H HEURISTICS

POLYCRISIS RESILIENCE SERIES · RESEARCH REPORT

Polycrisis Resilience in Africa

Reducing human and systemic vulnerability this century



Hunter Hughes
Founder, H Heuristics

H Heuristics Research Report · November 2026

researchreports.hheuristics.com

CONTENTS

Contents

PART I

The Challenges and the Framework

Executive Summary 4

1 The Central Argument: Exposure Is Not Destiny 6
1.1 The argument in brief 6
1.2 Why a century-long view 7
1.3 Vulnerability is not responsibility 8
1.4 What this report does and does not claim 8

2 Why Africa Is Particularly Important: Seven Interconnected Challenges 9
2.1 Seven challenges, nine measures 9
2.2 Climate change 9
2.3 Air pollution 9
2.4 Poverty 11
2.5 Food and water insecurity 11
2.6 Healthcare 11
2.7 Energy poverty 11
2.8 Conflict and instability 12

3 How the Challenges Compound 13
3.1 How the challenges feed one another 13
3.2 Where the challenges pile up 14
3.3 Progress since 2000, and the arithmetic of population growth 15
3.4 Why stacking matters for policy 15

4 The Polycrisis Resilience Framework Applied to Africa 16
4.1 The concept in plain language 16
4.2 A five-stage development cycle 16
4.3 Four development drivers 16

5 Ten Development Pathways That Reduce Vulnerability 18
5.1 The ten pathways and Africa's starting point 18
5.2 One investment, many benefits 18
5.3 Energy: clean power and clean cooking 18
5.4 Health and water 20
5.5 Climate adaptation and agricultural technology . . 20
5.6 Digital infrastructure, education and institutions . . 20
5.7 Urban infrastructure 20
5.8 Is the pace enough? 20

PART II

Scenarios, Impact and Priorities

6 Clean Cooking: A Worked Example of Multiple Benefits 23
6.1 Why cooking matters so much 23
6.2 Five benefits from one change 23
6.3 What the evidence shows, and what it does not . . 23
6.4 What it would take 25

7 Three Horizons, 2026–2100: What Different Paces of Progress Could Mean 26
7.1 Three strategic horizons 26
7.2 How the scenarios are built 27
7.3 Horizon 1, 2026–2040: foundations 27
7.4 Horizon 2, 2040–2070: acceleration and convergence 28
7.5 Horizon 3, 2070–2100: consolidation 28

8 The Human Impact: Counting People, Not Just Percentages 29
8.1 Child survival and household air pollution 29
8.2 What lower vulnerability looks like in people's lives 30
8.3 Beyond mortality 30

9 The Economic Dimension: Prevention Costs Less Than Repeated Response 31
9.1 Prevention versus response 31
9.2 What Africa is being asked to finance, and what is available 31
9.3 A layered approach to financing 32
9.4 The cost of waiting 32

10 Evidence from African Progress, and the Risks Ahead 33
10.1 What has worked 33
10.2 What could go wrong 34
10.3 Limits of this analysis 34

11 Priorities and a Scorecard for the Century Ahead 35
11.1 Ten priorities 35
11.2 A scorecard to track 36
11.3 From exposure to resilience 36

References 37

EXHIBITS

Figures, Tables and Boxes

Figure 1 Africa's population, 1950–2100 . . . 7
Table 1 Seven challenges compared . . . 10
Figure 2 Africa compared with other developing... . . . 10
Figure 3 Africa's share of global deprivation . . . 12
Figure 4 How the seven challenges interact . . . 13
Figure 5 Challenges by country . . . 14
Figure 6 Stacked challenges, 2000 and 2024 . . . 15
Table 2 Six capacities in an African setting . . . 17
Table 3 Five-stage cycle . . . 17
Table 4 Ten pathways and Africa's position . . . 19
Figure 7 Pathways and challenges matrix . . . 19
Figure 8 Pace of progress versus peers and requirements . . . 21
Figure 9 Trends since 2000 . . . 22
Figure 10 Clean cooking and population growth . . . 24
Table 5 Clean cooking benefits and evidence . . . 24
Table 6 Three strategic horizons . . . 26
Figure 11 Scenarios: clean cooking and electricity . . . 27
Table 7 Headcounts without basic services . . . 28
Figure 12 Deaths avoided at faster progress . . . 29
Table 8 Financing anchors . . . 32
Table 9 Five African experiences . . . 33
Table 10 Scorecard for 2040 . . . 36

ABOUT THIS REPORT

Suggested citation. Hughes, H. (2026). *Polycrisis Resilience in Africa: Reducing Human and Systemic Vulnerability This Century*. H Heuristics Research Report, November 2026.

The concept. Polycrisis Resilience and the H Heuristics Polycrisis Resilience Framework are concepts developed by Hunter Hughes, Founder of H Heuristics.

Licence. Text and figures are released under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 licence. Data remain subject to the terms of their original publishers.

Data and methods. All data are public: World Bank, WHO, UN, INFORM and others, as cited. Scenarios are arithmetic, not forecasts. Africa means the 54 African countries. Blue text links to sources; figure, table and section references link within the document.

THE CONCEPT AND FRAMEWORK AT A GLANCE

THE DEFINITION

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

SIX CAPACITIES

- **Risk reduction** lower the drivers of vulnerability
- **Preventive** make crises rarer and milder
- **Absorptive** keep essential functions working
- **Recovery** restore functions and welfare
- **Adaptive** learn and adjust between crises
- **Transformative** change vulnerable pathways

FIVE-STAGE CYCLE

1. Identify vulnerability
2. Prioritise development interventions
3. Strengthen interconnected systems
4. Reduce systemic vulnerability
5. Strengthen long-term resilience

Continuous assessment, learning and improvement

EXECUTIVE SUMMARY

Executive Summary

Africa's exposure to interconnected crises is not a fixed outcome. Sustained investment in development, prevention, adaptation and technology diffusion could cut human and systemic vulnerability on a scale that matters across generations.

Africa enters the second half of the twenty-first century with the world's most rapidly growing population and the world's heaviest concentration of unmet basic needs. Roughly 1.5 billion people live in its 54 countries today, and the United Nations expects 3.8 billion by 2100. Many of them face several linked problems at once: a warming climate, polluted air, poverty, unreliable food and water, weak health services, scarce electricity and, in some places, conflict. This report asks whether that exposure is destiny. Its answer is **no**: the evidence suggests that **Polycrisis Resilience**, built through development rather than emergency response alone, can reduce African vulnerability substantially across this century.

70%	5×	109 m	3.8 bn
of Africans live in countries that are in the world's worst fifth on four or more of seven challenges	faster progress on clean cooking than Africa achieved in 2010–24 is needed to reach 95% access by 2040	fewer child deaths in 2025–2100 if every country matched the best peer pace, compared with its current pace	Africans projected for 2100 (UN medium variant), up from 1.5 bn today

Principal findings

- **The challenges stack up in the same places.** On seven measures (climate hazard, air pollution, poverty, food and water, health, energy and political stability), 34 of 54 African countries are in the world's worst fifth on four or more. They hold 1.06 billion people, 73% of everyone on Earth in that position (Section 3). Thirteen African countries, by contrast, have two or fewer, which shows that the pattern is not fixed by geography.
- **Progress is real but is being outrun by population growth.** Since 2000 the share of Africans with electricity rose from 38% to 62% and under-five mortality fell from 128 to 62 per 1,000 births. Yet the number of Africans without clean cooking grew from 636 million to 996 million, and Africa now holds 89% of the world's people without electricity (Section 2).
- **The pace has to change.** To reach 95% access by 2040, Africa would need to gain 2.1 points a year on electricity (it managed 1.4), 3.8 on clean cooking (0.8) and 3.1 on sanitation (0.7). Faster rates are not hypothetical: the top tenth of comparable countries have achieved 3.6, 2.7 and 2.5 points a year (Section 5).
- **Ten development pathways reduce several vulnerabilities at once.** Clean cooking, for example, is an energy, air-quality, public-health and household-welfare intervention at the same time. Household air pollution killed about 762,000 Africans in 2021 (WHO, 2026); the Interna-

tional Energy Agency estimates that universal access by 2040 would cost about $37 billion in total, or $2 billion a year (IEA, 2025) (Section 6).

- **The century-long difference is very large.** At each country's current pace, 1.5 billion Africans would still lack clean cooking in 2100; at the best-peer pace the figure is 35 million. Cumulative child deaths from 2025 to 2100 would be about 160 million at current pace and 52 million at the best-peer pace, and household air pollution deaths would be 61 million lower (Section 7; Section 8). These are scenario calculations, not forecasts.
- **Prevention is usually cheaper than response, but the money is moving the wrong way.** Global estimates put benefit-cost ratios for adaptation and resilient infrastructure at between 2:1 and more than 10:1 (Global Commission on Adaptation, 2019; Hallegatte et al., 2019). Meanwhile official development assistance fell by 23% in 2025 (OECD, 2026) and international adaptation finance covers a small fraction of estimated needs (UNEP, 2025) (Section 9).

What this means for policy

The report concludes with ten priorities (Section 11). Four carry the most weight. First, **aim at the bottleneck pathways**, clean cooking, sanitation and electricity, where the gap between current and needed pace is widest. Second, **favour interventions with multiple benefits**, because each dollar then works against several challenges at once. Third, **finance prevention before crisis**, using concessional funds, risk pools and domestic budgets that survive aid cuts. Fourth, **measure progress by people, not percentages**: with the population set to rise sharply, a rising share can hide a rising headcount. The aim of Polycrisis Resilience is not a fixed end state but continuous improvement, so that each generation of Africans inherits lower vulnerability than the last.

About the evidence

All figures come from public sources, mainly the World Bank, the World Health Organization, the United Nations and the European Commission's INFORM Risk Index, and are linked in the text. The analysis covers all 54 African countries and uses the latest data year (mostly 2023 or 2024). Scenario results are arithmetic based on stated paces and are labelled as such. Where the evidence is mixed, as with clean cooking and health outcomes, the report says so.

SECTION 01

The Central Argument: Exposure Is Not Destiny

Africa's exposure to interconnected crises over this century is not predetermined. It will be shaped by how much is invested in development, prevention, adaptation and technology diffusion, and how well those investments are coordinated.

IN BRIEF

- Africa's population is projected to rise from 1.5 billion to 3.8 billion by 2100, from 19% to 37% of humanity.
- Africa contributes about 4% of global CO_2 emissions yet carries some of the heaviest burdens from climate, pollution and poverty.
- Polycrisis Resilience is a framework for understanding, coordinating and evaluating the interventions that can reduce this vulnerability.

1.1 The argument in brief

Most discussion of Africa's future risks treats each crisis separately: a drought here, a disease outbreak there, a debt problem somewhere else. This report starts from a different observation. In much of Africa the same households and the same governments face **many challenges at once**, and those challenges reinforce one another. A family that cooks over an open fire breathes polluted air, which raises the risk of childhood pneumonia; a clinic without reliable power cannot keep vaccines cold; a drought that cuts the harvest raises food prices, which pushes families deeper into poverty and strains public budgets. The harm from the combination is greater than the sum of the parts. Researchers call this pattern a *polycrisis* (Lawrence et al., 2024; Lawrence et al., 2022).

The good news is that the same interconnection works in reverse. Because the challenges share upstream causes (low incomes, weak infrastructure, limited institutional capacity), a well-chosen investment can reduce several of them together. Electrifying a health clinic improves care and food storage. A clean cookstove cuts household smoke, saves women's time and reduces pressure on forests. Better water systems reduce disease and lower the cost of drought. Seen this way, development spending is not separate from risk reduction. It is one of the strongest forms of it. Research on disaster mortality points the same way: differences in income, institutions and infrastructure explain much of why the same hazard kills far fewer people in some countries than in others (Kahn, 2005; Toya and Skidmore, 2007).

Polycrisis Resilience

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

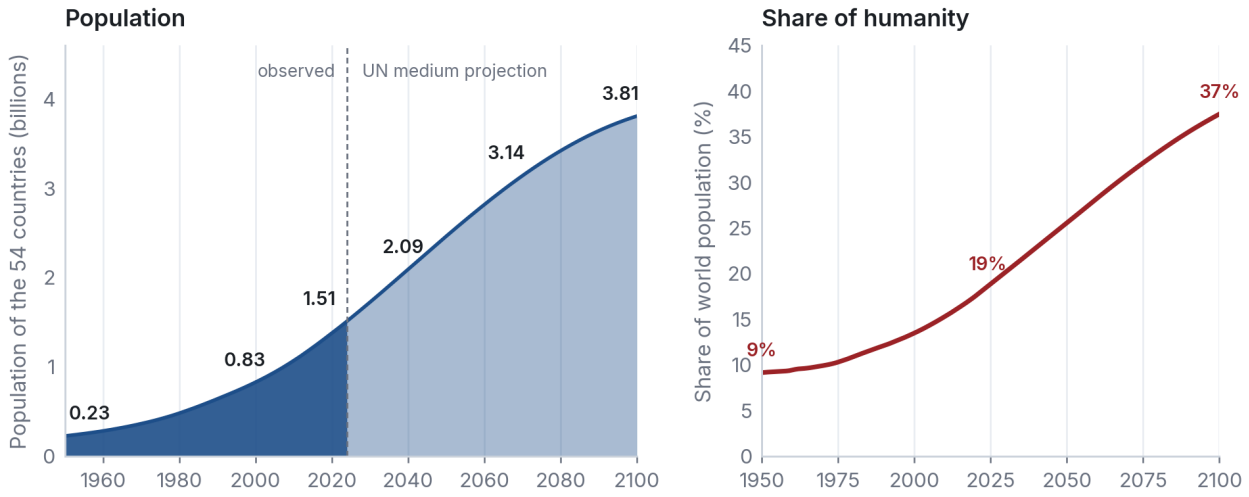
General definition. A concept developed by Hunter Hughes, Founder of H Heuristics (Hughes, 2026).

1.2 Why a century-long view

Polycrisis Resilience should not be judged only by what happens in the next five or ten years. Its contribution becomes much more interesting over several decades, for two reasons. The first is that many of the most effective investments are slow to mature: a girl who finishes secondary school in 2030 raises children with better prospects in the 2040s and 2050s, and a city that is planned well in 2030 is safer in 2080. The second is demography. Africa's population is projected to rise by 2.3 billion people between now and 2100 (United Nations, 2024; Our World in Data, 2025). A given level of vulnerability today will affect far more people in the future unless it is reduced faster than the population grows.

Figure 1 Africa's population is projected to more than double, from 19% to 37% of humanity

Left: population (billions). Right: share of world population (%), 1950–2100



Source: United Nations World Population Prospects 2024, medium variant, via Our World in Data (United Nations, 2024; Our World in Data, 2025). Sum of 54 African countries. Calculations by H Heuristics.

This report therefore uses three strategic horizons: **2026–2040**, when foundations are laid; **2040–2070**, when development and convergence accelerate; and **2070–2100**, when long-term resilience is consolidated. These are planning horizons rather than predictions. Progress will differ greatly between countries, and Section 7 shows how different the outcomes could be depending on the pace of investment.

1.3 Vulnerability is not responsibility

Africa's exposure to climate and pollution stresses is largely not of its own making. In 2023 the 54 African countries together emitted about 4% of global fossil-fuel and industry CO_2, or roughly 1.0 tonne per person against 4.6 tonnes for the world as a whole (Our World in Data, 2025a). This matters for two reasons. It means that Africa's resilience investments cannot be financed on the assumption that the continent can simply cut its own emissions to solve the problem. And it means that low-carbon development choices made now, such as clean cooking and distributed solar power, are chances to avoid locking in the higher-emission, higher-pollution pathways that richer countries followed.

1.4 What this report does and does not claim

The report combines public data for all 54 African countries from the World Bank's World Development Indicators, the European Commission's INFORM Risk Index, the World Health Organization and the UN population projections (World Bank, 2026; World Bank, 2025; European Commission JRC, 2026; WHO, 2026; United Nations, 2024). It does four things. Section 2 documents seven interconnected challenges. Section 3 shows how they stack up. Section 4 and Section 5 set out the framework and ten development pathways. Section 6 examines clean cooking as a worked example. Section 7 and Section 8 ask what the next 75 years could look like at three different paces of progress. Section 9, Section 10 and Section 11 cover costs, evidence from African successes, risks and priorities.

It does **not** claim that development will automatically reduce vulnerability, that all interventions are equally effective, or that the scenarios are predictions. Scenario results are arithmetic: they show what would follow if countries progressed at stated paces, using real historical rates as the benchmarks. Where evidence is mixed (clean cooking trials are a notable example) the report says so. Limits and uncertainties are set out in Section 10.

SECTION 02

Why Africa Is Particularly Important: Seven Interconnected Challenges

Africa faces climate stress, polluted air, poverty, food and water insecurity, health gaps, energy poverty and instability together, and on most measures it lags other developing regions by wide margins.

IN BRIEF

- Africa has 62% electricity access and 34% clean cooking access, against 97% and 69% in other low- and lower-middle-income countries.
- Africa holds 19% of the world's people but 89% of those without electricity and an estimated 63% of child deaths.
- Climate hazard exposure is not what sets Africa apart. What sets it apart is how little protection most people have when hazards arrive.

2.1 Seven challenges, nine measures

Table 1 sets out the seven challenges and the indicators used to track them. The comparison group is the 'other low- and lower-middle-income' countries, meaning every non-African country the World Bank classifies in those income bands, including India, Pakistan, Bangladesh and Indonesia. This is a fairer yardstick than the world average, because it asks how Africa compares with places at a similar stage of development. The last column shows the share of Africans living in countries that fall in the **worst fifth of all countries in the world** on each measure.

2.2 Climate change

Africa's climate challenge is better described as **low protection** than as unusually high hazard. On the INFORM hazard score, which averages flood, cyclone, coastal flood and drought exposure, Africa's population-weighted score (3.5) is below that of other low- and lower-middle-income countries (6.9), largely because South Asia is so exposed to floods and storms (European Commission JRC, 2026). Still, 7 African countries, home to 30% of Africans, are in the world's worst fifth, including Mozambique, Madagascar and Somalia. What differs is the cost of a given hazard. The World Meteorological Organization reports that African countries are losing 2–5% of GDP to climate extremes and that many divert up to 9% of their budgets to respond to them (WMO et al., 2024). The IPCC estimates that 3.3 to 3.6 billion people worldwide live in contexts highly vulnerable to climate change, including many in Africa (IPCC, 2023).

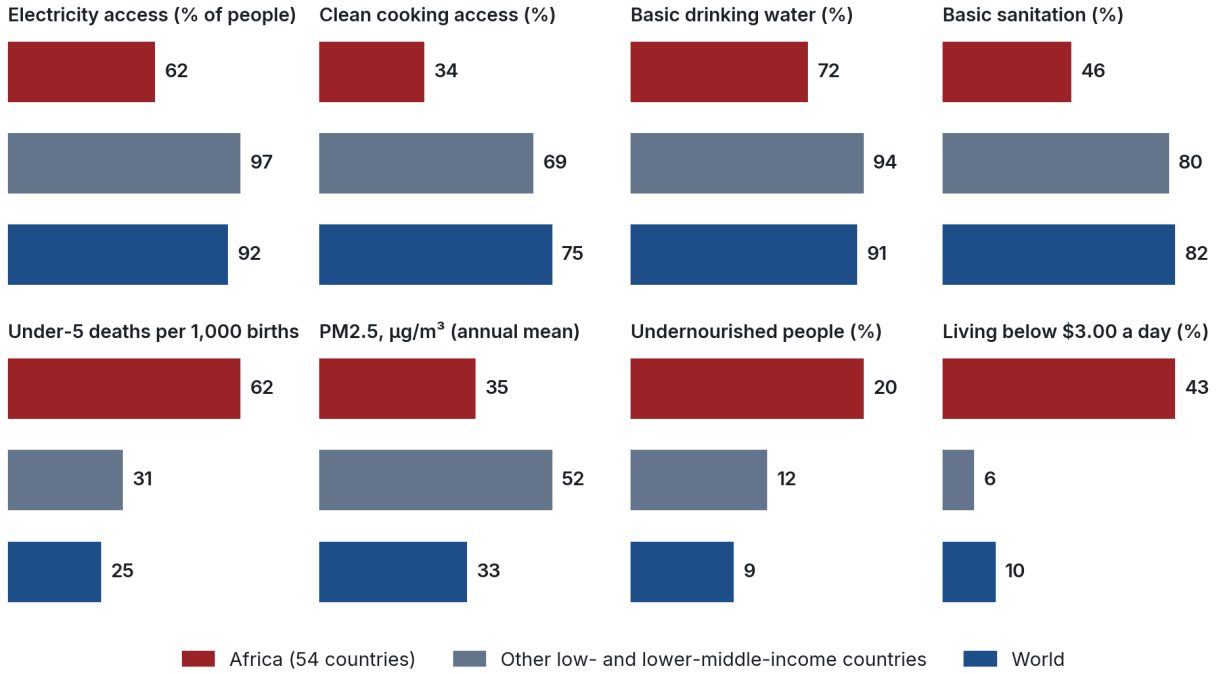
Table 1 Seven challenges: Africa compared with other developing countries and the world

Challenge	Measure (latest year)	Africa	Other LMIC	World	Africans in worst-fifth countries
1. Climate change	Climate hazard score, 0–10 (flood, cyclone, coastal flood, drought)	3.5	6.9	5.7	30%
2. Air pollution	PM2.5, µg/m³	35	52	33	48%
	Clean cooking access, %	34	69	75	61%
3. Poverty	GDP per person, PPP dollars	6,370	8,414	21,444	51%
4. Food and water insecurity	Undernourished people, %	20	12	9	61%
	Basic drinking water, %	72	94	91	75%
5. Healthcare	Under-5 deaths per 1,000 births	62	31	25	67%
6. Energy poverty	Electricity access, %	62	97	92	78%
7. Conflict and instability	Political stability index (−2.5 to +2.5)	-1.2	-1.0	-0.6	70%

Source: H Heuristics calculations from World Bank (2026), World Bank (2025) and European Commission JRC (2026). Population-weighted averages; Africa = 54 countries. 'Worst fifth' uses the 20th or 80th percentile of all countries in the latest year.

Figure 2 On most measures Africa is far behind other developing countries, and the gap is widest in energy and child health

Africa, other low- and lower-middle-income countries, and the world



Source: World Bank World Development Indicators, latest year, 2023–24 (World Bank, 2026). Population-weighted. Poverty uses the latest survey year (mostly 2018–22). Calculations by H Heuristics.

2.3 Air pollution

Average outdoor air in Africa is not much dirtier than the world average (PM2.5 of 35 against 33 μg/m^3), although the figure includes natural Saharan and Sahelian dust (World Bank, 2026). The larger problem is indoors. Only 34% of Africans cook with clean fuels or technologies, so about 996 million rely on wood, charcoal, dung or kerosene. The World Health Organization attributes about 762,000 African deaths in 2021 to household air pollution and a further 510,000 to outdoor air pollution (WHO, 2026). In other words, the main pollution risk for many Africans is the family kitchen.

2.4 Poverty

In the latest household surveys about 43% of Africans (population-weighted across 44 countries with data) lived on less than $3.00 a day, compared with 6% in other low- and lower-middle-income countries (World Bank, 2026). Poverty matters for resilience because it removes the cushion that lets households absorb a shock: when a harvest fails or a family member falls ill, a poor household sells assets, pulls children from school or goes hungry, and may not recover. GDP per person (about $6,370 in purchasing-power terms) is lower than in other developing regions and less than a third of the world average.

2.5 Food and water insecurity

About 20% of Africans are undernourished, against 9% worldwide, and only 72% have at least basic drinking water services (World Bank, 2026). Farming is both the main source of livelihoods and the sector most exposed to rainfall variability, yet cereal yields average about 2,151 kg per hectare, less than half the world's 4,434 kg. Low yields leave little margin for a poor season. Water and food insecurity also feed into each other: unsafe water spreads diarrhoeal disease that stunts children's growth, and droughts raise food prices for urban consumers as well as rural farmers.

2.6 Healthcare

Africa's under-five mortality rate (62 per 1,000 births) is twice that of other low- and lower-middle-income countries and life expectancy (64 years) is about 7 years shorter (World Bank, 2026). Combining births with these rates suggests that roughly 3.1 million African children under five died in 2024, about 63% of the world total, even though Africa has only 19% of its people. There are about 0.4 physicians per 1,000 people, against 0.9 in other developing countries and 1.8 worldwide. Health systems are the front line when other crises arrive: a flood, a heatwave or a food shortage all show up first as clinic visits.

2.7 Energy poverty

About 581 million Africans have no electricity, 89% of all such people in the world, and 996 million lack clean cooking (World Bank, 2026; IEA et al., 2025). Energy poverty is the most clearly Africa-specific of the seven challenges, and it is a keystone for the rest: electricity powers clinics, water pumps, schools, phones and cold storage; clean cooking fuels cut indoor pollution. The World Bank and African Development Bank have launched Mission 300, a plan to connect 300 million Africans to electricity by 2030 (World Bank, 2024). Early reports in mid-2026 put connections at more than 50 million (Business Report, 2026).

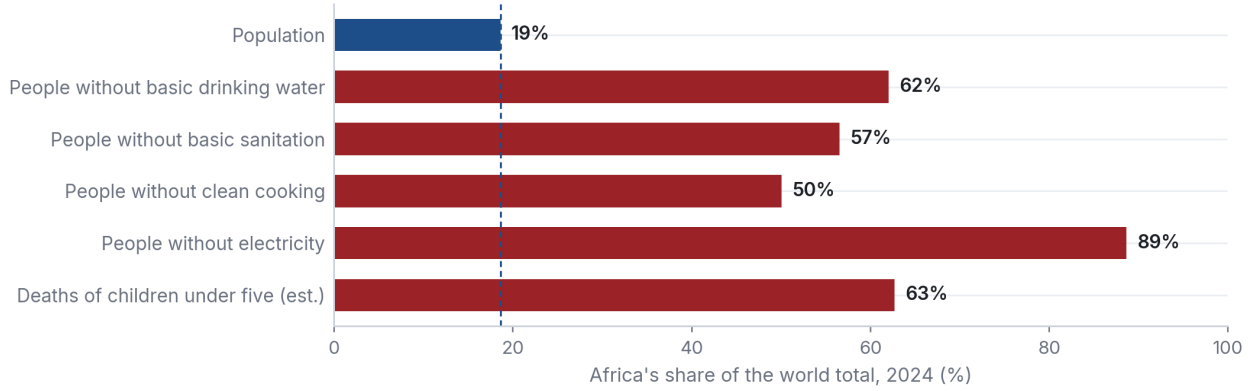
2.8 Conflict and instability

Africa's average score on the World Bank's political stability index (-1.2) is below that of other low- and lower-middle-income countries (-1.0) and the world (-0.6) (World Bank, 2025). Twenty-four of 54 countries, with 70% of Africans, fall in the world's worst fifth. Conflict disrupts the other six challenges: it destroys infrastructure, displaces farmers and health workers, and diverts public budgets. The Uppsala Conflict Data Program recorded the highest number of state-based conflicts worldwide in 2024 since its records began in 1946 (UCDP, 2025). Governance and security are therefore not outside the resilience agenda but part of it.

Taken together, the seven challenges describe a continent where the basic services that insulate people from shocks (power, clean fuel, water, sanitation, health care and reliable institutions) are least available to the people who face the most shocks. That is the starting point for the analysis that follows. Section 3 shows how the challenges cluster and why single-issue approaches struggle.

Figure 3 Africa has 19% of the world's people but 89% of those without electricity and an estimated 63% of child deaths

Africa's share of the world total, 2024



Source: World Bank World Development Indicators and UN World Population Prospects 2024 (World Bank, 2026; United Nations, 2024). Child deaths estimated as births times the under-five mortality rate. Calculations by H Heuristics.

SECTION 03

How the Challenges Compound

The seven challenges are not scattered evenly. They pile up in the same countries, and each reinforces the others, which is why single-issue fixes so often disappoint.

IN BRIEF

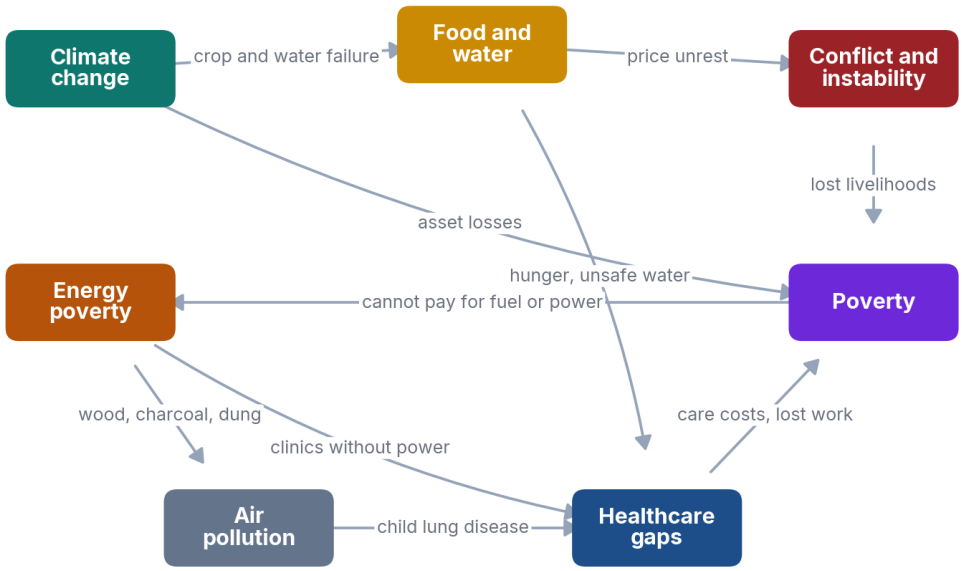
- 34 of 54 African countries, with 1.06 billion people, are in the world's worst fifth on four or more of the seven challenges.
- That is 73% of the world's people in that position, from a continent with 19% of the population.
- Since 2000 the share of Africans in such countries fell from 78% to 70%, but the number rose from 650 million to 1,061 million.

3.1 How the challenges feed one another

Polycrisis researchers describe three ways in which separate problems become entangled: **common causes**, where one stress drives several crises; **domino effects**, where one crisis triggers the next; and **feedback loops**, where crises reinforce one another (Lawrence et al., 2024). All three show up in the African data. Figure 4 sketches the main links among the seven challenges. Poverty is a hub: it makes households unable to buy clean fuel or power, which keeps indoor air polluted and clinics dark; polluted air and weak health care raise the cost of illness; and illness pushes families deeper into poverty. Climate shocks and conflict enter the same loop from outside, through failed harvests, lost livelihoods and displaced people.

Figure 4 The seven challenges form loops, with poverty and health at the centre

Main causal links among the seven challenges



Source: H Heuristics synthesis of evidence discussed in Section 2 and Lawrence et al. (2024). Arrows show the main direction of influence; most links also run the other way.

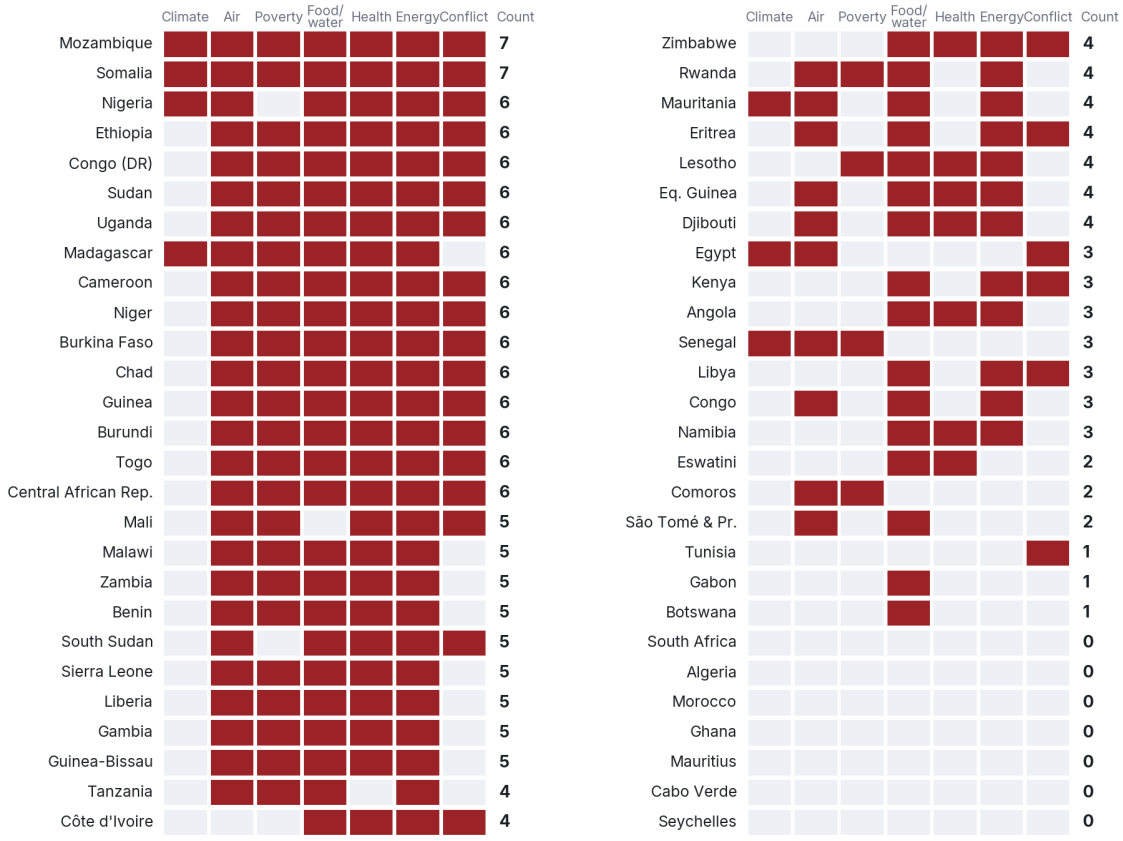
Consider a single drought year in a Sahelian country. The harvest falls, so food prices rise. Families sell livestock and tools, and some members migrate to cities or across borders for work. Children are pulled from school, malnutrition rises, and clinics see more cases of diarrhoea and respiratory disease. The government, already spending more on interest than on health in many African countries (Boston University GDP Center, 2025), has little room to respond. A year later, the next shock arrives before the household has rebuilt its assets. This is the 'whole is more dangerous than the sum of its parts' logic of the polycrisis.

3.2 Where the challenges pile up

To see where challenges concentrate, each country is flagged on each of the seven challenges if it falls in the worst fifth of all countries in the world. The seven rules are: climate hazard score above 4.3; PM2.5 above 32 µg/m^3 *or* clean cooking access below 31%; GDP per person below $5,146; undernourishment above 17% *or* basic water access below 83%; under-five mortality above 39 per 1,000; electricity access below 78%; and a political stability score below -0.7. Figure 5 shows every African country. Two, Mozambique and Somalia, are in the worst fifth on all seven. A further 14 countries are on six, among them Nigeria, Ethiopia, the Democratic Republic of the Congo, Sudan and Uganda. At the other end, 13 countries (including Algeria, Botswana, Ghana, Mauritius, Morocco, South Africa and Tunisia) are on two or fewer.

Figure 5 Most African countries are in the world's worst fifth on four or more challenges, but a minority are on two or fewer

Seven challenges by country, 2024



Source: H Heuristics calculations from (World Bank, 2026; World Bank, 2025; European Commission JRC, 2026). Latest year. Red = in the world's worst fifth. Countries ordered by number of challenges, then population.

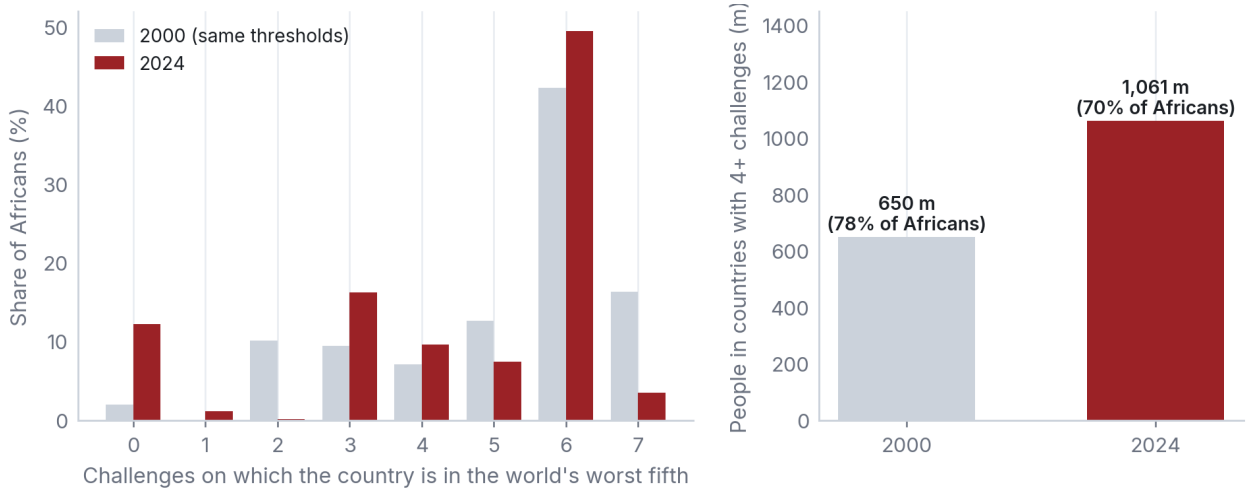
The pattern is not an artefact of the threshold chosen: with a more generous worst-third cut-off, 46 countries and 88% of Africans would be flagged on four or more. Income matters, but it is not destiny. All 21 low-income African countries have four or more flags, against 12 of 24 lower-middle-income countries and 1 of 8 upper-middle-income countries. Ghana, a lower-middle-income country, has no flags at all, and specific choices, such as Ghana's electrification drive and Morocco's widespread use of bottled gas for cooking, visibly change outcomes.

3.3 Progress since 2000, and the arithmetic of population growth

Applying the same thresholds to the year 2000 shows how far Africa has come, and how far it has not. In 2000, 78% of Africans lived in countries with four or more flags. By 2024 that share had fallen to 70%. The population-weighted average number of flags fell from 5.1 to 4.5, compared with 2.2 for the world today. Yet because the population grew by about 680 million people over the period, the **number** of people in such countries rose from 650 million to 1,061 million (Figure 6). Progress in percentages is not the same as progress in lives.

Figure 6 A smaller share of Africans live with stacked challenges than in 2000, but the number has grown by more than 400 million

Left: share of Africans by number of challenges. Right: people in countries with four or more



Source: H Heuristics calculations from (World Bank, 2026; World Bank, 2025; European Commission JRC, 2026; United Nations, 2024). Thresholds fixed at 2024 world worst-fifth values; climate hazard is held constant.

3.4 Why stacking matters for policy

Stacked challenges have two practical implications. First, **buffers are shared**: a country with weak electricity, weak health systems and low incomes has no strong sector to draw on when another sector is hit. Second, **sequencing and coordination matter**. A programme that tackles one challenge alone may be undermined by another, for example when new clinics lack power. Energy poverty (78% of Africans in worst-fifth countries), food and water insecurity (76%) and air pollution (76%) are the most widespread, and all three can be reduced by investments within reach. The framework in Section 4 is built to deal with exactly this problem.

SECTION 04

The Polycrisis Resilience Framework Applied to Africa

Polycrisis Resilience provides a common language for understanding, coordinating and evaluating the many interventions that reduce vulnerability, from the household to the continent.

IN BRIEF

- Polycrisis Resilience has six capacities: risk reduction, prevention, absorption, recovery, adaptation and transformation.
- The H Heuristics framework applies them through a five-stage development cycle that starts by identifying vulnerability and ends by strengthening long-term resilience.
- In Africa, the greatest leverage lies in risk-reduction and transformative investments that shrink vulnerability itself, supported by strong absorptive capacity.

4.1 The concept in plain language

Most people think of resilience as 'bouncing back'. Polycrisis Resilience goes further. It asks whether people, communities, institutions and systems can **anticipate, withstand, adapt to, recover from and reduce their vulnerability** to several crises that interact. The last phrase is the key one. A society that recovers from every flood but stays just as exposed to the next is not resilient for long. Making fewer people poor, sick, exposed or cut off is the surest long-term resilience.

The framework breaks this idea into six capacities that act at different moments: before, during and after a crisis, and in the long quiet years between (Hughes, 2026). Table 2 shows what each means in Africa, with an example and an indicator to watch.

4.2 A five-stage development cycle

The H Heuristics framework turns the concept into a cycle of five stages, repeated continuously as conditions change (Hughes, 2026). Table 3 shows how this report follows it.

4.3 Four development drivers

The framework also names four drivers that move societies through the cycle: **convergence** (poorer countries catching up in incomes and living standards), **technology diffusion** (new tools such as solar power and mobile payments reaching people quickly), **sustainable development** (growth that does not lock in pollution or degrade the resource base) and **coordinated improvement** (progress in linked systems at the same time). Africa has large gaps to close and can adopt newer technologies without first building legacy systems. Because interventions can produce multiple benefits simultaneously, Section 5 looks across ten pathways rather than one sector.

Table 2 Six capacities of Polycrisis Resilience and what they look like in Africa

Capacity	What it does	African example	Indicator to watch
Risk reduction	Lowers the underlying drivers of vulnerability	Morocco reached 97% clean cooking and 100% electricity access; Rwanda cut under-five mortality by 80% since 2000	Share of people with clean cooking and electricity
Preventive	Makes crises rarer or milder	Rwanda's community health workers treat malaria, pneumonia and diarrhoea in villages (Farmer et al., 2013); early warning cuts storm damage (Global Commission on Adaptation, 2019)	Under-five mortality; early-warning coverage
Absorptive	Keeps essential functions working during shocks	Ethiopia's Productive Safety Net Programme cut the initial hit of drought by 57% (Knippenberg and Hoddinott, 2017); African Risk Capacity pools drought risk (African Risk Capacity, 2025)	Households covered by shock-responsive transfers
Recovery	Restores functions and welfare afterwards	Mobile money in Kenya raised household consumption and helped women move into business (Suri and Jack, 2016)	Time to regain pre-shock output and incomes
Adaptive	Learns and adjusts between crises	Better-educated populations suffer fewer climate disaster deaths (Lutz et al., 2014); climate-smart farming	Completion of schooling; adoption of improved farming
Transformative	Changes pathways that generate vulnerability	Leapfrogging to distributed solar and mobile payments rather than copying older infrastructure	Structural shifts in energy, finance and cities

Source: H Heuristics, drawing on Hughes (2026) and sources cited in the table; country figures from World Bank (2026).

Table 3 The five-stage cycle and where it appears in this report

Stage	Question it answers	Applied in this report
1. Identify vulnerability	Where are people most exposed, and to which interacting challenges?	Seven-challenge map and stacking analysis (Section 2, Section 3)
2. Prioritise development interventions	Which investments reduce the most vulnerability for each dollar?	Ten pathways and the multiple-benefit matrix (Section 5, Section 6)
3. Strengthen interconnected systems	How do energy, health, water, digital, urban and institutional systems support each other?	Co-benefit reasoning in every pathway; priorities for coordination (Section 11)
4. Reduce systemic vulnerability	How many fewer people are exposed, and how much less is lost in shocks?	Three-horizon scenarios and human impact (Section 7, Section 8)
5. Strengthen long-term resilience	Are gains durable, financed and learning from experience?	Costs, risks and scorecard (Section 9, Section 10, Section 11)

Source: H Heuristics, from the framework in Hughes (2026).

SECTION 05

Ten Development Pathways That Reduce Vulnerability

Ten pathways, from clean energy to institutions, each cut several vulnerabilities at once. On the four most measurable, Africa is moving at one-quarter to one-half of the pace its peers have shown is possible.

IN BRIEF

- The pathways are clean energy, clean cooking, healthcare, climate adaptation, water, agricultural technology, digital infrastructure, education, institutions and urban infrastructure.
- Each links to several of the seven challenges; six of the ten have strong links to two of them.
- Africa gained 1.4 points a year on electricity, 0.8 on clean cooking and 0.7 on sanitation in 2010–24, while the best peers achieved 3.6, 2.7 and 2.5.

5.1 The ten pathways and Africa's starting point

Table 4 lists ten development pathways, the contribution each can make to resilience, and where Africa stands today. They are not new ideas. What the Polycrisis Resilience lens adds is a way to see them **together**, as investments in the same underlying vulnerability, rather than as separate sector programmes competing for scarce funds.

5.2 One investment, many benefits

Figure 7 scores each pathway against the seven challenges. The scoring is a transparent judgement by H Heuristics, based on the evidence cited in this section, and readers may weigh it differently. Three patterns stand out. First, no pathway tackles everything; each has a home challenge where its effect is strongest. Second, education, institutional development and urban infrastructure are the most broadly useful, with moderate or strong links to at least five of the seven challenges. Third, digital infrastructure has no strong links but moderate ones with three challenges, which fits its role as an enabler of other pathways rather than a solution on its own.

5.3 Energy: clean power and clean cooking

Electricity and clean cooking are the two energy pathways, and they need different solutions. Electricity access in Africa rose from 38% to 62% between 2000 and 2024, a good pace, and a handful of countries, including Kenya, Rwanda, Ghana and Ethiopia, gained between 40 and 66 points. Grid extension and off-grid solar are both contributing, and for remote households distributed systems are usually cheaper (IEA et al., 2025). Clean cooking has moved far more slowly (from 23% to 34%), and the headcount without access has risen. Section 6 treats it in detail.

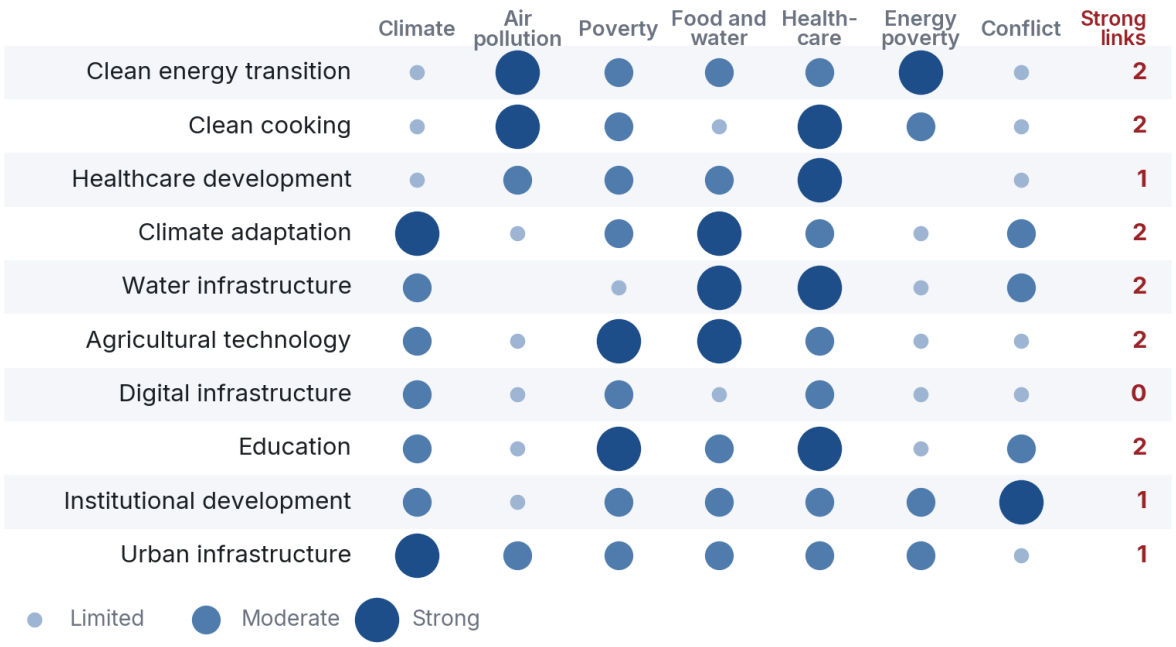
Table 4 Ten pathways, their resilience contribution, and Africa's position

Development pathway	Potential resilience contribution	Africa today (latest year)
Clean energy transition	Reduces pollution and energy insecurity	62% have electricity; 581 million do not
Clean cooking	Reduces household air pollution exposure	34% have clean cooking; 996 million do not
Healthcare development	Improves preventative care and crisis response	Under-5 mortality 62 per 1,000; 0.4 physicians per 1,000 people
Climate adaptation	Reduces exposure to extreme weather	Losses of 2–5% of GDP; adaptation costs $30–50 billion a year in sub-Saharan Africa (WMO et al., 2024)
Water infrastructure	Reduces water insecurity and drought vulnerability	72% have basic drinking water; 46% basic sanitation
Agricultural technology	Improves food security and climate resilience	Cereal yields 2,151 kg/ha against 4,434 for the world
Digital infrastructure	Expands access to information, services and economic opportunities	40% use the internet, against 61% in other developing countries
Education	Strengthens long-term adaptive capacity	Primary completion 75%, against 91% in other developing countries
Institutional development	Improves preparedness and coordination	Government effectiveness -0.72, against 0.00 in other developing countries (scale −2.5 to +2.5)
Urban infrastructure	Reduces exposure to environmental and infrastructure risks	Urban population up from 299 million to 695 million since 2000; 46% urban

Source: H Heuristics, from World Bank (2026), World Bank (2025) and sources cited. Contribution column summarises the framework in Hughes (2026).

Figure 7 Every pathway reduces several challenges; the strongest links are in each pathway's home area

Strength of link between each pathway and each of the seven challenges



Source: H Heuristics judgement based on the evidence discussed in Section 5. Larger circles indicate stronger and better-evidenced links.

5.4 Health and water

Health and water are tightly linked, because dirty water and poor sanitation drive child illness. Rwanda is the standout case: under-five mortality fell from 184 to 38 per 1,000 between 2000 and 2024, a fall of 80%. Analysts credit a mix of village health workers, community-based health insurance and sustained government commitment (Farmer et al., 2013). Sanitation is Africa's slowest-moving basic service: only 46% of Africans have at least basic sanitation, and the rate has risen by about 0.7 points a year, less than the rate for other low- and lower-middle-income countries (1.0).

5.5 Climate adaptation and agricultural technology

The Global Commission on Adaptation estimated that investing $1.8 trillion globally over 2020–2030 in five areas (early warning systems, resilient infrastructure, improved dryland agriculture, mangrove protection and water resource management) could generate $7.1 trillion in net benefits, with benefit-cost ratios between 2:1 and more than 10:1 (Global Commission on Adaptation, 2019). Warning people 24 hours before a storm or heatwave can cut damage by about 30%, according to the same commission. For African farmers, who produce food mostly on rainfed land, improved seeds, soil management and small-scale irrigation are the most direct tools: they raise average yields and also reduce the harm of dry spells. Africa's low cereal yields mean that the gains available from catching up are large.

5.6 Digital infrastructure, education and institutions

Three pathways build the capacity to use the others. **Digital infrastructure** brought mobile money to Kenya, which raised household consumption and lifted an estimated 2% of households out of extreme poverty (Suri and Jack, 2016); yet only 40% of Africans use the internet. **Education** raises incomes and, across countries, is associated with lower deaths from climate disasters (Lutz et al., 2014); primary completion is 75% in Africa. **Institutional development** includes everything from disaster agencies and social registers to tax collection. Ethiopia's Productive Safety Net Programme is a well-studied example: payments to poor households cut the initial food-security damage from drought by 57% and removed it entirely within two years (Knippenberg and Hoddinott, 2017).

5.7 Urban infrastructure

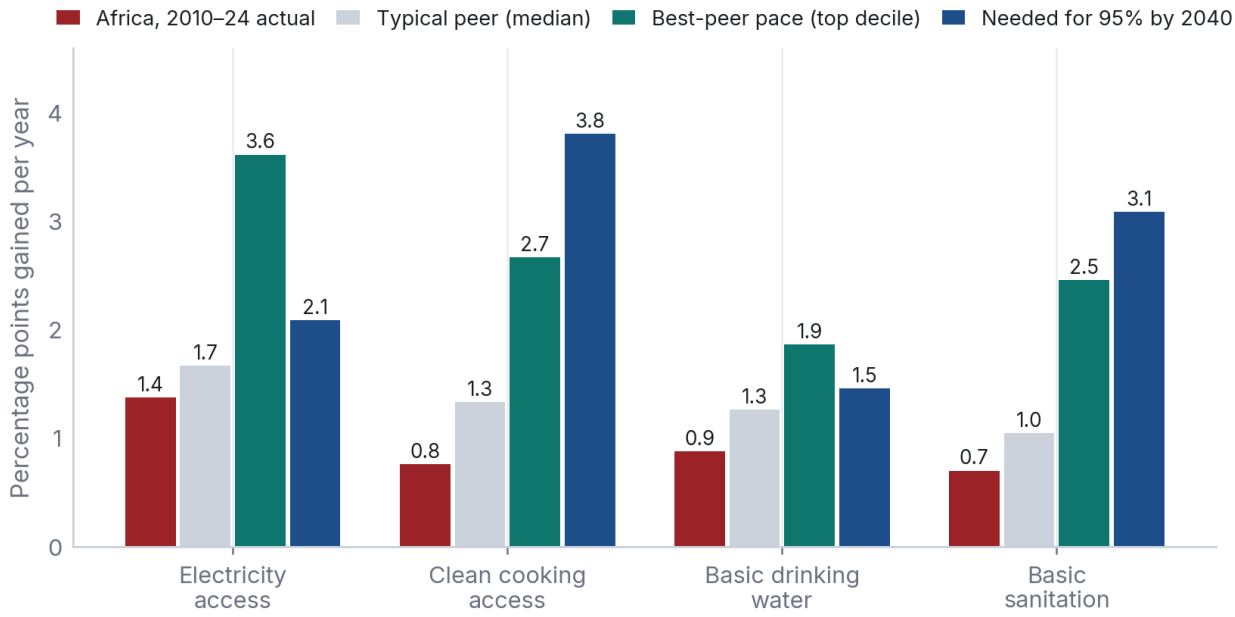
Africa's urban population has risen from 299 million to 695 million since 2000 and is projected to keep growing quickly. Roads, drains, housing, water and power laid down now will shape exposure to floods and heat for generations. The World Bank's *Lifelines* study found that, in low- and middle-income countries, every $1 invested in more resilient infrastructure yields about $4 in benefits (Hallegatte et al., 2019). Building resilience into cities is cheaper before they are built than after.

5.8 Is the pace enough?

Figure 8 compares four measures of pace for the four basic services. Africa's recent progress is slower than what a typical peer country achieved, and well below what the fastest decile achieved. The pace needed to reach 95% access by 2040 is within the best-peer range for electricity and water but **above** it for clean cooking (3.8 against 2.7 points a year) and sanitation (3.1 against 2.5), because the starting points are so low. Reaching 95% by 2050 requires 2.3 points a year for cooking and 1.9 for sanitation, both within the best-peer range. That is the benchmark used for the accelerated scenario in Section 7. Figure 9 shows why the gap matters. In 2000 Africa was level with other developing countries on clean cooking (23% in Africa, 23% elsewhere) and ahead on sanitation (33% against 24%); by 2024 other developing countries had pulled far ahead on both (69% and 80%). The practical implication is that clean cooking and sanitation need dedicated delivery systems, finance and targets, rather than a continuation of business as usual. These two services are where faster progress would reduce the most vulnerability per person reached, because they are the gaps that most directly produce illness, lost time and lost income.

Figure 8 Africa's recent pace is below the typical peer, far below the best peers, and well short of what 2040 targets need

Percentage points of the population gaining access per year



Source: H Heuristics calculations from World Bank WDI (World Bank, 2026). Africa: population-weighted average of country trends 2010–24. Peers: 15-year gains in non-African, non-high-income countries starting between 15% and 75%.

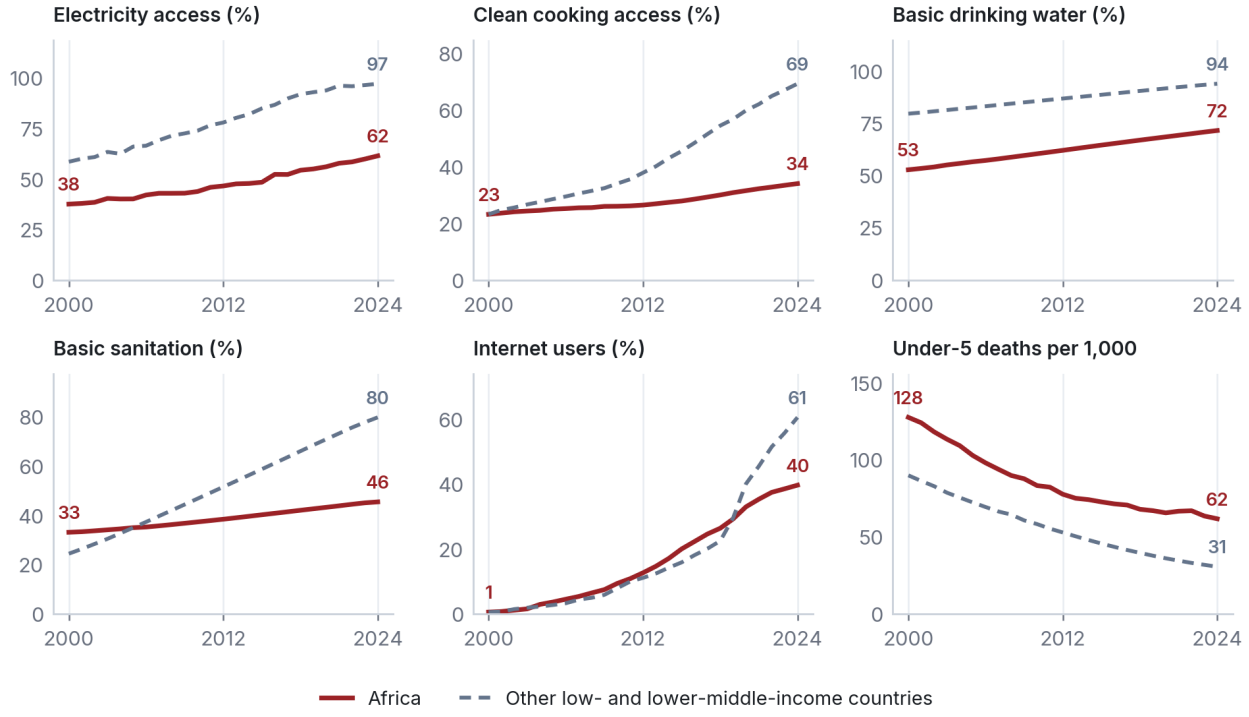
METHOD

What 'best-peer pace' means

It is the pace achieved by the fastest tenth (90th percentile) of non-African, non-high-income countries over 15-year periods, starting from a comparable level of access. It is demanding, but it is an observed pace, not a theoretical one. Several African countries have matched it for particular services: Kenya, Rwanda, Ghana and Eswatini each added 48 to 69 points of electricity access between 2000 and 2024, which is about 2 to 2.9 points a year.

Figure 9 Since 2000 Africa has made progress on every service, but other developing countries have moved faster, and the gap in clean cooking has widened

Selected indicators, 2000–2024



Source: World Bank World Development Indicators (World Bank, 2026). Population-weighted averages. Africa: 54 countries; comparison: other low- and lower-middle-income countries.

> The report uses this pace as a benchmark for ambition. It does not assume that every country will reach it, and it uses each country's own pace where that is faster.

SECTION 06

Clean Cooking: A Worked Example of Multiple Benefits

Clean cooking is not simply an energy intervention. It is also an air-quality intervention, a public-health intervention, a household-welfare intervention and potentially a significant contributor to reduced long-term human vulnerability.

IN BRIEF

- About 996 million Africans, 66% of the population, cook with wood, charcoal, dung or kerosene; half of all such people in the world are in Africa.
- Household air pollution was linked to about 762,000 African deaths in 2021 (WHO, 2026).
- Trial evidence is mixed: cleaner stoves cut smoke exposure, but benefits for health depend on full, sustained switching.

6.1 Why cooking matters so much

Cooking is the largest single source of household air pollution. When a family burns wood, charcoal, dung or kerosene on an open fire or basic stove, it fills the home with fine particles and carbon monoxide. Women and young children, who spend the most time near the fire, breathe the most smoke. The World Health Organization attributes about 762,000 deaths in Africa in 2021 to household air pollution, roughly 26% of the world total (WHO, 2026). On average that is about 80 deaths a year for every 100,000 people without clean cooking. Collecting fuel also takes hours each week, usually from women and girls, and in some places drives forest loss (IEA, 2025).

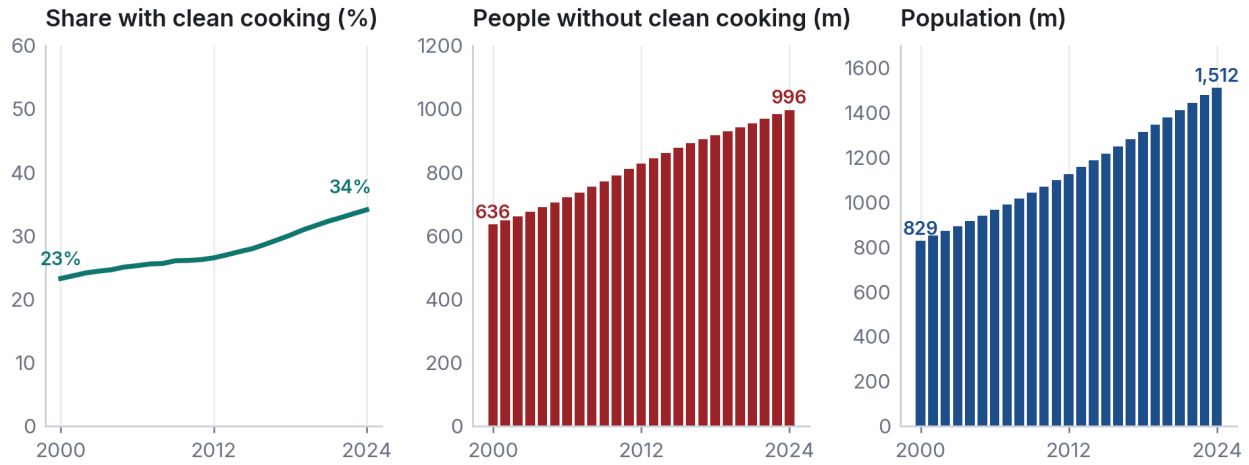
Despite these costs, access has moved slowly. Between 2000 and 2024 the share of Africans with clean cooking rose only from 23% to 34%. Population growth meant that the number without access **increased** from 636 million to 996 million (Figure 10). There are large differences between countries. Egypt and Algeria are at 100%, Morocco at 97% and South Africa at 90%, while the Democratic Republic of the Congo (5%), Ethiopia (7%) and Rwanda (9%) are below 10%. Nigeria, with 233 million people, is at 28%.

6.2 Five benefits from one change

A shift from open fires to clean fuels or clean technology touches at least five dimensions of vulnerability, summarised in Table 5. The table also records the strength of the evidence, because the benefits differ in how well they have been measured.

Figure 10 The share of Africans cooking cleanly has risen slowly, so the number without access has grown by more than 350 million

Share with clean cooking, number without, and total population, 2000–2024



Source: World Bank World Development Indicators and UN World Population Prospects (World Bank, 2026; United Nations, 2024). Population-weighted for 54 countries. Calculations by H Heuristics.

Table 5 How clean cooking reduces vulnerability on several fronts

Dimension	How clean cooking helps	Evidence and caveats
Air quality	Cuts indoor and neighbourhood smoke	LPG lowered pollutant levels in the HAPIN trial (HAPIN Investigators, 2024); benefits require near-exclusive use
Public health	Lowers risks of lung disease, heart disease and child illness	About 762,000 African deaths linked to household air pollution in 2021 (WHO, 2026); but one large trial found no reduction in severe infant pneumonia (below)
Household welfare	Saves time and sometimes money; improves safety	Women and girls gain hours otherwise spent collecting fuel (IEA, 2025); costs of LPG or electricity can still be a barrier
Climate and forests	Reduces demand for unsustainably harvested wood and charcoal; avoids black-carbon emissions	Benefits depend on the fuel chosen and the sustainability of wood supply (IEA, 2025)
Long-term vulnerability	Healthier children and adults, more time for schooling and work, lower health spending	Plausible and widely expected, but long-run effects have been studied less than short-run exposure

Source: H Heuristics, drawing on sources cited in the table.

6.3 What the evidence shows, and what it does not

It is important to be honest about the evidence. The most rigorous test so far is the Household Air Pollution Intervention Network (HAPIN) randomised trial, which gave liquefied petroleum gas (LPG) stoves and fuel to pregnant women in India, Guatemala, Peru and Rwanda. LPG lowered the levels of harmful pollutants in homes, but it did **not** significantly reduce severe pneumonia in infants: the incidence was 5.67 cases per 100 child-years in the LPG group and 6.06 in the comparison group (HAPIN Investigators, 2024). The authors concluded that cooking with LPG did not lead to a lower incidence of severe infant pneumonia despite lower pollutant levels.

This result does not mean clean cooking is unimportant. Several explanations are possible, including that households often kept using their old stoves alongside the new one ('fuel stacking'),

that outdoor and neighbourhood pollution remained high, and that infant pneumonia has other causes. The lesson for policy is to aim for **complete and sustained switching**, to build clean cooking into wider health and air-quality programmes rather than relying on one device, and to evaluate results over a longer period. The case for clean cooking rests on its combined benefits, not on a single health outcome.

6.4 What it would take

The International Energy Agency estimates that universal clean cooking access in Africa by 2040 would need about $37 billion of cumulative investment, roughly $2 billion a year, and that it is achievable if African countries match the best historical rates of progress seen elsewhere in the developing world. Reaching 2040 would mean about 80 million additional people gaining access every year, around seven times the recent rate; over 60% of those gaining access would do so through LPG (IEA, 2025). The IEA estimates that this would avoid more than 4.7 million premature deaths by 2040. Dividing the investment by those avoided deaths gives roughly $8,000 per premature death avoided, *before* counting time savings, income gains or climate benefits.

The pace data tell the same story. Africa gained 0.8 points a year in 2010–24; the best peers achieved 2.7. At the best-peer pace, Africa-wide clean cooking access would reach 90% around 2052, but at each country's current pace it would still be below 90% in 2100 (Section 7). Clean cooking is therefore the clearest case in which acceleration, not continuation, is needed.

COUNTRY CONTRASTS

A cooking ladder for African countries

Already at or above 90%: Egypt, South Africa, Algeria, Morocco, Tunisia, Libya, Gabon, Mauritius, Seychelles. Most rely on bottled gas or electricity.

Large populations, low access: Nigeria (28%), Ethiopia (7%) and the Democratic Republic of the Congo (5%) alone have 474 million people. Progress here moves the continental total more than anywhere else.

Fast movers: Lesotho, Djibouti, Equatorial Guinea and Sudan each gained about 40 percentage points between 2000 and 2024, evidence that large jumps are possible within one generation.

SECTION 07

Three Horizons, 2026–2100: What Different Paces of Progress Could Mean

Over the next 75 years, the difference between stalling, continuing at today's pace and matching the best peers is the difference between hundreds of millions in deprivation and near-universal access.

IN BRIEF

- At the best-peer pace, Africa could reach about 96% electricity access by 2040; at the current pace, the figure is 79%.
- By 2100, 1.5 billion Africans would still lack clean cooking at today's pace, against 35 million at the best-peer pace.
- The scenarios are arithmetic, not forecasts: they show what would follow if each country progressed at a stated pace.

7.1 Three strategic horizons

Polycrisis Resilience should not be judged only by what happens in the next five or ten years. Consider three broad periods (Table 6). They are strategic horizons rather than predictions, and progress will differ substantially between countries and regions.

Table 6 Three horizons for building Polycrisis Resilience in Africa

Horizon	Strategic focus	What it involves	Typical measures of success
2026–2040	Establishing resilience foundations	Expand clean energy, clean cooking, healthcare, water infrastructure, agricultural productivity and climate adaptation	95% electricity access; cooking and sanitation headcounts cut by a third or more; under-five mortality below 30
2040–2070	Accelerating development and convergence	Wider technological diffusion, improved living standards, stronger institutions, more resilient infrastructure and reduced environmental exposure	Near-universal basic services; incomes converging with other developing regions
2070–2100	Consolidating long-term resilience	More developed economies, stronger adaptive capacity, lower structural vulnerability and improved ability to withstand interconnected crises	Residual deprivation below 2%; vulnerability comparable to today's high-income countries

Source: H Heuristics, from the horizons in the Polycrisis Resilience framework (Hughes, 2026). Measures of success are illustrative.

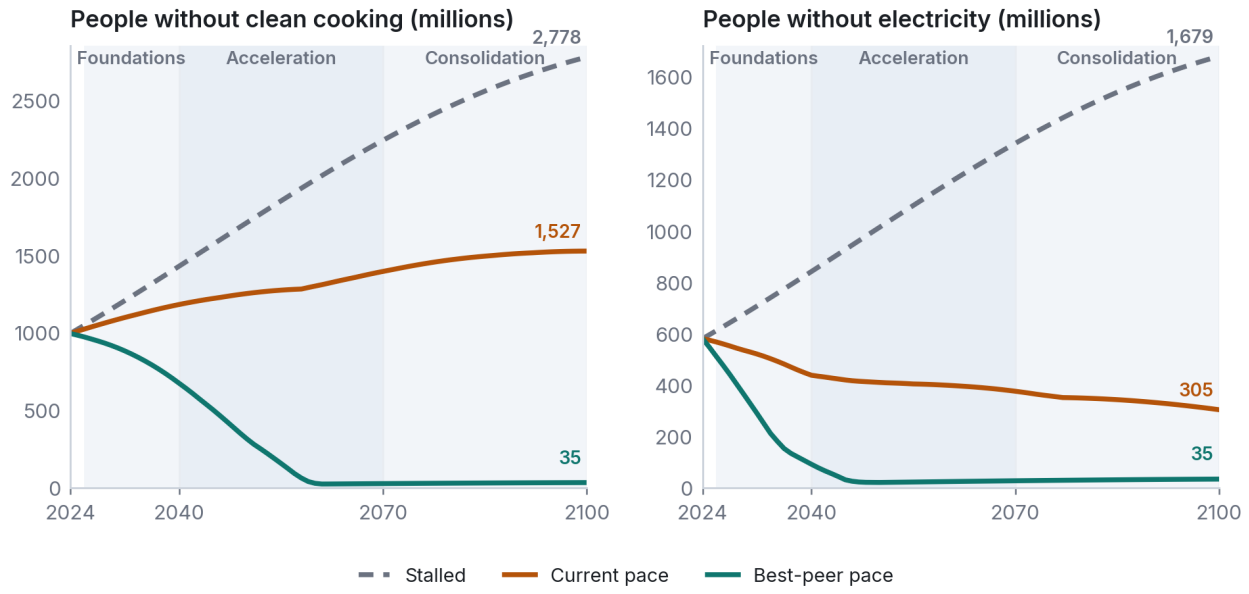
7.2 How the scenarios are built

Each scenario runs country by country from 2024 to 2100 using UN medium-variant populations (United Nations, 2024; Our World in Data, 2025). It follows four basic services, electricity, clean cooking, basic drinking water and basic sanitation, and under-five mortality. Three paces are compared. **Stalled**: coverage stays at 2024 levels, so more people are deprived as the population grows. **Current pace**: each country continues at its own 2010–24 rate of improvement. **Best-peer pace**: each country improves at the rate achieved by the fastest tenth of comparable non-African developing countries over 15-year periods (3.6 points a year for electricity, 2.7 for clean cooking, 1.9 for water and 2.5 for sanitation), or its own rate if faster. Coverage is capped at 99%. Mortality falls proportionally, with a floor of 5 per 1,000.

The best-peer scenario is demanding but not fanciful. It asks every African country to do what the fastest-improving developing countries have already done, for example Rwanda's health gains, Kenya's electrification and Morocco's cooking transition. It is a benchmark for ambition and a way to measure the value of acceleration. It is not a prediction that every country will succeed.

Figure 11 At the best-peer pace the number of Africans without clean cooking and electricity falls to a few tens of millions; at today's pace it stays in the hundreds of millions to billions

People without access, millions, 2024–2100



Source: H Heuristics scenario calculations from World Bank WDI and UN World Population Prospects 2024 (World Bank, 2026; United Nations, 2024). See text for method. Shading marks the three horizons.

7.3 Horizon 1, 2026–2040: foundations

The first 15 years decide how steep the later path is. At the best-peer pace Africa would be at about 96% electricity access and 93% basic water by 2040, with 93 million still without power, against 439 million at current pace. For clean cooking and sanitation the gains are smaller in this period: 676 million would still lack clean cooking even at best-peer pace, but 507 million fewer than at current pace. The priority is to build the delivery systems (supply chains, finance, institutions) that make fast progress possible later.

Table 7 People without basic services under three paces of progress (millions)

Service	Scenario	2024	2040	2070	2100	Person-years 2025–2100 (bn)
Clean cooking	Stalled	996	1,430	2,241	2,778	152
	Current pace	996	1,183	1,396	1,527	101
	Best-peer pace	996	676	29	35	21
Electricity	Stalled	581	842	1,341	1,679	91
	Current pace	581	439	377	305	31
	Best-peer pace	581	93	28	35	6
Basic sanitation	Stalled	824	1,176	1,837	2,279	125
	Current pace	824	942	973	972	73
	Best-peer pace	824	464	31	38	16
Basic drinking water	Stalled	430	619	984	1,235	67
	Current pace	430	358	343	392	27
	Best-peer pace	430	157	31	38	7

Source: H Heuristics scenario calculations (World Bank, 2026; United Nations, 2024). Water and sanitation follow the same pattern as cooking and electricity. Person-years = sum over 76 years of people deprived in each year. Figures are scenario arithmetic, not forecasts.

7.4 Horizon 2, 2040–2070: acceleration and convergence

Population keeps growing strongly in this period, rising from 2.1 billion to 3.1 billion. That makes headcounts a moving target: at today's pace, 973 million would still lack basic sanitation in 2070 and 1.4 billion would lack clean cooking, even though the *share* without would have fallen. At the best-peer pace, universal access to basic services is largely achieved: about 29 million without clean cooking in 2070 and 31 million without sanitation. Technology diffusion matters most here, because new tools spread fastest once the first infrastructure is in place.

7.5 Horizon 3, 2070–2100: consolidation

By 2100 the gap between the paths is 1,492 million people for clean cooking, 934 million for sanitation, 354 million for water and 270 million for electricity. The remaining 35 million at best-peer pace reflect the 99% cap and are about the same for all four services. Over the whole period, best-peer progress would avoid roughly 80 billion person-years without clean cooking, 57 billion without sanitation, 24 billion without electricity and 20 billion without basic water, compared with the current pace.

SECTION 08

The Human Impact: Counting People, Not Just Percentages

The most important outcome is not the number of crises prevented. It is the number of people whose vulnerability to those crises is reduced.

IN BRIEF

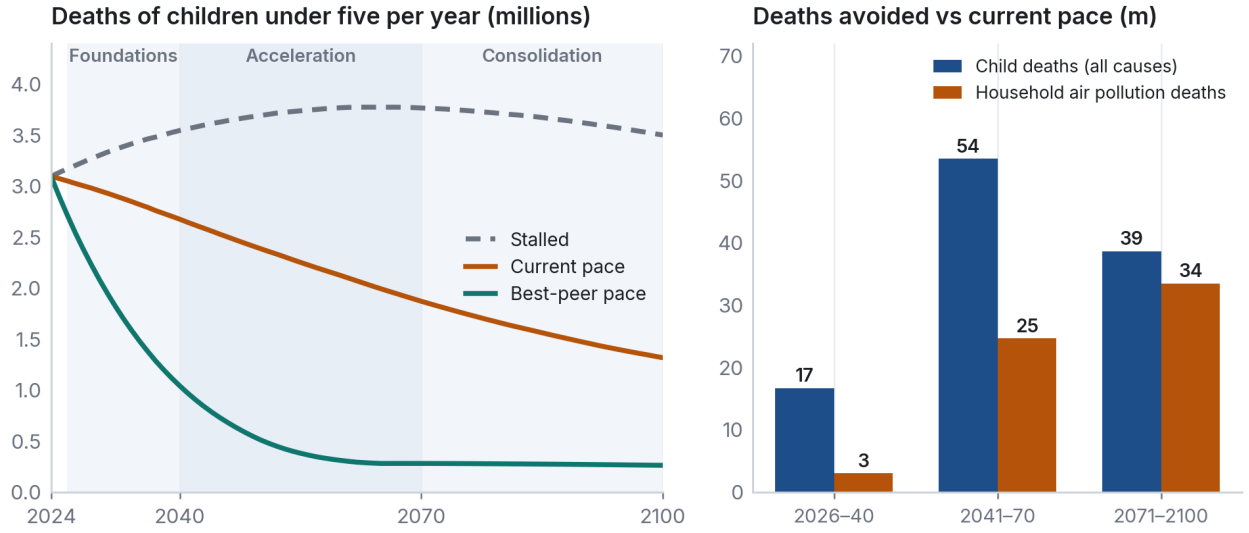
- Compared with the current pace, best-peer progress would mean about 109 million fewer child deaths in 2025–2100.
- It would also mean about 61 million fewer deaths from household air pollution; the two measures overlap and cannot be added.
- Behind the totals are everyday gains: cleaner kitchens, safer water, stronger clinics, more reliable harvests and safer cities.

8.1 Child survival and household air pollution

Figure 12 converts the scenarios into deaths. Child deaths are calculated as births (UN medium projection) times the under-five mortality rate. At a stalled rate of 62 per 1,000, about 275 million African children would die before their fifth birthday between 2025 and 2100, because births keep rising. At current pace the total is 160 million. At the best-peer pace it is 52 million. The difference, 109 million children, is the value of acceleration in the survival of children alone, and it grows with each horizon: 17 million in 2026–40, 54 million in 2041–70 and 39 million in 2071–2100.

Figure 12 Faster progress would avoid about 109 million child deaths and 61 million household air pollution deaths by 2100

Left: child deaths per year by scenario. Right: deaths avoided at best-peer pace relative to current pace



Source: H Heuristics scenario calculations from World Bank WDI, UN World Population Prospects 2024 and WHO Global Health Observatory (World Bank, 2026; United Nations, 2024; WHO, 2026). The two death measures overlap and are not additive.

Household air pollution deaths use a simple rule: each African country's 2021 WHO estimate is divided by the number of people without clean cooking, and that rate per deprived person is held constant, so deaths change only as the number without clean cooking changes. On this basis the stalled path would lead to 121 million deaths in 2025–2100, the current pace to 78 million and the best-peer pace to 17 million. For comparison, the IEA estimates 4.7 million premature deaths avoided in Africa by 2040 under its accelerated path (IEA, 2025), while this report's best-peer path, which reaches 90% clean cooking only around 2052, avoids about 3 million by 2040 compared with the current pace. The IEA path reaches universal access faster, so the two sets of numbers are consistent in scale but not identical.

8.2 What lower vulnerability looks like in people's lives

- **People who gain clean cooking** may experience substantially lower exposure to household air pollution. Under the best-peer pace about 80 billion person-years in smoke-filled kitchens would be avoided by 2100.
- **Communities with reliable water infrastructure** may become less vulnerable to drought and disease. About 20 billion person-years without basic drinking water would be avoided.
- **Populations with stronger healthcare systems** may experience better outcomes during disease outbreaks and environmental emergencies. Rwanda's community health workers and insurance scheme coincided with an 80% fall in under-five mortality (Farmer et al., 2013).
- **Farmers with improved agricultural technology** may become less vulnerable to climatic variability. In Ethiopia, safety-net payments cut the initial drought damage to food security by 57% (Knippenberg and Hoddinott, 2017).
- **Urban populations with better infrastructure** may experience lower exposure to extreme heat and flooding. Resilient infrastructure yields about $4 in benefits for every $1 in low- and middle-income countries (Hallegatte et al., 2019).

8.3 Beyond mortality

Deaths are the most measurable outcome but not the only one. Fewer illnesses mean more years of schooling and work. Reliable electricity keeps vaccines cold and supports small businesses, and mobile-money access in Kenya raised household consumption (Suri and Jack, 2016). Over decades, these improvements could translate into substantial health, economic and human-development benefits.

CAUTION

How to read the scenario numbers

They are not forecasts. They show what would follow from stated paces, using real historical rates as benchmarks.

The paces are averages. Country experiences will vary; some will exceed the best-peer pace and some will fall short, particularly where conflict or governance failures intervene.

Births are fixed. Population follows the UN medium variant in every scenario, although faster development would probably lower fertility and so slow population growth and lower these totals.

Mortality links are simplified. Child deaths use births times the under-five rate; household air pollution deaths assume a constant death rate per person without clean cooking.

SECTION 09

The Economic Dimension: Prevention Costs Less Than Repeated Response

Preventing damage and reducing vulnerability can be considerably less costly than repeatedly responding to crises after they occur, but the money for prevention is shrinking just as the need grows.

IN BRIEF

- Global estimates put returns on adaptation and resilient infrastructure at 2:1 to more than 10:1.
- Universal clean cooking in Africa by 2040 would cost about $2 billion a year, roughly $8,000 per premature death avoided before counting other benefits.
- Official development assistance fell by 23% in 2025 and is projected to fall again in 2026, while debt interest crowds out health spending in many African countries.

9.1 Prevention versus response

There is an economic as well as a human case for investing early. Crises that are responded to after the fact leave a trail of destroyed assets, lost output and emergency spending, and often a second crisis as households and budgets are depleted. The World Meteorological Organization reports that African countries are losing 2–5% of GDP to climate extremes and that many divert up to 9% of their budgets to respond (WMO et al., 2024).

Evidence from several fields points to high returns on prevention. The Global Commission on Adaptation estimated that investing $1.8 trillion globally between 2020 and 2030 in five areas could generate $7.1 trillion in net benefits, with benefit-cost ratios of 2:1 to more than 10:1 (Global Commission on Adaptation, 2019). The World Bank's *Lifelines* study concluded that for low- and middle-income countries, every $1 invested in more resilient infrastructure yields about $4 in benefits (Hallegatte et al., 2019). The International Energy Agency's cost estimate for Africa's clean cooking, about $37 billion to 2040, is small beside the health burden it would address (IEA, 2025). These are not guarantees, since returns depend on design, maintenance and governance, but the direction is consistent: prevention usually pays.

9.2 What Africa is being asked to finance, and what is available

The sums involved are large in absolute terms but modest against the scale of the economies and benefits involved, and they are moving in different directions. Table 8 collects the main anchors. Some are needs, some are programme goals and some are flows, so they should be compared with care.

Table 8 Selected financing anchors for Africa's resilience agenda

Item	Figure	Why it matters
Adaptation cost, sub-Saharan Africa	$30–50 billion a year over the next decade, 2–3% of regional GDP (WMO et al., 2024)	Scale of adaptation need
Adaptation needs, all developing countries	$310–365 billion a year by 2035, against about $26 billion of international public flows in 2023 (UNEP, 2025)	Needs are 12 to 14 times current flows
Universal clean cooking in Africa	About $37 billion cumulative to 2040, roughly $2 billion a year (IEA, 2025)	Small relative to benefits; most is household technology
Mission 300 electrification	Goal of 300 million connected by 2030; reports of over 50 million connected by mid-2026 (World Bank, 2024; Business Report, 2026)	Shows what coordinated programmes can deliver
Official development assistance	Fell 23.1% in real terms in 2025, to about $174 billion; a further fall projected for 2026 (OECD, 2026)	Aid is shrinking just as needs rise
Debt interest versus health	30 of 49 African countries with data spent more on interest than on public health in 2023 (Boston University GDP Center, 2025)	Fiscal space for prevention is limited

Source: sources cited in the table. Figures are reported as published; some are projections or secondary analyses of primary data.

9.3 A layered approach to financing

No single source can fund the transition, so the framework suggests layering. **Domestic budgets** should carry recurring costs such as health workers and maintenance, and should reform subsidies that favour the wealthy. **Concessional and blended finance** from development banks suits large, long-lived infrastructure with benefits that exceed commercial returns. **Risk pools and contingent finance** such as African Risk Capacity, which offers drought insurance to African Union members (African Risk Capacity, 2025), bring money quickly after shocks. **Private and household finance**, including pay-as-you-go solar and consumer finance for stoves, can fund the technology itself. **Debt relief and restructuring** may be needed where interest payments crowd out prevention.

9.4 The cost of waiting

The scenarios show why delay is costly. At the current pace Africa would accumulate about 101 billion person-years without clean cooking between 2025 and 2100. The best-peer pace would cut that to 21 billion, and each year of earlier action brings the later curve down. Infrastructure also locks in choices: houses, roads, power systems and cities built without resilience in mind are expensive to retrofit.

ECONOMIC REASONING

Whose costs, whose benefits?

Many of the benefits of resilience investment accrue to people who do not pay for it, including women who save time, children who survive, and neighbours who breathe cleaner air. These external benefits are a reason for public and concessional funding, not just private markets.

At the same time, Africa contributes about 4% of global CO_2 emissions (Our World in Data, 2025a). International climate and development finance for the continent is therefore as much an issue of fairness as of efficiency.

SECTION 10

Evidence from African Progress, and the Risks Ahead

Large gains have already happened in specific African countries. But progress is uneven, it can reverse, and several forces could slow it.

IN BRIEF

- Rwanda cut under-five mortality by 80% in 24 years; Kenya raised electricity access from 15% to 77%; Morocco reached 97% clean cooking.
- Falling aid, heavy debt, conflict and climate shocks could slow progress, and the same stresses interact.
- The analysis has limits that readers should keep in mind, from data quality to scenario simplifications.

10.1 What has worked

Evidence that rapid improvement is possible comes from Africa itself. Since 2000, Eswatini, Rwanda, Kenya, Lesotho and Botswana each added more than 50 points of electricity access, and Rwanda, Angola, Senegal, Malawi and Tanzania each cut under-five mortality by more than 70%. Kenya, Ghana, Rwanda and Tanzania alone are home to about 170 million people. Table 9 looks at five experiences.

Table 9 Five African experiences and what they suggest

Country	What changed (2000 to 2024)	Mechanism and lesson
Rwanda	Under-five mortality 184 to 38 per 1,000; electricity 6% to 72%	Community health workers, community-based health insurance and sustained political commitment (Farmer et al., 2013)
Kenya	Electricity 15% to 77%; clean cooking 2% to 32%; mobile money raised household consumption	Grid extension plus off-grid solar; digital payments that reach the poor (Suri and Jack, 2016)
Ethiopia	Electricity 13% to 57%; under-five mortality 140 to 44	Large-scale public programmes, including the safety net that cut drought's initial food-security damage by 57% (Knippenberg and Hoddinott, 2017)
Ghana	Electricity 44% to 92%; under-five mortality 100 to 36; no worst-fifth flags	Sustained electrification; a lower-middle-income country that clears the worst-fifth bar on all seven measures
Morocco	Electricity 70% to 100%; under-five mortality 52 to 16; clean cooking 97%	Broad expansion of electricity and basic services; wide use of bottled gas for cooking

Source: H Heuristics calculations from World Bank (2026); mechanisms as cited. Attribution of causes is indicative: these are descriptive comparisons, not impact evaluations.

Three lessons recur. First, **progress was driven by sustained programmes**, not by one-off projects: community health systems, safety nets and electrification programmes ran for a decade

or more. Second, **institutions mattered as much as money**, with clear mandates, local delivery and data to track results. Third, **technology helped but did not substitute for delivery**: off-grid solar and mobile payments spread because commercial and public actors built distribution, finance and trust around them.

10.2 What could go wrong

- **Shrinking external finance.** Official development assistance fell by 23% in real terms in 2025, the largest annual fall on record, and is projected to fall again (OECD, 2026). Programmes that rely on donor money, especially in health and humanitarian response, are most exposed.
- **Debt.** Thirty of 49 African countries spent more on interest than on health in 2023 (Boston University GDP Center, 2025). High debt service squeezes the recurring spending, such as health workers and maintenance, on which resilience depends.
- **Conflict and fragility.** Twenty-four of 54 countries are in the world's worst fifth for political stability. Conflict can reverse gains quickly and make aid delivery impossible, so the best-peer scenario will be hardest to achieve in precisely the places that need it most.
- **Climate shocks.** Each additional degree of warming raises exposure to heat, drought and floods. Adaptation can offset part of the damage but not all of it, and shocks can deplete the budgets and assets needed for development (IPCC, 2023; WMO et al., 2024).
- **Implementation capacity.** Many good programmes fail because of procurement delays, weak maintenance or low trust. Faster pace requires more institutional capacity, not only more money.

10.3 Limits of this analysis

LIMITS

Things to keep in mind

Country-level data. Averages hide differences within countries. Rural, poor, female-headed and displaced households usually fare worse than national numbers suggest.

Choice of thresholds. The 'worst fifth' rule is a transparent convention. A different cut-off changes the numbers (a worst-third cut-off flags 88% of Africans on four or more challenges) but not the broad pattern.

Measure choices. Climate is captured by hazard exposure, which is held constant over time; air pollution uses PM2.5, which includes natural dust. Health uses child mortality because the World Bank's universal health coverage index is no longer available.

Scenario simplicity. Linear paces by country, capped at 99%, population from the UN medium variant, and no feedback between development and fertility. Real paths are more varied.

Mortality arithmetic. Child deaths are births times rates, not official estimates; household air pollution deaths assume a constant rate per deprived person and are an overlapping subset of other deaths.

Association is not causation. The case comparisons and cross-country benchmarks are descriptive. Trials such as HAPIN show that expected health benefits do not always appear.

SECTION 11

Priorities and a Scorecard for the Century Ahead

Ten priorities follow from the evidence. Together they aim to make each generation of Africans less exposed to interconnected crises than the last.

IN BRIEF

- Start with the bottlenecks (clean cooking, sanitation, electricity) and the places where the largest populations are furthest behind.
- Choose investments by how many vulnerabilities they reduce together, and finance prevention before crises arrive.
- Track progress in numbers of people, not only percentages, and review it on a regular cycle.

11.1 Ten priorities

1. **Accelerate the bottleneck services.** Set national targets for clean cooking and sanitation at best-peer pace and fund delivery systems, not only pilot projects.
2. **Electrify the places that deliver other services.** Prioritise health clinics, schools, water pumps and markets within electrification programmes such as Mission 300, and work toward connecting the 581 million Africans still without power.
3. **Aim for complete switching in clean cooking.** Combine consumer finance, reliable fuel supply and behaviour support so that households stop using polluting fuels, not merely add a second stove.
4. **Scale community health and financial protection.** Back community health workers, supply chains and insurance, and make sure clinics have power, water and cold storage.
5. **Protect farmers from climatic variability.** Invest in improved seed and soil practices, small irrigation schemes, weather information and drought insurance.
6. **Plan cities before they are built.** Put drainage, water, power and cool, safe housing into urban plans now for the large urban growth ahead.
7. **Make social protection shock-responsive.** Build registers and payment systems that can scale up automatically when a drought or flood strikes (Knippenberg and Hoddinott, 2017).
8. **Use digital infrastructure as an enabler.** Mobile money, digital identity and connectivity make other pathways cheaper to deliver and faster in a crisis (Suri and Jack, 2016).
9. **Invest in education, especially for girls.** Schooling raises incomes and adaptive capacity, and is linked with lower disaster mortality (Lutz et al., 2014).
10. **Strengthen institutions, data and finance together.** Improve coordination across ministries, use regular data to find gaps, and secure predictable finance through domestic revenue, concessional funds and risk pools (African Risk Capacity, 2025).

11.2 A scorecard to track

Table 10 sets a baseline and two reference points for 2040, the end of the first horizon: where Africa would be at current pace, and at best-peer pace. It can be updated each year from public data. Because population is growing, both share and headcount are shown.

Table 10 Scorecard: Africa's position in 2024 and in 2040 at two paces

Indicator	2024	2040: current pace	2040: best-peer pace
Electricity access (% of people)	62%	79%	96%
Clean cooking access (%)	34%	43%	68%
Basic drinking water (%)	72%	83%	93%
Basic sanitation (%)	46%	55%	78%
Under-5 deaths per 1,000 births	62	50	20
People without electricity (millions)	581	439	93
People without clean cooking (millions)	996	1,183	676
People without basic sanitation (millions)	824	942	464
People without basic drinking water (millions)	430	358	157

Source: H Heuristics scenario calculations from World Bank (2026) and United Nations (2024). 2024 figures use UN populations; shares are population-weighted averages of country results.

11.3 From exposure to resilience

Africa's exposure to interconnected crises is real, large and unequal. It is also, to a considerable extent, a matter of choices. Countries on the same continent, starting from similar positions, have reached very different outcomes in one generation. The evidence suggests that sustained investment in development, prevention, adaptation and technology diffusion can reduce human and systemic vulnerability on a scale that matters across generations. Polycrisis Resilience provides a framework for coordinating that effort, choosing interventions that work against several challenges at once, and holding ourselves accountable for the number of people whose vulnerability is reduced. The cumulative benefits could be considerable: lives saved, and lives made longer, healthier and freer to plan.

REFERENCES

References

African Risk Capacity Group (2025). *About ARC: sovereign disaster risk pooling for African Union member states*. Johannesburg: ARC. arc.int/

Boston University Global Development Policy Center (2025). *The Cost of Inaction: Explaining Africa's Debt Distress in 10 Charts and Five Fixes for the G20*. Boston, MA: BU GDP Center. bu.edu/gdp/2025/06/18/the-cost-of-inaction-explaining-africas-debt-distress-in-10-chart...

Business Report (2026). World Bank and African Development Bank's Mission 300: early milestone in electrification. 17 June 2026. iol.co.za/business-report/companies/2026-06-17-world-bank-and-african-development-banks...

European Commission Joint Research Centre and Inter-Agency Standing Committee (2026). *INFORM Risk Index, Mid 2026*. Ispra: JRC. drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Results-and-data

Farmer, P. E., Nutt, C. T., Wagner, C. M., et al. (2013). Reduced premature mortality in Rwanda: lessons from success. *BMJ*, 346, f65. doi.org/10.1136/bmj.f65

Global Commission on Adaptation (2019). *Adapt Now: A Global Call for Leadership on Climate Resilience*. Rotterdam and Washington, DC: GCA and World Resources Institute. gca.org/reports/adapt-now-a-global-call-for-leadership-on-climate-resilience/

Hallegatte, S., Rentschler, J. and Rozenberg, J. (2019). *Lifelines: The Resilient Infrastructure Opportunity*. Washington, DC: World Bank. openknowledge.worldbank.org/handle/10986/31805

HAPIN Investigators (2024). Liquefied petroleum gas or biomass cooking and severe infant pneumonia. *New England Journal of Medicine*, 390(1). pubmed.gov/38169488/

Hughes, H. (2026). *Polycrisis Resilience: A General Definition and the H Heuristics Framework*. H Heuristics Flagship Report, November 2026. researchreports.hheuristics.com

IEA, IRENA, UN Statistics Division, World Bank and WHO (2025). *Tracking SDG 7: The Energy Progress Report 2025*. Washington, DC: World Bank. trackingsdg7.esmap.org/

International Energy Agency (2025). *Universal Access to Clean Cooking in Africa*. Paris: IEA. iea.org/reports/universal-access-to-clean-cooking-in-africa

IPCC (2023). *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report*. Geneva: Intergovernmental Panel on Climate Change. ipcc.ch/report/ar6/syr/

Kahn, M. E. (2005). The death toll from natural disasters: the role of income, geography, and institutions. *Review of Economics and Statistics*, 87(2), 271–284. doi.org/10.1162/0034653053970339

Knippenberg, E. and Hoddinott, J. (2017). *Shocks, Social Protection, and Resilience: Evidence from Ethiopia*. IFPRI ESSP Working Paper 109. Washington, DC: International Food Policy Research Institute. econpapers.repec.org/RePEc:fpr:esspwp:109

Lawrence, M., Homer-Dixon, T., Janzwood, S., Rockström, J., Renn, O. and Donges, J. F. (2024). Global polycrisis: the causal mechanisms of crisis entanglement. *Global Sustainability*, 7, e6. doi.org/10.1017/sus.2024.1

Lawrence, M., Janzwood, S. and Homer-Dixon, T. (2022). *What Is a Global Polycrisis? And How Is It Different from a Systemic Risk?* Technical Paper 2022-4. Victoria, BC: Cascade Institute. cascadeinstitute.org/technical-paper/what-is-a-global-polycrisis/

Lutz, W., Muttarak, R. and Striessnig, E. (2014). Universal education is key to enhanced climate adaptation. *Science*, 346(6213), 1061–1062. doi.org/10.1126/science.1257975

OECD (2026). *International aid fell sharply in 2025, says OECD* (preliminary ODA data). Paris: OECD, April 2026. oecd.org/en/about/news/press-releases/2026/04/international-aid-fell-sharply-in-2025-sa...

Our World in Data (2025). *Population, with UN projections* (country series from World Population Prospects 2024, medium variant). Oxford: Global Change Data Lab. ourworldindata.org/grapher/population-with-un-projections

Our World in Data (2025a). *Annual CO_2 emissions* (data from the Global Carbon Project). Oxford: Global Change Data Lab. ourworldindata.org/grapher/annual-co2-emissions-per-country

Suri, T. and Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science*, 354(6317), 1288–1292. doi.org/10.1126/science.aah5309

Toya, H. and Skidmore, M. (2007). Economic development and the impacts of natural disasters. *Economics Letters*, 94(1), 20–25. doi.org/10.1016/j.econlet.2006.06.020

United Nations Environment Programme (2025). *Adaptation Gap Report 2025: Running on Empty*. Nairobi: UNEP. unep.org/resources/adaptation-gap-report-2025

United Nations, Department of Economic and Social Affairs, Population Division (2024). *World Population Prospects 2024*. New York: United Nations. population.un.org/wpp/

Uppsala Conflict Data Program (2025). *UCDP Conflict Encyclopedia and datasets*. Uppsala: Department of Peace and Conflict Research, Uppsala University. ucdp.uu.se/

World Bank (2024). *Five ways the World Bank will achieve Mission 300*. Washington, DC: World Bank. worldbank.org/en/news/feature/2024/09/19/five-ways-the-world-bank-will-achieve-mission-300

World Bank (2025). *Worldwide Governance Indicators*, 2025 update. Washington, DC: World Bank. worldbank.org/en/publication/worldwide-governance-indicators

World Bank (2026). *World Development Indicators*. Washington, DC: World Bank. Retrieved through the World Bank API, November 2026. databank.worldbank.org/source/world-development-indicators

World Health Organization (2026). *Global Health Observatory: air pollution attributable deaths* (indicators AIR_11, AIR_41; 2021 estimates). Geneva: WHO. who.int/data/gho/data/themes/air-pollution

World Meteorological Organization, African Union Commission, UN Economic Commission for Africa and African Ministerial Conference on Meteorology (2024). *State of the Climate in Africa 2023*. Geneva: WMO. wmo.int/resources/publication-series/state-of-climate-africa/state-of-climate-africa-2023

About the author. Hunter Hughes is the Founder of H Heuristics and developed the concept of Polycrisis Resilience and the H Heuristics Polycrisis Resilience Framework.

About H Heuristics. H Heuristics is an independent research practice founded by Hunter Hughes. It publishes research on polycrisis, resilience, development and the clean transition, with an emphasis on public data, transparent methods and practical recommendations. Reports are available at researchreports.hheuristics.com.

About this report. This report applies the Polycrisis Resilience framework to Africa, setting out seven interconnected challenges, ten development pathways and three scenario horizons to 2100.

Disclaimer. The views expressed are the author's. Country figures summarise public indicators and are not ratings of governments or advice on investment. Scenario results are illustrative calculations. Every effort has been made to verify facts against original sources; corrections are welcome.