



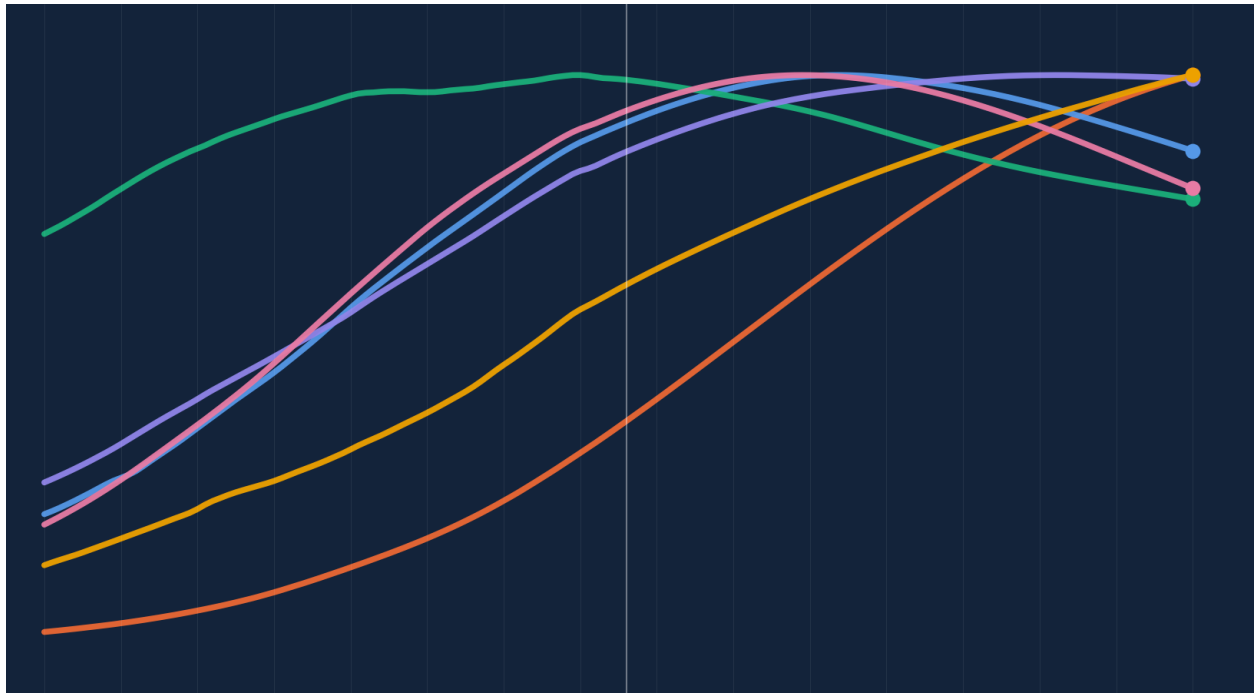
H HEURISTICS

Research · Foresight · Long-range thinking

RESEARCH REPORT · OCTOBER 2026

The Century Compass

Recalibrating humanity's direction to 2100: demography, convergence, polycrisis, and the life of the median human



Edition 1.0 · Data through 2025, UN World Population Prospects 2024, IPCC AR6

Where is humanity headed by 2100? This report ties together the demographic shift toward Africa and South Asia, the ageing and relative decline of the West and East Asia, the economic convergence of the Asian century, and the polycrisis of climate, pollution, poverty, and conflict, and asks what life will be like for the median human at the end of the century.

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FRONT MATTER

About This Report

Why this report exists, how it was built, and how to read the confidence of its claims.

H Heuristics publishes long-range analysis built for decisions rather than headlines. This report is our attempt to set a **sense of direction for the twenty-first century**: a single, coherent picture of where humanity is headed between now and 2100, built from the best available demographic, economic, and climate projections, and stress-tested against the most common narratives of collapse and the most common narratives of inevitable progress.

The report was prompted by a set of claims that circulate widely and deserve a careful answer. Is the Western world collapsing? Will Africa approach four billion people? Is this the Asian century? Is the polycrisis of climate, pollution, poverty, and conflict converging on the places where population is still growing? And if all of that is true, what is life actually like in 2100 for the average human being, and in particular for the people in the middle-to-lower part of the global distribution, the 25th to 50th percentile?

Our answer, in short, is that the century is **net upward but bifurcating**. Most of humanity will be healthier, more educated, more urban, older, and materially richer in 2100 than today. At the same time, a large minority, plausibly one to two-and-a-half billion people, faces a genuine risk of being trapped where heat, weak infrastructure, and poverty overlap. Whether that minority shrinks or grows is the defining question of the century, and it is decided far more by energy access, education, and governance than by any single climate number.

How the report was built

- **Data.** Population, fertility, median age, and projections come from the [UN World Population Prospects 2024](#) (medium variant), accessed through [Our World in Data](#). Long-run economic data come from the [Maddison Project Database](#). Poverty uses the World Bank’s \$3.00-a-day international line (2021 prices). Climate scenarios follow the [IPCC Sixth Assessment Report](#).
- **Charts.** Every chart in this report was generated directly from downloaded source data, except where a figure reproduces published headline numbers (for example, the climate-niche estimates of Lenton et al., 2023). Each figure carries its source line.
- **Judgement.** Scenario weights, the “secure / constrained / trapped” banding of humanity in 2100, and the illustrative vignettes are H Heuristics judgements. They are labelled as such wherever they appear.
- **Links.** Sources are hyperlinked in the text. A consolidated list appears in Appendix C.

Confidence conventions

Table 1 How to read the strength of claims in this report

Label	Meaning	Typical examples
High confidence	Driven by people already born, physical laws, or long, stable trends. Errors are of degree, not direction.	Population ageing; Europe and East Asia shrinking; warming continuing until net-zero.

Label	Meaning	Typical examples
Medium confidence	Direction is clear, but magnitude depends on policy and behaviour.	Africa’s 2100 population; India’s growth path; the pace of decarbonisation.
Low confidence	Plausible, contested, or dependent on politics and discontinuities.	Scenario probabilities; the economic impact of AI; geopolitical alignments.

A NOTE ON FRAMING

Several popular claims bundle a true observation with a mistaken mechanism. The clearest example is the idea that immigration is causing Europe’s population decline. Europe’s population is set to decline because of sustained low fertility; immigration is the main reason it has not already begun to shrink. We address each of these framings directly, because a projection is only as good as its causal model.

EXECUTIVE SUMMARY

The Century in Brief

Humanity is finishing two great transitions and racing to complete a third. The direction is upward. The distribution is the problem.

10.3B Projected world population peak, around 2084 (UN medium)	37% Share of humanity that will be African in 2100, up from 19% today	44% Asia’s share of world GDP (PPP), up from 17% in 1950	2.6–3.1°C Approximate warming by 2100 on current policies
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The twenty-first century is the century in which humanity completes the **demographic transition** (from high to low fertility and from young to old populations) and the **development transition** (from mass poverty to mass middle income), and must complete the **energy transition** quickly enough that climate damage does not undo the first two. Viewed from 1900, the destination is extraordinary. Viewed from inside, the path is turbulent, uneven, and hardest at the end.

Ten findings

- 1. World population peaks this century, and it peaks by choice.** The UN projects a peak of about 10.3 billion in the mid-2080s, falling to 10.2 billion by 2100. Alternative models from IHME and the Wittgenstein Centre peak earlier and lower, between roughly 8.8 and 9.7 billion. The range is driven above all by how fast fertility falls in sub-Saharan Africa.
- 2. The West faces relative decline, not collapse.** Europe’s population peaked around 2020 and is projected to fall about 20% by 2100. The cause is fertility near 1.4, not immigration; migration is what has kept the EU’s population growing since deaths began exceeding births around 2012. The United States is demographically far more robust.
- 3. Africa becomes the centre of gravity of human population.** Africa grows from about 1.5 billion people today to roughly 2.5 billion by 2050 and 3.8 billion by 2100, from one in five humans to more than one in three. Whether this becomes a demographic dividend or a demographic trap depends on jobs, schooling, and electricity.
- 4. The Asian century is real, but it splits in two.** Asia’s share of world output has climbed from 17% in 1950 to about 44%, returning toward its pre-industrial norm. But East Asia is ageing faster than any society in history. China’s population is projected to halve by 2100. Growth leadership shifts toward South and Southeast Asia.
- 5. The polycrisis is real and its burdens are concentrated.** Warming passed 1.5°C in a single calendar year for the first time in 2024. On current policies the world is heading for roughly 2.6–3.1°C. Heat, water stress, sea-level rise, and conflict cluster in the tropics and subtropics, which are precisely where populations are still growing.

- 6. **The core overlap is heat and population.** Research led by Lenton et al. (2023) estimates that around 2 billion people could live outside the climate conditions humans have historically lived in at about 2.7°C of warming, concentrated in India, Nigeria, Indonesia, the Philippines, and Pakistan.
- 7. **The upside engine is technology diffusion.** Extreme poverty fell from 43% of humanity in 1990 to about 10% today. Child mortality fell from one in four in 1950 to under 4%. Solar module prices have fallen about 89% since 2010. Technologies now reach poor countries in years rather than generations.
- 8. **For the median human, 2100 is likely richer, older, hotter, more urban, and lived more indoors.** The median person in 2100 is most likely a city-dweller in South Asia or Africa, about 42 years old, with secondary education and a material standard of living resembling today’s middle-income countries.
- 9. **The survivability trap is real, but under central assumptions it describes a large minority, not the median.** Our probability-weighted estimate is that about 17% of humanity in 2100 (roughly 1.7 billion people) would be “trapped” by the overlap of heat, poverty, and weak states. The trap becomes the median experience only in a fragmented, high-warming world.
- 10. **The decisive variables are cheap electricity, girls’ education, and migration governance.** Heat without cooling kills; heat with reliable power is an expensive inconvenience. The century’s outcome is largely a race between diffusion and damage.

Scenario summary

Table 2 Four pathways to 2100 (H Heuristics judgement)

Scenario	Weight	What 2100 looks like	Share “trapped”
Broad Convergence	~25%	Africa electrifies and industrialises on time; warming peaks near 2–2.5°C; AI gains diffuse widely.	~7%
Uneven Progress (central)	~50%	Most of humanity converges; a trapped last billion persists in hot, fragile regions; ~2.5–3°C; chronic migration pressure.	~15%
Fortress World	~20%	Fragmented order, ~3.5°C; the North walls off; the South splits into connected and stranded.	~30%
Catastrophic Break	~5%	Nuclear war, engineered pandemic, or systemic collapse resets the trajectory.	~40%

The century will be judged not by Shanghai or Berlin, but by the Sahel, the Congo basin, and the Indo-Gangetic plain.

SECTION 01

Why Recalibrate?

Our intuitions about the century were formed by the last one. Both the collapse story and the progress story get important things wrong.

Every generation carries a mental map of the world it grew up in, and that map ages badly. For most readers, the default picture still places the West at the economic centre, treats rapid population growth as the main global problem, and sees climate change as a distant threat. Each element of that picture is now out of date. The West’s share of world output peaked around 1950. Global fertility has already fallen below 2.3 children per woman and is heading below replacement. And the climate system has already warmed by roughly 1.3–1.5°C, with impacts that are measurable today.

Two competing narratives have rushed in to replace the old map. The first is a **collapse narrative**: the West is in terminal decline, Africa’s population boom will overwhelm the planet, the climate is spiralling out of control, and civilisation faces a breakdown. The second is a **progress narrative**: poverty is falling, technology is accelerating, and the long arc of history bends toward abundance. Both narratives cherry-pick. Both contain truths. Neither is a reliable guide to the century.

Three transitions define the century

The most useful way to read the twenty-first century is as the completion of three transitions, each of which began in Europe two centuries ago and has been spreading outward ever since.

Table 3 The three transitions

Transition	From	To	Status in 2026
Demographic	High birth and death rates; young populations	Low birth and death rates; old populations	Complete in Europe, the Americas, and East Asia; mid-way in South Asia; early-to-mid in sub-Saharan Africa
Development	Agrarian poverty; most people below \$3/day	Urban middle income; mass education	About 90% of humanity above extreme poverty; convergence stalled in fragile states
Energy	Fossil-fuel combustion	Clean electricity and electrified end-uses	Clean power now the cheapest new supply in most markets; emissions near a plateau, not yet falling

The first two transitions are self-reinforcing: as people grow richer and more educated, especially women, fertility falls, child survival rises, and investment per child increases. The third transition is different. It is a race against a physical clock. Carbon dioxide accumulates, and warming continues until net emissions reach zero. If the energy transition lags, climate damage falls hardest on the regions that are still completing the first two transitions.

What we are recalibrating

This report tests the five big claims most often used to describe the century. In each case we separate the observation from the mechanism and assign a confidence level.

Table 4 Five common claims, recalibrated

Common claim	Recalibrated view	Confidence
The Western world is collapsing; immigration and ethnic mixing are driving European population decline.	The West faces relative economic decline and rapid ageing. Low fertility drives population decline; immigration offsets it. Ethnic composition is changing, which is a social and political question, not a measure of collapse.	High
Africa will reach nearly 4 billion people.	The UN medium projection is 3.8 billion in 2100. Alternative models project 2.5–3 billion. The gap depends on girls' education and access to contraception.	Medium
This is the Asian century.	Yes for economic weight; but East Asia faces the fastest demographic decline on record. Leadership shifts toward India and Southeast Asia over time.	Medium-high
The polycrisis is converging on the Global South.	Yes. Heat, water, sea-level, and conflict risks overlap with the world's fastest-growing populations.	High
Life will become unbearable for ordinary people.	True for a large minority under central assumptions; true for the median only in a fragmented, high-warming world.	Medium

THE CORE HEURISTIC

Vulnerability = hazard × exposure × poverty. The same heatwave, flood, or drought kills orders of magnitude more people in a poor, poorly governed place than in a rich, well-governed one. Any projection that treats climate hazards as destiny, without modelling the wealth, infrastructure, and institutions that mediate them, will mistake the shape of the century.

SECTION 02

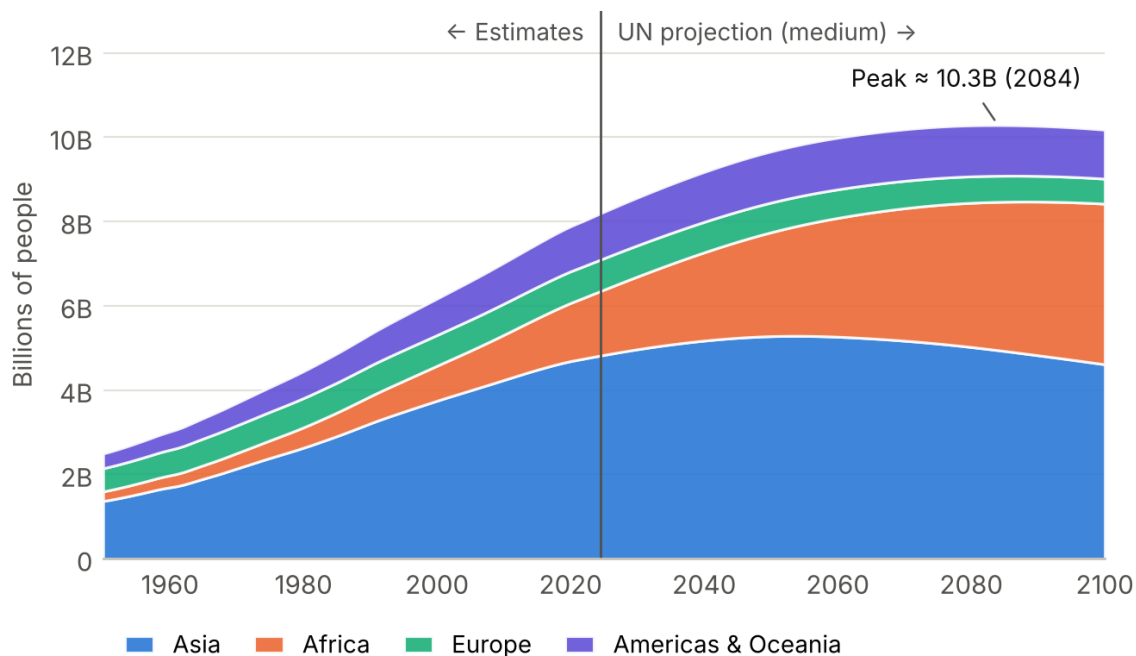
The Demographic Arc: Peak, Age, and Shift

Population is the slowest-moving and most predictable force of the century. It is also where the biggest surprises of the next fifty years are already locked in.

In 1950 there were about 2.5 billion people on Earth. Today there are about 8.2 billion. According to the [UN World Population Prospects 2024](#), the world will reach about 9.7 billion by 2050, peak at roughly **10.3 billion around 2084**, and decline slightly to about 10.2 billion by 2100. For the first time in modern history, global population is projected to peak and fall not because of famine, war, or plague, but because of billions of individual decisions about family size.

Figure 1 World population by region, 1950–2100

Billions of people. Estimates to 2023; UN medium-variant projection thereafter.



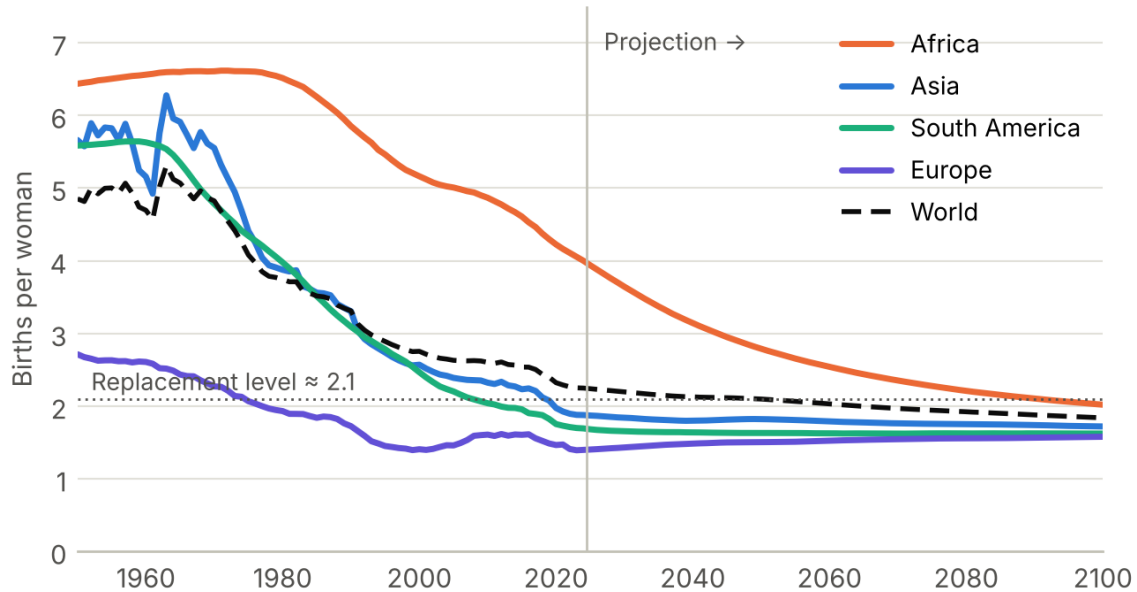
Source: [UN World Population Prospects 2024](#), via [Our World in Data](#). “Americas & Oceania” combines North America (including Central America and the Caribbean), South America, and Oceania.

Why the peak is coming

The global fertility rate, the average number of children a woman has over her lifetime, peaked at about 5.3 in the early 1960s. It is now about 2.25, close to the replacement level of roughly 2.1. Every major world region except Africa is already below replacement. Asia averages about 1.9, Latin America about 1.7, North America about 1.8, and Europe about 1.4. Africa’s average has fallen from about 6.5 in 1980 to about 4.1 today, and the UN projects it reaching about 2.8 by 2050 and roughly 2.0 by 2100.

Figure 2 Fertility rate by region, 1950–2100

Average births per woman. Dotted line marks replacement level (≈ 2.1).



Source: [UN World Population Prospects 2024](#), medium variant, via [Our World in Data](#).

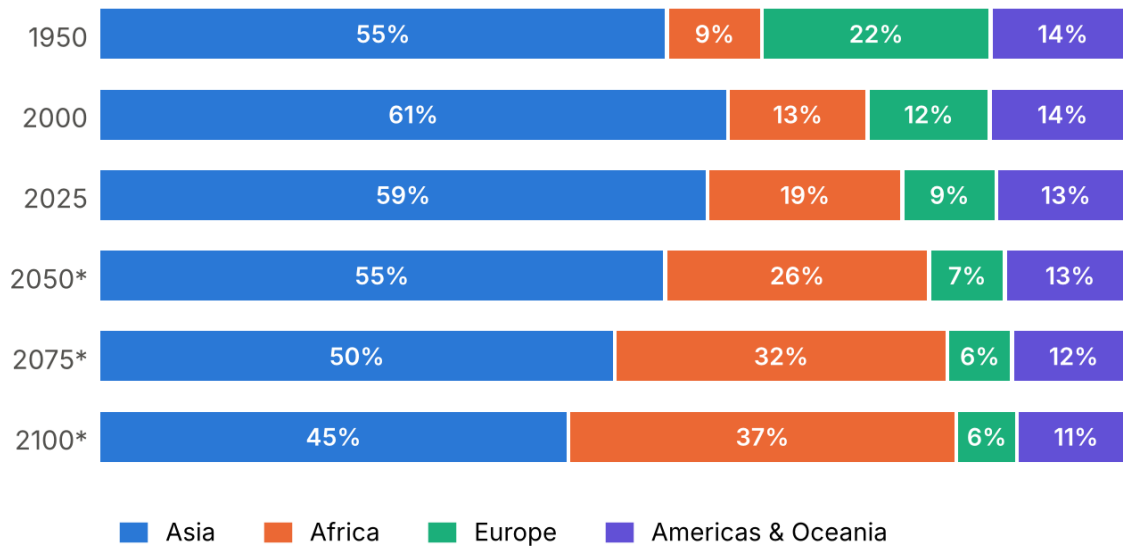
Population keeps growing for decades after fertility falls below replacement because of **momentum**: large cohorts of young people are still entering their childbearing years. That momentum is why population growth to 2050 is effectively locked in, and why most of the uncertainty about the century concerns the second half.

The great regional shift

The composition of humanity is changing faster than its size. In 1950, Europe was home to 22% of the world's people and Africa to 9%. By 2100, on UN projections, Europe falls to under 6% and Africa rises to about 37%. Asia remains the largest region, but its share falls from about 59% today to 45%, as China and East Asia shrink.

Figure 3 Share of world population by region

Percent of world total. Years marked * are UN medium-variant projections.

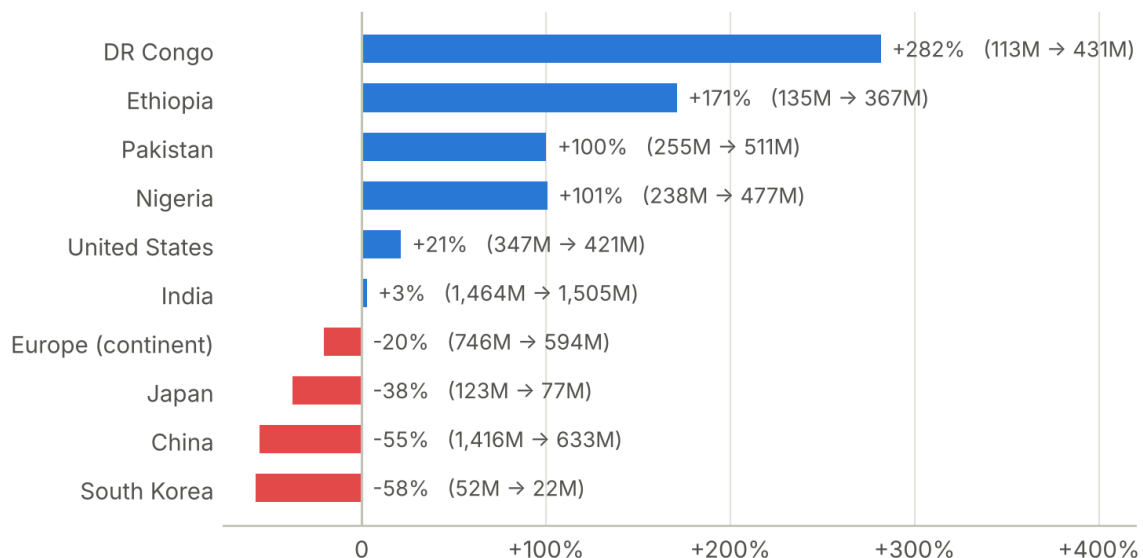


Source: [UN World Population Prospects 2024](#), via [Our World in Data](#).

Country by country, the shift is even sharper. Nigeria is projected to grow from about 238 million to 477 million people. The Democratic Republic of the Congo grows nearly fourfold, from about 113 million to 431 million. Pakistan doubles to around 511 million. Meanwhile, China is projected to fall from 1.42 billion to around 633 million, Japan from 123 million to 77 million, and South Korea from 52 million to 22 million. India peaks at about 1.7 billion around 2061 and then declines gently.

Figure 4 Projected population change, 2025–2100, selected countries

Percent change, with 2025 and 2100 population in parentheses.



Source: [UN World Population Prospects 2024](#), medium variant.

The age revolution

The world is not only shifting south; it is getting older everywhere. The global median age was about 21 in 1975. It is about 31 today and is projected to reach about 42 by 2100. China's median age is projected to rise from about 40 to 61, South Korea's from 46 to 60. Even today's youngest countries age dramatically: Nigeria's median age is projected to almost double, from 18 to 34. An older world is, on balance, a more peaceful and more cautious one, but it also faces heavier pension and health burdens, slower labour-force growth, and, potentially, slower innovation.

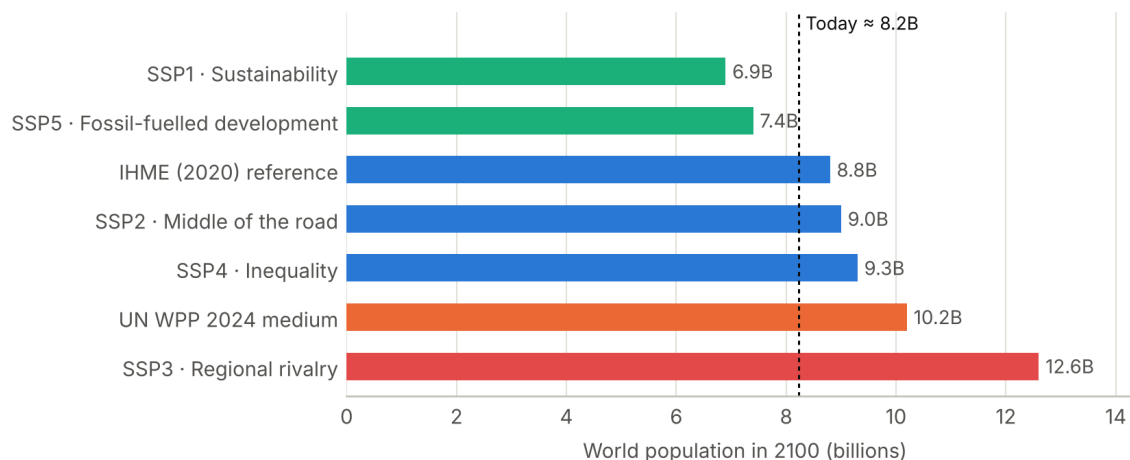
How certain is the projection?

Demographic projections are among the most reliable forecasts in social science for the next 25 years, because most of the people who will be alive in 2050 are already born. Beyond mid-century, the uncertainty widens quickly. The leading alternative models disagree mainly on how fast fertility will fall in high-fertility countries.

- The [UN WPP 2024](#) medium variant projects 10.2 billion in 2100.
- The [IHME model published in The Lancet \(2020\)](#) projected a peak of about 9.7 billion in 2064 and 8.8 billion in 2100, assuming faster fertility decline linked to education and contraception. IHME's [2024 update](#) projected fertility falling even faster.
- The [Wittgenstein Centre](#) scenarios, built around education, range from under 7 billion (rapid development, SSP1) to over 12 billion (stalled development, SSP3), with the middle-of-the-road path near 9–9.5 billion. The original SSP population scenarios were published by [KC and Lutz \(2017\)](#).

Figure 5 World population in 2100 under different projections

Billions. Shared Socioeconomic Pathways (SSPs) from the original IIASA/Wittgenstein scenario set.



Source: [UN WPP 2024](#); [Vollset et al., The Lancet \(2020\)](#); [KC & Lutz, Global Environmental Change \(2017\)](#). SSP values rounded.

IMPLICATION FOR THE CENTURY

The most important uncertainty in the global population outlook is not in Europe or Asia, but in about a dozen countries in sub-Saharan Africa, including Nigeria, the DRC, Ethiopia, Tanzania, Niger, and Uganda. The difference between the UN path and the faster-transition paths for Africa alone is close to one billion people by 2100. That difference is determined largely by whether girls stay in school, whether families can access contraception, and whether child mortality keeps falling.

SECTION 03

The West: Relative Decline, Not Collapse

Europe and the wider West are shrinking as a share of the world and ageing fast. That is a profound change. It is not a collapse, and its causes are often misread.

The phrase “Western collapse” bundles together several different trends: falling birth rates, rising immigration, changing ethnic composition, slowing productivity growth, political polarisation, and a shrinking share of global output. Some of these are well established; others are misattributed. Untangling them matters, because the policy responses to each are entirely different.

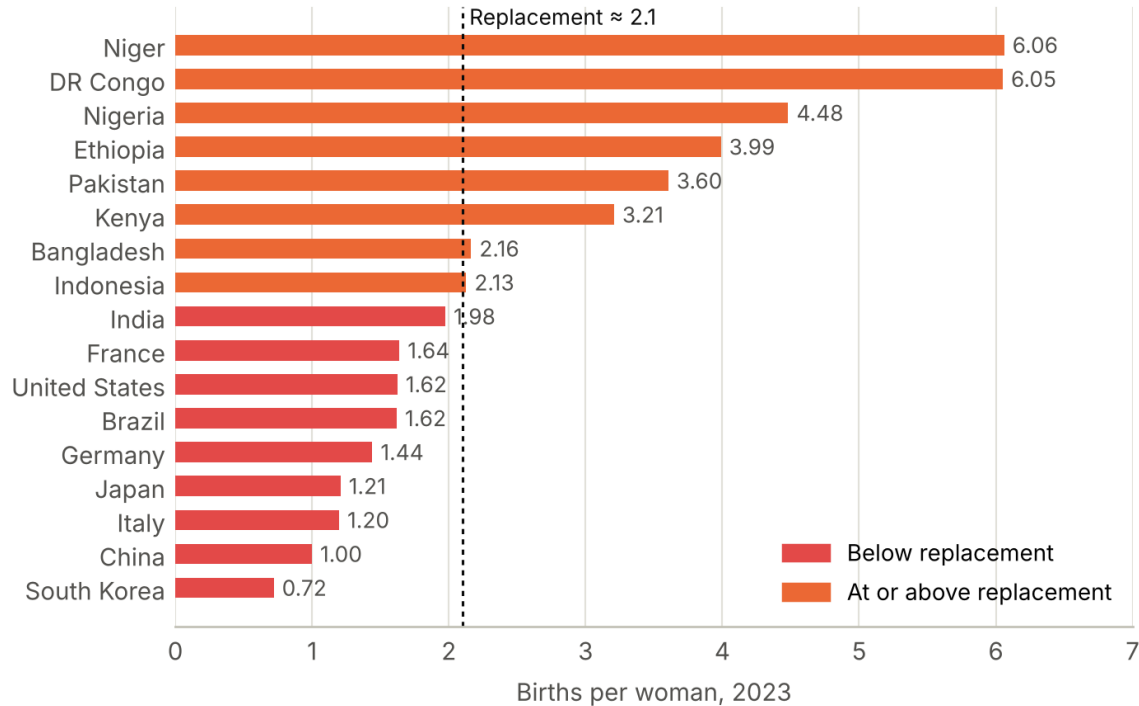
What is actually driving Europe’s population decline

Europe’s population, on the UN’s continental definition, peaked around 2020 at about 745 million. It is projected to fall to roughly 705 million by 2050 and 594 million by 2100, a decline of about 20%. The driver is fertility. The European Union’s total fertility rate was [1.38 in 2023](#), a record low and far below the 2.1 needed to keep a population stable without migration. Italy and Spain sit near 1.2; Germany near 1.4; France, long Europe’s outlier, has fallen to about 1.6.

According to [Eurostat](#), the EU has recorded more deaths than births every year since around 2012. Its population has nevertheless continued to grow, reaching about 450 million, because net migration has more than offset natural decrease. In other words, **immigration is the reason Europe’s population has not yet started to shrink, not the reason it is shrinking**. Without migration, the EU’s working-age population would be contracting considerably faster than it is.

Figure 6 Fertility rates in 2023, selected countries

Average births per woman. Most of the rich world, and now most of Asia and Latin America, is below replacement.



Source: [UN World Population Prospects 2024](#), via [Our World in Data](#).

Composition change is not population decline

Europe's population is becoming more diverse in origin. Roughly one in ten EU residents was born outside the EU, and the share is higher among younger adults and in major cities. This is a real and significant social change, and it is politically contentious. But it is a change in **who** Europeans are, not a reduction in **how many** there are, and it should not be conflated with demographic collapse.

For forecasting purposes, the variables that actually determine Europe's trajectory are measurable:

- **Dependency ratios.** Eurostat projects the EU's old-age dependency ratio (people 65+ per 100 people aged 15–64) rising from about 33 today toward 60 by 2100. Fewer workers will support more retirees.
- **Integration outcomes.** Employment rates, language acquisition, educational attainment of second generations, and residential segregation determine whether migration adds to or subtracts from fiscal capacity.
- **Productivity.** Europe's productivity growth has lagged the United States for two decades, particularly in digital technology. Ageing societies need faster productivity growth, not slower.
- **Fiscal sustainability.** Pensions, health care, and long-term care will absorb a rising share of output, crowding out investment, defence, and foreign aid.
- **Political cohesion.** Migration has become the most powerful driver of electoral realignment across Europe, with consequences for EU policy on climate, trade, and enlargement.

The West is not one thing

The United States differs sharply from Europe. Its fertility rate is about 1.6, its population is projected to grow from about 347 million to 421 million by 2100, and it continues to attract large inflows of migrants and capital. It leads the world in frontier technology, especially in artificial intelligence and software. Its risks are political rather than demographic: polarisation, institutional erosion, fiscal deficits, and volatile trade and immigration policy.

Japan, often grouped with the West, is the leading indicator for an ageing rich society. Its population has been falling since about 2010 and is projected to decline to about 77 million by 2100. Japan has not collapsed. It remains rich, safe, and technologically capable, but it has experienced three decades of slow nominal growth, rising public debt, and growing rural depopulation. It is a useful template for what slow decline actually looks like.

Relative economic decline

The West's share of world output, measured at purchasing-power parity, peaked at roughly 57% around 1950 and has fallen to about 31% today, according to the [Maddison Project Database](#). This is the most important sense in which the West is "declining": other regions are catching up. But catching up is not the same as the West getting poorer. Western Europe's real income per person rose about 5.7-fold between 1950 and 2022, and in most scenarios it continues to rise through the century, albeit slowly.

RECALIBRATED VIEW: THE WEST IN 2100

- **Smaller share, still rich.** The West likely accounts for well under a quarter of world output by 2100, but remains among the richest places on Earth per person.
- **Older and more diverse.** Median ages near 45–55; large foreign-born and second-generation populations, particularly in cities.
- **Migration as a structural necessity.** Labour shortages in health, care, construction, and agriculture make managed migration an economic necessity, even as it remains politically contested.
- **The real risk is governance.** The scenario that should concern Western societies is not demographic collapse but political dysfunction: an inability to fund ageing, integrate newcomers, and invest in productivity at the same time.

SECTION 04

Africa’s Demographic Rise: Dividend or Trap?

By 2100 more than one in three people on Earth may be African. Whether that becomes the century’s great growth story or its great humanitarian crisis is still undecided.

Africa is the only world region whose population is projected to grow strongly throughout the century. Under the UN medium variant, Africa grows from about 1.55 billion people in 2025 to 2.47 billion in 2050 and 3.81 billion in 2100. Its share of humanity rises from 19% today to 25% by mid-century and 37% by 2100. Africa is also the youngest region: the median age in Nigeria is about 18, in the DRC about 16.

3.8B Africa’s projected population in 2100 (UN medium)	~4.1 Births per woman across Africa today, down from 6.5 in 1980	55% Share of sub-Saharan Africans with electricity access (2024)	10–12M Young Africans entering the labour market each year
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How confident is the four-billion figure?

The headline figure of “nearly four billion” is the UN’s medium projection. It assumes that African fertility continues to decline at roughly the pace observed in recent decades, reaching about replacement level only near the end of the century. Other modelling groups expect a faster transition. IHME’s models and the Wittgenstein Centre’s education-based scenarios imply African populations in 2100 in the range of roughly 2.5 to 3 billion. The gap, close to a billion people, is the single largest uncertainty in the global population outlook.

The evidence suggests that the pace of fertility decline in Africa is highly sensitive to a small number of levers. Women with secondary education have, on average, far fewer children than women with primary or no education, and the [Wittgenstein Centre](#) projections show that education trajectories alone can move national populations by tens of millions. Falling child mortality, urbanisation, access to contraception, and rising female employment all push in the same direction.

The dividend and its conditions

A demographic dividend occurs when the working-age share of the population rises relative to dependants, freeing resources for savings, investment, and higher consumption per person. East Asia’s miracle economies captured an enormous dividend between 1960 and 2010. Africa’s working-age share will rise for most of this century. But a dividend is not automatic. It requires jobs.

The [African Development Bank](#) estimates that 10–12 million young Africans enter the labour market each year, while only around 3 million formal jobs are created annually. The gap is absorbed by informal work, underemployment, and migration. If it persists, a growing youth bulge becomes a source of frustration and instability rather than growth.

The disappearing ladder

The development path followed by Japan, South Korea, Taiwan, and China ran through export-oriented manufacturing: move farm workers into factories, learn by producing for world markets, and climb the value chain. Economist Dani Rodrik has documented a pattern of [premature deindustrialisation](#), in which today's developing countries see manufacturing employment peak at much lower levels of income than earlier industrialisers did. Automation, robotics, and AI may further reduce the labour intensity of manufacturing just as Africa's workforce peaks.

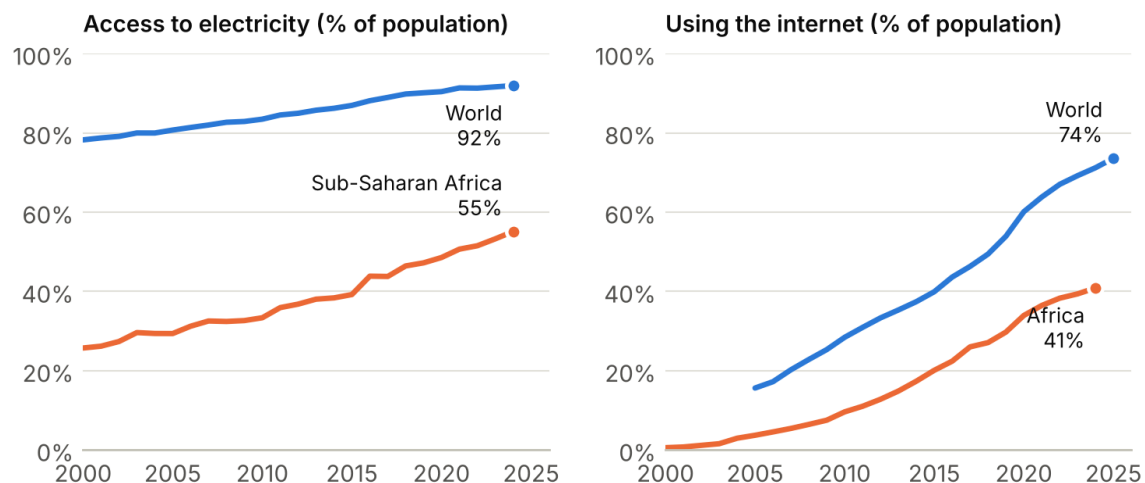
This does not mean Africa cannot grow rich. Alternative ladders exist: agricultural productivity, agro-processing, tradable services, tourism, mining value-added, green-industrial supply chains for critical minerals, and a continental single market under the African Continental Free Trade Area. But no alternative has yet been proven at the scale and speed that manufacturing delivered for East Asia.

Electricity: the master variable

Of all the indicators that determine Africa's trajectory, access to reliable electricity may be the most decisive. Power is a precondition for industry, digital services, refrigeration, water pumping, health care, and, crucially for a warming continent, cooling. Access has more than doubled since 2000, from about 26% to 55% of sub-Saharan Africans. Yet roughly 600 million people in Africa still lack electricity, the large majority of the world's unconnected population. The World Bank and African Development Bank's "Mission 300" initiative aims to connect 300 million Africans by 2030.

Figure 7 Electricity access and internet use: the world vs. Africa

Percent of population. Electricity access compares the world with sub-Saharan Africa; internet use compares the world with Africa as a whole.



Source: World Bank, via [Our World in Data: Energy Access](#) and [Our World in Data: Internet](#).

Cities of the future

Africa is the world's fastest-urbanising region. Lagos, Kinshasa, Dar es Salaam, Luanda, Addis Ababa, and Khartoum are on track to rank among the world's largest cities by mid-century, according to [UN urbanisation projections](#). Much of this growth is in informal settlements with limited water, sanitation, drainage, and

power, and many coastal cities face rising seas and intensifying rainfall. How these cities are planned and financed over the next 25 years will shape the daily lives of more people than any other urban project on Earth.

Table 5 Africa's pathways: dividend vs. trap

Factor	Dividend pathway	Trap pathway
Fertility	Falls toward 2.5 by 2050 as schooling and contraception spread	Stays above 3.5 in large countries into the 2050s
Jobs	Manufacturing, agro-processing, and services absorb most new workers	Informality and underemployment dominate; migration pressure soars
Electricity	Near-universal access by 2040 via grid and distributed solar	Hundreds of millions remain unconnected into mid-century
Governance	Gradual consolidation of institutions; regional trade integration	Coups, insurgencies, and state fragility spread (as in parts of the Sahel since 2020)
Climate	Adaptation investment in water, crops, and cooling keeps pace	Heat, drought, and floods outpace adaptation; agricultural incomes fall
2100 outcome	~2.5–3B people, mostly middle income	~3.8–4B+ people, with a large trapped population

SECTION 05

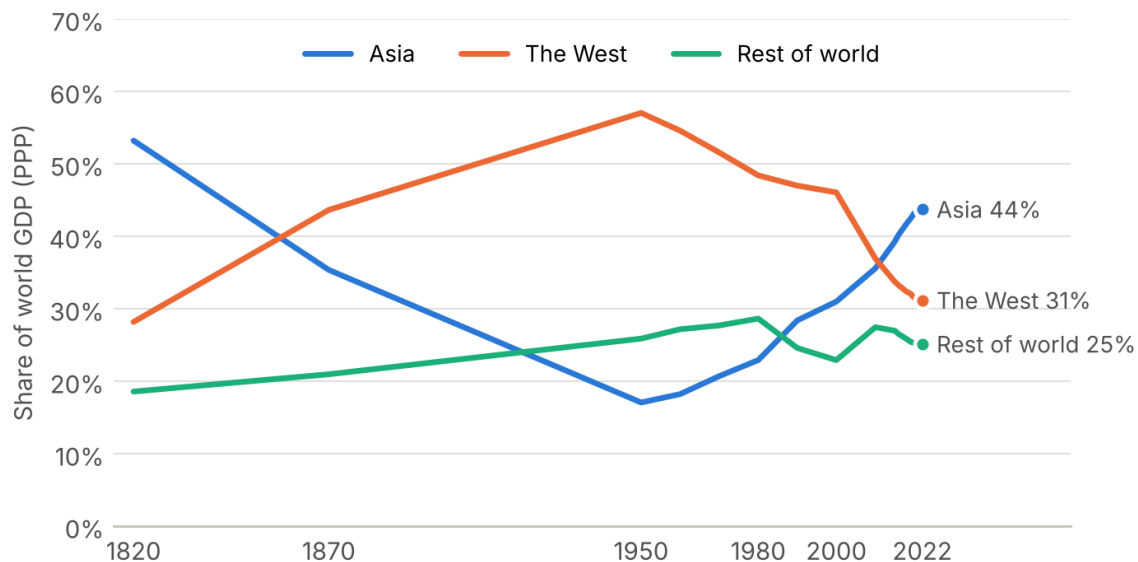
The Asian Century, Split in Two

Asia is returning to the economic weight it held before the industrial revolution. But its two halves are headed in demographically opposite directions.

Before 1820, Asia produced roughly half of the world's economic output, because it was home to most of the world's people and productivity differences between regions were modest. Industrialisation in Europe and North America opened an unprecedented gap. By 1950, Asia's share of world output had fallen to about 17%. Since then, first Japan, then the "Asian tigers," then China, and now India and Southeast Asia have driven one of the largest economic shifts in history. Asia's share has rebounded to about 44%.

Figure 8 Share of world GDP by region, 1820–2022

Percent of world GDP at purchasing-power parity. "The West" = Western Europe plus the US, Canada, Australia, and New Zealand.



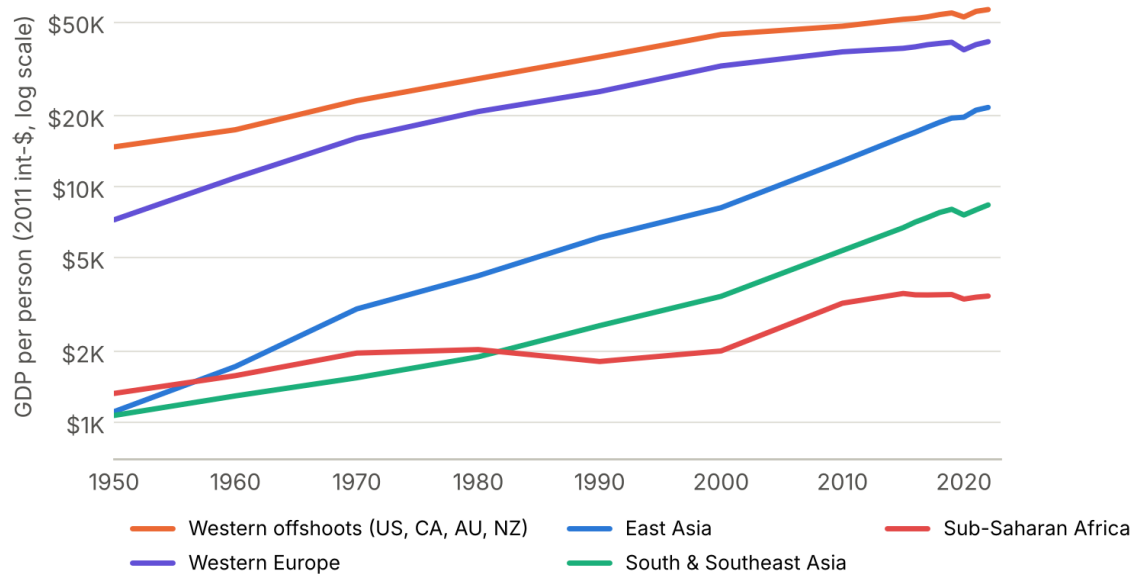
Source: [Maddison Project Database 2023](#), regional aggregates; H Heuristics calculations. Early years are sparse benchmark estimates.

Convergence, measured

The catch-up has been most dramatic in East Asia, where real income per person rose roughly twenty-fold between 1950 and 2022. South and Southeast Asia have grown nearly eight-fold. Sub-Saharan Africa, by contrast, grew only about 2.6-fold over the same period, and much of that gain came after 2000. Convergence is real, but it is not universal.

Figure 9 GDP per person by region, 1950–2022

Real GDP per capita, international dollars (log scale). Steeper lines mean faster growth.



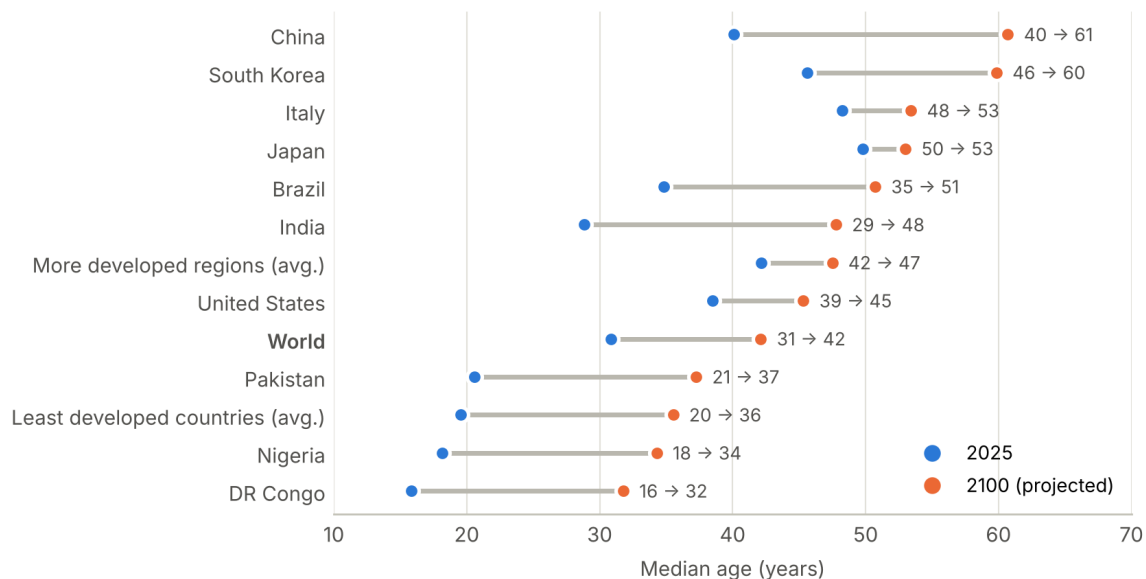
Source: [Maddison Project Database 2023](#), via [Our World in Data](#).

East Asia: rich, innovative, and ageing at record speed

East Asia contains both the engine of the Asian century and its starkest demographic warning. South Korea's fertility rate, at 0.72 in 2023, is among the lowest ever recorded for any country. China's fertility rate is about 1.0, and its population has been falling since 2022. On UN projections, China's population roughly halves by 2100, to about 633 million, and its median age rises above 60. Japan, Taiwan, Hong Kong, Singapore, and Thailand are on similar paths.

Figure 10 Median age, 2025 vs. 2100

Years. Half the population is older than the median age, half younger.



Source: [UN World Population Prospects 2024](#), medium variant, via Our World in Data.

China's near-term challenges are as much economic as demographic: a deflating property sector that once accounted for about a quarter of economic activity, heavy local-government debt, weak household consumption, and high youth unemployment. At the same time, China has become the world's dominant clean-technology manufacturer, producing the large majority of the world's solar modules, battery cells, and electric vehicles, according to the [IEA](#). It is both the largest emitter and the principal supplier of the tools to decarbonise.

The central question for China is whether it can **grow rich before it grows old**. Its income per person remains well below that of Japan or Korea when they reached similar median ages. Productivity growth, through automation, AI, and innovation, is the only way to sustain rising living standards with a shrinking workforce.

South and Southeast Asia: the next growth frontier

India is now the world's most populous country and among its fastest-growing major economies, with growth running at about 6–7% a year. Its fertility rate has just fallen below replacement, to about 2.0, but its population will keep growing until about 2061, peaking near 1.7 billion. India's median age is about 29, giving it a working-age window that stays open into the 2040s. On [IMF projections](#), India is expected to become the world's third-largest economy before 2030.

India's constraints are well known: manufacturing remains a small share of output, female labour-force participation is low by international standards though rising, air pollution is severe, water stress is acute across the Indo-Gangetic plain, and much of the country is among the most heat-exposed places on Earth. India is therefore both the strongest candidate for the next great convergence story and the largest single population exposed to dangerous heat.

Southeast Asia, led by Indonesia, Vietnam, the Philippines, Malaysia, and Thailand, is benefiting from supply-chain diversification away from China. Vietnam has become a major electronics exporter. Indonesia is

pursuing downstream processing of nickel and other critical minerals. Several of these countries face their own ageing (Thailand, Vietnam) and climate exposure (the Philippines, coastal Vietnam, Jakarta) challenges.

The middle-income trap

Growing from poor to middle income is common; growing from middle income to high income is rare. The World Bank's [World Development Report 2024](#) notes that only 34 middle-income economies have made the transition to high income since 1990, many of them aided by EU accession or oil wealth. China, India, Indonesia, and Vietnam are all attempting a transition that few have achieved, at a time of ageing, protectionism, and climate stress.

RECALIBRATED VIEW: THE TWO ASIAN CENTURIES

- **2000–2040: the East Asian century.** China drives global growth, manufacturing, and clean-technology deployment. East Asia becomes a centre of innovation, capital, and ageing.
- **2030–2080: the South Asian and Southeast Asian century.** India, Bangladesh, Indonesia, Vietnam, and the Philippines supply the bulk of Asia's labour-force growth and much of world growth.
- **Throughout: the climate test.** South and Southeast Asia contain the largest populations exposed to dangerous humid heat, sea-level rise, and monsoon disruption. Their success depends on adaptation as much as on growth.

SECTION 06

The Polycrisis: Climate, Pollution, Poverty, Conflict

The century's stresses are not independent. They compound one another, and they concentrate in the same places.

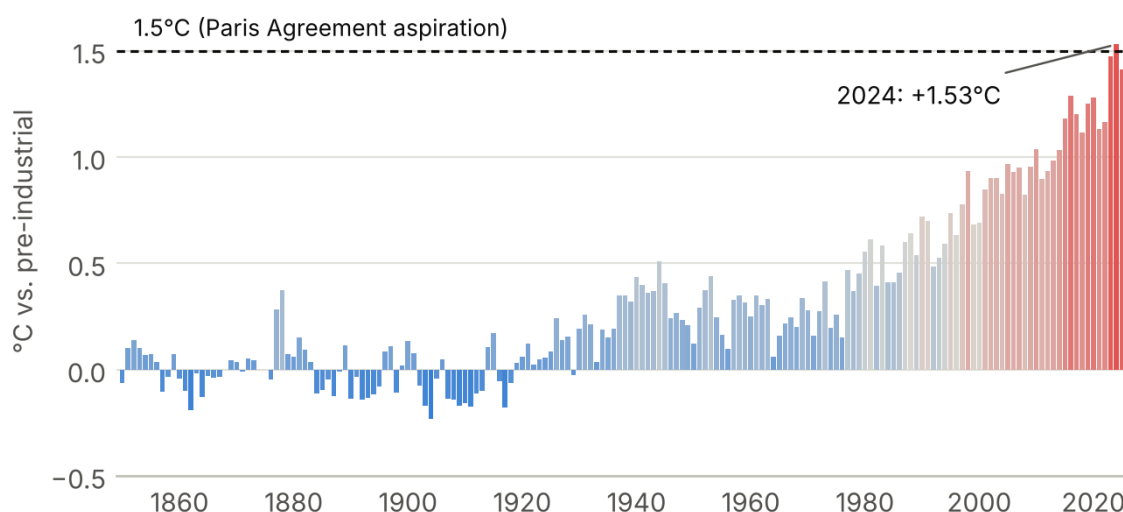
"Polycrisis" describes a condition in which multiple crises interact so that the whole is worse than the sum of the parts. Drought raises food prices; food prices fuel unrest; unrest weakens states; weak states fail to adapt to the next drought. This section reviews the four main strands, climate, pollution, poverty, and conflict, before Section 7 examines where they overlap.

Climate: past the first threshold

2024 was the first calendar year in which global average temperature exceeded 1.5°C above pre-industrial levels, according to the [Copernicus Climate Change Service](#) and other major datasets. A single year above 1.5°C does not mean the Paris Agreement threshold, defined over a 20-year average, has been crossed, but the long-term average is now around 1.3–1.4°C and rising at about 0.2°C per decade.

Figure 11 Global average temperature anomaly, 1850–2025

Degrees Celsius relative to the pre-industrial baseline. Each bar is one year.

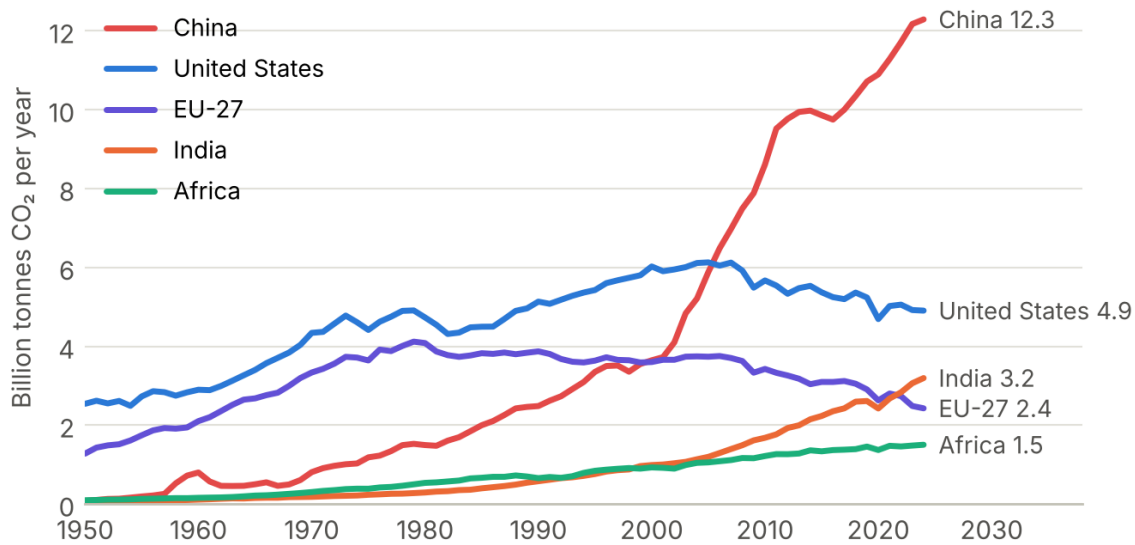


Source: Copernicus/ECMWF and Met Office Hadley Centre series as compiled by [Our World in Data](#). Baselines differ slightly between datasets.

Warming continues as long as net carbon dioxide emissions remain above zero. Global fossil CO₂ emissions reached about 38.6 billion tonnes in 2024, up from about 22.7 billion in 1990, according to the [Global Carbon Budget](#). The geography of emissions has transformed: the European Union's emissions peaked around 1979 and the United States' around 2005, while China's now exceed those of the US and EU combined. India's emissions are rising quickly but remain low per person. Africa's entire continent emits about 1.5 billion tonnes, less than 4% of the global total.

Figure 12 Annual CO₂ emissions from fossil fuels and industry, 1950–2024

Billion tonnes per year. Excludes land-use change.

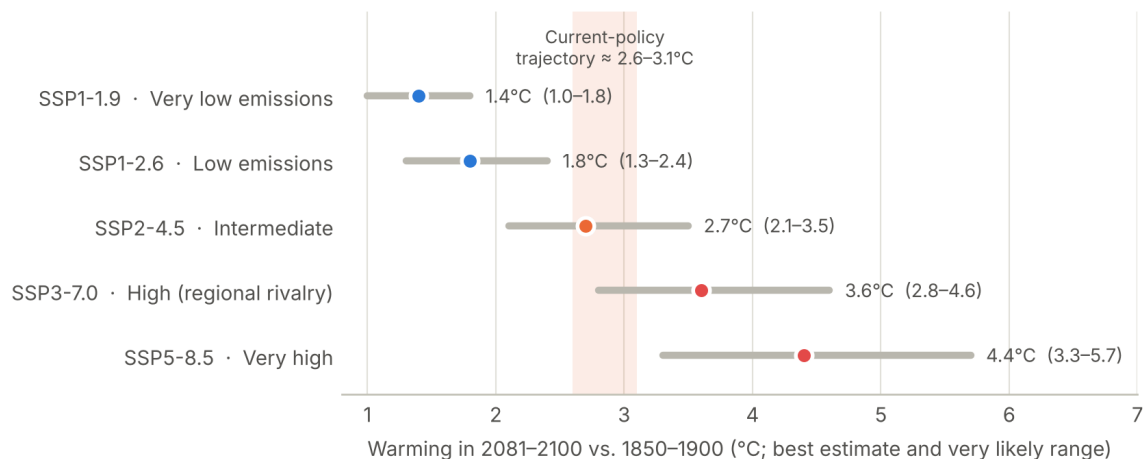


Source: [Global Carbon Budget](#), via [Our World in Data](#).

There are early signs that global emissions are approaching a plateau. Clean power now meets most of the growth in electricity demand, and analysts have reported that China's emissions appear to have flattened since 2024. But a plateau is not a decline, and the [UNEP Emissions Gap Report 2024](#) estimates that current policies point toward roughly 2.6–3.1°C of warming by 2100. The [Climate Action Tracker](#) reaches similar conclusions.

Figure 13 How much warming? IPCC scenarios to 2100

Best estimate and very likely range of warming in 2081–2100. Shaded band shows the approximate current-policy trajectory.



Source: [IPCC AR6 Working Group I](#), Summary for Policymakers, Table SPM.1; current-policy range from [UNEP Emissions Gap Report 2024](#).

What 2.5–3°C means physically

- **Heat.** Extreme heat events that occurred once in 50 years in a pre-industrial climate become roughly 14 times as frequent at 2°C and nearly 40 times as frequent at 4°C, according to the [IPCC](#).

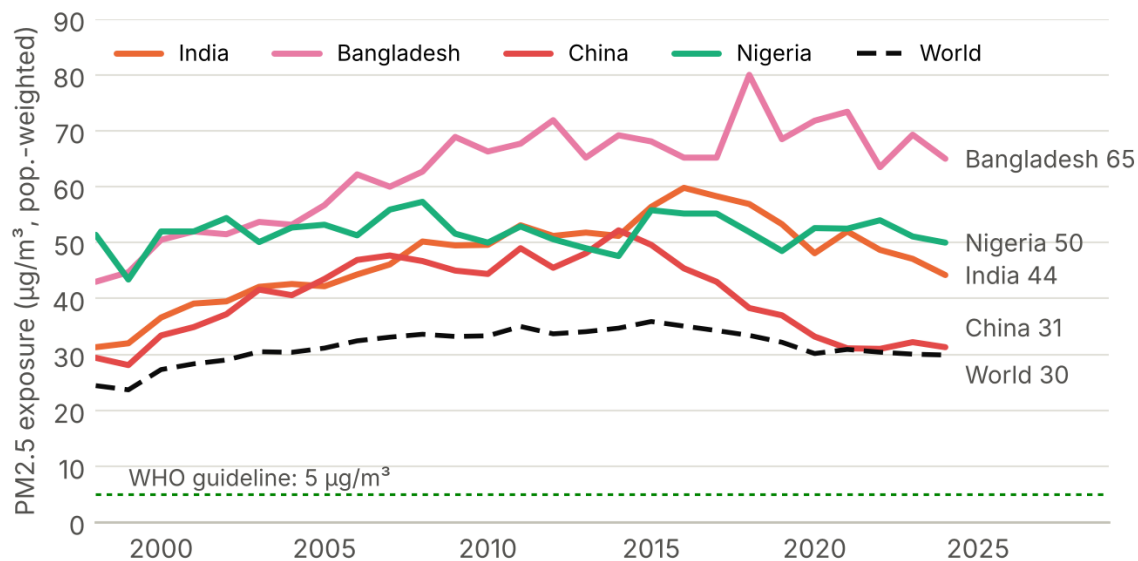
- **Sea level.** IPCC projects 0.44–0.76 metres of global sea-level rise by 2100 under intermediate emissions, with higher outcomes not ruled out, and continued rise for centuries.
- **Water.** Himalayan glaciers that feed rivers serving well over a billion people could lose between a third and three-quarters of their volume by 2100 depending on warming, according to [ICIMOD](#). Meltwater flows rise toward mid-century and then decline.
- **Food.** Yields of key staples are projected to fall in many tropical regions, while rising CO₂ lowers the nutritional content of some crops.
- **Tipping points.** Risks of crossing thresholds in ice sheets, permafrost, and ocean circulation rise sharply above 1.5–2°C. These are low-probability, high-impact risks that the central scenario does not include.

Pollution: the hidden killer, likely to recede

Air pollution kills more people than climate change does today. The [State of Global Air](#) report attributes roughly 8 million deaths in 2021 to outdoor and household air pollution, making it one of the leading risk factors for death worldwide. The burden is concentrated in South Asia, East Asia, and sub-Saharan Africa, where most people breathe air many times dirtier than the [WHO guideline](#) of 5 micrograms of fine particles (PM2.5) per cubic metre.

Figure 14 Fine-particle (PM2.5) air pollution exposure, 1998–2024

Population-weighted average concentration, micrograms per cubic metre. Dashed green line: WHO guideline.



Source: Atmospheric Composition Analysis Group (Washington University) satellite-derived estimates, via [Our World in Data](#).

The encouraging news is that air pollution is one of the problems that development and decarbonisation solve together. China cut average PM2.5 exposure by about 40% between 2014 and 2024 through a crash programme of emissions controls, coal-to-gas and coal-to-electric switching, and industrial relocation. India's exposure appears to have peaked around 2016, though it remains very high. Because most deadly air pollution comes from burning fuel, a world that electrifies and decarbonises is also a world that breathes more easily. For the median human, **air quality in 2100 is likely to be better than it is today.**

Other forms of pollution are less tractable. Plastics and microplastics are now ubiquitous, persistent chemicals such as PFAS are found in water and blood worldwide, and nutrient run-off is creating coastal dead zones. Their long-term health effects remain uncertain and are a genuine wildcard.

Poverty: dramatic progress, stalled at the hardest frontier

Extreme poverty has fallen faster in the past 35 years than at any time in history. Under the World Bank’s updated \$3.00-a-day line, the share of humanity in extreme poverty fell from about 43% in 1990 to about 10% in 2025, from roughly 2.3 billion people to about 815 million. But progress has slowed sharply since 2015, and the [World Bank](#) warns that extreme poverty is increasingly concentrated in sub-Saharan Africa and in fragile and conflict-affected states, where it is falling slowly if at all. Hunger has followed a similar path: the [FAO](#) estimates that roughly 670–730 million people faced chronic hunger in recent years.

Conflict: a rising tide

After decades of decline, armed conflict has been rising. Data from the [Uppsala Conflict Data Program](#), analysed by the [Peace Research Institute Oslo](#), show that 2024 had more active state-based conflicts than any year since 1946. The number of people forcibly displaced worldwide exceeded 120 million, according to [UNHCR](#). Conflict is the strongest single predictor of persistent extreme poverty, and conflict-affected states are often the least able to adapt to climate change.

Table 6 The four strands of the polycrisis

Strand	Current state	Direction to 2100 (central case)	Who bears the burden
Climate	~1.3–1.4°C long-term warming; first year above 1.5°C in 2024	Worsens to ~2.5–3°C; slows after mid-century	Tropics and subtropics; outdoor workers; coastal deltas
Pollution	~8M deaths a year from air pollution	Improves sharply as fuels are electrified and decarbonised	South Asia, sub-Saharan Africa until ~2050
Poverty	~10% below \$3/day; progress stalled since 2015	Falls further, but a hard core persists in fragile states	Sahel, Central Africa, conflict zones
Conflict	Highest number of state-based conflicts since 1946	Uncertain; risk elevated by climate stress and great-power rivalry	Fragile states; displaced populations

SECTION 07

Where the Trends Collide

The defining overlap of the century: the places where population is still growing are the places where heat stress is rising fastest and the capacity to adapt is weakest.

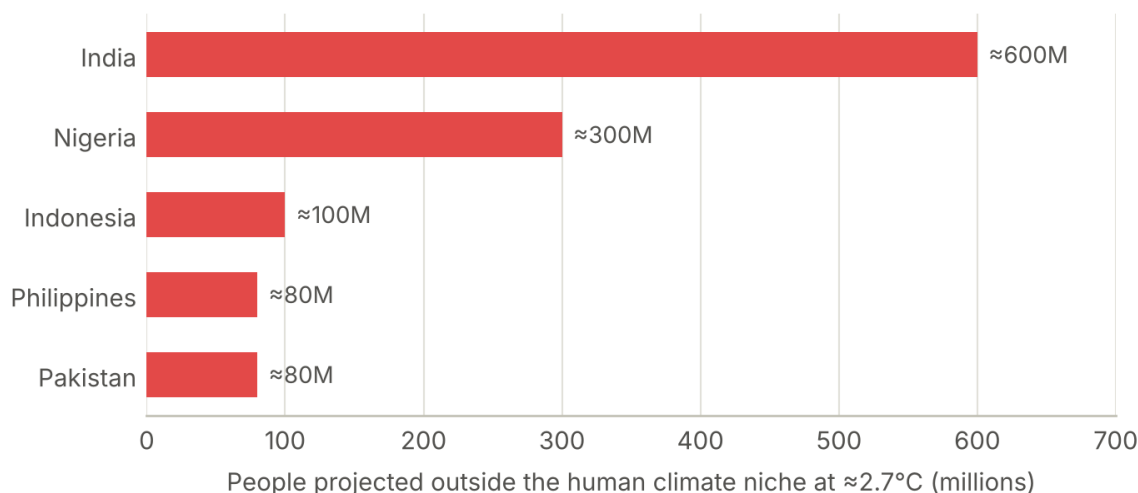
The previous sections described each trend separately. The essential insight of this report is that they do not operate separately. They are coupled, and the coupling is geographically concentrated. The overlap of rapid population growth, rising heat, limited infrastructure, and fragile governance across the tropical belt is the central risk of the century.

The human climate niche

For thousands of years, human populations have been concentrated within a fairly narrow band of climate conditions, centred on mean annual temperatures of roughly 11–15°C, with a secondary peak around 20–25°C. Research by [Xu et al. \(2020\)](#) described this as the “human climate niche.” A follow-up study by [Lenton et al. \(2023\)](#) estimated that around 60 million people already live outside the niche, in places with mean annual temperatures of 29°C or more. At roughly 2.7°C of global warming, close to the current-policy path, that number could rise to about **2 billion people**, around 22% of the projected population.

Figure 15 Where the climate niche breaks: the five most exposed countries

Estimated population exposed to unprecedented heat (mean annual temperature $\geq 29^\circ\text{C}$) at about 2.7°C of warming, around 2100.



Source: [Lenton et al., “Quantifying the human cost of global warming,” *Nature Sustainability* \(2023\)](#). Headline figures as published; rounded.

The study’s most important finding for this report is that limiting warming to 1.5°C instead of 2.7°C would reduce the exposed population roughly five-fold. Each 0.1°C of avoided warming spares on the order of 140 million people from dangerous heat. The countries most affected, India, Nigeria, Indonesia, the Philippines, and Pakistan, are also among those where population is still growing or will peak late.

The physiology of heat

Human bodies cool themselves by sweating. When air is both hot and humid, sweat cannot evaporate and the body loses its ability to shed heat. This combined stress is measured as the **wet-bulb temperature**. A wet-bulb temperature of 35°C has long been considered the theoretical limit of human survivability for a healthy person at rest. Laboratory research by [Vecellio et al. \(2022\)](#) suggests that the practical limit for young, healthy adults is lower, around 31°C wet-bulb in humid conditions, and lower still for older people, people with health conditions, and anyone doing physical work.

[Raymond, Matthews, and Horton \(2020\)](#) found that wet-bulb temperatures near or above 35°C have already been briefly recorded at weather stations along the Persian Gulf coast and in the Indus Valley, and that extreme humid heat events have more than doubled in frequency since 1979. As warming approaches 2.5–3°C, such events become recurrent across South Asia, the Persian Gulf, parts of West Africa, coastal Southeast Asia, and the North China Plain.

THE CRITICAL DISTINCTION

Heat itself is not destiny. **Heat without cooling kills; heat with reliable cooling is an expensive constraint.** Air-conditioned buildings, shaded streets, cool roofs, night-shift work, early-warning systems, and functioning hospitals reduce heat mortality dramatically. The [IEA](#) has noted that of the roughly 2.8 billion people living in the hottest parts of the world, fewer than one in ten own an air conditioner. Survivability is, in large part, an energy-access problem.

Trapped populations

The UK Government’s [Foresight report on migration and environmental change \(2011\)](#) introduced a concept that is central to this report’s question: **trapped populations**. When environmental conditions deteriorate, it is often not the poorest who migrate. Migration requires money, networks, documents, and destinations. The people with the fewest resources are often the least able to move away from danger, and may become trapped in places of increasing risk while slightly better-off neighbours leave.

The [World Bank’s Groundswell analysis](#) projected that climate change could force up to 216 million people to migrate within their own countries by 2050 in a pessimistic scenario, with the largest numbers in sub-Saharan Africa and South Asia. Most climate-related movement is internal and regional, from rural areas to cities, rather than intercontinental.

The coupling map

Table 7 How the century’s trends interact

Coupling	Mechanism	Net effect
Young South ↔ ageing North	Labour shortages in ageing societies meet youth surpluses and climate stress in young ones. Migration becomes the main pressure valve.	Rising migration pressure; central political issue in rich democracies
Africa’s workforce ↔ automation	Factory jobs that lifted East Asia are increasingly automated just as Africa’s workforce peaks.	Risk of a missing development ladder

Coupling	Mechanism	Net effect
Asian growth ↔ clean technology	Asian demand drives emissions, but China's clean-tech scale makes solar, batteries, and EVs cheap for everyone.	Main positive offset to the climate trend
Heat ↔ food ↔ conflict	Drought and heat cut farm incomes; food prices rise; youth unemployment and weak states turn grievance into violence.	Self-reinforcing instability in the Sahel and Horn of Africa
Ageing ↔ fiscal ↔ politics	Older electorates shift budgets toward pensions and health, away from investment and aid.	Weaker capacity of the North to finance adaptation in the South
Heat ↔ electricity	Cooling demand soars; where grids are weak, heat directly drives mortality and lost work.	Energy access becomes a survival variable

These couplings make the century's outcome sensitive to a small number of leverage points. The most important are the speed of electrification across Africa and South Asia, the pace of girls' education, the cost and availability of adaptation finance, and whether rich countries treat migration as a managed labour flow or as a security threat.

SECTION 08

The Upside Engine: Convergence and Diffusion

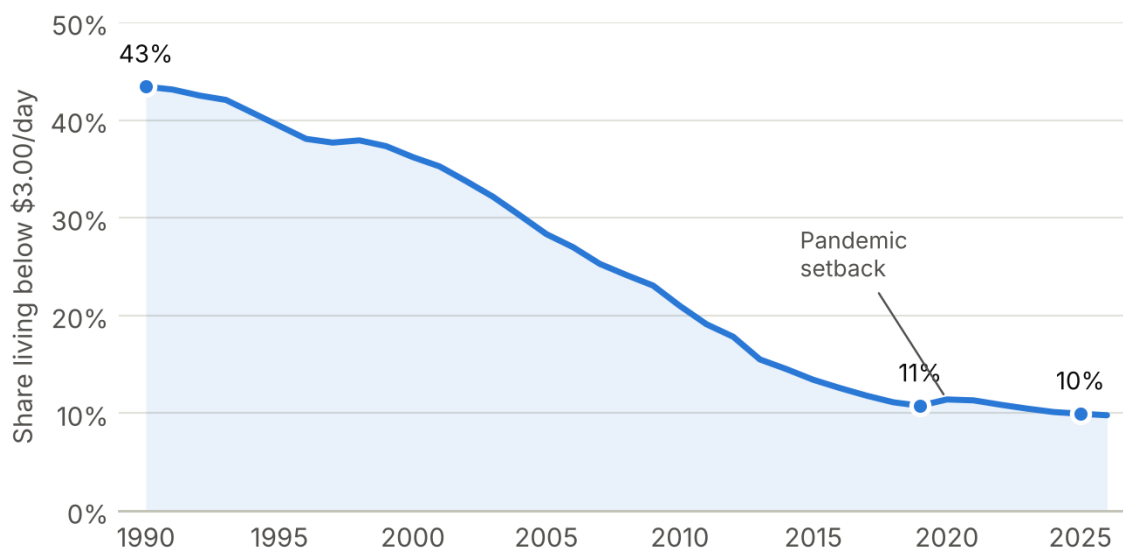
The strongest force for good in the twenty-first century is the speed at which knowledge, technology, and institutions now spread.

A projection that only catalogues risks will be systematically too pessimistic. Over the past 75 years, the dominant trend for most of humanity has been dramatic improvement in health, income, education, and access to technology. That trend has not stopped. Its pace and reach are the main reasons the central scenario for 2100 is better than today for most people.

The great escape from poverty

Figure 16 Share of humanity in extreme poverty, 1990–2025

Percent of world population living on less than \$3.00 a day (2021 prices). Recent years are World Bank nowcasts.



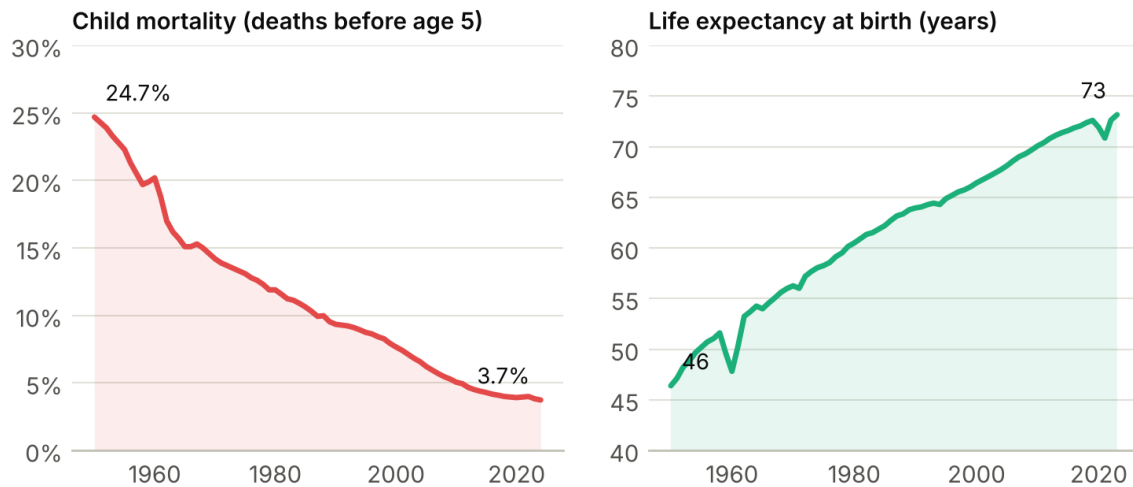
Source: World Bank Poverty and Inequality Platform, via [Our World in Data](#).

In 1990, about 43% of humanity lived in extreme poverty. Today it is about 10%. The largest reductions came in China, India, Indonesia, and Vietnam, driven by agricultural productivity, urbanisation, export manufacturing, and public investment in infrastructure and schooling. The same mechanisms are available, in modified form, to the countries where poverty persists.

Health: the most underrated revolution

Figure 17 Child mortality and life expectancy, world, 1950–today

Share of children dying before age five; average life expectancy at birth.



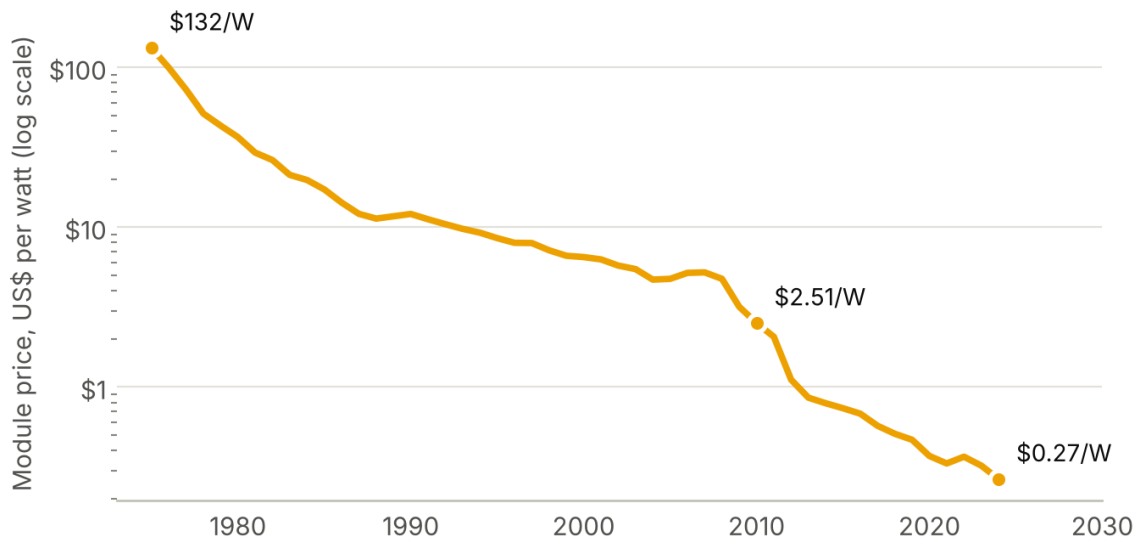
Source: UN Inter-agency Group for Child Mortality Estimation and UN WPP, via Our World in Data: [child mortality](#), [life expectancy](#).

In 1950, roughly one child in four died before reaching age five. Today it is fewer than one in 25. Global life expectancy has risen from about 46 to about 73 years. These gains continue: the WHO has recommended two [malaria vaccines](#) (RTS,S in 2021 and R21 in 2023), long-acting HIV prevention injections given twice a year were approved in 2025 ([WHO](#)), and mRNA platforms can be adapted to new pathogens within months. Each of these innovations is reaching low-income countries far faster than earlier medical breakthroughs did.

Energy: the price collapse that changes everything

Figure 18 Price of solar photovoltaic modules, 1975–2024

US dollars per watt of capacity (log scale), inflation-adjusted.



Source: IRENA, Nemet (2009), and Farmer & Lafond (2016), compiled by [Our World in Data](#).

Solar module prices have fallen from over \$100 per watt in the 1970s to about \$0.27 today, roughly 89% since 2010 alone. Solar is now the cheapest source of new electricity in most of the world, and it can be deployed in small increments, without a national grid. Pakistan offers a glimpse of what this means: households and businesses imported roughly 17 gigawatts of Chinese solar panels in 2024 alone, according to [Ember](#), largely bypassing an expensive and unreliable grid. Paired with ever-cheaper batteries, distributed solar may allow parts of Africa and South Asia to leapfrog the centralised fossil-fuel grid, much as mobile phones allowed them to leapfrog landlines.

Digital diffusion

About 74% of the world's population now uses the internet, according to [ITU](#) data, and the share in Africa has risen from almost zero in 2000 to about 41%. Digital public infrastructure has shown that state capacity can be built quickly. India's Aadhaar biometric ID covers more than 1.3 billion people, and its [UPI payment system](#) now processes on the order of 20 billion transactions a month. Mobile money, pioneered by Kenya's M-Pesa, has brought financial services to hundreds of millions of people who never had a bank account.

Diffusion is accelerating

[Comin and Hobijn \(2010\)](#) documented that the average lag between a technology's invention and its adoption in a typical country was around 45 years, and that the lag has shortened substantially for newer technologies. Railways took the better part of a century to spread; electricity, decades; mobile phones, roughly a decade. Generative AI has reached hundreds of millions of users worldwide within a few years. Faster diffusion means the benefits of frontier innovation reach poor countries sooner, though not always with the complementary infrastructure and skills needed to make full use of them.

Artificial intelligence: the wild card

AI is the largest source of uncertainty in the upside case. In its optimistic form, it delivers near-free tutoring, medical diagnosis, agricultural advice, and legal and administrative help to billions of people in their own languages, accelerating human-capital formation in exactly the places where teachers and doctors are scarce. It may also accelerate science, including materials, batteries, crops, and drugs. In its pessimistic form, it concentrates economic gains in a few countries and firms, automates away the labour-intensive jobs that developing countries rely on, and amplifies surveillance and disinformation. Both outcomes are plausible; the distribution of AI's gains is a policy choice.

Table 8 The upside ledger: forces lifting the century

Force	Evidence today	Why it matters for 2100
Poverty reduction	43% → 10% below \$3/day since 1990	Wealth is the strongest buffer against every hazard
Health technology	Child mortality under 4%; new vaccines and HIV prevention	Longer, healthier lives; lower fertility as child survival rises
Cheap clean energy	Solar ~89% cheaper since 2010	Electricity for cooling, water, industry, and clean air
Digital diffusion	~74% of humanity online	Access to markets, finance, knowledge, and public services

Force	Evidence today	Why it matters for 2100
Education	Near-universal primary enrolment; secondary rising fast	Drives fertility decline, productivity, and adaptability
Falling fertility	Global fertility ~2.25 and falling	Eases long-run pressure on land, water, and public services

SECTION 09

Life in 2100: The Median Human

Strip away the regional stories and ask a simple question: what is life like for an ordinary person at the end of the century?

Projections usually describe countries and regions. People, however, live individual lives. This section translates the demographic, economic, and climate trends into a portrait of the typical person in 2100, and of the band of humanity that this report pays particular attention to: the **25th to 50th percentile**, the people who are neither among the world’s poorest nor yet comfortably secure.

Who is the median human of 2100?

If we lined up all 10.2 billion people projected to be alive in 2100, the person standing in the middle would, on central assumptions, look something like this. These are probabilistic characteristics derived from UN projections and the middle-of-the-road Shared Socioeconomic Pathway (SSP2), not a prediction about any individual.

Table 9 Portrait of the median human, 2026 vs. 2100 (central scenario)

Characteristic	Today (2026)	2100 (central scenario)
Where they live	Asia (59% of humanity); Africa 19%	Most likely South Asia or sub-Saharan Africa: Asia 45%, Africa 37%
Setting	Just over half live in cities	Roughly four in five live in urban areas, many in megacities of the tropics
Age	Median age about 31	Median age about 42
Life expectancy	About 73 years	Around 80 years (UN projections)
Education	Most adults have primary or lower-secondary schooling	Most adults have completed at least lower-secondary schooling
Family	About 2.25 children per woman	Fewer than 2 children; more living grandparents than grandchildren
Income (central case)	Global median roughly \$8–9 a day (2021 prices)	Roughly 3–5 times higher in real terms: similar to today’s middle-income households
Climate	~1.3–1.4°C of warming	~2.5–3°C; dangerous heat seasons common across the tropics
Air	Severe air pollution across much of Asia and Africa	Substantially cleaner air in most places as combustion declines
Technology	Smartphones and mobile money widespread	Ubiquitous connectivity, AI assistance, and distributed solar power

Source: H Heuristics synthesis from [UN WPP 2024](#), [UN World Urbanization Prospects](#), [Wittgenstein Centre](#), and SSP2 assumptions ([Riahi et al., 2017](#)). Income figures are indicative.

The 25th–50th percentile today and tomorrow

Today, people in the 25th to 50th percentile of the global income distribution live on roughly \$4 to \$9 a day in 2021 prices. They are typically small farmers, informal urban workers, factory and construction workers, and small traders across South Asia, Southeast Asia, and Africa, along with the lower-income households of Latin America. They usually have a phone, intermittent electricity, some schooling, and little or no social protection. They are highly exposed to shocks: a failed harvest, an illness, or a heatwave can push them back into extreme poverty.

In the central scenario, this band is considerably better off in 2100 in material terms. Middle-of-the-road SSP projections imply average incomes several times higher than today even after accounting for climate damages. Climate damages mean they are **less rich than they would otherwise have been**, not, for most, poorer than today. Estimates of damages vary widely: [Burke, Hsiang, and Miguel \(2015\)](#) estimated that unmitigated warming could reduce average global incomes by around 23% by 2100 relative to a world without climate change, with far larger losses in hot, poor countries. For the hottest and poorest places, the shortfall could be half or more of the no-warming path, which could mean stagnation rather than progress.

Daily life: what gets better and what gets worse

Table 10 Daily life for the median human in 2100, central scenario

Domain	Direction	What it looks like
Heat	Much worse	Weeks to months each year when afternoon outdoor activity is dangerous. Life shifts toward early mornings, evenings, shade, and cooled indoor spaces. Heat warnings become as routine as rain forecasts.
Air quality	Probably better	Combustion-related pollution falls as transport, cooking, and power are electrified. South Asia's worst air is likely in the decades before 2050.
Water	Worse in hotspots	Groundwater depletion in north-west India and Pakistan; declining glacier meltwater after mid-century. Water becomes an engineering and pricing problem: desalination, reuse, and metering.
Coasts	Worse	Managed retreat, sea walls, and periodic displacement in delta megacities such as Dhaka, Lagos, Jakarta, Kolkata, and Ho Chi Minh City.
Health	Better overall	Lower infectious-disease burden and child mortality; more chronic disease; heat illness and climate-sensitive diseases such as dengue spread to new areas.
Work	Changes shape	Outdoor and agricultural work becomes seasonal, mechanised, or night-shifted. Automation removes many harsh jobs but also some routes out of poverty.
Food	Mixed	Diets are more varied and food is more often imported or processed; local harvests are less reliable; price spikes are more frequent.
Information	Much better	Universal connectivity and AI tools provide education, health advice, and services in local languages.

Two lives in 2100: illustrative vignettes

The following vignettes are **fictional composites** created by H Heuristics to make the central scenario concrete. They are not forecasts about any real person or place.

VIGNETTE A • THE CONSTRAINED MIDDLE (ILLUSTRATIVE)

Amara is 42 and lives in a high-rise district on the edge of a West African coastal megacity of more than 30 million people. She works as a technician servicing rooftop solar and battery systems, a job that did not exist when her grandmother was born. Her apartment block has shared cooling, and during the hot season she starts work at 5 a.m. and finishes before noon. Her two children attend a school that combines human teachers with AI tutors.

Amara is far richer than her grandparents, with reliable electricity, clean cooking, and a smartphone that handles her banking and health care. But her life is shaped by heat. The district's flood barriers were raised twice in her lifetime, her parents' home village inland was largely abandoned after repeated droughts, and the price of rice spikes every few years when Asian harvests fail. Her life is constrained and expensive, but not unbearable.

VIGNETTE B • THE TRAPPED (ILLUSTRATIVE)

Ibrahim is 38 and lives in a small town in the central Sahel. The grid reaches the town only intermittently, and few households can afford cooling. In the hottest months, outdoor work is possible only before dawn and after dusk, and the clinic records heat deaths among the elderly every year. Rainfall has become erratic, and his family's herd shrank after successive droughts.

Ibrahim's younger brothers left for the coast years ago, but Ibrahim stayed to care for his parents, and the cost of moving rose as borders tightened. Armed groups control parts of the countryside. Ibrahim is among the people this report calls "trapped": too poor to adapt in place, unable to move, and living where heat, insecurity, and weak services overlap.

The difference between Amara and Ibrahim is not mainly climate. Both live in hot places. The difference is **electricity, income, governance, and mobility**. That is the central lesson for anyone trying to understand what life will be like in 2100.

SECTION 10

Testing the Survivability-Trap Hypothesis

Will pollution and climate stress make life unbearable for ordinary people? The evidence supports a precise version of the hypothesis, not the general one.

The hypothesis this report set out to test is that the middle-to-lower part of humanity may become trapped in survivability risk, where pollution and climate stressors make life unbearable. We test it in three parts: is the physical hazard real, who is exposed, and does exposure translate into an unlivable life?

Part 1: the physical hazard is real

Yes. As Section 7 showed, humid heat near the limits of human tolerance has already been recorded, and at 2.5–3°C of warming it becomes recurrent across large, densely populated regions. Roughly 2 billion people could live outside the historical human climate niche at about 2.7°C ([Lenton et al., 2023](#)). This part of the hypothesis is supported with high confidence.

Part 2: exposure is concentrated, and partly overlaps with the 25–50% band

The most heat-exposed populations are in India, Nigeria, Indonesia, the Philippines, Pakistan, and across the Sahel and the Persian Gulf. Many of the people in the 25th–50th percentile of the global distribution live in exactly these places. This part of the hypothesis is also supported.

Part 3: whether exposure becomes unlivable depends on adaptive capacity

This is where the general hypothesis breaks down and a more precise version emerges. Exposure to a hazard is not the same as harm. The relationship is mediated by income, electricity, housing, health systems, work patterns, and governance. Survivability can be summarised as:

$$\text{Risk} = \text{heat exposure} \times \text{lack of cooling and reliable power} \times \text{dependence on outdoor work} \times \text{weak governance}$$

In the central scenario, most people in the 25–50% band move above the line where these factors combine into an unlivable condition. They gain grid or solar power, some access to cooling, indoor or mechanised work, and functioning public services. Their lives are constrained, more expensive, and less comfortable outdoors, but not unbearable. The people who remain below that line are disproportionately in the bottom quarter: rural, dependent on outdoor work, without reliable power, and often in conflict-affected states.

Table 11 Conditions that turn heat exposure into a survivability trap

Factor	Trap condition	Escape condition
Electricity	Intermittent or none; cooling unaffordable	Reliable grid or solar-plus-storage; affordable efficient cooling

Factor	Trap condition	Escape condition
Work	Outdoor agriculture and labour in peak heat	Indoor, mechanised, or shifted to cooler hours
Housing	Informal, uninsulated, dense, no shade	Insulated, ventilated, cool roofs, green space
Health system	Distant clinics; no early warning	Heat-health action plans; accessible care
Mobility	Too poor or legally blocked from moving	Able to relocate internally or migrate legally
Governance	Conflict, corruption, state absence	Functioning local government and public services

Verdict

H HEURISTICS VERDICT

Supported in a precise form. Under central assumptions, the survivability trap is real for a large minority, roughly 1 to 2.5 billion people by late century, concentrated in the hot, poor, fragile parts of the Sahel, Central Africa, rural South Asia, and informal settlements in delta cities. For them, “unbearable” is literally accurate.

Not supported as a description of the median. The 25–50% band mostly sits just above the trap line in the central scenario. Their lives are hotter and more constrained, but materially better than today.

Conditionally supported in pessimistic worlds. In a fragmented, slow-growth, high-warming world (SSP3, about 3.5–4°C), the trap expands to cover much of the 25–50% band. Low growth means fewer people can afford cooling; closed borders mean fewer can leave.

Pollution is the part of the hypothesis that is least supported over the long run. Air pollution is deadly today and will remain so in South Asia and parts of Africa for decades, but it is largely a by-product of combustion. Development and decarbonisation are likely to reduce it substantially by 2100, as China’s rapid improvement since 2014 illustrates.

SECTION 11

Four Scenarios for 2100

No single forecast can capture the century. Four coherent pathways, weighted by judgement, give a more honest picture of direction and risk.

Our scenarios build on the IPCC's Shared Socioeconomic Pathways ([Riahi et al., 2017](#)), which combine assumptions about population, economic growth, inequality, governance, and emissions. We collapse them into four storylines and assign each a subjective probability. These weights are **H Heuristics judgements**, intended to calibrate direction, not to be read as precise statistical estimates.

Scenario 1: Broad Convergence (~25%)

The energy transition accelerates through the 2030s as solar, batteries, and electrified industry become the default everywhere. Africa reaches near-universal electricity access by the early 2040s, girls' secondary schooling becomes the norm, and fertility falls faster than the UN projects. World population peaks below 10 billion. Warming peaks near 2–2.5°C late in the century. AI is widely diffused and boosts human capital in poor countries. Migration is managed through expanded labour-mobility agreements. By 2100 nearly all of humanity has reached at least today's middle-income standard.

Scenario 2: Uneven Progress (~50%, central)

Most of the world converges, but slowly and unevenly. Asia and Latin America reach upper-middle or high income; much of Africa makes progress but at a slower pace. Warming reaches about 2.5–3°C. A trapped “last billion” remains in the hottest, most fragile regions. Migration pressure is chronic and politically toxic, but borders are porous enough to act as a partial safety valve. This is the scenario described as “central” throughout this report.

Scenario 3: Fortress World (~20%)

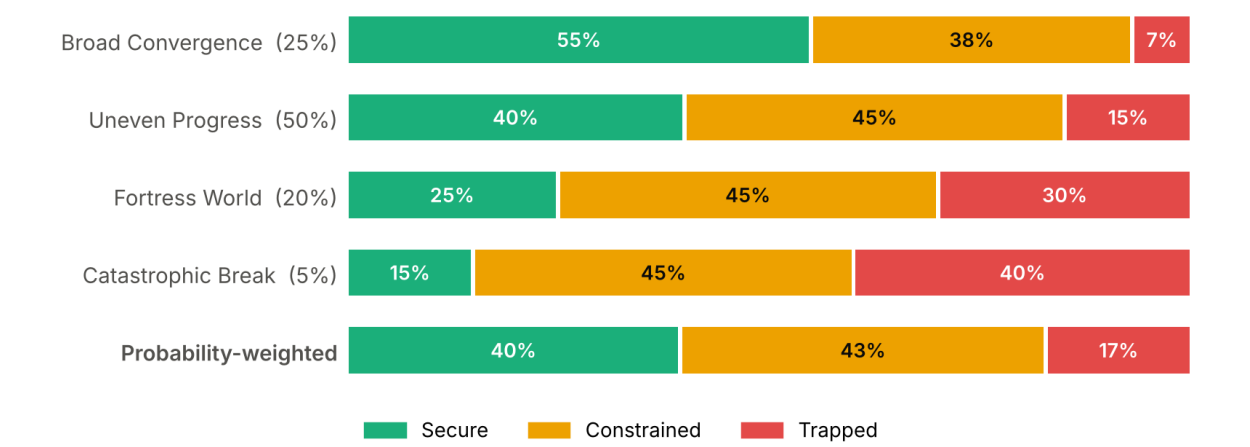
Geopolitical rivalry deepens, trade fragments into blocs, aid collapses, and rich countries prioritise border security over adaptation finance. Growth in poor countries slows, fertility declines more slowly, and world population approaches or exceeds the upper end of projections. Warming reaches about 3.5°C. The Global South splits into connected, electrified urban zones and stranded rural and fragile regions. In this world the survivability trap becomes the experience of a large share of the 25–50% band.

Scenario 4: Catastrophic Break (~5%)

A discontinuity, such as a nuclear exchange, an engineered or natural pandemic far more lethal than COVID-19, a cascade of climate tipping points, or a loss of control over advanced AI systems, resets the trajectory. Outcomes vary widely, but in most versions global living standards fall for decades and the most vulnerable suffer most.

Figure 19 Humanity in 2100 by condition, under each scenario

Illustrative share of world population that is secure, constrained, or trapped. Scenario weights in parentheses.



Source: H Heuristics judgement. “Secure” = reliable power, cooling, and resilient income; “constrained” = materially better off than today but exposed to costly climate stress; “trapped” = unable to adapt in place or move away from dangerous conditions.

Weighting the four scenarios by their probabilities gives an expected distribution for 2100 of roughly 40% secure, 43% constrained, and 17% trapped. Applied to a population of about 10 billion, that implies around 1.7 billion people in the trapped category, within the range of 1–2.5 billion discussed above.

Table 12 Scenario comparison

Dimension	Broad Convergence	Uneven Progress	Fortress World	Catastrophic Break
Weight	~25%	~50%	~20%	~5%
Population 2100	~8.5–9.5B	~9.5–10.5B	~11–12.5B	Highly uncertain
Warming 2100	~2–2.5°C	~2.5–3°C	~3.5°C+	Varies
Africa electrified	By early 2040s	By ~2060	Partial	Reversed
Migration regime	Managed labour mobility	Chronic pressure, porous borders	Fortified borders	Mass displacement
Median human	Secure, middle income	Constrained but improving	Constrained or trapped	Trapped or impoverished
Closest SSP	SSP1	SSP2	SSP3/SSP4	None

The present is pulled two ways

Where is the world today relative to these scenarios? The honest answer is that it is being pulled in two directions at once. **Politics is drifting toward Fortress World:** tariffs, aid cuts, restrictive migration policy, and great-power rivalry. **Technology is pulling toward Broad Convergence:** collapsing clean-energy costs, rapid digital diffusion, and medical innovation. The central scenario, Uneven Progress, is in effect the outcome of these two forces partly cancelling each other out.

SECTION 12

The Century in Three Acts

A timeline of the most likely milestones under the central scenario, with the decisions that shape each act.

Act I • 2026–2050: The transition squeeze

World population grows from about 8.2 to 9.7 billion. Europe, East Asia, and much of Latin America age rapidly; China’s population falls below 1.3 billion. India becomes the third-largest economy. Warming passes 1.5°C on a long-term basis and approaches 2°C. Clean power dominates new capacity, and global emissions plateau and begin to fall. Air pollution peaks and declines in South Asia. The decisions of this act, especially on electrification, education, and emissions, determine most of what follows.

Act II • 2050–2075: The peak and the pivot

World population approaches its peak. Africa becomes the world’s principal source of new workers, with about a quarter to a third of humanity. India’s population peaks around 2061. Climate damages are greatest in the tropics; adaptation becomes a central function of government. Himalayan meltwater begins to decline. Migration pressure is at its most intense, and the political settlement reached in rich countries largely determines whether the century tilts toward Convergence or Fortress.

Act III • 2075–2100: A smaller, older, hotter world

World population peaks around 2084 and begins a slow decline. Nearly every country has below-replacement fertility. Warming slows if net-zero has been achieved, but sea levels keep rising for centuries. Asia and Africa together hold more than 80% of humanity. The central question becomes whether shared prosperity has been reached, or whether a fortified North coexists with a stressed and fragmented South.

Table 13 Milestones under the central scenario

Period	Demography and economy	Climate and technology
2026–2035	India becomes the third-largest economy; China’s population decline accelerates; Africa passes 1.8B people	Global emissions plateau; solar on track to become the largest source of electricity globally; Africa’s electrification push
2035–2050	World ~9.7B; Africa ~2.5B; EU old-age dependency rises sharply	Long-term warming passes 1.5°C and approaches 2°C; air pollution falls in South Asia
2050–2065	India peaks (~1.7B, ~2061); Africa ~3B; Pakistan and Nigeria overtake the United States in population	Peak Himalayan meltwater; recurrent extreme humid heat in South Asia and the Gulf
2065–2084	World population peaks at ~10.3B (~2084)	Emissions falling steeply in most major economies; several at net zero; adaptation spending large
2084–2100	World ~10.2B and slowly declining; median age ~42; Africa ~37% of humanity	Warming ~2.5–3°C and rising only slowly; sea-level rise continues

SECTION 13

Signposts: Tracking the Direction of Travel

A sense of direction is only useful if it can be updated. These indicators tell us which scenario the world is moving toward.

The following dashboard identifies the indicators that best discriminate between the four scenarios. For each, we give a current reading and the thresholds that would signal a shift toward Broad Convergence or toward Fortress World. H Heuristics will use these signposts to update the scenario weights in future editions.

Table 14 The H Heuristics century dashboard

Indicator	Latest reading	Toward Convergence	Toward Fortress
Sub-Saharan Africa electricity access	55% (2024)	Above 75% by 2035	Below 65% by 2035
Africa fertility rate	~4.1 (2023)	Below 3.2 by 2035	Above 3.6 by 2035
Girls’ lower-secondary completion, Sahel	Low; rising slowly	Rapid gains through 2030s	Stagnation or reversal
Global fossil CO ₂ emissions	~38.6 Gt (2024), near plateau	Clear decline from late 2020s	Still rising after 2030
Current-policy warming estimate	~2.6–3.1°C	Below 2.5°C	Above 3°C
Extreme poverty (\$3/day)	~10% (2025)	Below 6% by 2035	Flat or rising
Air conditioner ownership, hottest regions	Under 10% of people	Rapid, efficient uptake	Stalls with weak grids
State-based armed conflicts	Highest since 1946 (2024)	Clear decline	Continued rise
Official development & climate finance	Under pressure	Rising adaptation finance	Sustained cuts
Labour-mobility agreements	Limited	Expanding, rules-based	Closure and securitisation

THE THREE SIGNPOSTS TO WATCH MOST CLOSELY

- **Electricity in Africa.** The single best predictor of whether heat exposure becomes a survivability trap.
- **Fertility and girls’ education in the Sahel and Central Africa.** These determine whether Africa’s 2100 population is closer to 2.5 or 4 billion.
- **The emissions peak.** The year global emissions begin a sustained decline sets the warming level against which every adaptation effort is measured.

SECTION 14

Heuristics for the Century

Twelve rules of thumb for thinking clearly about where humanity is headed.

1. **Relative decline is not absolute decline.** A region can shrink as a share of the world while its people continue to grow richer. Most debates about Western decline confuse the two.
2. **Averages improve while tails fatten.** The typical person can be better off at the same time as the worst-off are in greater danger. Both statements can be true, and in this century they probably are.
3. **Vulnerability = hazard × exposure × poverty.** Reduce poverty and the same hazard kills far fewer people. Electricity is the single largest lever.
4. **Demography is slow, technology is fast, politics is noisy.** Trust population projections about 30 years out, technology trends about 10, and political forecasts barely at all.
5. **Separate the observation from the mechanism.** Europe's population decline is real; the cause is fertility, not immigration. Getting the mechanism wrong produces the wrong response.
6. **Bet on diffusion; watch distribution.** Technology almost always spreads. Who captures its gains is what decides the outcome.
7. **The last billion decides the story.** The century will be judged by the Sahel, the Congo basin, and the Indo-Gangetic plain, not by Shanghai or Berlin.
8. **Every tenth of a degree matters.** Each 0.1°C of avoided warming spares on the order of 140 million people from unprecedented heat.
9. **Pollution is a development problem; carbon is a coordination problem.** Countries clean their air as they grow richer. They do not automatically cut carbon.
10. **Migration is a pressure valve, not a flood.** Most climate migration is internal and regional. The poorest are often trapped rather than mobile.
11. **Watch the ladder.** If automation removes the manufacturing route out of poverty, new routes must be built deliberately.
12. **Direction is not destiny.** The century's outcome is still being decided, mostly by choices made in the next 25 years.

SECTION 15

Conclusion: Where Humanity Is Headed

Net upward, but bifurcating. The century's central race is between diffusion and damage.

The evidence assembled in this report supports a clear sense of direction. Humanity is headed toward a world that is larger until the 2080s and then slowly smaller; older everywhere; far more African and South Asian; mostly urban; mostly educated; and, for most people, materially richer and healthier than today. The West will be a smaller share of that world, but not a collapsed one. Asia will be its economic centre for much of the century, with leadership shifting from East to South and Southeast Asia. Africa will be its demographic centre.

That world will also be hotter, with roughly 2.5–3°C of warming on current trajectories, and the burden of that heat will fall on the regions where population growth is concentrated. For a large minority of humanity, perhaps 1 to 2.5 billion people, the overlap of heat, poverty, and fragile governance will create a genuine survivability trap. For the median person, including most of the 25–50% band, life in 2100 is likely to be constrained and costly in new ways, but better in most material respects than it is today.

The difference between those outcomes is not set by physics alone. It is set by how quickly cheap clean electricity reaches the hottest places, how quickly girls' education and health care spread through the youngest countries, how well cities in the tropics are built, and whether rich and ageing societies choose cooperation or fortification. These are choices, and most of them will be made in the next quarter-century.

The century is a race between diffusion and damage. The direction is upward; the distribution is the problem. The task is to ensure that the last billion is not left behind.

ABOUT H HEURISTICS

H Heuristics produces long-range research and practical rules of thumb for understanding the forces shaping the century. This report is Edition 1.0 of The Century Compass. Future editions will update the scenario weights and dashboard as new data arrive.

APPENDIX A

Data Notes and Methods

How the figures in this report were produced, and their limitations.

Population and demography

Population, fertility, and median-age figures use the [UN World Population Prospects 2024](#) estimates to 2023 and the medium-variant projection thereafter, downloaded from Our World in Data in October 2026. Regional groupings follow the UN continental definitions used by Our World in Data: “North America” includes Central America and the Caribbean. Values are rounded in the text.

Economy

Regional shares of world GDP were calculated by H Heuristics from the Maddison Project Database 2023 regional GDP aggregates (2011 international dollars at purchasing-power parity). “The West” is defined as Western Europe plus the Western offshoots (United States, Canada, Australia, and New Zealand). “Asia” is East Asia plus South and Southeast Asia. Pre-1950 values are sparse benchmark estimates and should be read as approximate.

Poverty

Extreme poverty uses the World Bank’s international poverty line of \$3.00 per person per day in 2021 purchasing-power-parity prices, which replaced the earlier \$2.15 line (2017 prices) in 2025. Recent years are nowcasts based on growth projections. Income estimates for the 25th–50th percentile are indicative, derived from World Bank distribution data, and rounded.

Climate and pollution

Temperature anomalies are as compiled by Our World in Data; individual datasets differ by a few hundredths of a degree depending on baseline and method. Warming projections use IPCC AR6 SSP best estimates and very likely ranges for 2081–2100. The current-policy range is from the [UNEP Emissions Gap Report 2024](#). PM2.5 exposure is a satellite-derived, population-weighted estimate as published by [Our World in Data](#).

Judgemental elements

Scenario probabilities, the “secure / constrained / trapped” banding, and the dashboard thresholds are H Heuristics judgements informed by the literature reviewed in this report. They are designed to be updated as signposts evolve. The vignettes in Section 9 are fictional composites.

Retracted and contested evidence

Estimates of the economic damage from climate change vary widely by method. A prominent 2024 study estimating very large committed income losses was subsequently retracted; it is not used in this report. We rely instead on long-standing peer-reviewed estimates and present damages as ranges.

APPENDIX B

Glossary

Key terms used in this report.

Table 15 Glossary of terms

Term	Definition
Demographic dividend	The boost to economic growth that can occur when the working-age share of a population rises relative to children and older dependants.
Demographic transition	The shift from high birth and death rates to low birth and death rates that accompanies development.
Fertility rate (TFR)	The average number of children a woman would have over her lifetime at current age-specific birth rates.
Replacement level	The fertility rate (about 2.1) at which a population replaces itself from one generation to the next, absent migration.
Median age	The age that divides a population into two equal halves.
Old-age dependency ratio	People aged 65+ per 100 people of working age (15–64).
PPP	Purchasing-power parity: an adjustment that compares incomes across countries by accounting for differences in price levels.
Extreme poverty	Living on less than \$3.00 per person per day (2021 PPP), the World Bank’s international poverty line.
SSP	Shared Socioeconomic Pathways: five scenario families used by the IPCC to describe alternative futures for population, growth, inequality, and emissions.
Wet-bulb temperature	A measure combining heat and humidity that indicates the body’s ability to cool by sweating.
Human climate niche	The range of climate conditions in which human populations have historically been concentrated.
Trapped populations	People exposed to worsening environmental conditions who lack the resources or legal ability to move away.
Polycrisis	A situation in which multiple crises interact so that their combined impact exceeds the sum of their separate effects.
Premature deindustrialisation	The tendency for manufacturing employment in developing countries to peak at lower levels of income than in earlier industrialisers.
PM2.5	Fine particulate matter smaller than 2.5 micrometres, the most harmful common air pollutant.

APPENDIX C

Sources and Further Reading

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