**: a clinic without power, a school without water or a cash-transfer program without administrative capacity delivers less than its designers intend. Third, and most hopefully, clustering means that **gains can also cluster**. The same underlying improvements in income, infrastructure and institutions that ease one deficit tend to ease the others. The next chapter shows that, over the past quarter-century, this is what happened in much of the world.

Interrupting the cycles

The framework seeks to interrupt reinforcing cycles through **simultaneous improvements across multiple development dimensions**. That does not mean doing everything everywhere at once. It means sequencing and bundling investments so that each removes a constraint on the others: power for clinics and water pumps, roads that connect farms to markets, digital identity that lets social protection reach people quickly, and the institutional capacity to run all of them.

PART II · THE STRUCTURE OF VULNERABILITY

6. Deficit Stacking, 2000 to Today

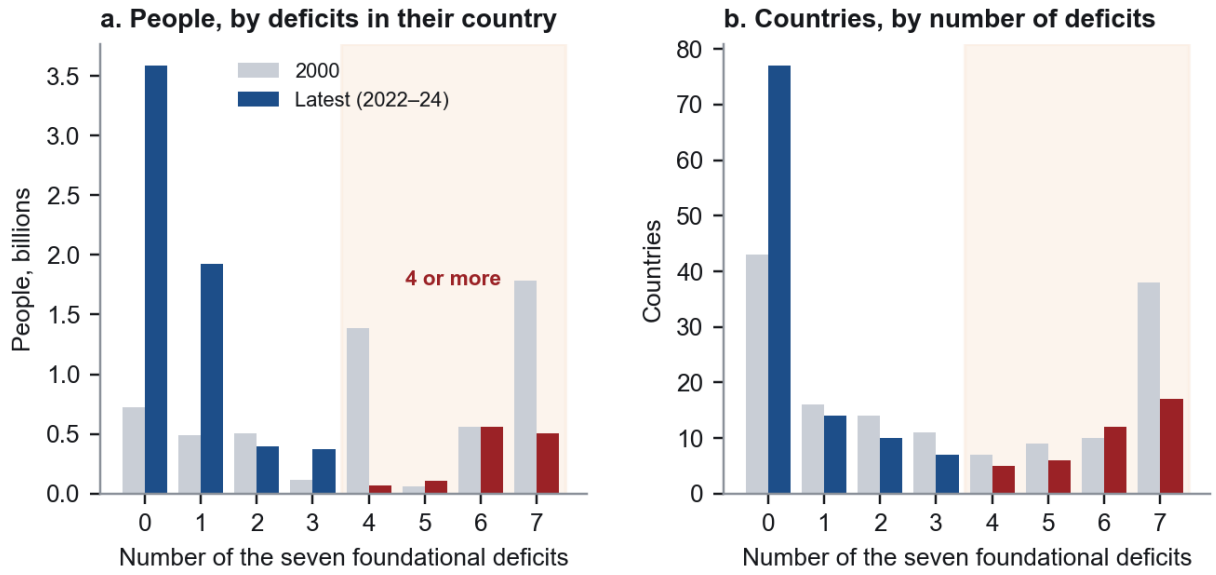
IN BRIEF

- The number of people living in countries with four or more of the seven foundational deficits fell from 3.8 billion in 2000 to 1.2 billion today.
- Thirteen countries, among them China, India, Indonesia and Viet Nam, moved from four or more deficits to one or none.
- But every one of the 40 countries carrying four or more deficits today already carried them in 2000. Progress has been large, and also highly uneven.

6.1 The great unstacking

If vulnerabilities cluster, the most useful single measure of a country's foundational vulnerability is not any one deficit but how many it carries at once. **Figure 5** counts the seven deficits defined in Chapter 5 for the 148 countries with complete data in both 2000 and the latest year, and shows how many people and countries sit at each level.

Figure 5. People and countries by number of foundational deficits, 2000 and latest year



Source: H Heuristics calculation from World Bank WDI and WGI; 148 countries with data on all seven deficits in both periods, covering 5.6 bn people in 2000 and 7.5 bn in the latest year. People are counted by the deficits of the country they live in, not their own household circumstances.

The change is one of the largest improvements in human conditions on record. In 2000, two-thirds of the population covered (67%, or 3.8 billion people) lived in countries with four or more foundational deficits, and only 0.7 billion lived in countries with none. Today the figures are almost reversed: 1.2 billion (16.5%) live in countries with four or more deficits, and 3.6 billion in countries with none. The average country carried 3.2 deficits in 2000 and 2.0 today.

The change in people is larger than the change in countries because of a few very large transitions. China, India and Indonesia each moved from four or more deficits to one or none. In all, thirteen countries made that transition: Azerbaijan, Cabo Verde, Cambodia, China, the Dominican Republic, India, Indonesia, Mongolia, Paraguay, Peru, the Philippines, Sri Lanka and Viet Nam. They span four regions, several political systems and

very different growth models, but they share sustained growth combined with large public investment in electrification, water, sanitation and health.

6.2 The countries that remain

The other side of the picture is just as clear. Forty countries carry four or more deficits today, and **every one of them already carried four or more in 2000**. No country entered the high-deficit group over the period; but most of those that were in it have not left. Twenty-nine countries carry six or all seven deficits, home to about 1.06 billion people. Twenty-six of the 29 are in Sub-Saharan Africa; the others are Djibouti, Haiti and Papua New Guinea.

This is the central geographic fact for the framework. The world's foundational vulnerability is no longer spread across most of the developing world, as it was in 2000. It is concentrated in a smaller group of countries, mostly low-income and mostly in Sub-Saharan Africa, which combine the full stack of deficits with the fastest population growth, high climate exposure and, as Chapter 10 shows, the weakest recent growth.

6.3 Which deficits closed, and which reopened

Table 4 shows, for each deficit, how many of the 148 countries had it in 2000, how many closed it by the latest year, and how many opened it. Infrastructure and health deficits behave like ratchets: once closed, they almost never reopen. Electricity access closed in 34 countries and reopened in one; child mortality closed in 34 and reopened in one. Two deficits behave differently. Undernourishment closed in 32 countries but opened in eight, and government effectiveness closed in 33 but deteriorated past the threshold in six. These are the domains where conflict, economic crisis and climate shocks can undo progress, and they are where the development cycle described in Chapter 9 is most fragile.

Table 4. Which foundational deficits closed and which reopened, 2000 to latest year

Deficit (threshold)	Countries with deficit in 2000	Closed by latest year	Newly opened
Electricity access below 90%	73	34	1
Clean cooking below 50%	64	22	0
Basic drinking water below 80%	52	22	0
Basic sanitation below 50%	50	20	1
Under-five mortality above 25 per 1,000	87	34	1
Undernourishment at or above 10%	75	32	8
Government effectiveness below −0.5	75	33	6

Source: H Heuristics calculation from World Bank WDI and WGI; 148 countries with complete data.

A caution on country-level counts

Counting people by the deficits of the country they live in overstates the change for some and understates it for others. Within a country that has closed a deficit on average, millions may still lack the service; within a high-deficit country, many households do not. The measure is a summary of national conditions, which is what national development strategies act on. Household-level analysis, using surveys such as the Demographic and Health Surveys, is a priority for future work (Chapter 14).

PART III · TESTING THE PROPOSITION

7. Testing the Central Proposition: The Development Gradient

IN BRIEF

- H Heuristics built a Development Capability Index (DCI) from the framework's eight Global South priorities for 194 countries.
- Across nine of thirteen vulnerability measures, vulnerability falls steeply as capability rises; correlations reach −0.90 for child mortality.
- The least-capable two-fifths of countries hold 45% of the world's population but recorded 78% of its climate-disaster deaths in 2010–2024.

7.1 Building a Development Capability Index

To test the central proposition, H Heuristics constructed a **Development Capability Index (DCI)** that maps one-to-one onto the eight priorities the framework emphasizes for the Global South. Each priority is represented by one indicator from the World Development Indicators or the Worldwide Governance Indicators, using the latest value from 2019 onward.

Table 5. Components of the Development Capability Index

Framework priority	Indicator	Transformation
Closing technology and productivity gaps	GDP per person employed (constant 2021 PPP $)	Logarithm
Expanding clean energy access	Access to electricity, % of population	None
Improving public health infrastructure	Current health expenditure per person (US$)	Logarithm
Accelerating clean cooking adoption	Access to clean fuels and technologies for cooking, %	None
Strengthening water and food security	Basic drinking water services, % of population	None
Supporting climate-resilient industrialization	Manufacturing value added, % of GDP	None
Expanding digital infrastructure	Individuals using the internet, %	None
Improving institutional and economic capacity	Government effectiveness estimate (WGI)	None

Source: H Heuristics. Each indicator is converted to a percentile rank across countries; the DCI is the mean of available ranks, requiring at least six of eight. Undernourishment is deliberately left out of the index so that it can be tested as an outcome.

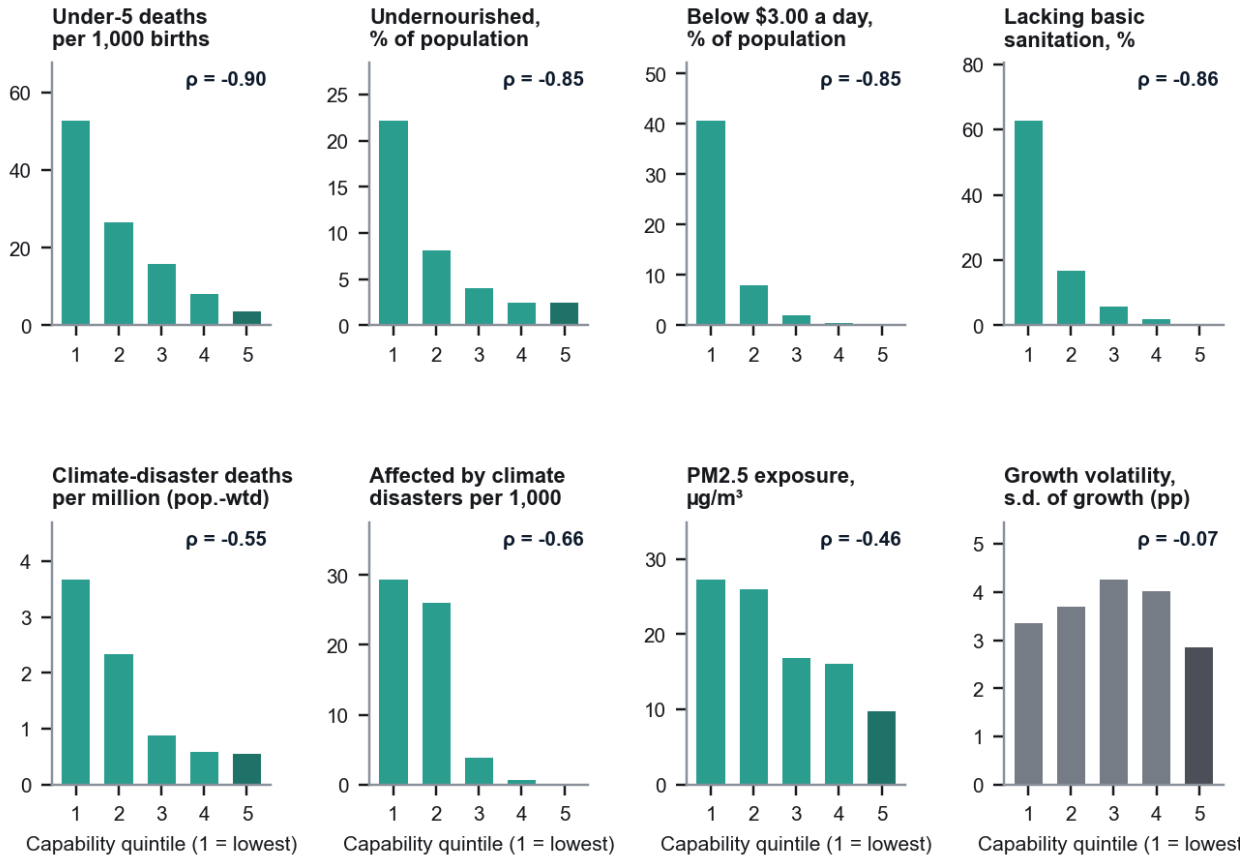
The index covers 194 countries. Its components are strongly related: the first principal component explains 72% of their joint variation, and the DCI correlates at 0.95 with the logarithm of GDP per person. The exception is manufacturing's share of GDP, which is essentially uncorrelated with the other components (correlation 0.03 with government effectiveness), a reminder that industrial structure is not a simple ladder. Average DCI scores are 13 for low-income countries, 31 for lower-middle, 51 for upper-middle and 75 for high-income countries.

Because the DCI is so close to income, the test that follows cannot separate the effect of the eight capabilities from the effect of income as such. That is by design: the framework treats income, technology, infrastructure, services and institutions as a bundle that moves together, and asks whether the bundle reduces vulnerability. Separating the parts is a research priority (Chapter 14).

7.2 The gradient

Figure 6 divides the 194 countries into five equal groups by DCI and shows the median value of eight vulnerability measures in each group. For direct human harm, the gradient is steep and monotonic.

Figure 6. Vulnerability by Development Capability Index quintile



Source: H Heuristics calculation from World Bank WDI and WGI and EM-DAT (via Our World in Data). Bars show medians across countries in each quintile, except climate-disaster deaths, which are population-weighted (total deaths divided by total population). Climate disasters are floods, droughts, storms, landslides and wildfires, 2010–2024; extreme-temperature events are excluded because heat deaths are recorded far more completely in rich countries. ρ is the Spearman rank correlation with the DCI across all countries.

- **Child mortality** falls from a median of 53 per 1,000 births in the lowest-capability fifth to 3.7 in the highest, a fourteen-fold difference (ρ = −0.90).
- **Undernourishment** falls from 22% to the 2.5% floor below which estimates are not reported (ρ = −0.85).
- **Poverty** at $3.00 a day falls from a median of 41% to near zero (ρ = −0.85), and the share lacking basic sanitation from 63% to under 1% (ρ = −0.86).
- **Climate-disaster deaths** fall from 3.7 per million people a year in the lowest fifth to 0.55 in the highest, a 6.7-fold difference on a population-weighted basis (ρ = −0.55). The share of people **affected** by climate disasters falls even more steeply, from a median of 29 per 1,000 a year to below 0.1 (ρ = −0.66).
- **Air pollution** exposure falls from 27 to 10 micrograms of PM2.5 per cubic metre (ρ = −0.46), a weaker gradient because desert dust and regional haze affect some middle-income countries heavily.

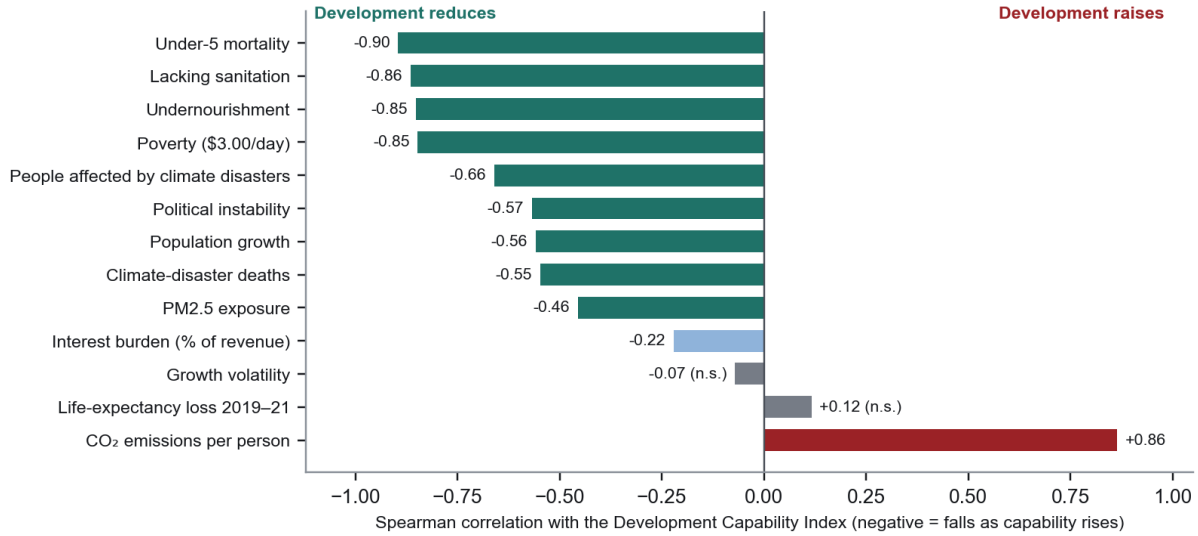
The concentration of disaster deaths is especially striking. The two lowest-capability fifths of countries hold 45% of the world's population but recorded 78% of its climate-disaster deaths in 2010–2024. That matches the IPCC's finding of roughly fifteen-fold mortality differences between highly and minimally vulnerable regions (IPCC, 2022), and the pattern documented by Kahn (2005) and by Formetta and Feyen (2019): hazards strike rich and poor

countries alike, but they kill far more people where capability is low.

7.3 The full picture: where development works, and where it does not

Figure 7 summarizes the correlation between the DCI and all thirteen vulnerability measures examined. Nine show strong negative relationships, meaning that vulnerability falls as capability rises: child mortality, sanitation, undernourishment, poverty, people affected by climate disasters, political instability, population growth, climate-disaster deaths and PM2.5 exposure. Debt burdens show a weaker negative relationship (ρ = −0.22). Two measures show no significant relationship at all: growth volatility and pandemic life-expectancy loss. One shows a strong positive relationship: CO_2 emissions per person.

Figure 7. Development capability and thirteen measures of vulnerability



Source: H Heuristics calculation from World Bank WDI and WGI and EM-DAT (via Our World in Data); 149 to 194 countries depending on the measure. n.s. = not statistically significant at the 5% level.

The result supports the central proposition for the domains in which vulnerability is a matter of **direct deprivation and harm**: health, hunger, poverty, basic services and disaster mortality. In those domains, the correlation with development capability is among the strongest relationships in cross-country social science. The proposition fails, at least in its simple form, for **systemic and macroeconomic** vulnerabilities and for the **pressures that development itself creates**. That pattern is the subject of the next chapter.

Is the gradient causal?

Cross-country correlations can reflect many things: richer countries may differ in geography, history or reporting. Three lines of evidence suggest the gradient is substantially causal for disaster mortality. Within-country studies show disaster deaths falling as the same country develops (Jongman et al., 2015; Formetta and Feyen, 2019). Studies that control for hazard intensity find that income, education and institutions still predict lower deaths (Kahn, 2005; Toya and Skidmore, 2007; Lutz, Muttarak and Striessnig, 2014). And specific mechanisms, such as cyclone shelters and early warning in Bangladesh, have documented effects. The gradient in child mortality and hunger is even better established. The DCI analysis adds breadth, not causal proof.

PART III · TESTING THE PROPOSITION

8. What Development Does Not Buy

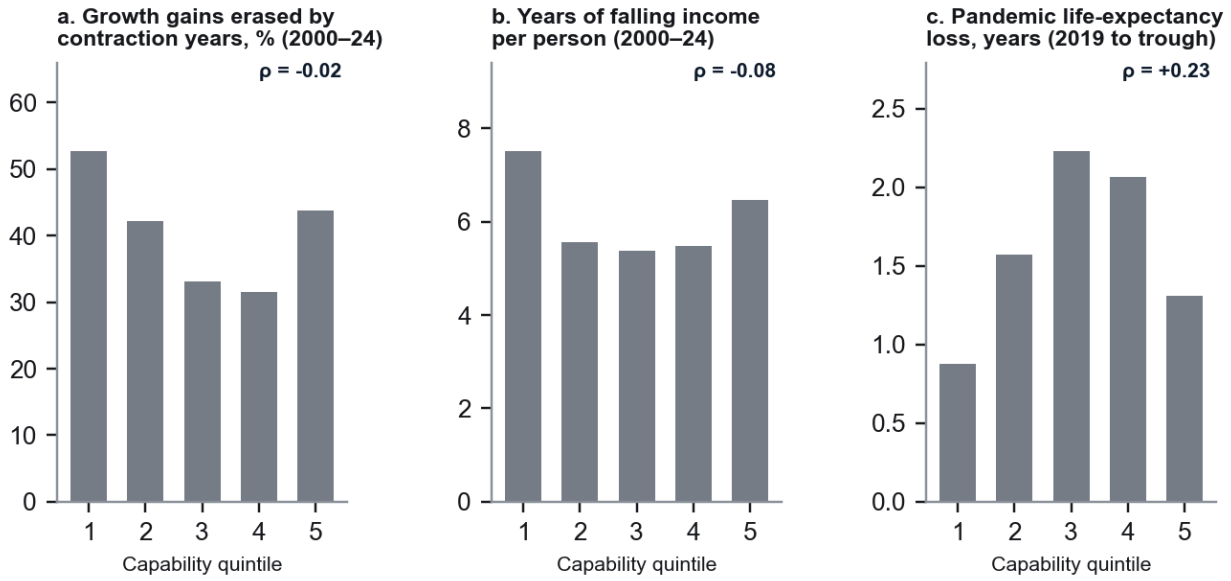
IN BRIEF

- Development capability is unrelated to growth volatility and to the share of growth gains erased in contraction years.
- Pandemic life-expectancy losses were largest in upper-middle capability countries, and one in five of the most capable countries had not regained 2019 life expectancy by 2024.
- CO_2 per person rises 23-fold from the lowest to the highest capability fifth. These limits explain why the framework is broader than growth.

8.1 Macroeconomic shocks

If development reduced every kind of vulnerability, more capable countries would also suffer fewer and shallower economic contractions. They do not. **Figure 8** shows three measures of how often and how much countries lost ground between 2000 and 2024. The number of years in which income per person fell averages between 5.4 and 7.5 in every capability fifth, with no trend (ρ = −0.08). The share of cumulative growth gains erased by contraction years is highest in the lowest fifth (53%) but almost as high in the top fifth (44%), and the overall correlation is effectively zero (ρ = −0.02).

Figure 8. Losses that development capability does not prevent



Source: H Heuristics calculation from World Bank WDI (NY.GDP.PCAP.KD.ZG, SP.DYN.LE00.IN). Panel a: sum of negative annual growth rates of GDP per person as a share of the sum of positive rates, 2000–2024. Panel b: number of years with negative growth. Panel c: fall in life expectancy at birth from 2019 to its lowest value in 2020–2022. Bars show quintile means; 190 to 194 countries.

This matches earlier H Heuristics findings that resilience to the 2009 and 2020 shocks was barely persistent across episodes and only weakly predicted by income, and that most of the long-run cost of volatility comes from discrete shortfalls rather than from ordinary fluctuations. Development changes what a contraction does to people, because richer countries have savings, insurance and social protection, but it does not by itself prevent contractions. Global financial shocks, commodity cycles, pandemics and trade disruptions reach rich and poor economies alike.

8.2 Pandemics

COVID-19 offered a direct test of whether development capability protects against a novel, globally transmitted hazard. It did not, at least not straightforwardly. Life expectancy fell by an average of 0.9 years from 2019 to its 2020–2022 low in the lowest-capability fifth, but by 2.2 years in the middle fifth and 2.1 in the fourth ($\rho = +0.23$). One in five countries in the highest-capability fifth (20.5%) had still not regained its 2019 life expectancy by 2024, against 2.6% in the lowest. Younger populations explain part of this pattern; differences in how deaths were recorded explain more. But the broader lesson is clear: a pandemic exploits connectivity, urban density and older populations, all of which rise with development.

8.3 The pressures that development creates

The strongest relationship in **Figure 7** is a positive one. CO_2 emissions per person rise from a median of 0.3 tonnes in the lowest-capability fifth to 6.9 tonnes in the highest, a 23-fold difference ($\rho = +0.86$). Historically, development has been one of the main drivers of the climate hazard that the framework seeks to reduce vulnerability to. If the remaining 40 high-deficit countries followed the historical path, their development would make the polycrisis worse even as it made their own populations less vulnerable to it.

This is why the clean transition is a core objective of the framework rather than an optional addition. The cost of clean power has fallen far enough that most new renewable capacity is now cheaper than fossil alternatives (IRENA, 2025), and a growing number of high-capability countries emit well below the world average per person. The framework's position is that development and decarbonization are complements: the second makes the first durable. The founding report in this series and its companion on the clean transition develop this argument in detail.

8.4 Debt and fiscal space

Interest burdens fall only weakly with capability ($\rho = -0.22$): the median country in the two lowest fifths spends about 9.5 to 10% of government revenue on interest, against 3.5% in the highest. But the spread within every fifth is wide, and the relationship is driven as much by access to cheap borrowing as by development itself. Fiscal space is a capability the framework treats separately, because it determines whether a country can recover from shocks and invest in the other seven.

What follows for the framework

The pattern in this chapter defines the boundaries of the central proposition. Development reliably reduces vulnerability to **harm**: deaths, hunger, disease and deprivation. It does not reliably reduce vulnerability to **shocks** themselves, and it can raise **systemic pressures**. A development-oriented framework therefore needs three complements: protection (buffers, insurance, social protection and health-system surge capacity), a clean transition, and adaptive capacity for new and unfamiliar risks. These are built into the seven core objectives in Chapter 12.

PART III · TESTING THE PROPOSITION

9. The Polycrisis Resilience Development Cycle

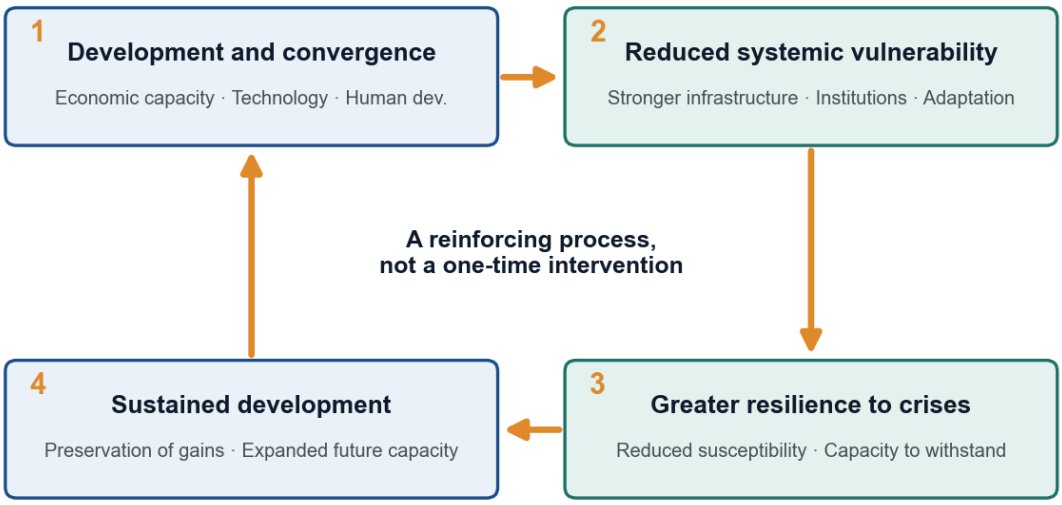
IN BRIEF

- The framework describes a reinforcing cycle: development reduces vulnerability, lower vulnerability preserves gains, and preserved gains enable further development.
- The cycle breaks where shocks reverse gains and where development creates new pressures.
- Making the cycle robust means protecting gains as deliberately as creating them.

9.1 Four stages

The framework's dynamic logic is a cycle, shown in **Figure 9**. **Development and convergence** build economic capacity, technology and human development. These produce **reduced systemic vulnerability** through stronger infrastructure, institutions and adaptation. Lower vulnerability yields **greater resilience to interconnected crises**: reduced susceptibility and a greater capacity to withstand disruption. And resilience enables **sustained development**, by preserving past gains and expanding future capacity. The process is reinforcing rather than one-time: each turn of the cycle makes the next easier.

Figure 9. The Polycrisis Resilience development cycle



Source: H Heuristics. Conceptual diagram.

9.2 Evidence that the cycle turns

The analysis in Chapters 6 and 7 supports each link. Development capability is strongly associated with lower vulnerability to harm. The thirteen countries that dismantled their deficit stacks since 2000 did so in an order consistent with the cycle: rising incomes funded infrastructure and services; better infrastructure and health reduced losses from shocks; and fewer losses allowed growth to continue. Deficits in infrastructure and health, once closed, almost never reopened, which is the signature of a ratchet: gains that preserve themselves.

The reverse cycle is equally visible. Countries that remain in the high-deficit group combine low capability, high losses and stalled growth. The H Heuristics series has documented how severe climate shocks leave lasting scars on output in low- and lower-middle-income countries, but not in richer ones, and how the reversals that interrupt development cost a large share of gains. The cycle can run in either direction.

9.3 Where the cycle breaks

Chapter 8 identified the two places where the cycle is weakest. The first is **shocks that reverse gains**: economic contractions, pandemics and conflict, against which development alone offers little protection. The second is **pressures that development creates**: emissions, ageing populations and new technological dependencies. The undernourishment and governance deficits, which reopened in some countries after 2000, show that the first is not hypothetical.

9.4 Making the cycle robust

- **Protect gains as deliberately as creating them.** Adaptive social protection, contingent finance, food reserves and health-system surge capacity turn shocks into temporary setbacks rather than reversals.
- **Choose development paths that do not create the next crisis.** Clean power, clean cooking, efficient buildings and low-carbon industry keep the cycle from feeding the climate hazard.
- **Build in adaptive capacity.** Education, information systems and flexible institutions let societies respond to risks that no one anticipated.
- **Sequence for momentum.** Investments that ease several constraints at once, such as electricity for health and water services, start the cycle fastest.

PART IV · THE GLOBAL SOUTH AND THE CENTURY

10. The Global South at the Centre

IN BRIEF

- The Global South occupies a particularly important position in the framework: overlapping vulnerabilities make accelerated development there a resilience strategy of global significance.
- Lower-middle and upper-middle income countries have closed much of the foundational gap since 2000; low-income countries have not.
- Since 2015, income per person in low-income countries has grown at a third of the high-income pace; in Sub-Saharan Africa it has slightly fallen.

10.1 Why the Global South

Many emerging and developing economies face overlapping vulnerabilities associated with limited infrastructure, lower incomes, environmental exposure, constrained public services and insufficient access to technology. Consequently, accelerating development in these regions has substantial resilience implications, for their own populations and for the world. Most of the people in the high-deficit countries identified in Chapter 6, most of the projected growth in the world's population, and most of the remaining growth in energy demand are in the Global South. How development proceeds there will decide much of the 21st century's vulnerability.

10.2 The eight priorities

H Heuristics emphasizes eight priorities for the Global South, the same eight that make up the Development Capability Index. **Table 6** states each, with the current position of low-income and lower-middle-income countries and the main reason it matters for resilience.

Table 6. The eight Global South priorities: where low- and lower-middle-income countries stand

Priority	Low income (latest)	Lower-middle income (latest)	Why it matters for resilience
Closing technology and productivity gaps	GDP per person $2,480 (PPP); growth 0.55%/yr since 2015	$9,350; growth 3.3%/yr since 2015	Income and savings are the most general form of coping capacity
Expanding clean energy access	49% with electricity	91% with electricity	Power underpins health, water, cooling, communication and livelihoods
Improving public health infrastructure	Under-five mortality 69 per 1,000	44 per 1,000	Reduces susceptibility to disease, heat and pollution
Accelerating clean cooking adoption	16% with clean cooking	64%	Removes a leading environmental health risk and a time burden
Strengthening water and food security	60% basic water; 27% undernourished	91%; 12%	Water and food shocks are the main channel from climate to hunger
Supporting climate-resilient industrialization	Small, often shrinking manufacturing base	Mixed; services-led growth common	Diversifies jobs and the tax base away from climate-sensitive activity
Expanding digital infrastructure	23% use the internet	63%	Enables warnings, payments and services at scale

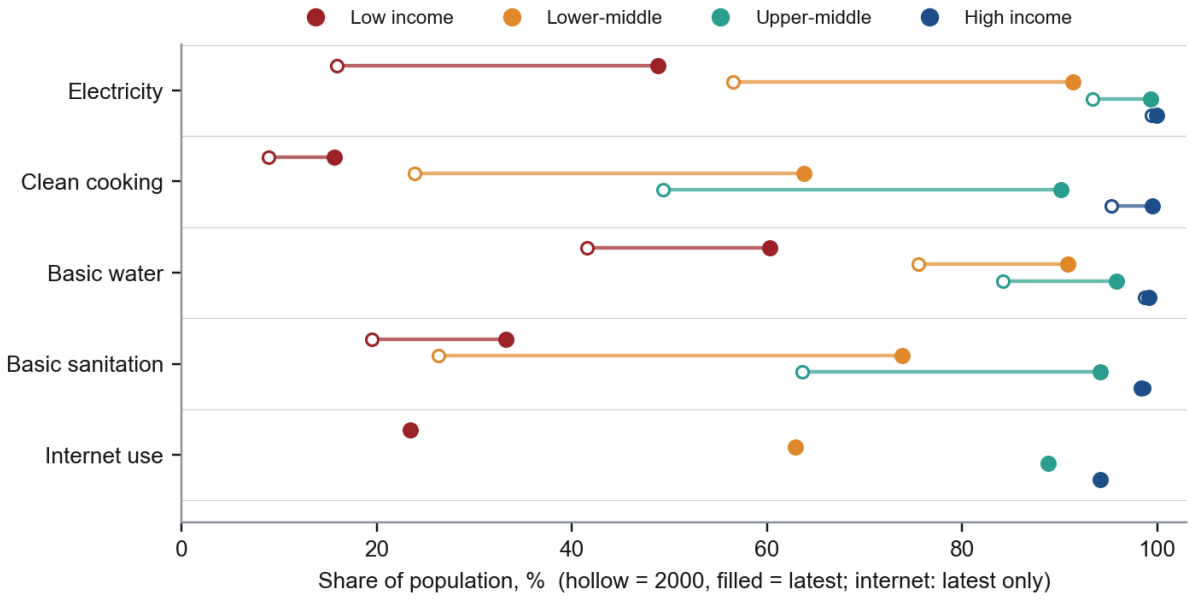
Priority	Low income (latest)	Lower-middle income (latest)	Why it matters for resilience
Improving institutional and economic capacity	Lowest government effectiveness scores	Wide range	The capacity to plan, regulate, protect and rebuild

Source: H Heuristics calculation from World Bank WDI aggregates by income group, latest year 2024 or 2025.

10.3 A divided picture

Figure 10 shows progress on the five access priorities from 2000 to the latest year. Upper-middle-income countries have reached or nearly reached universal access to electricity, water and sanitation and are close to high-income levels on clean cooking and internet use. Lower-middle-income countries have made the largest absolute gains: electricity from 57% to 91%, sanitation from 26% to 74% and clean cooking from 24% to 64%. Low-income countries have gained too, but from a much lower base and more slowly: electricity from 16% to 49%, and clean cooking from 9% to just 16%.

Figure 10. Progress on five Global South access priorities by income group, 2000 to latest year

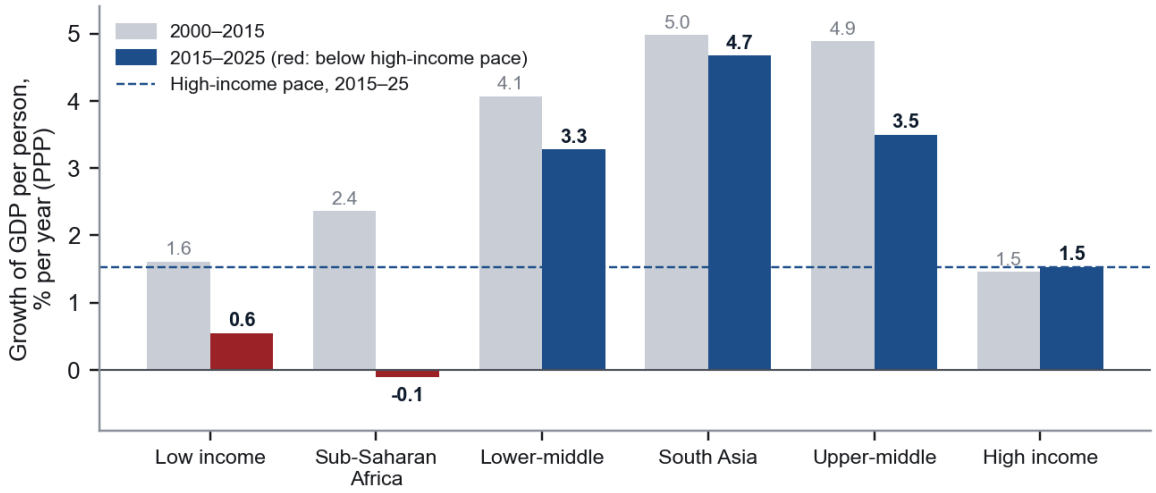


Source: World Bank WDI income-group aggregates (EG.ELC.ACCS.ZS, EG.CFT.ACCS.ZS, SH.H2O.BASW.ZS, SH.STA.BASS.ZS, IT.NET.USER.ZS); latest year 2024 (internet 2025). Income groups follow the current World Bank classification.

10.4 Convergence that reduces vulnerability

The objective is not simply economic convergence. It is convergence that reduces vulnerability to the global polycrisis. Even so, income convergence remains the engine. **Figure 11** compares the growth of GDP per person in 2000–2015 and 2015–2025. South Asia, lower-middle and upper-middle-income countries continue to grow well above the high-income pace and are therefore converging, though more slowly than before 2015. Low-income countries are not: their growth has fallen from 1.6% a year to 0.55%, about a third of the high-income rate of 1.53%. Sub-Saharan Africa as a whole has gone from 2.4% a year to a slight decline (−0.1%).

Figure 11. Growth of GDP per person, 2000–2015 and 2015–2025



Source: H Heuristics calculation from World Bank WDI aggregates (NY.GDP.PCAP.PP.KD, constant 2021 international $); compound annual growth rates.

This is the most worrying finding in the report. The countries where vulnerabilities stack most heavily are the ones where the engine of the development cycle has slowed most. The World Bank reaches a similar conclusion: nearly half of developing economies have failed to narrow the income gap with advanced economies since 2019 (World Bank, 2026). UNDP reports that the gap in human development between the highest and lowest groups has widened in recent years after decades of narrowing (UNDP, 2025). Restarting convergence in the low-income world is, on the framework's logic, among the highest-value resilience investments available anywhere.

PART IV · THE GLOBAL SOUTH AND THE CENTURY

11. Three Periods: 2000–2030, 2030–2050, 2050–2100

IN BRIEF

- The framework treats the 21st century as a particularly consequential period for long-term global vulnerability and divides it into three planning horizons.
- At recent rates of progress, lower-middle-income countries finish most foundations in the early 2030s; low-income countries and Sub-Saharan Africa do not finish clean cooking or sanitation this century.
- Undernourishment has risen since 2015 in low- and lower-middle-income countries, the clearest sign that the foundations are not secure.

11.1 The three periods

The framework considers the 21st century a particularly consequential period for determining long-term global vulnerability. Three broad periods provide a useful analytical structure. They are planning horizons, not predictions of when particular transitions will occur.

Table 7. The framework's three planning periods

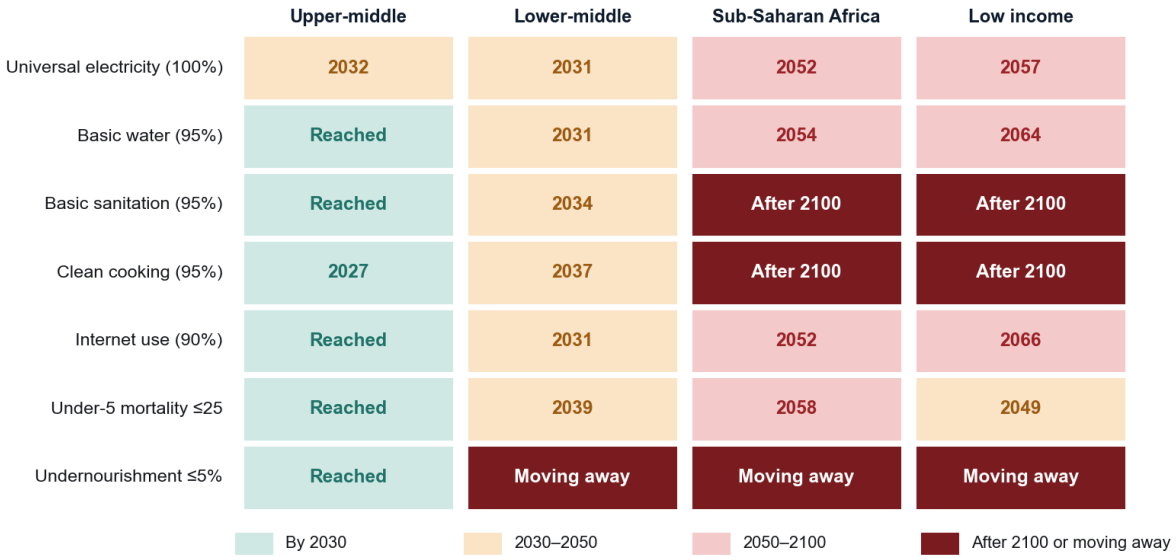
Period	Resilience priority	What success looks like
2000–2030	Establishing development foundations and accelerating technological diffusion	Universal electricity, water and digital access within reach in middle-income countries; deficit stacks dismantled outside the poorest countries; diffusion of low-cost clean technology
2030–2050	Scaling convergence, clean transition and adaptation	Foundations completed in low-income countries; convergence restarted; power systems largely clean; adaptation embedded in infrastructure and planning
2050–2100	Maintaining resilience amid compounding environmental, demographic and systemic pressures	Gains protected against higher warming, ageing populations and new technological risks; vulnerability falling even as hazards rise

Source: H Heuristics.

11.2 Where the world stands against the first period

To see how the world is tracking against these horizons, H Heuristics projected forward the linear trend of 2015 to the latest year for seven foundational indicators and four groups of countries, and noted the year in which each would reach a target. **Figure 12** colours each result by the period in which it falls. Targets are universal electricity, 95% coverage for water, sanitation and clean cooking, 90% internet use, under-five mortality of 25 per 1,000, and undernourishment of 5% or less.

Figure 12. When foundational targets are reached at the 2015–latest rate of progress



Source: H Heuristics calculation from World Bank WDI aggregates. Each cell extends the linear trend from 2015 to the latest year (2024 or 2025) to the target. "Moving away" means the indicator worsened over the period. Linear extrapolation is a benchmark of current momentum, not a forecast: access gains often accelerate or slow near saturation.

The results divide sharply by income. Upper-middle-income countries have met or will meet nearly every foundational target by the early 2030s, completing the first period's agenda on time. Lower-middle-income countries reach universal electricity, basic water and 90% internet use around 2031, sanitation around 2034, clean cooking around 2037 and the child-mortality threshold around 2039: their foundations fall mainly in the second period. Low-income countries reach universal electricity only around 2057 and basic water around 2064; at the recent pace of a quarter of a percentage point a year, universal clean cooking lies centuries away, and basic sanitation lies beyond 2100. Sub-Saharan Africa has a similar profile.

The most serious signal is undernourishment. The share of people undernourished has risen since 2015 in low-income countries (by about a third of a percentage point a year, to 27%), in lower-middle-income countries and in Sub-Saharan Africa. Hunger is the domain where conflict, economic shocks and climate stress converge, and its reversal after decades of decline is the clearest sign that progress in the first period is not secure.

11.3 What the periods imply

- **The first period's work will spill into the second.** For low-income countries, the 2030–2050 period must complete the foundations that the framework assigns to 2000–2030, while also scaling the clean transition and adaptation. That is a heavier agenda, under higher warming, with less time.
- **Acceleration is worth more now than later.** Because gains compound and deficits cluster, a decade's acceleration in the 2020s and 2030s lowers vulnerability through the rest of the century. H Heuristics analysis elsewhere in the series finds that countries growing without reversals converge roughly three times faster than those that suffer them.
- **The third period depends on the first two.** Ageing, heat and compounding systemic pressures after 2050 will be most dangerous for populations that arrive there without the foundations. The best preparation for 2050–2100 is to finish 2000–2030's agenda.

PART V · IMPLEMENTING THE FRAMEWORK

12. Seven Core Objectives and How to Track Them

IN BRIEF

- The framework has seven core objectives, from reducing vulnerability to strengthening long-term stability.
- Each can be tracked with existing public data; this chapter proposes a headline indicator for each and its current value.
- The objectives are designed to be pursued together: each supports the others.

12.1 The seven objectives

- **1. Reduce vulnerability.** Strengthen the ability of populations and systems to withstand interconnected risks.
- **2. Strengthen development.** Improve economic conditions, institutional capacity, infrastructure and human capabilities.
- **3. Accelerate technological diffusion.** Expand access to technologies that improve productivity, health, environmental conditions and resilience.
- **4. Advance the clean transition.** Reduce environmental pressures while supporting sustainable economic development.
- **5. Promote convergence.** Reduce development gaps between economies and expand access to the capabilities necessary for resilience.
- **6. Improve adaptive capacity.** Enable societies to anticipate, absorb and respond to changing conditions.
- **7. Strengthen long-term stability.** Reduce the likelihood that individual crises develop into cascading systemic disruptions.

12.2 A tracking framework

Table 8 proposes a headline indicator for each objective, chosen for global coverage and annual updating, with the latest world or group value and the direction of recent change. Together they form a compact dashboard that H Heuristics intends to update annually.

Table 8. Headline indicators for the seven core objectives

Objective	Headline indicator	Latest value	Recent direction
1. Reduce vulnerability	People in countries with four or more foundational deficits	1.24 bn (16.5%), down from 3.79 bn (67%) in 2000	Improving, but concentrated in 40 countries
2. Strengthen development	Development Capability Index, low-income average	13 (vs 75 high-income)	Slow
3. Accelerate technological diffusion	Internet use and clean cooking, low-income countries	23% and 16%	Internet rising 1.6 pts/yr; cooking 0.25 pts/yr
4. Advance the clean transition	CO_2 per person by capability fifth	0.3 t (lowest) to 6.9 t (highest)	Decoupling in some high-capability countries

Objective	Headline indicator	Latest value	Recent direction
5. Promote convergence	Growth of GDP per person, low-income vs high-income	0.55% vs 1.53% a year (2015–2025)	Diverging
6. Improve adaptive capacity	Climate-disaster deaths per million, lowest vs highest capability fifth	3.7 vs 0.55 (2010–2024)	Long-run decline; gap persists
7. Strengthen long-term stability	Undernourishment, low-income countries	27% (2024)	Worsening since 2015

Source: H Heuristics calculation from World Bank WDI and WGI and EM-DAT (via Our World in Data). Indicators are proposals for an annual dashboard.

12.3 How the objectives fit together

The objectives map onto the framework's architecture. Objectives 2, 3 and 5 are the **means**: they build the development capabilities on which the central proposition rests. Objective 1 is the **end**. Objectives 4, 6 and 7 are the **complements** identified in Chapter 8: the clean transition addresses the pressures that development creates, adaptive capacity addresses the shocks that development does not prevent, and long-term stability addresses the cascades that turn single crises into polycrises. A strategy that pursues only the means will reduce harm but leave the cycle exposed; a strategy that pursues only the complements will protect a fragile base. The framework asks for both.

12.4 Priorities for action

- **Concentrate on the 40.** The countries that still carry four or more deficits are where each dollar of development buys the most resilience. Concessional finance, debt relief and technical support should be weighted toward them.
- **Restart convergence in low-income countries.** Infrastructure, energy, agricultural productivity and the cost of capital matter most; the IEA estimates that the cost of capital for clean energy in emerging economies is at least twice that in advanced economies (IEA, 2024).
- **Bundle investments that ease several deficits at once.** Distributed clean power for clinics, schools, water pumps and businesses; clean cooking alongside electrification; digital public infrastructure that serves payments, identity and warnings together.
- **Protect the gains.** Adaptive social protection, contingent credit lines, regional insurance pools and food reserves make reversals less likely and less deep.
- **Make development clean from the start.** Low-cost solar, storage and efficient appliances make clean development cheaper than the alternative in much of the Global South.
- **Measure vulnerability, not only growth.** National development plans and multilateral lenders should report on the indicators in **Table 8**, or similar ones, alongside output.

PART V · IMPLEMENTING THE FRAMEWORK

13. Measuring Polycrisis Resilience

IN BRIEF

- A useful measure of Polycrisis Resilience must capture capability, vulnerability and their interaction, and avoid simply restating income.
- This report's Development Capability Index is a first, transparent step; it is not yet a resilience index.
- Five design principles guide the next version.

13.1 What should be measured

Polycrisis Resilience is a capacity, and capacities are hard to observe directly until they are tested. A measurement program therefore needs three kinds of evidence: **inputs** (the development capabilities a society has built), **exposures and vulnerabilities** (the conditions that determine how much harm a shock can do), and **performance** (how a society actually fared when shocks arrived). The DCI in this report measures inputs; the thirteen vulnerability measures in Chapter 7 measure the second; and earlier H Heuristics work on the 2009 and 2020 shocks measures the third.

13.2 Five design principles

- **Measure interaction, not only levels.** The number of co-occurring deficits, as in Chapter 6, captures the stacking that makes vulnerability systemic. A country with one large deficit is in a different position from one with seven moderate ones.
- **Avoid rewarding the absence of one deficit when others are severe.** Geometric or minimum-based aggregation penalizes imbalance more than a simple average and suits a framework that stresses bottlenecks.
- **Separate capability from outcome.** Indicators used to build a capability index should not also be used to judge its effect, or the test becomes circular. This report kept undernourishment and disaster outcomes outside the DCI for that reason.
- **Report distribution, not only averages.** National averages hide the households, regions and groups where deficits remain. Survey-based and subnational measures are needed.
- **Track change and reversals.** The framework's cycle is dynamic. Annual tracking of gains and losses, as in Table 4, shows whether progress is secure.

13.3 Toward a Polycrisis Resilience Index

A full index would combine capability, vulnerability and performance into a single profile for each country, with the components visible rather than hidden in a single score. H Heuristics' view is that the profile matters more than the rank: a country with strong capability but high systemic exposure needs different policy from one with weak capability but low exposure. The index should be published with open data and code so that others can re-weight and challenge it.

PART V · IMPLEMENTING THE FRAMEWORK

14. Critiques, Limits and the Research Agenda

IN BRIEF

- The framework faces five serious critiques; each identifies a real limit and a research task.
- The most important limits of this report's evidence are its cross-country design and its country-level units.
- Eight research questions would most improve the framework.

14.1 Five critiques

Table 9. Critiques of a development-oriented resilience framework, and the framework's response

Critique	Response
"This is just development economics renamed."	The framework draws heavily on development economics, deliberately. What it adds is the resilience objective: it judges development by whether it reduces vulnerability across interacting domains, and it identifies where development does not (Chapter 8).
"Growth causes the polycrisis."	Historically, development has raised emissions and resource use, as Chapter 8 shows. The framework's answer is clean development rather than less development, because the evidence that capability reduces harm is overwhelming and the costs of clean technology have fallen.
"Development is too slow for a fast-moving crisis."	Development is slow, which is why the framework pairs it with protection and adaptation. But many of the largest falls in disaster mortality have come from development itself, and the alternative of emergency response alone has not closed the gap.
"Correlation is not causation."	Correct. This report's new evidence is correlational. It is consistent with within-country and quasi-experimental studies for disaster mortality, health and hunger, and the research agenda below targets the causal gaps.
"National averages hide who is vulnerable."	Correct. The framework's distributive concern requires household and subnational analysis, which is a priority for future work.

Source: H Heuristics.

14.2 Limits of this report's evidence

The analysis has four main limits. It is **cross-sectional** for the gradient and so cannot separate the eight capabilities from income or from each other. It uses **country-level units**, which hide within-country inequality. Disaster data from EM-DAT are **incomplete**, particularly for small events and heat deaths in poorer countries; excluding extreme-temperature events, as here, reduces but does not remove the bias. And the projections in Chapter 11 are **linear extrapolations** that ignore saturation effects, policy changes and shocks.

14.3 Research agenda

Table 10. Eight research questions for the framework

#	Question	Approach
1	Which of the eight capabilities reduce vulnerability most, holding income constant?	Panel models with country fixed effects; within-country variation over 2000–2025
2	Do deficits cluster within households as well as countries?	Demographic and Health Surveys and Multiple Indicator Cluster Surveys
3	What sequence of investments dismantles deficit stacks fastest?	Event studies of the thirteen countries that escaped high-deficit status
4	Why did undernourishment and governance deficits reopen in some countries?	Case studies linking conflict, price shocks and climate stress
5	How much protection do buffers add on top of development?	Comparing shock outcomes across countries with similar capability but different fiscal space and social protection
6	Can clean development match the vulnerability reduction of past development?	Comparing low-emission and high-emission development paths on the same outcome measures
7	How will ageing change vulnerability after 2050?	Combining demographic projections with heat and disease exposure
8	What would restart convergence in low-income countries?	Growth diagnostics focused on energy, the cost of capital, agriculture and infrastructure

Source: H Heuristics.

PART V · IMPLEMENTING THE FRAMEWORK

15. Conclusion

The H Heuristics Polycrisis Resilience Framework begins from a simple observation: the crises of the 21st century interact, and the populations that suffer most from all of them are the same populations, in the same places, lacking the same foundations. If vulnerability is produced by underlying conditions, then improving those conditions is the most durable way to reduce vulnerability to many crises at once.

The evidence in this report broadly supports that proposition. Across 194 countries, development capability is among the strongest predictors of lower child mortality, hunger, poverty, deprivation and disaster deaths. Foundational deficits cluster, and they have been dismantled together: the population living with stacked deficits has fallen from 3.8 billion to 1.2 billion since 2000. Where development has proceeded, the reinforcing cycle the framework describes has turned.

The evidence also marks the framework's boundaries. Development does not by itself prevent economic contractions or pandemics, and it has historically raised the emissions that drive the climate hazard. That is why the framework is not a doctrine of growth alone. It pairs development with protection, a clean transition and adaptive capacity, and it judges success by the reduction of vulnerability rather than the growth of output.

The most urgent finding concerns where the work remains. Forty countries, home to about 1.2 billion people and concentrated in Sub-Saharan Africa, still carry four or more foundational deficits, and convergence has stalled in exactly those countries. At recent rates they will carry the first period's unfinished agenda deep into the second half of the century. Changing that trajectory is, on the framework's logic, the single largest opportunity to reduce global vulnerability to the polycrisis. Development, done cleanly and protected deliberately, is how Polycrisis Resilience is built.

> **THE FRAMEWORK IN ONE SENTENCE**
>
> Reduce vulnerability to interconnected crises by strengthening the systems, institutions, infrastructure, technologies and capabilities that support long-term human and societal development, and protect those gains as deliberately as they are made.

Glossary

Adaptive capacity	The ability of people, systems and institutions to anticipate, absorb and respond to changing conditions, including risks not previously experienced.
Clean transition	The shift of energy, industry, transport, households and agriculture toward low-emission, low-pollution technologies and practices.
Convergence	The narrowing of gaps in income and development between poorer and richer economies, which requires poorer economies to grow faster.
Deficit stacking	The co-occurrence of several foundational deficits in the same country. This report counts seven: electricity, clean cooking, water, sanitation, child mortality, undernourishment and government effectiveness.
Development Capability Index (DCI)	An H Heuristics index of the framework's eight Global South priorities, computed as the mean percentile rank of eight indicators across 194 countries.
Development cycle	The framework's reinforcing process in which development reduces vulnerability, lower vulnerability preserves gains, and preserved gains enable further development.
Exposure	The presence of people, livelihoods and assets in places and settings that could be adversely affected by hazards.
Foundational deficit	A serious shortfall in a basic development capability, defined in this report by a threshold on a standard indicator.
Global South	Used here for low- and middle-income countries, with particular attention to low-income countries and Sub-Saharan Africa.
H Heuristics Polycrisis Resilience Framework	The development-oriented framework developed by Hunter Hughes that examines how economic convergence, technological diffusion, clean transition, climate adaptation and human development can reduce vulnerability to interconnected global crises.
Polycrisis	A situation in which multiple crises interact in ways that amplify their combined consequences.
Polycrisis Resilience	The capacity of individuals, communities, societies, economies, institutions and interconnected systems to withstand, adapt to, recover from and reduce vulnerability to multiple interacting and compounding crises.
Spearman correlation (ρ)	A measure of how consistently two variables rank countries in the same (positive) or opposite (negative) order, from −1 to +1.
Susceptibility	The degree to which a person, community or system is harmed by a given level of exposure to a hazard.
Vulnerability	The propensity or predisposition to be adversely affected, encompassing susceptibility to harm and lack of capacity to cope and adapt (IPCC usage).

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