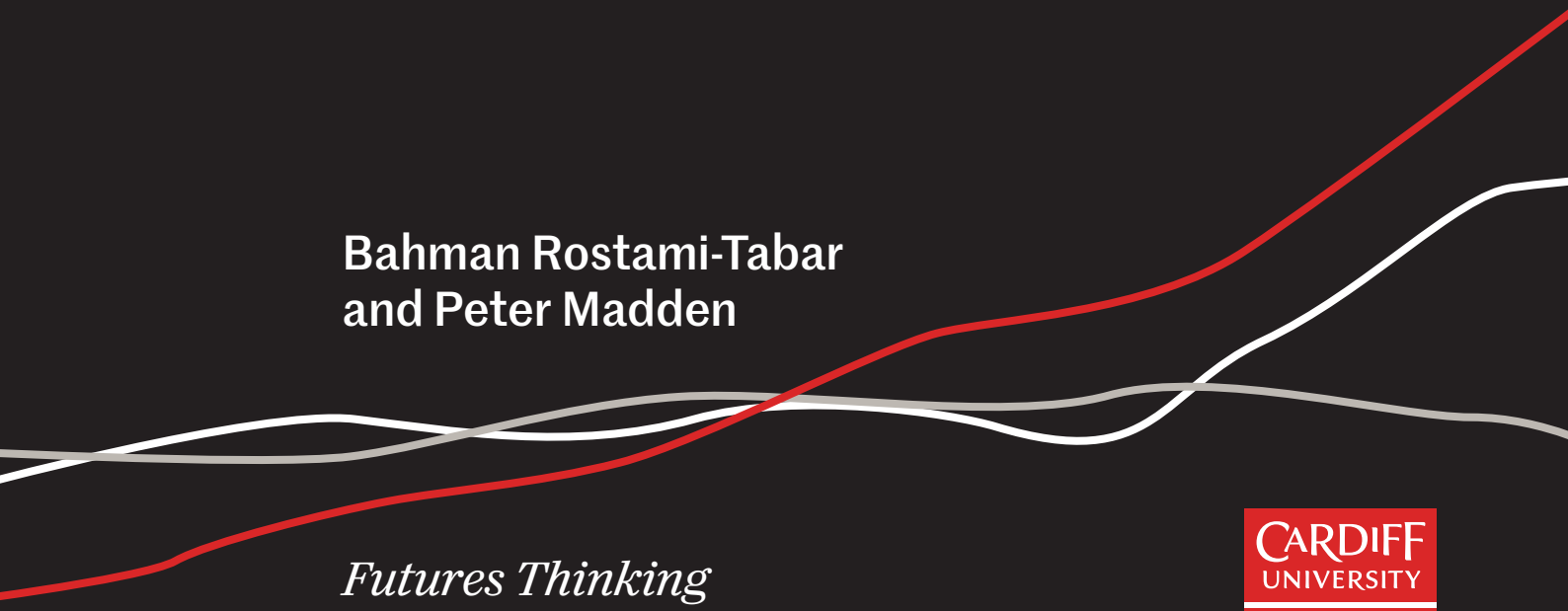
Global Megatrends and the Implications for our Futures

Bahman Rostami-Tabar
and Peter Madden



Futures Thinking
from Cardiff University

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Professor
Bahman Rostami-Tabar

Professor of Analytics and
Decision Sciences
Cardiff Business School
Cardiff University

Professor
Peter Madden, OBE

Professor of Practice,
Urban Futures
Welsh School of Architecture
Cardiff University

Cardiff University, June 2026

Founded in 1883, Cardiff University is established as one of Britain's leading research universities.

We work together towards a better future for all.

We believe that greatness comes from collaboration and diversity of opinion.

Future Generation Thinking

Future Generation Thinking defines what Cardiff is choosing to become. At its heart is a belief that we must help shape the future we want to see and develop the people who will help make it happen.

Future Generation Teaching

A Cardiff education builds more than knowledge. It develops the skills, judgement and confidence needed to shape what comes next.

Future Generation Research

At Cardiff, research has a clear purpose. To shape what comes next. Our work is aligned to the questions that will define how society lives, thinks and acts in the decades ahead.

Future Generation Impact

For over 130 years, Cardiff University has worked alongside the communities and institutions shaping the nation we call home, improving health and wellbeing, and tackling the inequalities that hold communities back.

A university deeply rooted in place, with ideas that travel.
That is Cardiff's civic ambition.

Executive Summary

This document sets out 25 mega trends likely to reshape societies, economies, and political systems in the coming decades. These are drawn from analysis and synthesis of major trends reports produced by governmental, intergovernmental and academic bodies.

A central theme running through these reports is the growing mismatch between the velocity and complexity of change and the institutional and social capacity to respond, a governance gap with profound consequences for collective action on the challenges ahead.

This document organises these 25 trends into five thematic areas: Social, Technological, Economic, Environmental, and Political (STEEP), and it examines the cross-cutting interdependencies between them. No trend operates in isolation: demographic pressures shape fiscal constraints, technological disruption amplifies inequality, and environmental crises test political systems in ways that demand joined-up responses.

Social

Ageing populations and falling birth rates in advanced economies are colliding with rising inequality, a deepening mental health crisis, rapid urbanisation, and declining institutional trust. These are not isolated pressures, they interact and reinforce one another, generating social fragmentation and political volatility at a moment when cohesion is most needed.

Technological

AI represents a defining transformation of the coming era, reshaping healthcare, industry, public services, and security at unprecedented speed. Advances in biotechnology, quantum computing, and robotics are equally consequential but receive less strategic attention. Alongside immense opportunity, these technologies introduce serious risks, from cyber weaponisation and labour displacement to the concentration of power in a small number of states and corporations.

Economic

The post-war globalised trading order is fracturing as states prioritise strategic security over efficiency, while the green transition is restructuring entire industries and intensifying competition for critical minerals. Government finances are severely strained by post-pandemic debt, ageing populations, rising defence costs, and decarbonisation investment needs arriving simultaneously, leaving little room to absorb further shocks.

Environmental

The picture is one of compounding crises. Climate change is intensifying beyond the 1.5°C threshold, biodiversity is collapsing at rates with no precedent in human history, and water, food, and material resource scarcity is worsening. Adaptation investment is urgently needed but fiscally constrained, and while circular and regenerative economic models offer systemic solutions, they remain far from the scale required to drive systemic change.

Political

The rules-based international order is cracking under the weight of populist politics, US-China rivalry, Russian aggression in Europe, and rising middle powers asserting new interests. Democratic governance faces simultaneous external pressure from authoritarian states and internal pressure from populism, polarisation, and institutional distrust, weakening the ability to take the collective action needed on climate, technology, and security.

The reports surveyed suggest that outcomes to mid-century will depend critically on whether governance can be reformed quickly enough to match the pace and complexity of these intersecting pressures. Can governance systems, at all levels, build anticipatory capacity, integrate expertise across disciplines, and rebuild the participatory legitimacy needed to sustain difficult long-term choices and changes?

The 25 trends are summarised in Table 1, overleaf.

Table 1:
The 25 global megatrends examined in this report, organised by STEEP category.

Category	Trend
Social	1. Ageing Populations and Demographic Divergence
	2. Widening Socio-Economic Inequality
	3. Deterioration of Mental Health and Social Connection
	4. Rapid Urbanisation and Infrastructure Pressures
	5. Eroding Institutional Trust and Polarisation
Technological	1. AI-Enabled Transformation
	2. Pervasive Digital Connectivity
	3. Technological Acceleration Beyond Digital
	4. Automation and the Transformation of Work
	5. Cyber Weaponisation
Economic	1. Geoeconomic Fragmentation
	2. The Green Transition
	3. Constraints on Government Spending
	4. Shifting Global Economic Power
	5. Labour Market Transitions
Environmental	1. Accelerating Climate Change
	2. Biodiversity Loss and Ecosystem Degradation
	3. Resource Scarcity
	4. Adaptation and Building Resilience
	5. Regenerative Economic Transformation
Political	1. Geopolitical Competition and Erosion of the Rules-Based Order
	2. Blurring Security Boundaries
	3. Pressures on Governance Systems
	4. The Rise of Populism and Nationalism
	5. Innovation in Governance

Introduction

Cardiff University has a commitment to Future Generation Thinking, a belief that we must help shape the future we want to see and develop the people who will help make it happen.

The purpose of this paper is to inform wider university work on foresight and futures by setting out some of the trends that are likely to shape the next decades. It draws on ten previously published trends documents (See Appendix A).

We may understand a trend in this context as something that began in the past, is happening in the present, and has such inbuilt momentum that it is likely to continue into the future. Examples might be a warming planet, the ageing UK population, or urbanisation in the developing world. The relative stability and certainty in the trajectory of these forces of change give important insights into the future. Analysis of future trends can guide researchers, policy-makers, and society more widely about upcoming issues they are likely to face.

The major trends covered in this document are often referred to as 'megatrends', a concept popularised by Naisbitt (1982) in 'Megatrends: Ten New Directions Transforming Our Lives.' Megatrends are defined by Saritas (2016): "These are megatrends – large-scale social, economic, political, environmental or technological changes that are slow to form but which, once they have taken root, exercise a profound and lasting influence on many if not most human activities, processes and perceptions."

In analysing trends, forecasters often use data and quantification to help predict the future, as Cote (2021) defines: "Predictive analytics is the use of data to predict future trends and events. It uses historical data to forecast potential scenarios that can help drive strategic decisions."

Trends do give a degree of certainty. However, they are not predictions. They indicate how the future might evolve based on past and present trajectories and current understanding.

The temporal horizon used in this document is predominantly up to 2040. This is the end-date used in most of the source documents. This time-horizon is also a 'Goldilocks' zone. Not too near to be dominated by today's constraints; not so far out that the signals lack meaning. Not too near to remove room for meaningful change, but not so far out to lose traction for today's decision makers (Smith and Ashby, 2020).

The Trends

1. **Social** (S)

The social landscape emerging from these analyses reveals five dominant, interconnected trends: changing demographics, persistent inequality, loss of connection, pressures on infrastructure, and decline in trust for institutions. These recur consistently across global, regional, and national foresight documents.

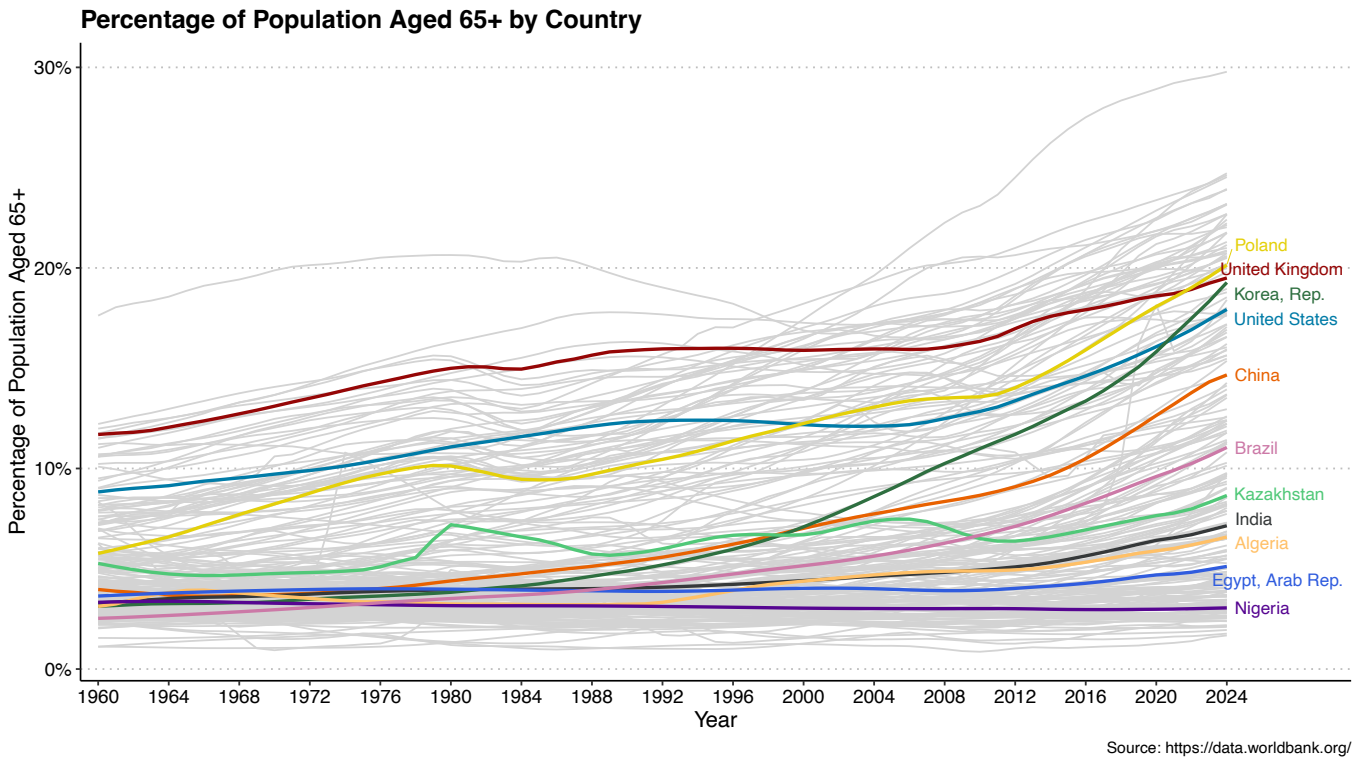
1. Ageing Populations and Demographic Divergence

The most commonly identified social trend is the fundamental demographic split reshaping human geography highlighted in Figure 1. Advanced economies, particularly Europe and East Asia, face rapidly ageing populations with shrinking workforces, placing severe strain on public finances, pensions, and healthcare systems (Figure 1). By 2040, the EU's working-age population is projected to shrink significantly, while regions like East Asia face having 24.8% of their population aged 65 or older. By mid-century, this demographic contraction will fundamentally alter economic productivity, care system demands, and the debate around intergenerational fairness.

Structural drivers of this divergence are rising longevity, coupled with the sustained and widespread decline in fertility rates across advanced and emerging economies. As illustrated in Figure 2, the long-run rise in the share of older populations is not only a function of increased longevity, but also of persistently falling birth rates. Conversely, some African countries may face a different but equally complex challenge: a persistently youthful demographic profile (with a median age of 17.6 years in 2020) that offers the prospect of a demographic dividend if education systems and labour markets expand in-step but also poses a risk of social instability. Key uncertainties are whether rapidly growing regions can create sufficient quality employment and infrastructure before social pressures weaken governance capacity, and whether ageing regions can maintain economic vitality and fiscal sustainability while managing unprecedented care burdens.

Figure 1:

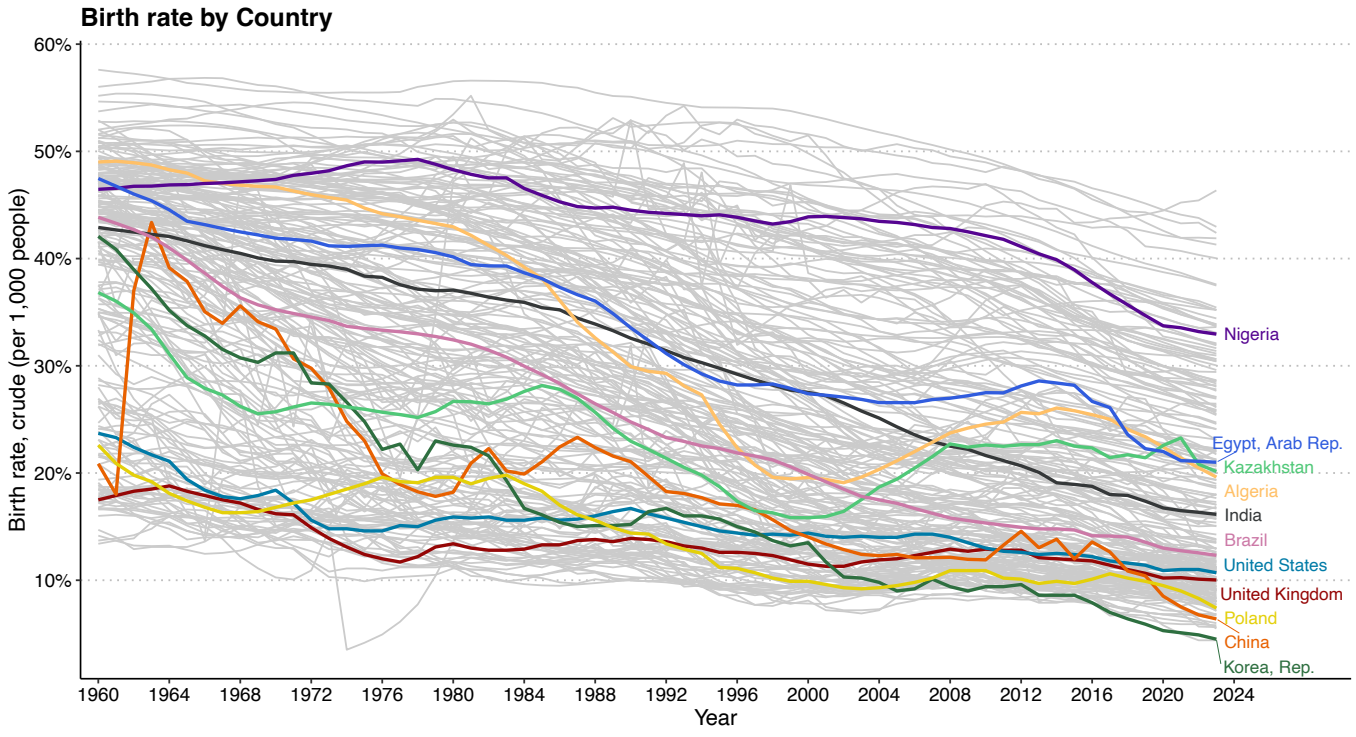
Percentage of population aged 65 and over by selected country, 1960–2024



Source: https://data.worldbank.org/

Figure 2:

Crude birth rate per 1,000 people by selected country, 1960–2024



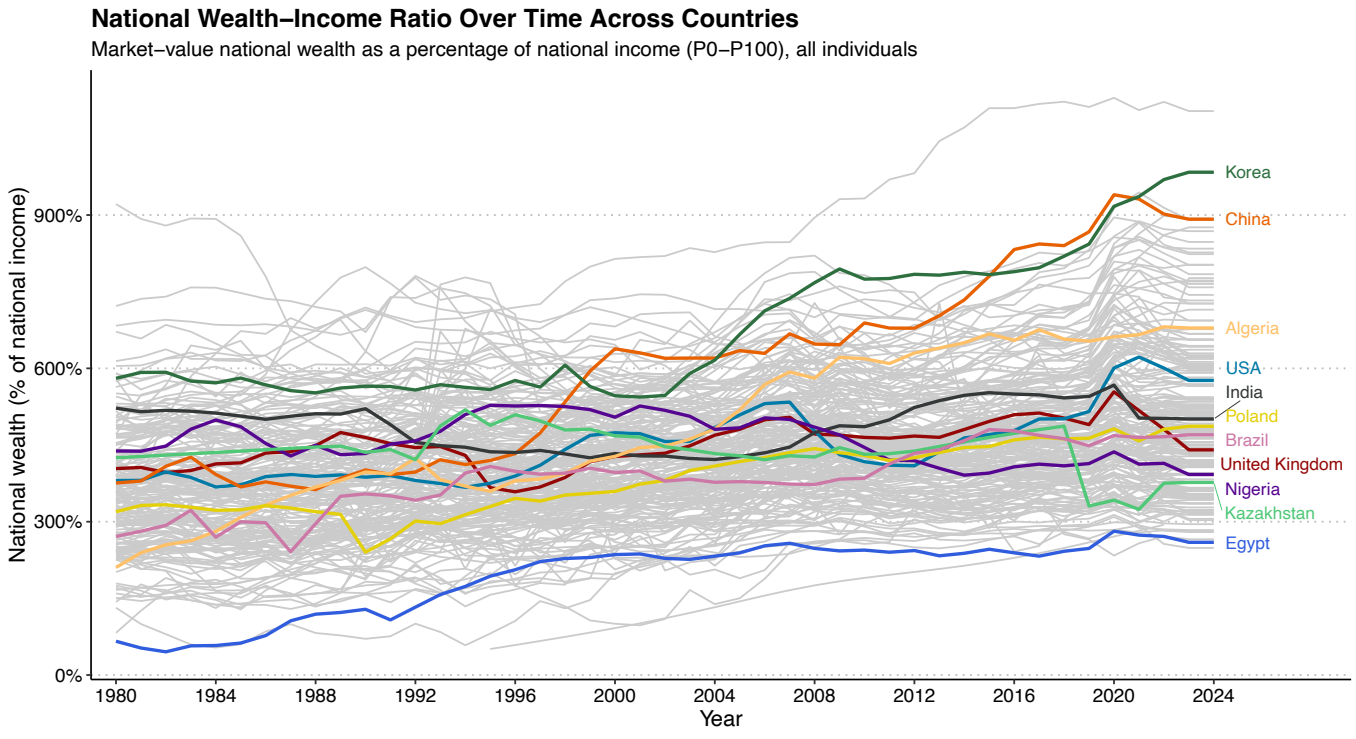
Source: https://data.worldbank.org/

2. Widening Socio-Economic Inequality

A commonly identified trend is intensifying inequality, both within and between countries, which is a critical driver of social fraying, political polarisation, and institutional distrust. This trend manifests through multiple dimensions: income and wealth concentration, regional disparities between “left-behind” places and metropolitan centres, housing unaffordability locking younger generations out of traditional economic milestones, and unequal access to quality education and healthcare. As Figure 3 illustrates, national wealth-to-income ratios in advanced economies such as the United States and the United Kingdom have climbed toward and beyond 500–600% since the 1980s, meaning that accumulated assets are growing far faster than the incomes most households depend upon - a wedge that directly reinforces barriers to mobility for those without inherited wealth.

The inequality is being amplified by technological change (automation displacing routine jobs), climate impacts (falling disproportionately on vulnerable communities), and economic fragmentation (creating winners and losers from shifting supply chains). The constellation of drivers combines wage stagnation, precarious work in the gig economy, rising costs of living, and weakening social mobility. These forces generate a near-to-mid-term dynamic (2025-2040) of declining trust, rising populism and nationalism, and political volatility. Wike et al. (2025) find that 60% of people globally believe that the outsized political influence of the wealthy contributes significantly to inequality; meanwhile, a median 57% expect children to be worse off financially than their parents, reflecting growing pessimism about intergenerational progress. The critical uncertainty is whether this inequality trajectory triggers backlash movements that fundamentally reshape economic and political systems.

Figure 3:
National wealth as a percentage of national income by selected country, 1980–2024

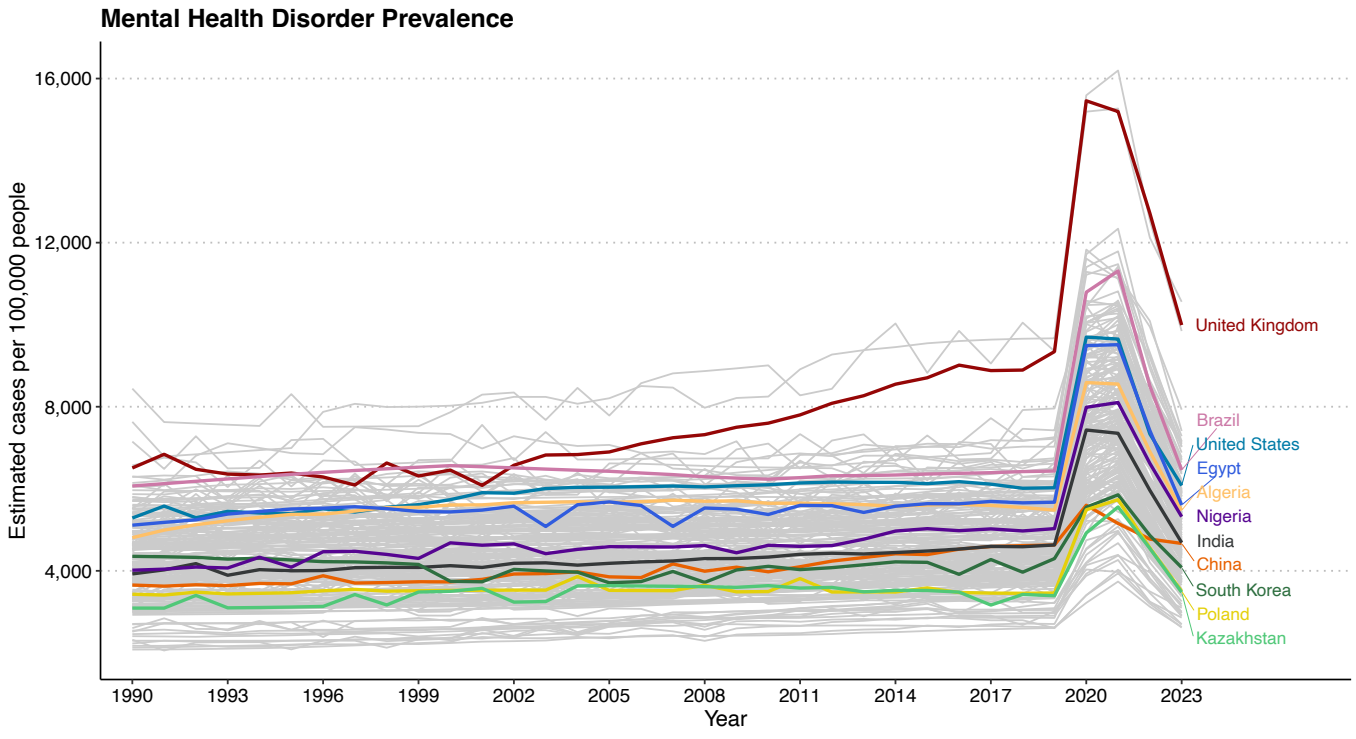


Source: https://wid.world/

3. **Deterioration of Mental Health and Social Connection**

An emerging but powerful cross-cutting trend is the deepening crises in mental health, loneliness, and social cohesion, particularly affecting young people but extending across age groups. This manifests as rising anxiety, depression, and loneliness, with social media algorithms, information disorder, and economic insecurity identified as key drivers. The EU Commission explicitly links this to the "damaging effects of social media" creating echo chambers and eroding shared social bonds, while the WHO now classifies loneliness as a major public health risk associated with approximately 871,000 deaths each year globally. Global data reinforces this concern, with estimated mental health disorder prevalence rising across countries at markedly different rates over recent decades, reflecting both growing recognition and growing increases in burden (Figure 4). The near-to-mid-term horizon (2025-2040) sees this trend intersecting negatively with other pressures: economic anxiety compounds mental distress, digital connectivity paradoxically increases isolation, and polarised information environments prevent collective coping. Wales reports persistent health inequalities with a 19-year gap in healthy life expectancy between most and least deprived areas. Questions remain whether societies can develop effective prevention and support systems at scale, or whether mental health burdens will continue escalating, further straining healthcare and social systems.

Figure 4:
Estimated prevalence of mental health disorders per 100,000 people by selected country, 1990–2023



Source: Global Burden of Disease Study

4. **Rapid Urbanisation and Infrastructure Pressures**

Mass urbanisation, identified as a megatrend with origins dating to 10,000 BCE but accelerating dramatically in recent decades, involves both opportunity and risk. By 2050, five billion people are projected to live in cities. Africa is experiencing the world's fastest urbanisation rate, often outpacing job creation, infrastructure development, and governance capacity.

Rapid urbanisation can contribute to the accelerated expansion of megacities marked by high levels of informality, housing shortages, and service deficits, which may place additional strain on social cohesion and urban governance and, in some contexts, increase the risk of instability or violence. Even in developed contexts, urban concentration heightens exposure to climate shocks (flooding, heat), cybersecurity threats to critical infrastructure, and pandemic transmission risks.

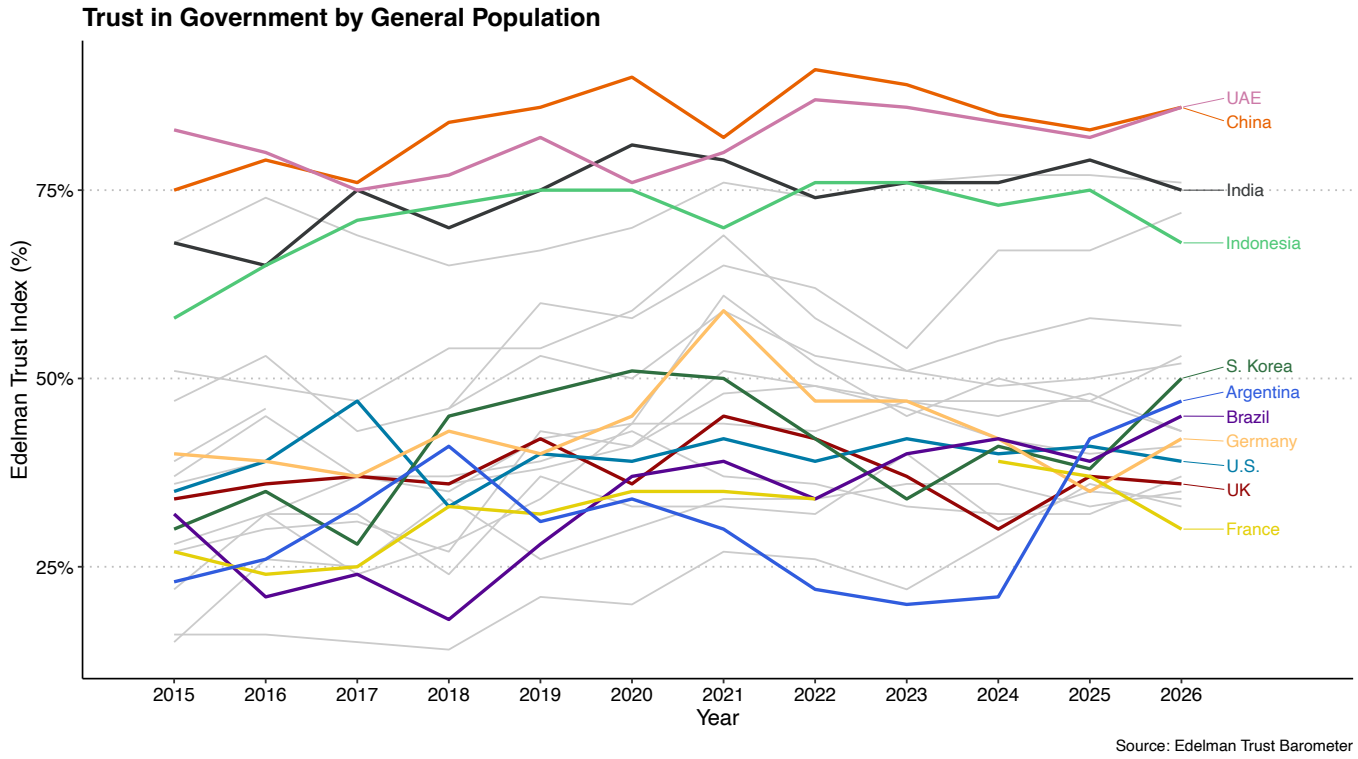
The drivers include rural-to-urban migration in search of economic opportunity, combined with economic and infrastructure investment that attracts further concentration. The mid-term uncertainty (2030-2040) revolves around whether cities become engines of resilient, inclusive prosperity through social inclusion, green infrastructure, and effective governance—or whether they amplify systemic vulnerabilities, creating dangerous feedback loops between physical exposure, social inequality, and governance strains.

5. **Eroding Institutional Trust and Polarisation**

A social trend with profound political consequences is the widespread collapse in trust in government, media, business, and democratic institutions. Ipsos reports that 56% globally believe "the system is broken," while Edelman identifies a "mass-class divide" characterised by grievance, with 70% feeling governments don't prioritise people like them. This near-term dynamic (2025-2030) is driven by performance gaps (governments unable to deliver on public demands), corruption perceptions, disinformation ecosystems, and algorithmic polarisation that segments populations into incompatible information bubbles. As Figure 5 shows, this erosion is particularly pronounced in Western democracies such as the US, UK, and France, who consistently register trust levels below 50% on the Edelman Trust Index, pointing to a deepening legitimacy gap in precisely those countries that have historically championed democratic governance. This is framed as a "State-Public Mismatch", a growing gap between what citizens need/expect and what institutions can deliver, portending greater political volatility. Trust erosion undermines the social license required for long-term policy commitments (climate action, pension reform, technological transitions), creates openness to populist and authoritarian alternatives, and fragments societies along identity lines (generational, cultural, ideological).

A critical uncertainty is whether democratic systems can reform and rebuild legitimacy through transparency, participation, and demonstrable effectiveness—or whether trust continues its downward trend, weakening collective action capacity and societal resilience.

Figure 5:
Trust in government by general population, 2015–2026



Source: Edelman Trust Barometer

Cross-Category Linkages:

Social trends are deeply interwoven with other STEEP domains. Demographics drive Economic constraints (care costs, labour shortages) and opportunities (consumption patterns, innovation capacity). Inequality and mental health crises are exacerbated by Technological disruption (automation displacing jobs, social media damaging wellbeing) and Environmental shocks (climate impacts falling hardest on vulnerable communities). Urbanisation both creates demand for Technological solutions (smart cities, digital infrastructure) and intensifies Environmental exposure (heat islands, flood risk). Trust erosion directly undermines the effectiveness of Political governance, constraining policy ambition on every other challenge. The Social domain functions as both outcome of, and constraint on, all other systemic changes.

2. **Technological** (T)

The technological landscape is defined by accelerating convergence, transformative potential, possible disruption, and profound governance challenges that are highlighted across all the documents analysed.

1. AI-Enabled Transformation

The dominant technological meta-trend is the rapid, mainstream integration of Artificial Intelligence, particularly generative and agentic AI, across all economic sectors, research domains, and societal functions. AI is characterised as a "general-purpose technology" comparable to electricity or the internet, with ChatGPT's achievement of 100 million users in just two months an example of unprecedented adoption velocity. Sector-level data illustrates this uneven but accelerating diffusion, with technology firms leading at over 75% AI subscription uptake by early 2026, while sectors such as construction and hospitality remain considerably behind (Figure 6). The technology is simultaneously lifting productivity (through automation, optimisation, and acceleration of scientific discovery) while introducing systemic risks (job displacement, algorithmic bias, safety concerns, and cognitive security threats).

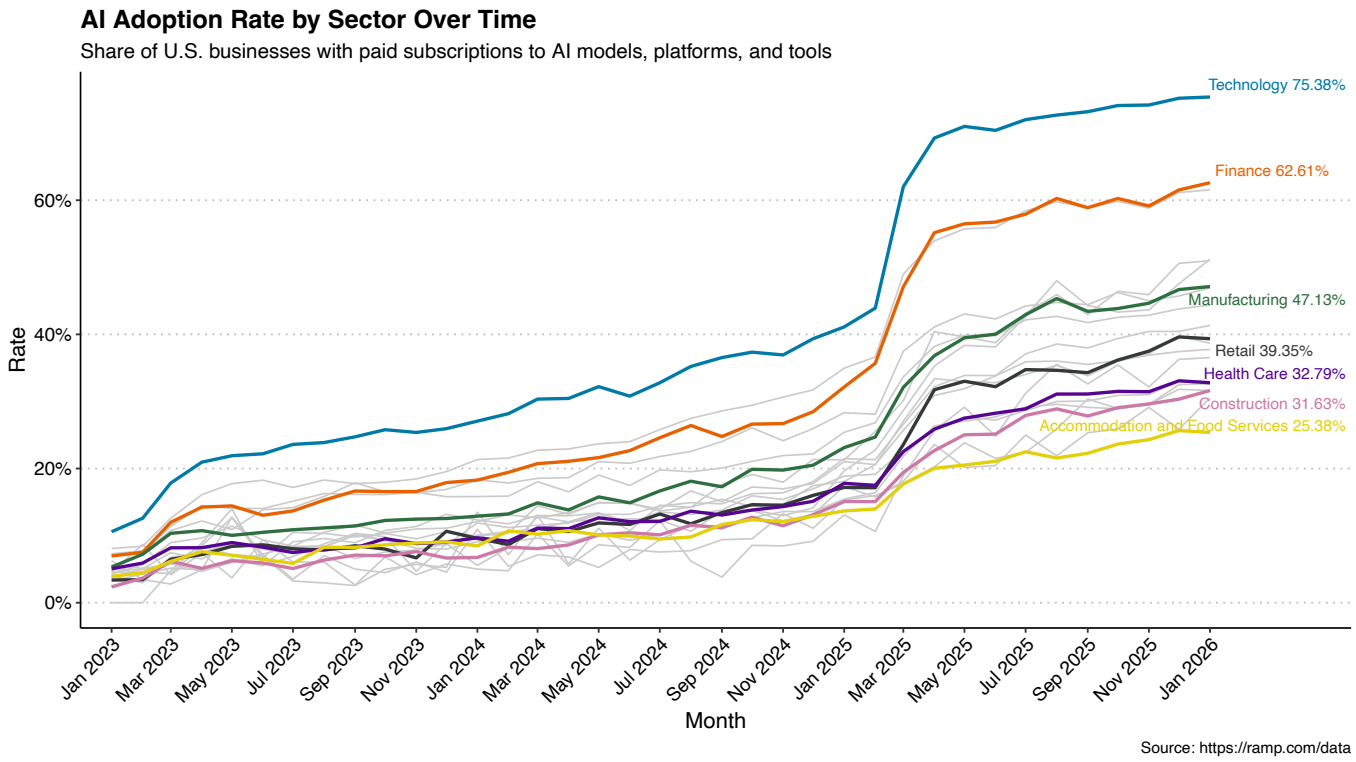
The drivers include exponential growth in computing capacity, massive data availability, breakthrough algorithmic architectures, and intense R&D investment from both public and private sectors. The transistor count per microprocessor has grown from a few thousand in 1971 to tens of billions by 2023, providing the raw computational substrate on which modern AI depends (Figure 7).

The near-to-mid-term horizon (2025-2040) sees AI becoming embedded in healthcare diagnostics, industrial manufacturing, energy optimisation, military systems and delivery of public services. Wike et al. (2025) estimate that 60% of workers in advanced economies are in jobs highly exposed to AI impacts, with semi-skilled roles particularly vulnerable. The EU Commission report notes that three US companies control 70% of EU cloud infrastructure, creating strategic dependencies.

The critical uncertainties include pace of adoption versus regulatory safeguards, labour market impacts (net displacement versus augmentation), concentration of AI capabilities in few actors creating power asymmetries, and dual-use risks (bioweapons design, autonomous weapons, surveillance). Artificial General Intelligence (AGI) is increasingly identified as a potential existential threat, to both the natural world and humanity, particularly if its development proceeds without robust safety frameworks (Mouton et al., 2023; Bloomfield et al., 2024). Governance challenges include achieving beneficial diffusion while preventing catastrophic misuse, a challenge complicated by the technology's global, dual-use, and rapidly evolving nature.

Figure 6:

Share of U.S. businesses with paid AI subscriptions by sector, January 2023–January 2026

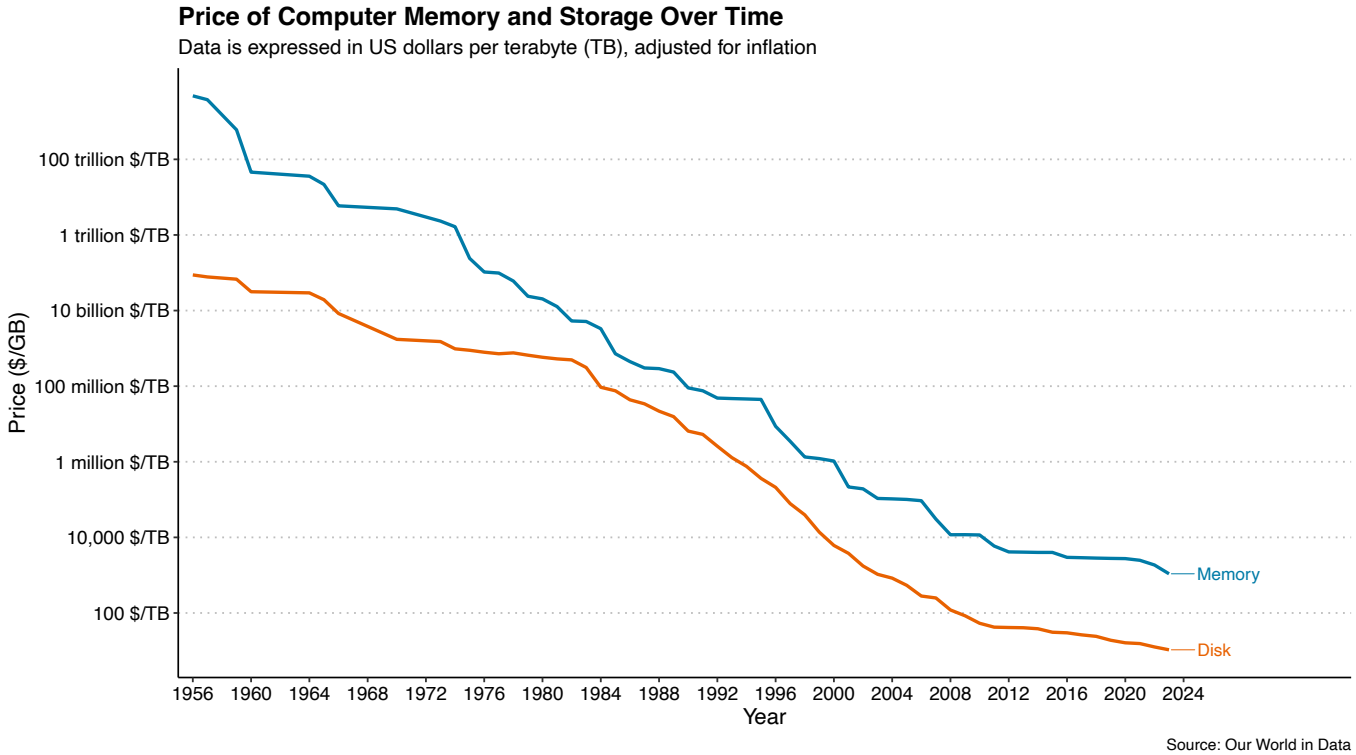


2. Pervasive Digital Connectivity

Underlying this AI acceleration is the broader expansion of digital connectivity, data flows, and platform-mediated economic activity. The megatrend includes 5G/6G telecommunications deployment, cloud computing infrastructure, Internet of Things sensor networks, and data analytics capabilities. Data itself has become "the oil of the 21st century", a strategic asset driving power and prosperity, with digital connectivity reaching exponential scale. The foundations of this expansion are illustrated by the reduction in storage costs, from trillions of dollars per terabyte in the 1950s to under a hundred dollars today, making mass data accumulation and platform-scale analytics economically viable (Figure 7).

Drivers include sustained investment in telecommunications infrastructure, network effects creating winner-takes-most platform dynamics, and the strategic imperative for states and firms to capture data advantages. This creates profound economic and political challenges: market concentration (a few tech giants dominating), surveillance capabilities (both state and commercial), and geopolitical contestation over digital sovereignty. Singapore's Centre for Strategic Futures (2022) explicitly identifies risk of a "Splinternet", fragmentation of the global internet into competing regional or national digital ecosystems governed by incompatible rules. Uncertainties include whether global data governance can prevent fragmentation while protecting rights (privacy, security, fairness), whether emerging economies can build sovereign digital capacity versus remaining dependent, and whether platform power concentrations can be managed without stifling innovation. The regulatory challenge is particularly acute because digital services are inherently transnational, creating jurisdictional conflicts and opportunities for regulatory arbitrage.

Figure 7:
Inflation-adjusted price of computer memory and disk storage per terabyte, 1956–2024



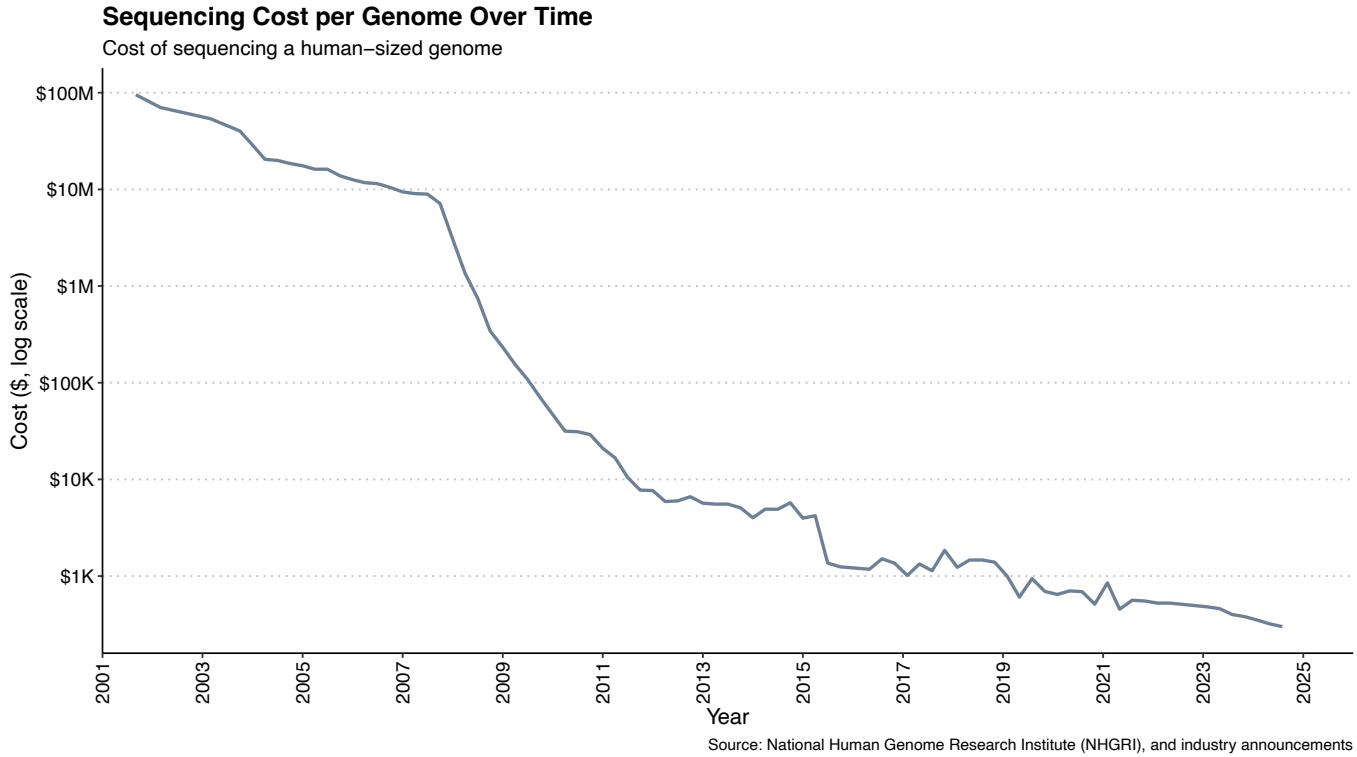
Source: Our World in Data

3. Technological Acceleration Beyond Digital

While AI dominates near-term attention, multiple documents warn against neglecting equally transformative convergence in biotechnology, quantum computing, advanced materials, neurotechnology, and space systems. A previous Cardiff University report (2023) explicitly cautions against being "blinded by digital," noting synthetic biology, new energy technologies, and materials science may be hugely consequential but receive disproportionately less strategic focus. Biotechnology includes gene editing (CRISPR), synthetic biology, creating programmable organisms, precision medicine, and bio-machine interfaces. Quantum computing promises revolutionary capabilities in processing speed, cryptography (breaking current encryption, enabling quantum-secure communications), materials discovery, and complex system simulation. Advanced materials (nanomaterials, smart materials) enable new energy storage, computing architectures, and manufacturing processes. These fields are converging, AI accelerates bio-discovery; quantum enables new AI architectures; materials breakthroughs enable both.

Key drivers are scientific breakthroughs, falling costs of key enabling technologies (gene sequencing, quantum qubit stability), and cross-pollination between fields. The cost of sequencing a human genome has fallen from roughly $100 million in 2001 to under $1,000 today, a decline that has democratised access to genomic tools and accelerated the pace of biological discovery (Figure 8). The mid-to-long-term horizon (2030-2055) sees these technologies potentially transforming healthcare (curing genetic diseases, extending health spans), addressing climate change (carbon capture materials, clean energy breakthroughs), and redefining security (quantum sensing, biological threats). However, uncertainties and risks are severe: bioweapons and pandemics from engineered pathogens, quantum computers breaking current cybersecurity, neurotechnology raising profound ethical questions about enhancement, fairness and cognitive liberty. Defra (2024) identifies the intersection of AGI with biotechnology as an acute risk requiring global governance frameworks that currently don't exist.

Figure 8:
Cost of sequencing a human-sized genome, 2001–2025 (log scale)



4. **Automation and the Transformation of Work**

On top of information technology, physical automation through advanced robotics, autonomous systems, and mechatronics is reshaping manufacturing, logistics, agriculture, and services. This trend intersects with AI (robots require intelligent control) and has direct implications for labour markets, requiring comprehensive reskilling across economies. The drivers are falling costs of sensors and actuators, AI advances enabling robots to handle unstructured environments, and competitive pressure driving firms to automate for efficiency.

The near-to-mid-term impact (2025-2040) is concentrated in routine physical and cognitive tasks—warehouse operations, vehicle operation, assembly line work, data entry, basic customer service. Cardiff University's report (2023) notes "the job for life is disappearing," with employment becoming more precarious and requiring lifelong learning. The workforce challenge is particularly acute for mid-skill workers whose tasks are automatable, but who may lack pathways to high-skill roles. A Welsh Government report (2021), shows the UK labour market will be highly exposed, with AI touching 60% of jobs significantly. The critical uncertainty is whether automation proves to be predominantly labour-augmenting (increasing productivity of human workers) or labour-replacing (net job destruction), and whether economic gains are broadly shared or accrue primarily to capital owners and high-skilled workers. This carries direct implications for inequality (Social), economic growth models (Economic), and political stability (Political). The skills systems must fundamentally adapt to enable continuous workforce transition—a challenge Cardiff University is directly confronting in redesigning educational offerings.

5. **Cyber Weaponisation**

The fifth technological trend is the weaponisation of digital connectivity and information systems, creating persistent cyber threats, information warfare, and blurring of peace/war boundaries. This encompasses state-sponsored cyber-attacks on critical infrastructure (energy grids, hospitals, financial systems), disinformation campaigns and cognitive security threats, surveillance technologies enabling authoritarian control, and AI-generated deepfakes undermining trust in authentic information. The drivers are the vulnerability of digitally connected critical infrastructure, low barriers to entry for cyber operations (compared to kinetic force), and geopolitical competition incentivising offensive capabilities. The near-term threat (2025-2030) is acute and growing: ransomware attacks, foreign election interference, supply chain compromises, and AI-enhanced social manipulation. A UK Government (2024) report characterises these as "hybrid threats" where "everything can be weaponised"—migration flows, energy dependencies, information ecosystems—with technology as the primary enabler. Uncertainties include effectiveness of defensive measures and international norms, escalation risks (cyber operations triggering kinetic responses), and societal resilience to persistent information disorder. The erosion of shared truth—where citizens can't distinguish authentic from manipulated information—directly feeds Social trend #5 (trust erosion) and Political challenges to democratic governance. The security paradigm shifts from protecting physical borders to defending invisible digital perimeters and cognitive spaces.

Cross-Category Linkages:

Technology is a primary disruptor and enabler across all other domains. It drives Economic transformation (productivity, new industries) while causing displacement and inequality. It offers solutions to Environmental crises (clean energy, climate modelling, precision agriculture) while increasing resource demands (critical minerals for chips/batteries, energy for data centres). It reshapes social connection and wellbeing (both positively and negatively), and redefines Political power through surveillance, propaganda capabilities, and digital sovereignty contests. The governance challenge—how to steer rapidly evolving, dual-use, globally diffused technologies toward beneficial outcomes—is a central strategic question for the period analysed.

3. **Economic** (E)

The economic landscape emerging from these documents is characterised by fragmentation, transformation pressures, and mounting fiscal constraints that interact to create heightened uncertainty about growth trajectories and distributional outcomes.

1. Geoeconomic Fragmentation

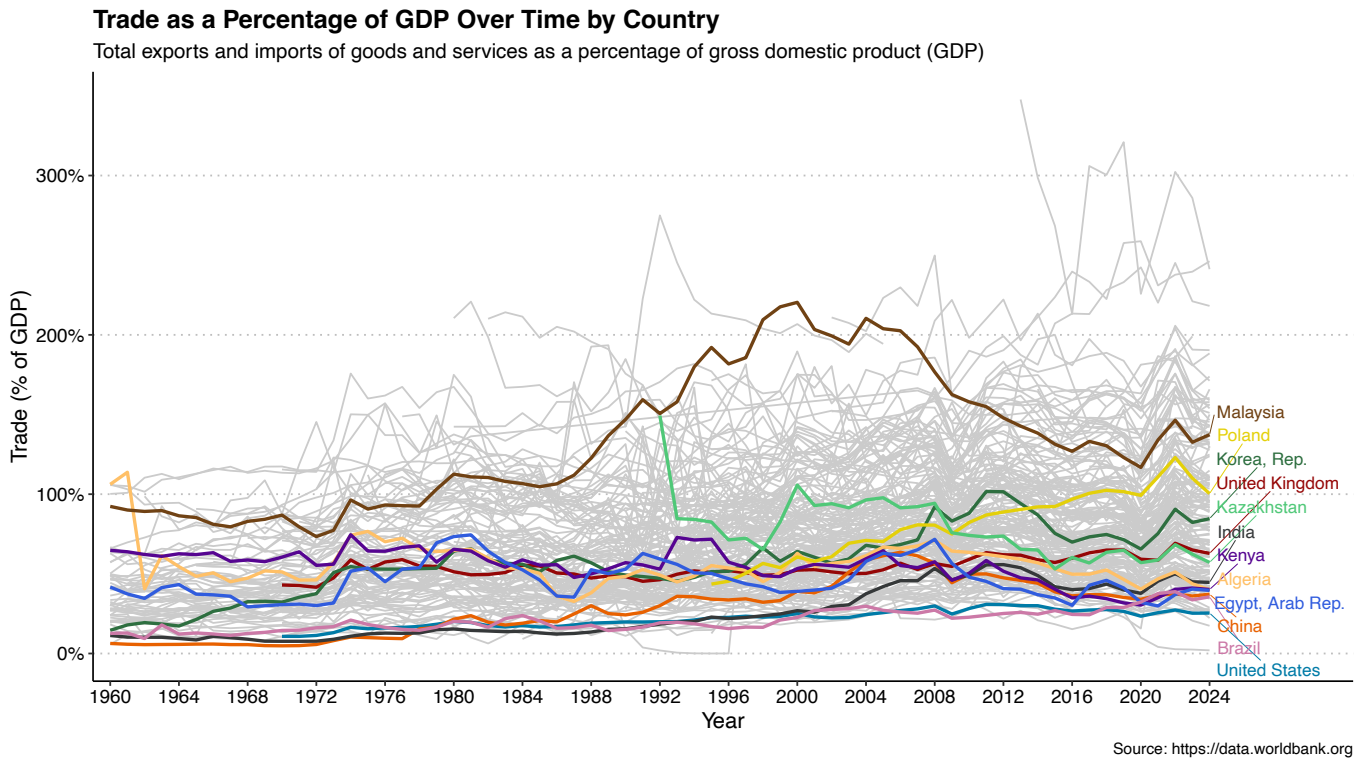
The most fundamental economic shift is the fracturing of the post-1945 globalised trading system, with states prioritising security and strategic autonomy over purely economic rationales. Trade as a share of GDP rose sharply across most economies from the 1960s through the 2000s before stalling or reversing in several cases, reflecting both the peak of hyper-globalisation and the headwinds now facing it (Figure 9). This manifests as "friend-shoring" (relocating supply chains to political allies), rising export controls on strategic technologies and materials, sanction regimes, industrial policy favouring domestic production, and the emergence of regional trading blocs. Ipsos (2025) characterises this as "Globalisation Fractures," while the CSF (2022) explicitly models scenarios ranging from "Bloc Party" (hardened regional blocs) to continued interdependence.

The drivers include the US-China strategic rivalry, Russia's weaponisation of energy dependencies, COVID-19 revealing supply chain vulnerabilities, and security concerns around critical technologies and materials. This creates what ESPAS terms a "security premium", the costs of redundancy, diversification, and sovereignty that act as a drag on pure economic efficiency and growth.

The near-to-mid-term trajectory (2025-2040) sees continued supply chain reorganisation, particularly in semiconductors, batteries, pharmaceuticals, and other strategic sectors. Critical uncertainties include the depth and duration of decoupling (partial versus comprehensive), whether regional blocs become competitive or cooperative, and impacts on global growth (modelling suggests 1-2% GDP drag from fragmentation). For smaller countries like Singapore and Wales, the challenge will be navigating between major bloc demands without being forced into binary choices that cut off markets or technology access.

This trend directly interacts with Political great power competition and Technological battles over standards and platforms.

Figure 9:
Trade as a percentage of GDP by selected country, 1960–2024

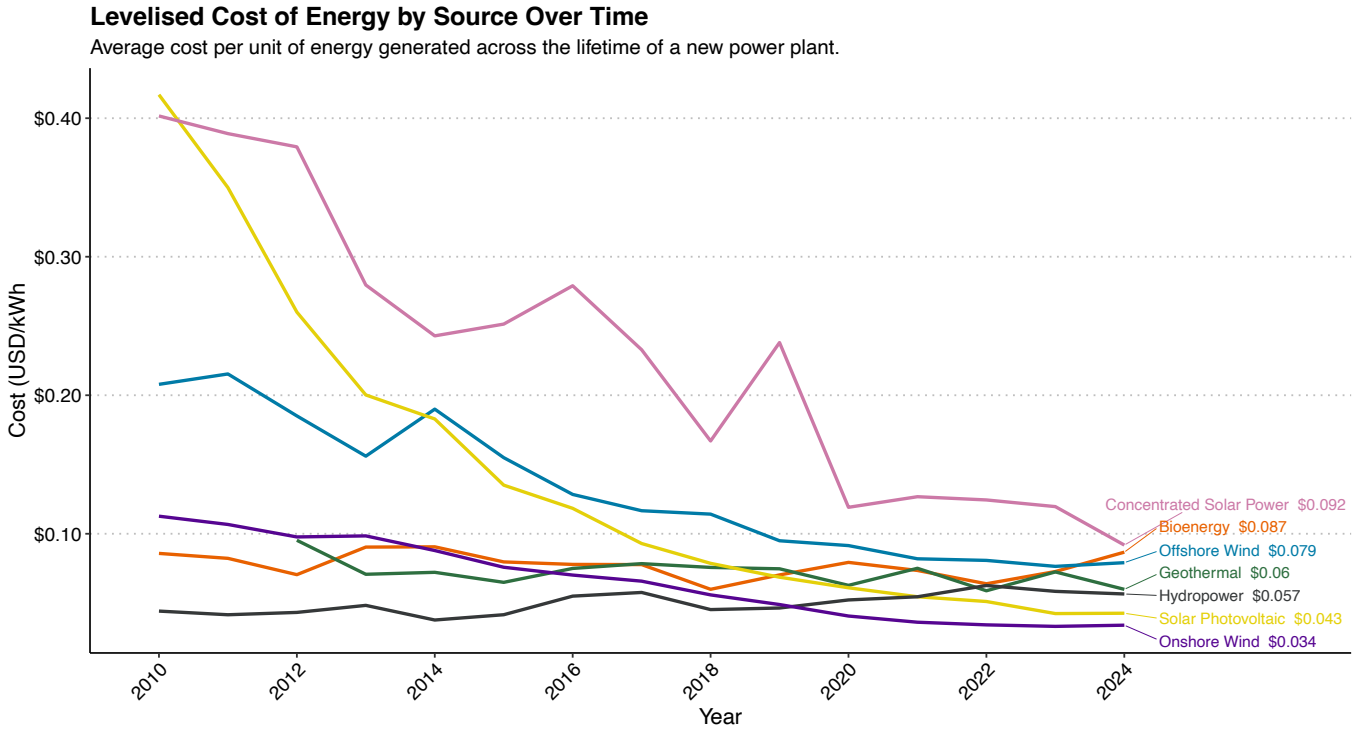


2. The Green Transition

Every document analysed identifies the energy transition and decarbonisation imperative as massive economic restructuring forces, creating major opportunities but also requiring significant investment and creating new resource dependencies. The green transition necessitates electrification of transport and heating, build-out of renewable generation and storage, grid modernisation, industrial process changes, and retrofitting of the built environment. ESPAS (2024) suggests that this creates a "green premium"—the cost differential between clean and carbon-intensive technologies—that can strain public and private budgets, while others (IEA, 2024) explain that "Onshore wind and solar PV are cheaper than both new and existing fossil fuel plants" and will become more cost-competitive. This shift is borne out in the data: the levelised cost of onshore wind and solar photovoltaic has fallen to around $0.03–0.04 per kWh by 2024, making them among the cheapest sources of new electricity generation ever recorded (Figure 10). Critically, the shift from fossil fuels to renewables and batteries creates intense new competition for critical minerals: lithium (demand projected up 800% by 2040), cobalt, rare earths, copper, and nickel. Defra identifies this as "Increasing Resource Scarcity and Shifting Competitive Dynamics" (megatrend GMT 5), noting these materials are geographically concentrated (often in geopolitically contested regions) and that current supply chains are inadequate for projected demand. This creates a mid-to-long-term dynamic (2030-2055) where control of mineral resources and processing capacity becomes as strategically significant as oil was in the 20th century.

The drivers of these changes are net-zero commitments (Paris Agreement, national pledges), technology maturation making renewables cost-competitive, and climate impacts creating insurance/adaptation pressures. Uncertainties cluster around financing (public fiscal constraints, private investment mobilisation), technology pathways (which solutions scale, breakthrough innovations like solid-state batteries or fusion), mineral supply (new deposits, recycling, substitution), and the management of 'just-transitions' (ensuring costs don't fall disproportionately on workers and disadvantaged communities). The economic opportunity is immense—new industries, export markets, innovation advantages—but the barriers, including from powerful incumbents remain high.

Figure 10:
Levelised cost of energy by source, 2010–2024 (USD/kWh)



Source: Data source: IRENA (2025); IRENA (2024) / Our World in Data

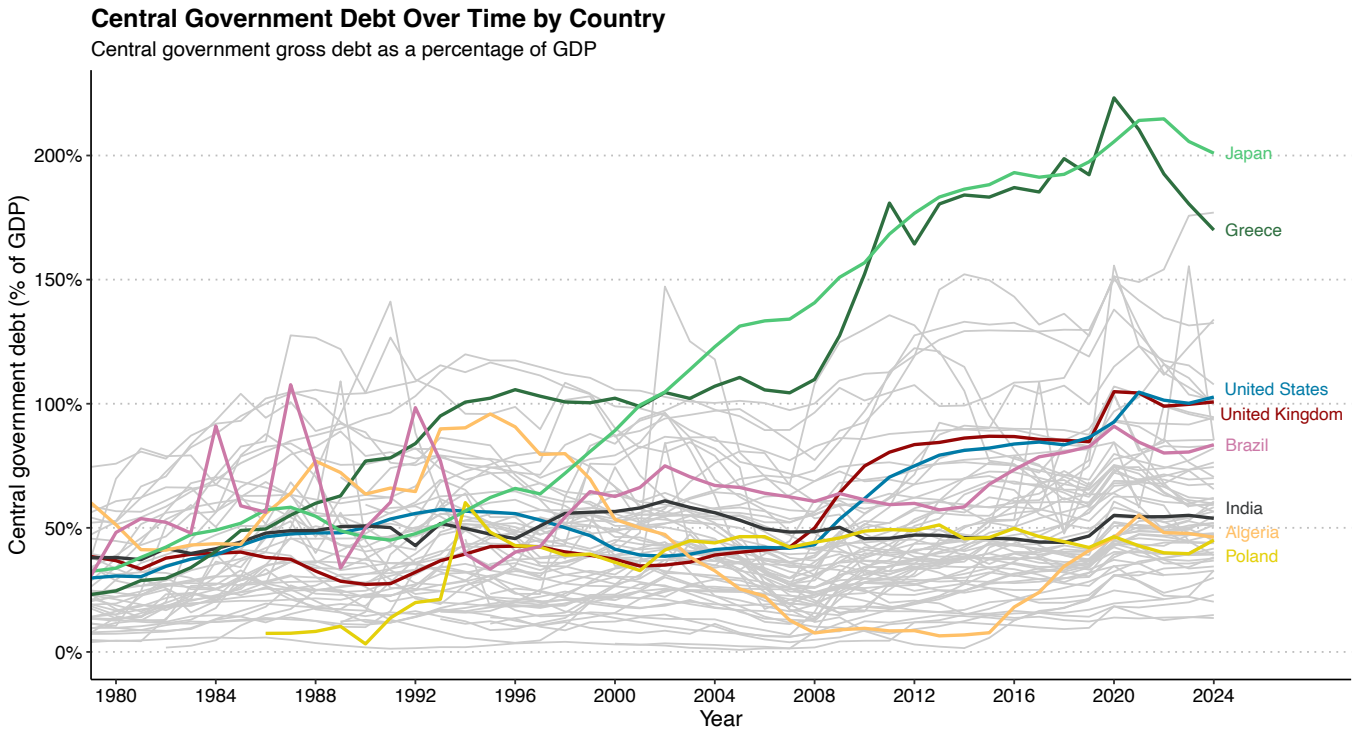
3. **Constraints on Government Spending**

Multiple reports highlight the squeeze on government fiscal capacity from rising debt levels, ageing-related spending (pensions, healthcare), defence requirements, and green transition needs. Post-pandemic debt-to-GDP ratios are at historical highs, with several major economies now carrying government debt exceeding 100% of GDP, a level that would have been considered exceptional a generation ago (Figure 11). Demographic ageing locks in growing mandatory spending; NIC (2021) notes the economic costs of ageing will strain public finances in all G20 economies, reducing flexibility to respond to other challenges. This creates acute near-term pressures (2025-2030) as governments face wicked trade-offs: ESPAS (2024) explicitly identifies "budgetary trade-offs between climate action targets and defence expenditures" as a long-term structural uncertainty. Infrastructure investment, education spending, social safety nets, and R&D all compete for limited resources. Welsh Government (2021) documents show public finances as a key driver constraining service delivery capacity. For universities like Cardiff, this translates to lagging tuition fees, uncertain research funding, and pressure to demonstrate economic value.

The drivers are demographic structure (ageing populations reducing numbers of workers/ taxpayers while increasing beneficiaries), geopolitical tensions driving defence spending, and climate imperatives requiring massive capital mobilisation. The compounding challenge is that fiscal constraint arrives precisely when transformative investments are most needed—in green infrastructure, digital systems, skills training, and resilience-building. Uncertainties include inflation trajectories (which affect real debt burdens), productivity growth from technology (which determines fiscal room), and political sustainability of austerity (with the alternative of rising taxes). Without productivity breakthroughs or fundamental fiscal reforms, these tensions define the economic operating environment for the horizon being considered here.

Figure 11:

Central government gross debt as a percentage of GDP by selected country, 1980–2024



Source: https://www.imf.org

4. Shifting Global Economic Power

Underlying other economic trends is the continued shift of global economic weight toward Asia, particularly China and India, with a corresponding relative decline of North American and European shares. Cardiff University's report (2023) notes China is projected to overtake the US as the largest economy, while UK Government (2024) identifies "Growing relative economic influence of Asia and the middle class" as a long-term driver (2040-2055) reshaping global demand patterns, investment flows, and innovation centres. This structural shift is driven by demographic scale (Asia contains most of the global population), ongoing industrialisation and urbanisation, rising productivity, and accumulated capital for investment. The Asian middle-class is expanding dramatically, shifting consumption patterns and creating new markets. However, this growth is heterogeneous—India and Southeast Asia show stronger growth trajectories than China —and is accompanied by rising inequality within Asian economies. The implications are profound: global governance institutions designed for 20th-century power distributions face legitimacy challenges, currency and financial system structures may shift away from dollar dominance, and innovation leadership in key technologies may migrate eastward. For Western economies, the challenge is adapting to relative decline while leveraging comparative advantages in high-value sectors (advanced services, frontier R&D, cultural/educational offerings). African Futures identifies the key question as whether African economies can leverage Asian demand and investment to industrialise and modernise or, alternately, remain commodity exporters caught in volatile price cycles.

5. Labour Market Transitions

The final major economic trend is the fundamental restructuring of labour markets driven by automation, AI, platform business models, and the green transition. As noted in the Technological section, around 40% of global jobs (60% in advanced economies) are highly exposed to AI impacts (Cazzinga et al., 2024).

The drivers are technological substitution of routine tasks, globalisation of knowledge work (remote collaboration tools), gig economy platform models fragmenting traditional employment, and green transition creating both job losses (fossil fuel sectors) and new roles (renewables installation, energy efficiency retrofitting). This manifests as growing labour market polarisation—rising demand for high-skill cognitive work and low-wage service jobs, with hollowing of middle-skill routine occupations. The EU Commission notes "anticipated labour market disturbances" as a critical long-term structural uncertainty affecting social stability. The key challenges are whether skills-provision adapts for lifelong learning versus front-loaded education, social safety nets are redesigned for precarious and portfolio work and ensuring productivity gains from automation are broadly shared rather than accruing only to capital and high-skilled labour. Cardiff University is directly confronting this in rethinking educational models—traditional three-year degrees versus modular, stackable credentials and professional upskilling. The uncertainty is whether economies achieve "augmentation" (technology amplifying human capabilities) or "replacement" (structural unemployment), with massive implications for inequality and political economy.

Cross-Category Linkages:

Economic trends are also both shaped by and shape all other domains. Geo-economic fragmentation is driven by Political rivalry but constrains Technological cooperation and in the Environmental domain, climate financing. Green transition demands are fundamentally Environmental but create economic winners/losers affecting social cohesion. Fiscal constraints limit capacity to address social needs (ageing, inequality) and to invest in Technological competitiveness. Labour market disruption from Technology directly impacts social stability. The economic system functions as both the resource-based enabling responses to other trends and the transmission mechanism through which those trends impact societies.

4. **Environmental** (E)

There is strong consensus on the importance of the environmental domain. All the ten documents analysed agree on the severity, urgency, and systemic nature of planetary crises—though significant divergence exists on response pathways and the social acceptability of rapid transitions.

1. Accelerating Climate Change

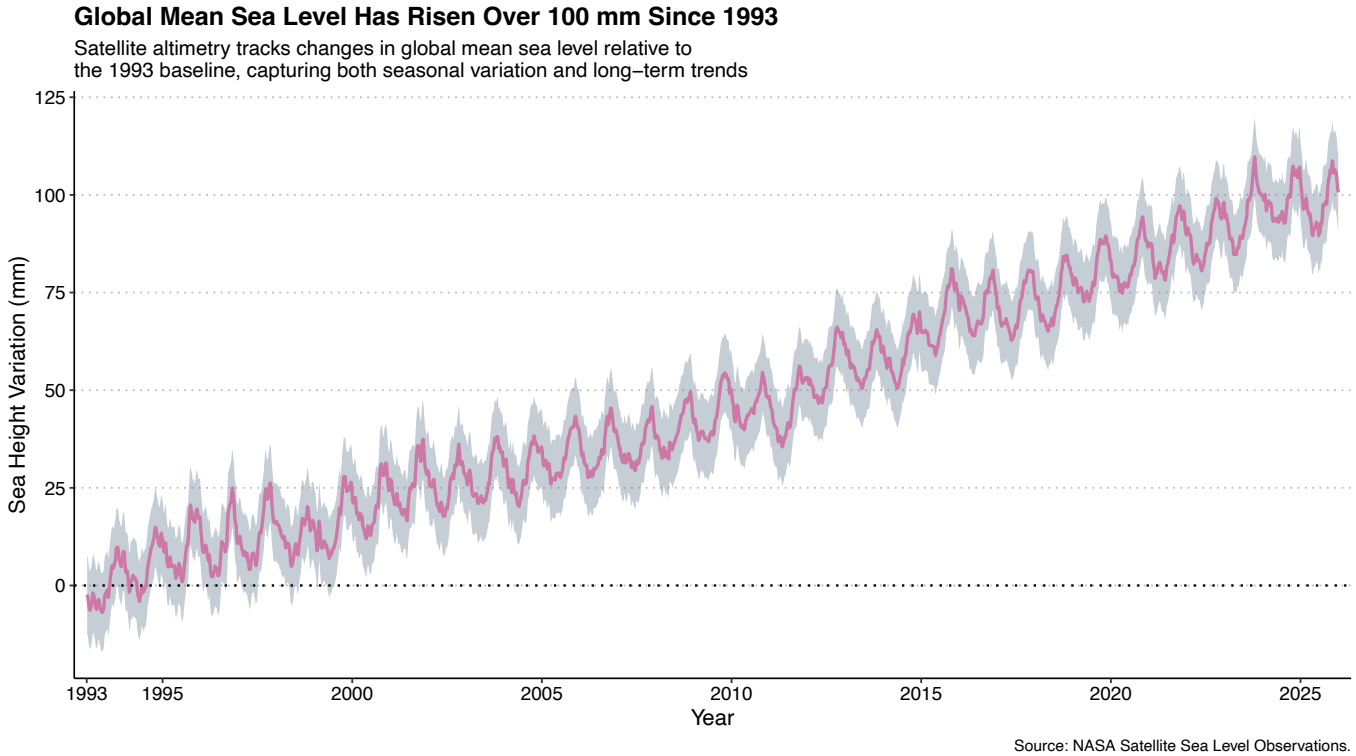
Every single trend document analysed in this research identifies climate change as an intensifying, non-negotiable reality with severe physical consequences. The 1.5°C threshold identified in the Paris Agreement has already been, or will imminently be, breached. The physical manifestations include rising global temperatures, more frequent and severe extreme weather events (floods, droughts, hurricanes, wildfires), sea-level rise threatening coastal cities and infrastructure, (global mean sea level has risen over 100mm since 1993, with the rate of rise itself accelerating in recent years, Figure 12) , changing precipitation patterns affecting agriculture, and intensifying heat waves creating direct health risks, particularly in cities.

The drivers are atmospheric accumulation of greenhouse gases from burning fossil fuels, deforestation, industrial processes, and agricultural emissions— the major components of economic activity since the Industrial Revolution, (Defra, 2024). The trajectory is mid-to-long-term (2030-2055) with impacts accelerating non-linearly. The National Intelligence Council (2021) emphasises that these costs will "disproportionately affect the developing world," creating risks to food, water, health, and energy security.

Reports by the Singapore and Welsh Governments (CSF, 2022, Welsh Government, 2021) specifically note the high probability of more frequent extreme weather events and sea-level rise affecting their territories. Critical uncertainties revolve around climate sensitivity (how much warming per unit of emissions), tipping points and cascades (Amazon die-back, permafrost methane release, ice sheet collapse), and effectiveness of adaptation measures.

The most acute concern across the documents is whether current mitigation trajectories -- even if all pledges are met—will avoid catastrophic warming levels. ESPAS (2024) notes current efforts make the required 43% drop in global GHG emissions by 2030 appear "unrealistic," setting up a mid-term crisis where adaptation pressures surge while mitigation ambition potentially falters.

Figure 12:
Global mean sea level rise relative to 1993 baseline, 1993–2025

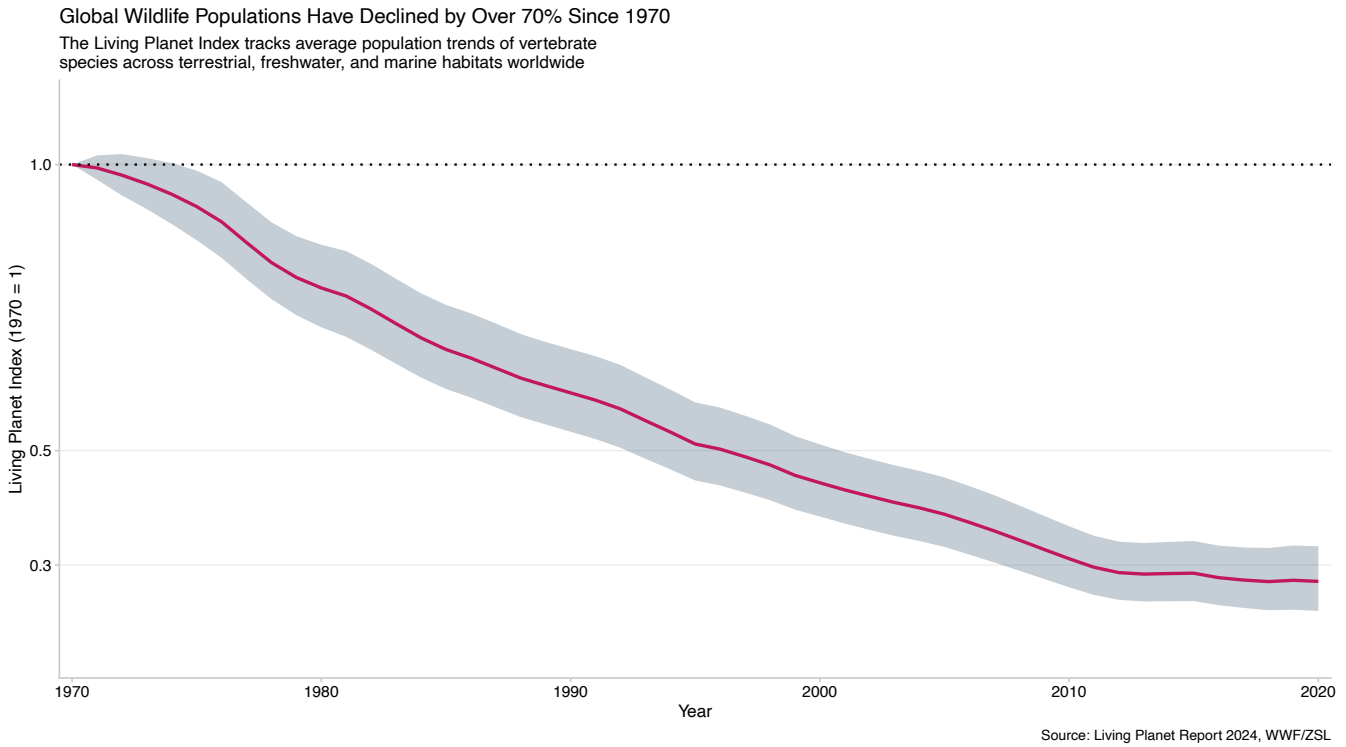


2. **Biodiversity Loss and Ecosystem Degradation**

Alongside climate change, accelerating loss of biodiversity and degradation of ecosystems has been identified as a fundamental threat to economic foundations and human wellbeing. Species extinction rates far exceed natural background levels (ESPAS, 2024); tracked vertebrate populations have declined by over 70% on average since 1970, a loss of biological abundance with no precedent in human history (Figure 13). The "triple planetary crisis" terminology from the EU Commission (2025) includes climate change, pollution, and biodiversity-loss as interconnected systemic failures. The mechanisms driving this include habitat destruction from land-use change (agriculture, urbanisation, infrastructure), pollution (plastics, agricultural run-off, chemical contamination), overexploitation of natural resources (overfishing, deforestation, wildlife trade), disruption by invasive species, and climate change itself. This combination results in unsurvivable conditions for many species.

The consequence is degradation of ecosystem services upon which human societies depend: pollination for agriculture, water filtration, soil formation, flood control through wetlands, carbon sequestration through forests, and genetic resources for food, medicine and biotechnology. The drivers are the same economic activities driving climate change, unsustainable resource extraction, industrial agriculture, and consumption patterns, compounded by population growth and modern lifestyles increasing absolute demands on ecosystems. The mid-to-long-term trajectory (2030-2055) sees irreversible losses of species and ecosystems, with Defra (2024) warning of "critical environmental tipping points" where ecosystem collapse triggers cascading failures. Uncertainties centre on threshold effects (when does partial degradation become total collapse?), whether degraded ecosystems can be restored, and the economic valuation and governance of nature (can ecosystem services be adequately valued and protected?). Recent attempts at "natural capital accounting" and nature-based solution frameworks represent partial efforts to address this.

Figure 13:
Global Living Planet Index, 1970–2020 (1970 = 1), tracking average vertebrate population trends across terrestrial, freshwater, and marine habitats



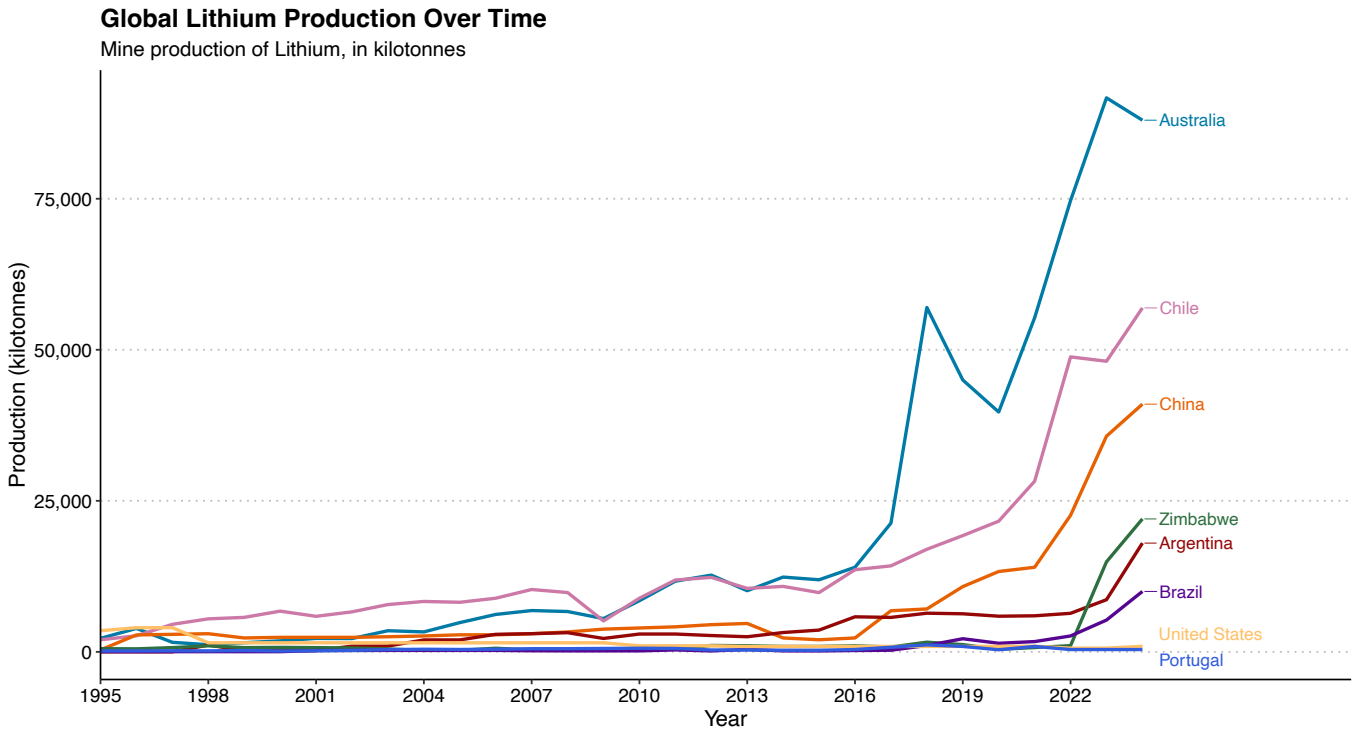
Source: Living Planet Report 2024, WWF/ZSL

3. Resource Scarcity

Compounding climate and biodiversity pressures is mounting scarcity and competition over fundamental physical resources (water, land, materials, food systems). This includes freshwater stress (depletion of aquifers, glacial melt affecting river flows, changing precipitation patterns creating droughts), agricultural land pressure (soil degradation, competing land uses for energy crops versus food), critical minerals for technology and energy transition (covered in Economic section), and food system vulnerabilities from all these pressures combined. Defra (2024) explicitly identifies this as "Increasing Resource Scarcity and Shifting Competitive Dynamics," noting spiking demand (e.g. lithium demand up 800% by 2040) fuelling intense geopolitical competition. Global lithium mine production has already increased roughly tenfold since the early 2000s, concentrated in a handful of countries, foreshadowing the supply chain tensions ahead (Figure 14). This UK Government report (2024) emphasises risks to food and water security globally, with vulnerability in regions facing water scarcity and agricultural productivity decline. Bello-Schünemann et al. (2018), and CSF (2022) foreground food security given climate exposures and import dependencies. A Welsh Government (2021) report notes that the UK faces supply chain risk from reliance on imports from climate-vulnerable countries, where crop yields will be hit by climatic changes.

The drivers are rising absolute demand from population growth and economic development, climate impacts reducing supply reliability (droughts, floods, heat affecting crops), and structural shifts (energy transition creating new mineral demands, dietary changes toward resource-intensive foods). The mid-term horizon (2030-2040) sees these scarcities intensifying, with uncertainties around technological solutions (desalination, drought-resistant crops, synthetic alternatives, circular economy closing material loops) versus hard limits creating conflict and forced adjustment. The "Redistribution of (Un)Natural Endowments" identified by CSF (2022) notes climate change itself will significantly alter which regions have arable land and water, potentially driving mass migration and geopolitical conflict.

Figure 14:
Global lithium mine production by country, 1995–2022



Source: Our World in Data / U.S. Geological Survey

4. Adaptation and Building Resilience

Given the inevitability of significant climate impacts regardless of mitigation, adaptation and building resilience to unavoidable changes emerge as critical near-to-mid-term priorities. These include physical infrastructure adaptation (flood defences, cooling systems, resilient buildings), nature-based solutions (wetland restoration for flood control, urban green space for heat management), agricultural adaptation (crop varieties, irrigation efficiency, changed practices), and social adaptation (early warning systems, disaster preparedness, migration management, insurance systems). The drivers are the locked-in warming from past emissions creating unavoidable impacts, mounting economic losses from extreme events (insurance payouts, reconstruction costs, business disruption), and recognition that vulnerable populations and regions cannot wait for global mitigation to succeed. The Welsh Government (2021) specifically notes the high probability of more frequent extreme weather requiring proactive adaptation. Singapore's island geography makes adaptation existential—rising sea levels and extreme heat directly threaten national viability (CSF 2022). The challenge is that adaptation requires significant investment precisely when public finances are constrained (Economic trend #3) and competes with spending on mitigation. The EU Commission (2025) identifies these competing priorities for public spending between climate action and other needs as a core tension. Furthermore, adaptation effectiveness is uncertain—what infrastructure assumptions are appropriate when future climate states are uncertain? When do incremental adaptations become inadequate, forcing transformational changes (managed retreat from coastlines, wholesale regional agricultural shifts)? The financing inequity is particularly acute for developing regions with the highest vulnerability but least fiscal capacity (Bello-Schünemann et al., 2018, NIC, 2021).

5. Regenerative Economic Transformation

The final environmental trend is the conceptual and practical shift toward systemic approaches: circular economy models that eliminate waste and keep materials in productive use, nature-based solutions that leverage ecosystem functions for climate and biodiversity goals, and regenerative practices in agriculture and land management. This represents a mid-term transformation (2030-2040) from linear "take-make-dispose" economic models toward closed-loop systems that work within planetary boundaries. Circular economy encompasses redesigning products for durability and disassembly, establishing take-back and recycling systems, shifting from ownership to service models (product-as-a-service), and industrial symbiosis where one facility's waste becomes another's input. Nature-based solutions include reforestation and afforestation (carbon sequestration, biodiversity habitat), wetland restoration (flood control, water filtration), green infrastructure in cities (heat and water management, air quality, biodiversity), and regenerative agriculture (soil health, carbon storage).

The drivers are resource scarcity (making efficiency an imperative), regulatory pressure (Extended Producer Responsibility, plastic bans), and business model innovation seeing value in resource retention. Uncertainties, however, remain: can circular approaches scale fast enough given entrenched linear infrastructure and business models? Will consumers accept shifts from ownership to access? Can nature-based solutions deliver at scale without triggering unintended consequences (monoculture tree plantations displacing biodiversity)? How to govern shared resources (oceans, atmosphere, migratory species) when benefits are global, but costs are local? The potential is enormous—Defra's work shows circular economy approaches could deliver economic benefits while reducing environmental footprint—but institutional, behavioural, and financial barriers remain substantial. This trend directly intersects with Technological innovation (materials science, biotechnology, monitoring systems), Economic restructuring (new business models, green finance), and Political governance challenges (transboundary cooperation, regulatory harmonisation).

Cross-Category Linkages:

Environmental trends are the ultimate constraining forces—planetary boundaries are physical limits that cannot be negotiated away. They drive Economic transformation (green transition, resource scarcity, stranded assets), create social pressures (migration, health impacts, food security, inequality of exposure), demand Technological solutions (clean energy, climate modelling, monitoring, adaptation technology), and test Political systems' capacity for long-term collective action under uncertainty. Conversely, responses to environmental crises depend on developments in all other domains: Economic growth provides resources for investment; Social cohesion enables acceptance of transitions; Technological breakthroughs can change constraint equations; Political effectiveness determines whether coordinated action materialises. The environmental domain thus functions as both the existential challenge and the integrating force compelling systemic thinking across all other STEEP categories.

5. **Political** (P)

The political domain is characterised by a fundamental shift from post-Cold War ideals of cooperation and convergence toward an era of sustained competition, fragmentation, and contested norms, with democratic governance itself under simultaneous external and internal pressure.

1. Geopolitical Competition and Erosion of the Rules-Based Order

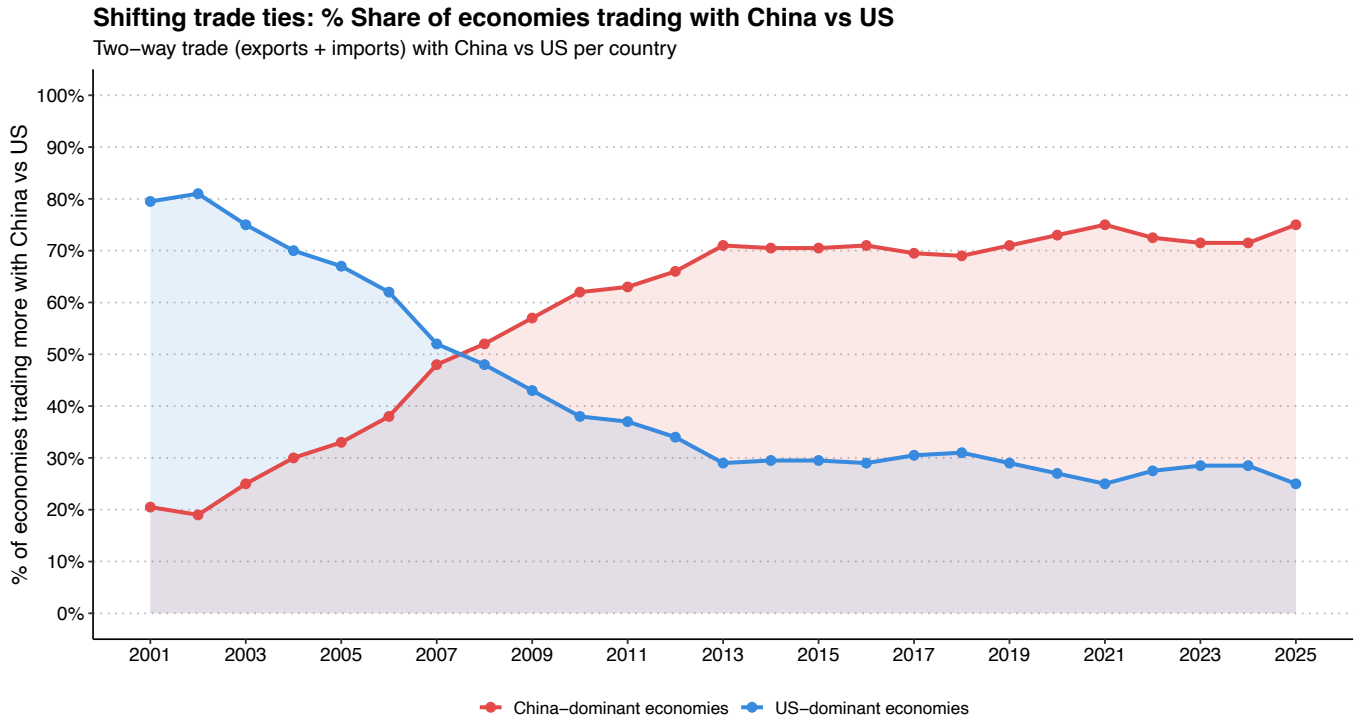
Every global and regional document analysed identifies the shift to a more contested, multipolar world as the dominant political meta-trend. The post-1945 liberal international order characterised by US hegemony, multilateral institutions (such as UN, WTO, IMF), and expanding trade and democratic governance is fracturing. NIC (2021) frames this as "A More Contested World," while ESPAS describes "the centrality of geopolitics" with profound shifts from cooperation toward competition and friction. The primary driver shaping the geopolitical environment is the US-China strategic rivalry, described by the Singapore Government as "Superpowers in Motion". This rivalry is increasingly reflected in global trade architecture: as Figure 15 illustrates, the share of economies where China is the dominant trading partner has grown steadily since 2001, overtaking the United States around 2007–2008 and reaching approximately 75% of economies by 2025, representing a near-complete reversal of the post-war trade order within just two decades. Notably, trade remains structurally more central to China's economy than to the US, representing approximately 37% of Chinese GDP compared to 25% for the United States (Figure 16), giving Beijing a strong structural incentive to deepen global trade relationships. This is compounded by Russia's challenge to European security (Ukraine war), rising middle powers asserting interests (India, Turkey, Brazil, Saudi Arabia), and weakening consensus on norms and rules. The UK Ministry of Defence (2024) report notes this Global Power Competition will involve not just major states but "a range of smaller state and non-state actors," including violent extremist organisations and organised crime groups whose capacity has increased.

The mid-to-long-term trajectory (2030-2055) sees persistent rivalry playing out across multiple domains: military competition and regional conflicts, technological supremacy races (covered in Technology section), economic statecraft and sanctions, and information warfare. Key uncertainties include whether competition escalates to direct military confrontation (particularly over Taiwan or in the South China Sea), whether middle powers can maintain strategic autonomy or are forced into bloc alignment, and whether any institutional architecture can manage global commons challenges (climate, pandemics, nuclear proliferation, cyber norms) in a fragmented system. ESPAS (2024) explicitly notes "the inability of major global powers to maintain a stable world order" as evidenced by successive crises. The UK Ministry of Defence (2024) identifies a core contradiction: global challenges demand cooperation precisely when political trends drive confrontation.

Figure 15:

Each economy is classified by whether its total two-way goods trade (exports + imports combined, in millions USD) with China exceeds that with the United States in a given year.

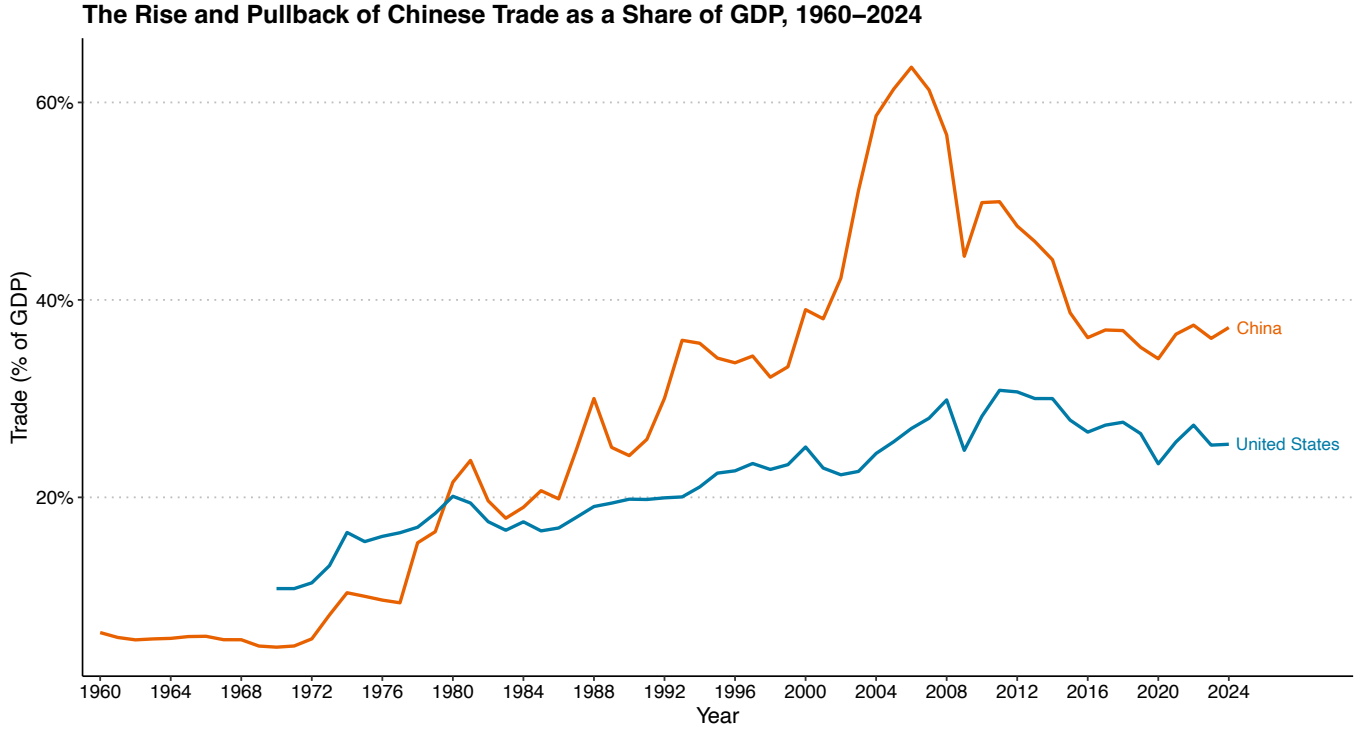
Since self-reported import data are not directly available for most economies in the IMF IMTS database, mirror data are used: each country's imports from China (or the United States) are approximated by China's (or the United States') own reported exports to that country. The number of economies where each partner is dominant is then counted and divided by the total number of economies with available data in that year, producing the percentage shown on the y-axis. Data cover up to 194 economies annually; economies with missing data for either partner in a given year are excluded.



Source: IMF Direction of Trade Statistics (IMTS)

Figure 16:

China's trade openness (exports plus imports as a share of GDP) increased sharply from the 1980s, peaking at over 60% in 2006, before declining and converging toward U.S. levels by the 2020s



Source: https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS

2. **Blurring Security Boundaries**

Linked directly to geopolitical competition is what the EU Commission terms a “changing security paradigm” where traditional boundaries between war and peace, military and civilian, foreign and domestic blur. This encompasses hybrid threats, cyberattacks on critical infrastructure, disinformation campaigns, economic coercion through dependencies, weaponisation of migration flows, and grey-zone operations below the threshold of traditional armed conflict. The EU report explicitly states, “everything can be weaponised,” from supply chains to information ecosystems to energy dependencies.

The drivers are the strategic utility of hybrid operations (achieving political objectives while avoiding direct conflict escalation and attribution), the proliferation of enabling technologies (cyber tools, social media platforms, surveillance systems), and the vulnerability of open, digitally connected societies to these tactics. The near-to-mid-term prediction (2025-2040) is for persistent, low-level conflict and interference, foreign election meddling, infrastructure sabotage, economic disruption, narrative warfare designed to erode cohesion and trust. This creates the trend of “securitisation of policy”, security logics spilling into domains traditionally considered civilian/economic: industrial policy justifying subsidies for national champions in strategic sectors, immigration policy driven by security concerns, technology regulation framed around dual-use risks, even climate policy considering resilience to adversarial disruption. The implications are significant: erosion of open trade and scientific collaboration, legitimation of state surveillance and control, and political discourse increasingly framed through threat rather than opportunity. The uncertainties include escalation risks (when do cyber operations trigger kinetic retaliation?), effectiveness of defensive resilience measures, and whether securitised policy postures can be sustained in democracies without undermining the open society values they ostensibly protect.

3. **Pressures on Governance Systems**

Multiple documents analysed identify pressures on democratic governance and the rise or resilience of authoritarian alternatives. ESPAS (2024) discusses “Democracy between threats and renewal,” noting growing political polarisation, attacks on media freedom, and disinformation undermining shared factual bases for debate. NIC (2021) identifies “State Dynamics” where governments struggle under mounting pressures, creating a “State-Public Mismatch” that portends greater political volatility and potential democratic erosion. However, there is notable divergence on the scope of this trend. While NIC and ESPAS emphasise democratic backsliding as a global phenomenon, Defra explicitly questions this, noting “lack of sufficient evidence… on a global scale” when viewed from deep-time perspective, suggesting high-profile Western examples may skew perception.

Bello-Schünemann et al. (2018) present a more complex picture: while democratic institutions remain fragile and trust has declined significantly (Botswana -40 points, South Africa -35 points in satisfaction with democracy), popular demand for democracy remains robust at 66% average, with the problem being a “supply-side failure” by leaders rather than citizen rejection of democratic ideals. Critically, 53% of Africans are willing to tolerate military intervention if elected leaders “abuse power”, showing the vulnerability of democracy to performance failures.

The drivers of democratic stress include the “State-Public Mismatch” (delivery gaps), economic anxiety and inequality fuelling populism, technological amplification of polarisation through algorithmic filter bubbles, external interference from authoritarian states, and corruption undermining institutions. The trajectory is near-to-mid-term (2025-2040) with significant variance by region. Uncertainties centre on whether democratic systems can reform and rebuild legitimacy through transparency, participation, and performance—or whether the combination of internal failures and external pressures creates an “authoritarian turn” even in historically democratic states. The implications for collective action on all other challenges (climate, technology governance, pandemic response) are severe, as effective response requires institutional capacity and social trust that these governance stresses erode.

4. The Rise of Populism and Nationalism

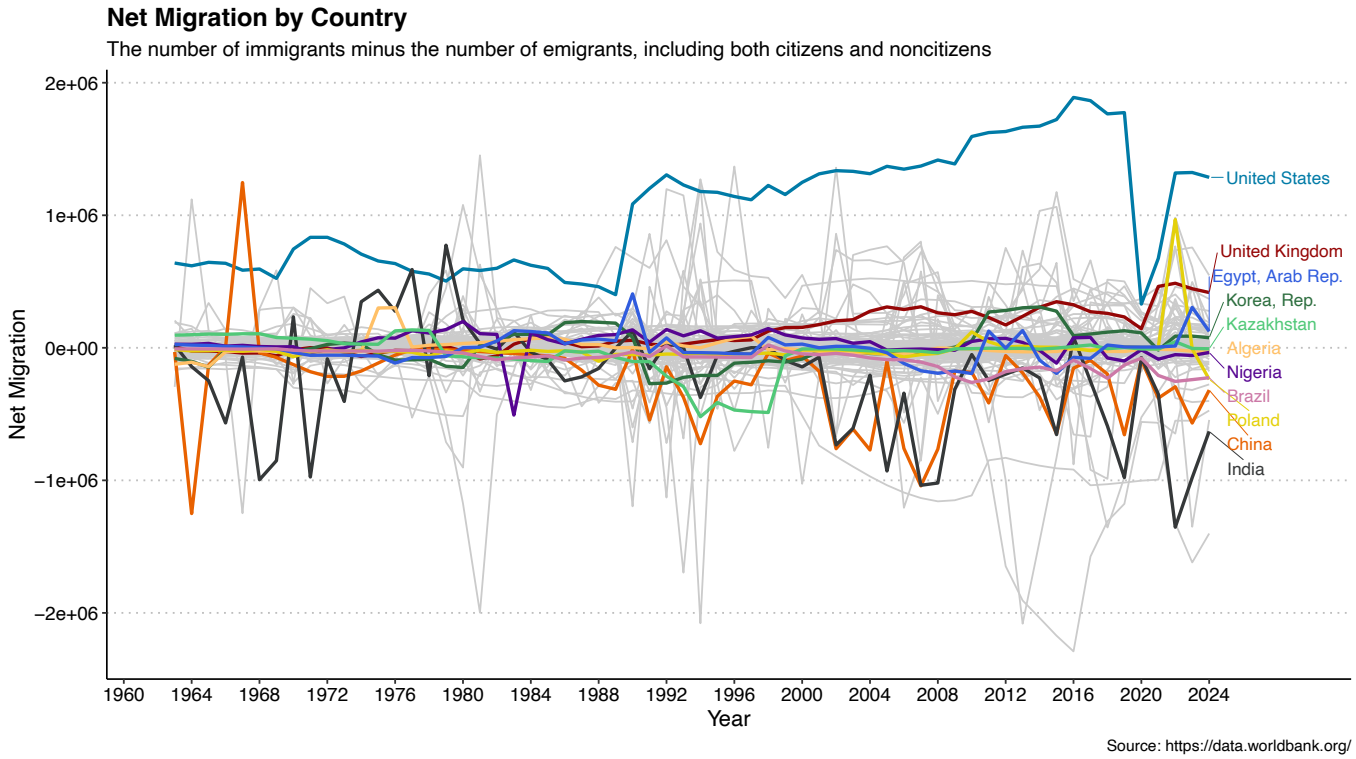
Overlapping with, but distinct from governance pressures and democratic backsliding is the rise of nationalist and populist movements, and what the Ipsos report terms “Retreat to Old Systems”, a nostalgic desire for “the way it used to be” driving pushback against trends that challenge traditional structures. This manifests as anti-immigration sentiment and cultural backlash, scepticism toward international institutions and agreements, protectionist economic policies (covered in Economic section), and assertion of traditional social hierarchies (resistance to gender equality, LGBTQ+ rights, multiculturalism).

The drivers are multifaceted: economic dislocation and inequality creating perceptions of unfairness (globalisation’s losers), rapid cultural change perceived as threatening traditional identities, and political entrepreneurs leveraging these anxieties. Ipsos data shows majorities in multiple countries agreeing “I would like my country to be the way it used to be” and exhibiting increased perceptions of immigration as a burden. As shown in Figure 17, net migration into major destination countries, particularly the United States and United Kingdom, has risen over recent decades, providing the material backdrop against which these political anxieties have intensified. This feeds directly into Social trend #2 (inequality and fragmentation) and is amplified by Social trend #5 (trust erosion and polarisation). In the short-term (2025–2030), the most likely political effect is that nationalist and populist parties gain power. This makes it harder for countries to work together internationally, and it shrinks the space for ambitious long-term policy. Climate action gets recast as something imposed by out-of-touch elites. Efforts to regulate technology get framed as attacks on national sovereignty.

There is uncertainty in what these movements actually represent. Are they a temporary backlash, a reaction to how fast the world is changing, that sensible economic policy and more responsive governments could eventually defuse? Or are they something more long-lasting: a genuine shift in how people think about national identity and global cooperation, one that breaks the world into rival, inward-looking economic blocs that trade and cooperate as little as possible? The implications cascade across all domains: Economic fragmentation (friend-shoring, protectionism), reduced Environmental cooperation (climate becoming a partisan issue), slower Technological diffusion (barriers to scientific exchange), and Social division (identity politics, culture wars).

Figure 17:

Net migration trends for selected countries, 1960–2024. Ukraine is excluded as its recent outflows — driven by the 2022 Russian invasion



5. Innovation in Governance

The final major political trend–identified primarily in EU and Singapore documents but with broader relevance—is the imperative for governance innovation to match the complexity and velocity of challenges. The EU frames this as "Resilience 2.0"—moving beyond reactive crisis management to proactive, anticipatory governance that builds adaptive capacity across interconnected risks. This includes multiple dimensions: institutionalising strategic foresight and early warning systems within government, building cross-domain coordination capacity for polycrisis response (where climate, health, economic, and security crises interact), engaging civil society and citizens in governance to rebuild trust, and designing flexible, adaptive policy frameworks rather than rigid planning (CSF, 2022).

The drivers are the demonstrable inadequacy of traditional governance for compound crises (COVID-19 revealing gaps in preparedness, climate change requiring decades-long policy consistency, technology development outpacing regulation), and recognition that legitimacy requires performance under stress. The mid-term challenge (2030-2040) is building this capacity while facing the headwinds of democratic pressures, fiscal constraint, and political short-termism. Uncertainties include whether sufficient political will exists for long-term investments in governance capacity, whether foresight can overcome cognitive biases (recency bias, normalcy bias) and vested interests, and whether democratic systems can be simultaneously responsive to immediate citizen demands and far-sighted for long-term challenges. The interdisciplinary implications are clear: effective governance requires integrating expertise across all STEEP domains, translating complex technical knowledge (Technological, Environmental) into politically viable pathways, managing Social acceptability of necessary transitions, and mobilising Economic resources efficiently. Cardiff University's positioning around interdisciplinary grand challenges, Future Generation Thinking, and global-civic mission directly engages this governance innovation agenda.

Cross-Category Linkages:

Political trends simultaneously shape, and are shaped by, all other domains in a tight feedback system. Geopolitical competition drives Economic fragmentation and Technological rivalry, while constraining Environmental cooperation. Democratic stress is caused by Social inequality and Economic dislocation, while undermining collective action capacity across all domains. Securitisation treats Technological advances and Economic dependencies as threats, while militarising responses to Environmental migration. Nationalism blocks the Economic openness, Technological cooperation, and Environmental multilateralism that cross-border challenges require. Conversely, Governance innovation could provide the institutional capacity to navigate these tensions if sufficient political will and Economic resources are mobilised to build it. The political domain is thus both the constraint (fragmentation, short-termism, distrust) and potential enabler (effective institutions, social license, strategic vision) for navigating other STEEP challenges.

Speed of Change Versus Capacity for Collective Action

A structural tension identified in many of the reports, and which plays out across all domains, is the mismatch between the velocity and complexity of change versus the institutional and social capacity to respond effectively.

- Technological change operates on exponential curves (Moore's Law, AI adoption rates), while regulation and ethics frameworks operate on linear and lumpy political timescales.
- Environmental tipping points may arrive suddenly and irreversibly, while political systems operate on electoral cycles optimising for near-term visible results.
- Economic transformations (automation displacing jobs, green transition restructuring industries) happen faster than workforce retraining, social safety net adaptation, or regional economic redevelopment.
- Social cohesion and trust—prerequisites for collective action—are eroding precisely when Political systems need stronger mandates for difficult long-term investments.

This creates a dangerous dynamic where the "action window" for effective response (before climate impacts, demographic shifts, or geopolitical fragmentation create irreversible path dependencies) may close while societies are still debating problem definitions, arguing over distributional impacts, and struggling with trust deficits that prevent consensus. The documents analysed all recognise this tension but diverge on whether existing institutions can adapt fast enough (the "renewal" path) or whether system-level disruption is inevitable (the "crisis" path). The outcomes over the 2025-2055 horizon will depend critically on whether governance innovations (anticipatory capacity, interdisciplinary integration, participatory legitimacy) can respond quickly and effectively enough to the combination of pressures that will be faced.

References

Bello-Schünemann, J., Cilliers, J., Donnenfeld, Z., Aucoin, C. and Porter, A., 2018.
African future 2035: key trends. Futures Stud, 23, pp.127-40.

Bloomfield, D., Pannu, J., Zhu, A. W., Ng, M. Y., Lewis, A., Bendavid, E., Asch, S. M., Hernandez-Boussard, T., Cicero, A., & Inglesby, T. (2024).
AI and biosecurity: The need for governance. Science.
https://www.science.org/doi/10.1126/science.adq1977#

Cardiff University (2024), *Our future, together.*
Available at https://www.cardiff.ac.uk/about/our-profile/strategy/our-future-together

Cardiff University (2023), Dylan Henderson, *Future Trends and Strategic Foresight*, internal report.

Centre for Strategic Futures (CSF) (2022) *Driving Forces 2040 Cards*.
Available at: https://www.csf.gov.sg/media-centre/publications/csf-df-cards/ (Accessed: 25 March 2026).

Cote, C (2021) *What Is Predictive Analytics? 5 Examples.*
Available at https://online.hbs.edu/blog/post/predictive-analytics (Accessed 28 March 2026)

Department for Environment, Food & Rural Affairs (Defra) (2024)
Global megatrends: 10 global megatrends shaping the world we live in. 4th ed.

Department for Energy Security and Net Zero (DESNZ) (2025)
Public attitudes tracker: net zero and climate change, Spring 2025 (UK).
Available at: https://www.gov.uk/government/statistics/desnz-public-attitudes-tracker-spring-2025/desnz-public-attitudes-tracker-net-zero-and-climate-change-spring-2025-uk (Accessed: 2 April 2026).

European Commission (EU) (2025)
Strategic foresight report 2025: Resilience 2.0 – Empowering the EU to thrive amid turbulence and uncertainty.
https://espas.secure.europarl.europa.eu/orbis/system/files/generated/document/en/SFR2025-Report_web.pdf

European Strategy and Policy Analysis System (ESPAS). (2024).
Global trends to 2040: Choosing Europe's future.
https://www.espas.eu/files/espas_files/about/ESPAS-Global-Trends-to-2040-Choosing-Europes-Future-EN.pdf

Future Generations Wales,
Long Term Thinking.
Available at https://futuregenerations.wales/do/tools/long-term-thinking/ (Accessed 28 March 2026).

International Energy Agency (IEA) (2024)
Renewables 2023: Analysis and forecast to 2028. Paris: IEA.
Available at: https://iea.blob.core.windows.net/assets/96d66a8b-d502-476b-ba94-54ffda84cf72/Renewables_2023.pdf (Accessed: 25 March 2026).

Ipsos (2025)
Ipsos global trends 9th edition: The uneasy decade – Reshaping society, technology, and the global economy.
Available at: https://www.ipsos.com/en/ipsos-global-trends-9th-edition-release (Accessed: 25 March 2026).

Khanna, P (2019)
The Future is Asian Global Order in the Twenty-first Century ; Publisher. Weidenfeld & Nicolson, London

Mouton, C. A., Lucas, C., & Guest, E. (2023).
The Operational Risks of AI in Large-Scale Biological Attacks: A Red-Team Approach. RAND Corporation.
https://www.rand.org/pubs/research_reports/RRA2977-1.html

National Intelligence Council (NIC) (2021)
Global trends 2040: A more contested world. Office of the Director of National Intelligence.
Available at: https://www.dni.gov/index.php/gt2040-home (Accessed: 25 March 2026).

Naisbitt, J. (1982)
Megatrends : ten new directions transforming our lives.

Naughtin, C.K., Schleiger, E., Bratanova, A., Terhorst, A. and Hajkowicz, S., (2024).
Forty years in the making: A systematic review of the megatrends literature. Futures, 157, p.103329.

Smith S, Ashby, M (2020)
How to Future : Leading And Sense-Making In An Age Of Hyperchange. Kogan Page, London

Saritas, O. (2016).
An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy.
https://www.sciencedirect.com/science/article/pii/S0016328724000120

UK Government (2024)
Global strategic trends: The future starts today. Ministry of Defence, 7th ed.
Available at: https://assets.publishing.service.gov.uk/media/68dba439dadf7616351e4bf8/GST_7_Final_post_pic_change_WEB.pdf (Accessed: 25 March 2026).

UK Government Office for Science, (2024)
Futures Toolkit
Available at: https://www.gov.uk/government/publications/futures-toolkit-for-policy-makers-and-analysts/the-futures-toolkit-html#about-the-toolkit

Welsh Government (2021)
Future trends report Wales 2021: Narrative summary.
Available at: https://www.gov.wales/sites/default/files/publications/2021-12/future-trends-report-wales-2021-narrative-summary.pdf (Accessed: 25 March 2026).

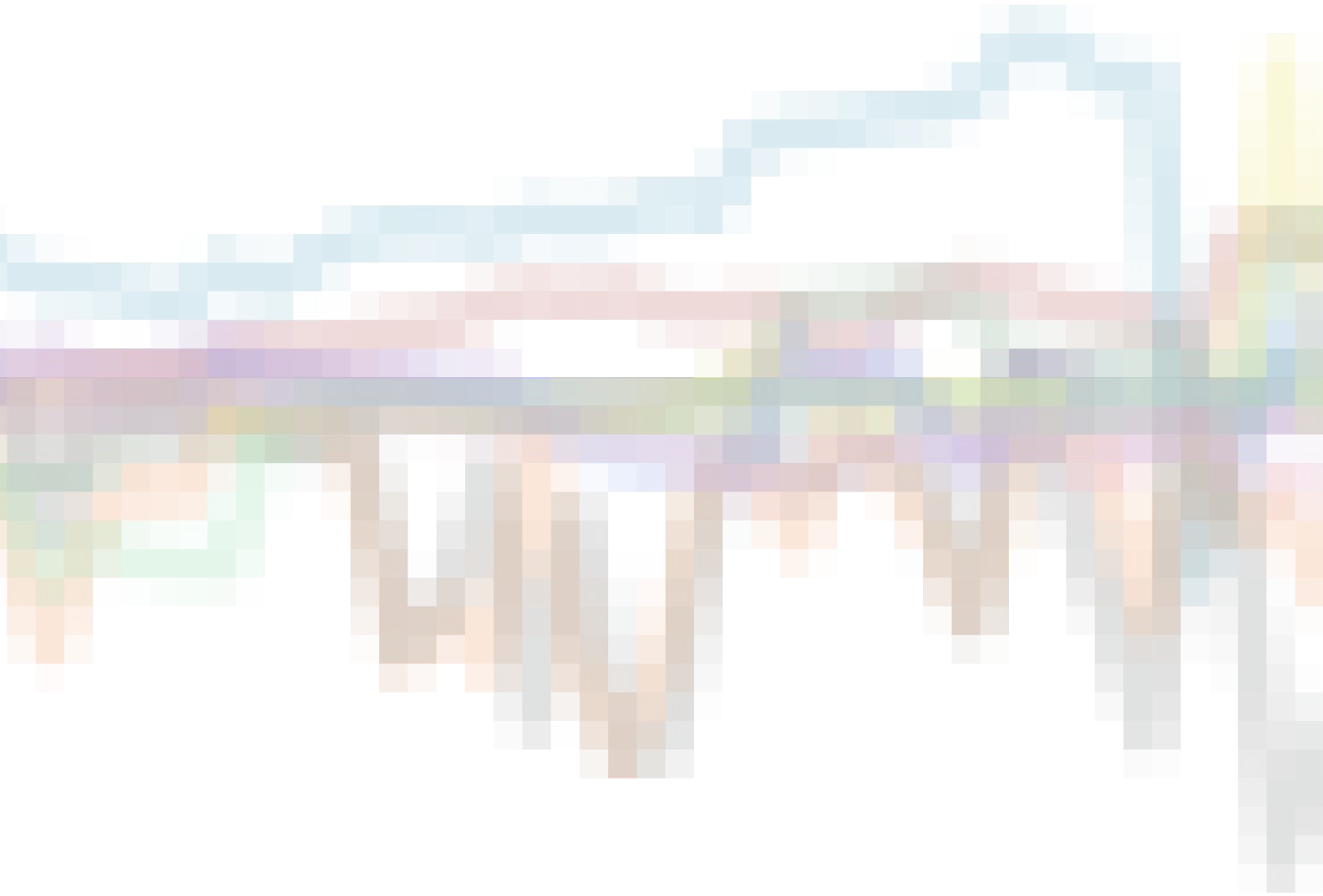
Wike, R., Fagan, M., Huang, C., Clancy, L. and Lippert, J. (2025)
Economic inequality seen as major challenge around the world. Washington, DC: Pew Research Center.

Cazzaniga, M., Jaumotte, M. F., Li, L., Melina, M. G., Panton, A. J., Pizzinelli, C., ... & Tavares, M. M. M. (2024).
Gen-AI: Artificial intelligence and the future of work. International Monetary Fund.

Appendix A
Sources and Methodology

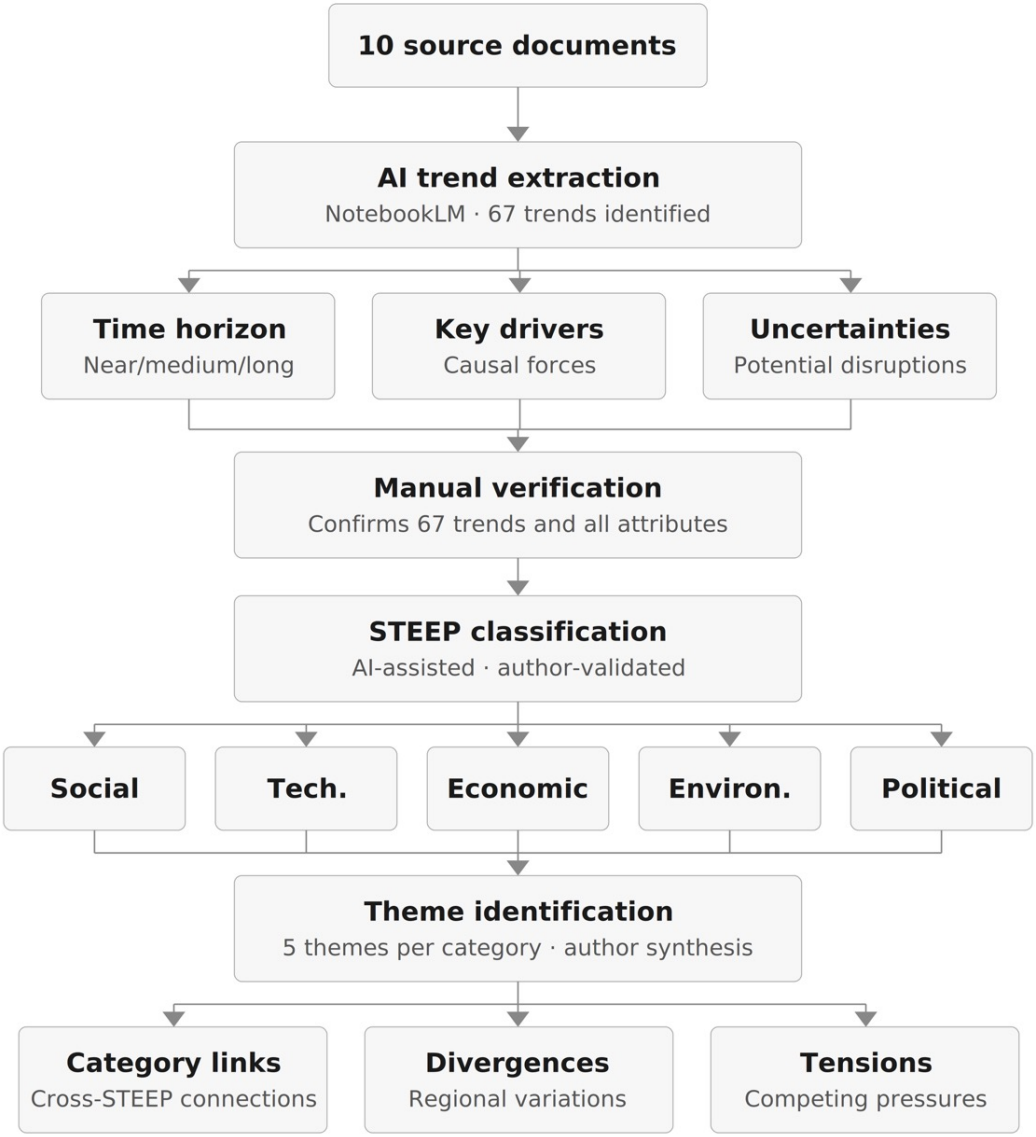
This report draws on ten trends documents listed here. These were selected because their authors have already undertaken substantial analytical work on which this report can build, and because they represent credible institutional sources. However, the selection is weighted towards Western government publications, which introduces a number of biases — towards policy concerns, particular geographical areas, and viewpoints representing a specific segment of global society. Subsequent work will be needed to challenge and enrich this material.

1. '**Choosing Europe's Future: Global Trends to 2040**' (2024), The European Strategy and Policy Analysis System (ESPAS).
2. '**Foresight Report 2025: Resilience 2.0**' (2025), European Commission.
3. '**African Futures 2035: Key Trends**', Bello-Schünemann, J, et al., Journal of Futures Studies, September 2018.
4. '**Driving Forces 2040 Cards**', Centre for Strategic Futures, Prime Minister's Office, Singapore.
5. '**Global Trends**' (2021), US National Intelligence Council.
6. '**Global Megatrends**' (2024), UK Department of Environment, Food and Rural Affairs (DEFRA).
7. '**Global Strategic Trends: Out to 2055**' (2024), UK Ministry of Defence (MoD).
8. '**Future Trends Report, Wales**' (2021), Welsh Government.
9. '**Global Trends 2025: An Uneasy Decade**' (2025), IPSOS.
10. '**Future Trends and Strategic Foresight**' (2023), Dylan Henderson, internal report, Cardiff University.



Appendix B
The analytical process followed summarised in Figure B-1

Figure B-1:
Overview of the analytical process used to extract, verify, classify, and synthesise trends across the ten source documents

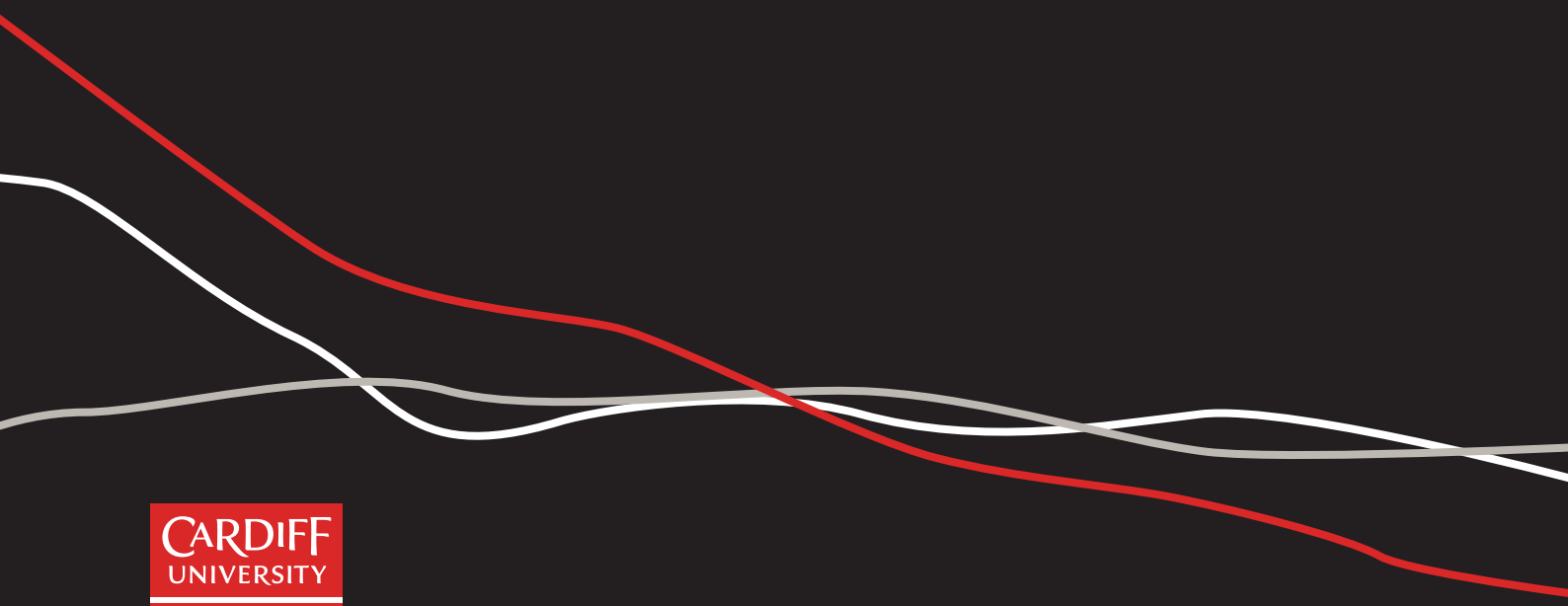


The analytical process used was as follows. In the first stage, the ten documents were processed using Google NotebookLM, an AI-assisted research tool. Each document was uploaded individually and the tool was prompted to extract up to ten major trends highlighted in it, providing for each trend a description, an anticipated time horizon (near-term: 2025–2030; medium-term: 2030–2040; or long-term: 2040–2055), the main drivers behind it, and the key uncertainties that could disrupt or alter its trajectory, with duplicate trends removed. The resulting long list was then reviewed manually by the authors to confirm that every trend identified was accurately and faithfully represented in the source material. This verification process yielded 67 confirmed trends in total, along with their associated attributes.

In the second stage, the 67 trends were classified using the STEEP framework, covering Social, Technological, Economic, Environmental, and Political factors. The framework was introduced to Google NotebookLM, which was prompted to assign each trend to one of the five categories. This AI-assisted classification was then reviewed and validated by the authors. Within each category, the authors identified five major theme trends — those representing the dominant patterns and appearing most frequently across the ten source documents, particularly where they were afforded salience in introductions or executive summaries.

The STEEP framework was chosen as the organisational backbone of this analysis. The predecessor PEST framework, covering Political, Economic, Social, and Technological factors, was introduced by Francis J. Aguilar in Scanning the Business Environment (1967). STEEP extends this by adding Environmental factors, making it better suited to futures and strategic foresight work, where ecological and planetary considerations are increasingly central. Related frameworks exist — PESTLE adds Legal factors, STEEPLE incorporates Ethics, and STEEPV includes Values — but STEEP is used here as sufficiently holistic without becoming unwieldy, with Legal considerations accommodated within the Political category and ethical concerns within the Social one. Futures work tends to overweight technological change at the expense of other drivers; the breadth of STEEP helps guard against this.

All visualisations to accompany main trends are produced using R software by the first author, drawing on publicly available data collected from a range of sources.



CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD