FUTURE TRENDS

Report

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TRENDS RESEARCH & ADVISORY

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

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AI and Geopolitics

Benyekhlef, K., & Zhu, J. (2024). La géopolitique de l'intelligence artificielle : régulation et puissance. Lex Electronica, 29(1). https://www.erudit.org/fr/revues/lex/2024-v29-n1-lex097421115070/ar/

The article "La géopolitique de l'intelligence artificielle : régulation et puissance" by Karim Benyekhlef and Jie Zhu (2024) explains how AI has become a priority geopolitical and geoeconomic resource in contemporary international power competition.

The article argues that AI is today closely engaged in both military and economic competition among major world powers—the U.S., China, and, to a lesser extent, the EU. AI technologies are enhancing national security and battlefield coordination resilience as well as transforming world markets and industrial dominance.

The U.S. still has a significant lead in AI with its digital behemoths—Google, Amazon, Meta, and Apple—and leverages its control over global financial infrastructures (such as the dollar system and supply chains). Through legislative tools such as the CHIPS and Science Act and the active enforcement of sanctions, America militarizes economic policy to ensure technological supremacy. China, however, accelerates its national strategy for AI development to challenge American dominance. Europe, lacking its own tech giants, is seeking to project influence through regulation, establishing itself as a normative power by compliance-based legislative proposals like the EU AI Act. The article, however, questions whether such regulation will have any tangible impact in a space where security and strategic interests guide policymaking.

The article also places AI within the broader context of the restructuring of geopolitical space by digital technologies. The creation of cyberspace—constructed by human infrastructure—blurs traditional notions of sovereignty, territory, and jurisdiction. The authors describe cyberspace as a multilayered domain made up of physical infrastructure, logical networks, software systems, and data flows, each of which opens up new terrain for geopolitical contest and regulatory tension.

They also argue that this digital revolution erodes the Westphalian order of state sovereignty. Sovereignty is no longer exclusively tied to territorial boundaries but is ever more exercised in terms of control over information flows, access to digital infrastructure, and standard-setting. This has generated new trends of centralization around technology giants and telecommunications companies, some of which rival states in their ability to shape behaviors and norms. Here, even individual rights are increasingly mediated by digital surveillance and governance technologies.

In all, AI is not just a technical revolution but a remaking force for global power arrangements, new paradigms of legal authority, and regulatory jurisdiction. The authors call for a critical reexamination of sovereignty, regulation, and normative legitimacy under conditions of algorithmic rule and digital interdependence, as the quest for AI supremacy continues to reshape the balance of power in the 21st century.

AI has become a priority geopolitical and geoeconomic resource in contemporary international power competition.

AI is not just a technical revolution but a remaking force for global power arrangements, new paradigms of legal authority, and regulatory jurisdiction.

Prospective research

The Rise of Techno-Solutionism

Pajot, B. (2025, 12 mai). Techno-solutionnisme : la Silicon Valley à l'assaut de la Maison Blanche ? [Épisode de podcast]. Le monde selon l'Ifri. Institut français des relations internationales. https://www.ifri.org/fr/podcast

On this episode of the podcast "Le monde selon l'Ifri" (The World According to Ifri), Benjamin Pajot, a co-researcher at Ifri's Geopolitics of Technology Center, discusses the rise of techno-solutionism, the idea that any social, political, or ecological problem can and should be solved with technology.

He writes about how this thinking first arose in Silicon Valley with a virtually religious belief in technological progress and the capability of electronic equipment. This instinct is to redefine troublesome questions as technical issues, thereby sidestepping the political or ethical arguments that go along with them. Pajot adds that this shift is oftentimes accompanied by a rejection of traditional democratic institutions and a growing appeal among some technology actors to more direct, even authoritarian, forms of governance, connected to the American far right.
The podcast explains how digital technologies are increasingly being employed by states as management tools and instruments of social transformation, in the guise of nudges, choice algorithms, or citizen engagement platforms. Defined by these technologies, the state takes on a "solutionist" role, replacing democratic discussion with algorithmic answers, directed frequently to symptoms and not causes. According to Pajot, this model erodes society's general ability to deliberate, bargain, and build community. He particularly highlights the danger of a state that no longer listens to its people, but profiles, segments, and governs them through algorithmic calculations.
Faced with this dynamic, Europe is attempting to place legal frameworks on top, specifically through the AI Act. But Pajot warns against regulation that, although intended to be protective, could potentially fall into the trap of solutionism itself if it fails to take the necessary step back. He gestures toward the already palpable temptation to introduce such authoritarian tools as social credit in softer forms, in the form of environmental optimization or behavioral management. What this analysis reveals is that the mythical "double transition"—digital and ecological—is more commonly envisioned on the same ideological grid, one that condenses the necessary changes into nothing more than engineering problems.
Benjamin Pajot therefore calls for a reappropriation of politics: not about denying technology, but about not letting it substitute democratic decision-making. Technology should be a tool, not the objective. He invites us to go back to understanding the social, economic, and historical reasons behind the crises of today, so that online tools can facilitate a collective project, and not be used as an excuse for political responsibility.

Techno-solutionism is the idea that any social, political, or ecological problem can and should be solved with technology.

Technology should be a tool, not the objective.

Prospective research

How is AI Reshaping International Relations?

Mokrova, E. (2025, 20 février). Artificial Intelligence in International Relations – Future or Reality? SSRN. https://ssrn.com/abstract=5149271

In this paper, Mokrova traces AI's evolution from philosophical conjecture to tangible tools whose traces are now visible in contemporary international relations—not just within the environments of the military and defense spheres, but the potential and scope are also present in education, business, culture, and healthcare.

Feeling the strategic value of AI, the author depicts it as a factor determining future global hegemony: those powers that would invest and manage AI effectively will determine the next decades' geopolitical map.

Mokrova's core thesis is that the speeding diffusion of AI in international affairs calls for a new framework of analysis. She inquires: how does AI differ from past technologies in its ability to reshape security, economics, and decision-making? And what are the implications for conventional International Relations (IR) theories? Employing interdisciplinarity methodology, the research evaluates rising trends and normative deficits in both academia and policy.

First, Mokrova names three spaces in which AI is revolutionizing IR. The analytical space includes the ability of AI to process huge volumes of data at accelerated speeds, for much enhanced situational awareness and strategic insight. Finally, her operational space foresees future use of AI in real decision-making, though one that she acknowledges continues to be circumscribed by regulative, ethical, and legal limits.

Second, the paper explores how AI interacts with great IR paradigms:

· Realism: AI increases great-power competition by intensifying arms races and surveillance capacity, especially through autonomous defense systems such as killer drones.

· Liberal/Idealist: AI presents new opportunities for global collaboration through multilateral regulation, dignity-centered innovation, and humanitarian norms. Worries remain regarding adherence to international law, human rights, and participatory regulation.

· Neoliberalism (global markets and free trade): AI complicates economic relations. It has the potential to widen disparities, as the less developed nations may not be able to afford advanced AI, and mass automation threatens labor markets.

· Constructivism: Grounded in norms, identity, and perception, this perspective is once again challenged: can decision logic encoded in AI include values, bias, and collective meaning-making, or will it replace human agency with algorithmic thinking?

Lastly, Mokrova contends that AI radically reshapes the structure and substance of international relations. Classical IR schools of thought are good starting points, but they must risk becoming obsolete if they are not capable of accounting for the revolutionary power of AI to redefine world governance, competition, and diplomacy. New theoretical tools and approaches are required, she encourages, to comprehend an AI-surrounded world.

The powers that would invest and manage AI well will determine the next decades' geopolitical map.

AI will radically reshape the structure and substance of international relations.

Prospective research

“Silicon Sovereignty”: Who Really Controls AI?

Chesterman, S. (2025, 7 mai). Silicon Sovereigns: Artificial Intelligence, International Law, and the T the Tech-Industrial Complex (arXiv preprint No. 2505.05506). arXiv. https://arxiv.org/abs/2505.05506

Chesterman critically examines the radical rise of what he terms "silicon sovereignty"—a world where the authority previously held by states is assumed by a small elite of tech companies. He notes that public debates around AI

As Chesterman believes, in the world of AI, there is a very distinctive reinforcement of a balance between public and private control. While governments are finding it increasingly difficult to keep up with rapidly changing technology, unprecedented power is concentrating in the hands of just a few technology companies—whose reach now approximates that of countries. According to Chesterman, "The 20th century saw the establishment of international institutions, but the 21st century could see their destruction under privately dominated digital power."

Chesterman argues that current debates on AI governance unfortunately address but pay scant attention to the structural distributional nature of the issues involved, mainly by assuming AI as a neutral technology; instead, he finds AI power deeply political and economic, with decisions in boardrooms being at least as determinative as those in legislatures.

As far as international law is concerned, Chesterman challenges the validity of contemporary legal structures in light of corporate hegemony. He presents the fear that international institutions, once foundations of global order, stand the risk of being superseded by proprietary platforms running transnationally but democratically unaccountable. This raises grave questions regarding legitimacy, enforcement, and fair representation in AI governance.

Furthermore, the essay identifies how the tech-industrial complex threatens global equity. Chesterman warns that disparate access to advanced AI can exacerbate differences between developed and developing countries, between the public and private spheres, and between powerful firms and common users.

Last but not least, Chesterman calls for democratic control, legal accountability, and distributive justice in the regulation of AI, challenging policymakers, researchers, and civil society to give up their dystopian or utopian myths and engage the institutional issue of silicon sovereignty on its own terms. By placing law, regulation, and public interest at the center, he contends, the future of AI can align with just and transparent forms of power for states and citizens alike, recontextualizing the technology not as a simplistic technical horizon or race to the battlefield but as the characteristic struggle over power, regulation, and world justice in an era defined by digital ascendancy.

Public debates around AI oscillate between utopian optimism and dystopian apprehensions of existential threat.

The regulation of AI requires democratic control, legal accountability, and distributive justice.

References:

Chesterman, S. (2025, May 7). Silicon Sovereigns: Artificial Intelligence, International Law, and the Tech-Industrial Complex (arXiv preprint No. 2505.05506). arXiv. https://arxiv.org/abs/2505.05506
Chesterman, S. (2024). Who governs artificial intelligence? SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5244169

Prospective research

How is AI Reshaping Global Order?

Momtaz, R., Ülgen, S., & Winter-Levy, S. (2025, April 16). How AI is reshaping the global order [Audio podcast]. Carnegie Europe. https://carnegieeurope.eu/podcasts/europe-inside-out/how-ai-is-reshaping-the-global-order

In the Europe Inside Out podcast, host Rym Momtaz joins Sinan Ülgen (Carnegie Europe) and Sam Winter-Levy (Carnegie Endowment) to talk about how AI—especially generative models and large language systems—is transforming global politics, economics, and strategic competition.

They start by highlighting the dual-use nature of AI: presenting immense capabilities—from automating creative work and optimizing service delivery to facilitating surveillance, disinformation, and cyber operations—while triggering alarm that AI may be weaponized by authoritarian governments, malign non-state actors, and surveillance states.

Emerging powers beyond the United States and Europe—such as China, Saudi Arabia, and the UAE—are making their own technology power plays, challenging the transatlantic duopoly in innovation and governance as well. Momtaz, Ülgen, and Winter-Levy discuss how these actors are attempting to rewrite rules and assert digital sovereignty. China, for instance, is proceeding quickly despite U.S. bans on chip exports by leveraging effective hardware utilization and indigenous innovation to keep up with AI development.

The conversation highlights intensifying transatlantic tensions over regulation. The U.S. and European Union have diverged in approach—while the EU pushes ambitious rules like the AI Act, the U.S. shifts through export controls and geopolitical strategy to shape AI's global diffusion. Winter-Levy emphasizes how export policies themselves are instruments of global influence, potentially redefining U.S. soft and hard power through AI policy.

A major concern is whether current governance frameworks can keep pace. The structural dimension is also critical: AI reshapes not just geopolitics but also international economic value chains. Dominant economies that lead in chip design, cloud infrastructure, and advanced models are entrenching advantages, whereas developing nations are at risk of entrenching dependence on AI providers.

Finally, Ülgen and Winter-Levy look to the future of the technology sector. They outline scenarios ranging from fragmented tech blocs driven by national interests to more integrated, multilateral governance structures, though both paths have trade-offs. The discussion outlines a picture of a world order in transformation where power is no longer solely state-centric but bound up with digital infrastructure, with emergent powers reshaping norms and extant institutions scrambling to catch up.

Generative models and LLMs are transforming global politics, economics, and strategic competition.

A major concern is whether current governance frameworks can keep pace.

References:

Carnegie Europe. (2024, March 13). How AI is reshaping the global order [Podcast episode]. In R. Momtaz (Host), Europe Inside Out. Carnegie Endowment for International Peace. https://carnegieendowment.org/podcasts/europe-inside-out/how-ai-is-reshaping-the-global-order

Winter-Levy, S., & Ülgen, S. (2024). Envisioning a Global Regime Complex to Govern Artificial Intelligence. Carnegie Endowment for International Peace. https://carnegieendowment.org/research/202403//envisioning-a-global-regime-complex-to-govern-artificial-intelligence

Time. (2024, March 14). How China is advancing in AI despite U.S. chip bans. https://time.com/7204164/china-ai-advances-chips

2 Applied research

How Is Canada Trying to Promote a Safe, Ethical, and Responsible Development of AI?

Institut canadien de la sécurité de l'intelligence artificielle (CAISI/ CIFAR). (2025, avril – juin). Programme de recherche de l'ICSIA [Page web]. CIFAR.

The Canadian AI Safety Institute (CAISI) Research Program at CIFAR (Canadian Institute for Advanced Research) captures Canada's evolving strategy for promoting the safe, ethical, and responsible development of AI. It envisions AI safety as a multidimensional problem that calls for an end-to-end solution—encompassing technical, social, legal, and geopolitical aspects.

The four key pillars of research informing the CAISI program need to be discussed. Technical resilience is a priority first; one wants AI systems to be transparent, controllable, and reliable. This entails conducting research in areas like adversarial robustness, interpretability, uncertainty estimation, and large-scale oversight methods. The program seeks to develop breakthroughs that provide capabilities for AI systems to act in reliable ways in uncharted situations, with particular emphasis on applications of high stakes such as healthcare, critical infrastructure, and autonomous systems.

Second, the program addresses institutional and legal regimes of AI regulation. This includes assessing what existing Canadian and international legal instruments can be adapted to address emerging technological advances, and where new regulations or norms might be needed. CAISI encourages anticipatory governance approaches that are proactive rather than reactive, drawing lessons from cybersecurity, biotechnology, and data protection law.

Third, CAISI incorporates social and ethical sensitivity, integrating applied sociology, philosophy, Indigenous studies, and education research. The paper stresses the importance of diversity in AI design to ensure that marginalized groups—most urgently, Indigenous peoples—are meaningfully included in research, consultation, and deployment. It invites efforts that bring together multiple epistemologies, including Indigenous knowledge systems, to improve the ethical remit of AI safety.

The fourth pillar concerns geopolitical and economic resilience. As AI becomes the source of international influence, CAISI sees Canada needing to gain access to critical AI infrastructure—compute power, data, and human capital—and end reliance on foreign tech monopolies. It advocates for international research cooperation, but under a framework that preserves Canadian sovereignty and security. This means investing in public-interest AI, capacity building, and university-industry-government partnerships that help set standards and norms.

In the report, CAISI imagines an AI safety vision that is holistic, participatory, and anticipatory. It recognizes that safety is not only about avoiding technical failure but also about creating institutional ecosystems that support democratic governance, equitable innovation, and long-term societal prosperity.

> **AI safety as a multidimensional problem that calls for an end-to-end solution—encompassing technical, social, legal, and geopolitical aspects.**

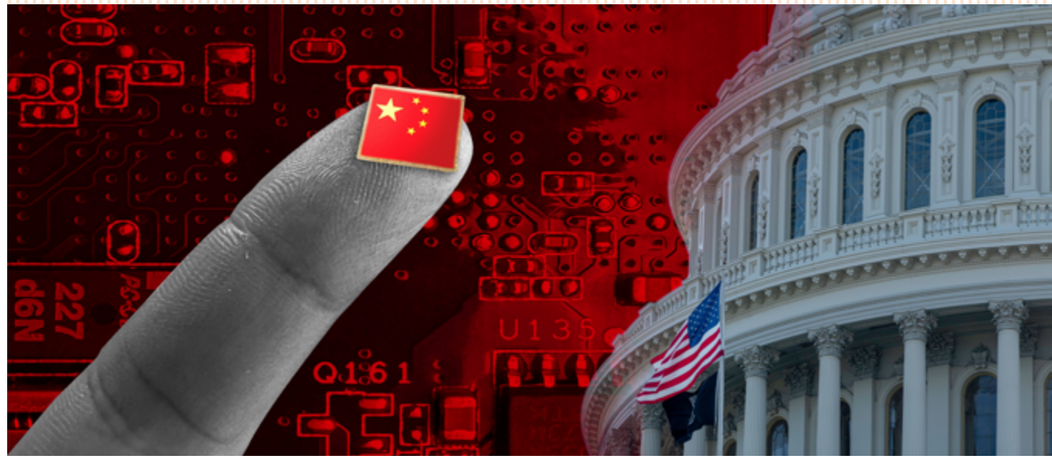
> **Diversity in AI design ensures that marginalized groups are meaningfully included in research, consultation, and deployment.**

Applied research

AI Safety Cooperation Among

Bucknall, B., Siddiqui, S., Thurnherr, L., McGurk, C., Harack, B., Reuel, A., ... & Segerie, C.-R. (2025, April 17). In which areas of technical AI safety could geopolitical rivals cooperate? arXiv. https://arxiv.org/abs/2504.12914

In this article, Bucknall et al. (2025) address the possibility of cooperation between geopolitical competitors—the United States and China—on technical AI safety, in the face of increasing tensions in global relations. The authors argue that while AI competition is increasingly influencing strategic dynamics, shared worries about existential risks, misalignment, and runaway deployments of advanced systems provide incentives for even rival states to cooperate on safety research and standards.



The article identifies numerous technical areas where such cooperation might be both feasible and advantageous to all sides.

These include robust studies (attempting to get AI systems to behave reliably in unexpected situations), interpretability (attempting to make AI decision-making more interpretable), adversarial robustness (protecting models from malicious manipulation), and scalable oversight (methods for controlling AI behavior as capabilities grow).

The authors stress that these subjects are not only vital to the safety of AI in the long term, but also relatively non-sensitive compared to military applications, and hence more amenable to joint research or open publication standards.

Pointing to historical examples such as U.S.–Soviet collaboration on nuclear non-proliferation and space science, the authors argue that international collaboration on technical AI safety need not be utopian.

They emphasize that cooperation does not have to entail full trust, but rather credible verification mechanisms, clear boundaries, and confidence-building measures—such as shared research benchmarks or multilateral technical standards.

In particular, the paper distinguishes between politically charged issues (like AI uses in surveillance, military systems, or ideological control) and technical safety concerns orthogonal to strategic advantage. For instance, research on anomaly detection, system monitoring, or safe shutdown mechanisms could improve global resilience to AI accidents without compromising national security. These technical domains constitute the "low-politicization zones" that the authors delineate, and they represent potential points of departure for discussion.

The report also deals with present challenges, including mistrust, asymmetry in capabilities, and differences in models of governance. Yet the authors believe that waiting for an AI crisis to occur would be far riskier than starting modest forms of cooperation right away. The authors call for multilateral institutions, research funders, and scientific communities to create a culture of open technical exchange, even in an era of geopolitical fragmentation.

In conclusion, Bucknall et al. demand the development of a shared scientific infrastructure for AI safety and emphasize that the global nature of the risks demands international collaboration. Their verdict is clear: technical coordination on AI safety is not only possible but essential to responsibly steer the emerging AI landscape.

Shared fears of existential risks, misalignment, and runaway deployments of advanced systems spur cooperation among rivals.

Cooperation does not have to entail full trust, but credible verification mechanisms, clear boundaries, and confidence-building measures.

Applied research

The Use of AI in a Military Context: Thoughts and Ethics

Anneken, M., Burkart, N., Jeschke, F., Kuwertz Wolf, A., Mueller, A., Schumann, A., & Teutsch, M. (2025, February 5). Ethical Considerations for the Military Use of Artificial Intelligence in Visual Reconnaissance. arXiv. https://arxiv.org/abs/2502.03376

The article "Ethical Considerations for the Military Use of Artificial Intelligence in Visual Reconnaissance" by Anneken et al. (2025) presents the complex ethical and operational problems arising when AI is used for military surveillance missions, specifically in visual data analysis.

The authors highlight how AI-driven systems can improve capabilities in surveillance, detection, and decision-making—but can also undermine legal standards, accountability, and moral responsibility in war zones.

Visual intelligence, a key part of combat intelligence, has long relied on human experts to interpret aerial, satellite, or drone imagery. The introduction of AI—computer vision and machine learning—is an attempt to accelerate and automate those processes with increased speed and scalability. However, the authors caution that the shift comes at catastrophic ethical costs. Among the most important issues are whether AI rulings are trustworthy, whether decision-making processes are transparent, and whether training biases may affect high-stakes decisions.

Anneken et al. identify four major ethical elements. First, they refer to epistemic risk or the risk of relying too heavily on AI output that may be insufficiently tested or explainable to human operators. When mistakes are made by AI—e.g., misclassifying civilians as combatants—their consequences can be lethal. Second, legal responsibility: if an AI system is used for unlawful surveillance or targeting, laws and institutions operating in a legal gray area must decide who is culpable—the developer, the commander, or the manufacturer. Third, the authors cite value alignment, questioning whether it is possible to code international humanitarian law, proportionality, and necessity—both very context-dependent and in many cases, not precisely known. They argue that coding these norms into software is not only technically problematic but perhaps reductionist as well, failing to appreciate the nuance of war ethics. Fourth, the authors emphasize human control. Although some degree of automation is inevitable, retaining substantive human control is vital to accountability and legitimacy.

Importantly, the article proposes policy and design recommendations that can mitigate these ethical risks. These include investing in interpretable AI models, integrating human-in-the-loop architectures, independent auditing, and disclosing data sources and system boundaries. The authors also require more cross-sectoral dialogue among engineers, ethicists, military personnel, and legal experts to create befitting development paths. In conclusion, although AI may enhance visual monitoring, its use in the military must be guided by robust ethical principles and institutional safeguards.

AI-driven systems improve surveillance, detection, and decision-making but erode legal standards, accountability, and moral responsibility in war zones.

AI can enhance visual monitoring, but military use must be governed by robust ethics and institutional safeguards.

Applied research

Digital Transformation of Education, Systems Approach and Applied Research

Allouche, É. (2024, 10 avril). Digital Transformation of Education, Systems Approach and Applied Research. arXiv. https://arxiv.org/abs/2406.11861

Éric Allouche's "Digital Transformation of Education, Systems Approach and Applied Research" (2024) explains how digital technologies are revolutionizing education systems and recommends a system, integrative approach that draws on applied research to conceptualize, implement, and evaluate digital transformation initiatives. Instead of considering digital tools in a vacuum, Allouche demands that education be considered a multi-faceted ecosystem in which governance, infrastructure, pedagogy, teacher training, and research all need to be aligned to create impactful and lasting change.

The article starts by acknowledging the spread of digital technologies in education over the past decade—accelerated by the COVID-19 pandemic—and the surrounding hype for innovation. Allouche warns, however, that piecemeal adoption of technologies in the absence of strategic planning inevitably results in fragmented systems, redundant spending, and teacher resistance. He argues that instead of merely digitizing traditional practices, education systems must be re-engineered using a systems thinking mindset that considers interdependencies between institutions, actors, technologies, and learning outcomes.

One of the key contributions of the article is the emphasis on applied research as a mediator of public policy and innovation. Education reforms, argues Allouche, are too often either politically mandated without empirical validation or academically ghettoized without effect on practice. Bridging this gap requires partnership models involving diverse stakeholders, from policymakers to practitioners and private actors, to pilot, evaluate, and iterate digital solutions in real educational environments. He illustrates this with case studies of pilot initiatives in teacher education, AI-powered learning analytics, and hybrid learning environments.

The systems approach provided by Allouche consists of five pillars: (1) governance structures that are aligned, (2) fair digital infrastructure, (3) professional development for teachers and leaders, (4) shared pedagogical models, and (5) robust feedback and assessment mechanisms. The model emphasizes that digital transformation is not only technical, but also political and cultural, requiring long-term vision and commitment at the institutional level. Allouche also broaches the social and ethical implications of digitalization, particularly in data privacy, equity, and access. He stresses that marginalized communities are usually left behind by the promise of educational technologies unless concerted efforts are made to bridge the digital divide. Equity, therefore, must be a guiding principle from the outset and not an afterthought.

In brief, Allouche suggests integrating applied research into every step of the digital transformation process—from concept and deployment to scaling and policy feedback. Only by adopting a systems perspective founded on real-world evidence can education systems fulfill the promise of digital tools to enhance learning, inclusion, and institutional resilience.

Education should be viewed as a multifaceted ecosystem in which governance, infrastructure, pedagogy, teacher training, and research must align to create lasting, impactful change.

Applied research

AI in Education: Concerns and Tensions

Audran, J. (2024). Cinq enjeux d'évaluation face à l'émergence des IA génératives en éducation. Mesure et évaluation en éducation, 47(1), 6–26. https://doi.org/10.72021114564/ar

Jean-Charles Audran's article addresses five main concerns that the advent of generative AI—such as ChatGPT or image generators—poses to the evaluation of students in education. As these technologies become increasingly accessible, they confront conventional models of evaluation, generating pedagogical, ethical, and practical tensions.

Audran considers these tensions through a research-informed lens, offering critical analysis alongside practical considerations for teaching professionals.

The first hurdle is the authenticity of student work. Since AI can now write essays, solve problems, and even mimic students' writing styles, instructors are left more and more wondering who completed their work. This calls for new strategies to ensure learning and evaluation remain student-centered and authentic. Audran suggests a return to process-oriented assessment, oral defense, or in-class activities where AI use is limited or made obvious.

The second issue is one of fairness and equality. Not all students have equal access to AI tools or the digital literacy to be able to use them in an optimal manner. There is a risk that those with more advanced skills or technological access will benefit disproportionately. To address this, Audran advocates for an equitable integration of AI literacy into curricula so that students from various backgrounds are not disadvantaged or excluded.

Third, the article discusses the remake of assessment criteria. Traditional rubrics are no longer relevant when AI-generated content is involved. Audran calls for a remake of assessment frameworks, where instructors would define learning outcomes that go beyond product-based deliverables and instead assess critical thinking, ethical reflection, and meta-cognition.

The fourth challenge is teacher and institutional readiness. The majority of teachers are unaware of how to respond to AI use, whether to ban it, embrace it, or utilize it as a learning tool. Audran recommends professional development modules that sensitize teachers to the affordances and boundaries of generative AI, along with the development of institutional policies that offer clear guidance while permitting pedagogical flexibility.

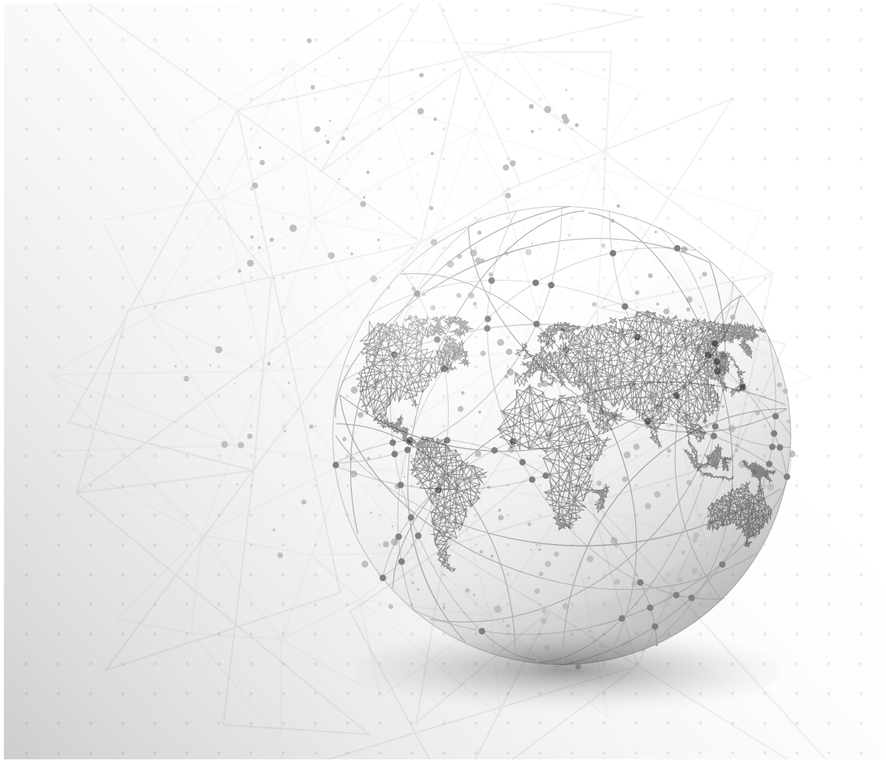
Finally, Audran addresses ethical and regulatory concerns, including data privacy, academic honesty, and the use of AI-generated feedback. As the boundaries between machine and human input blur, student, instructor, and institutional roles must be defined. He calls for open dialogue among all stakeholders on the ethical foundations to guide AI uses in education.

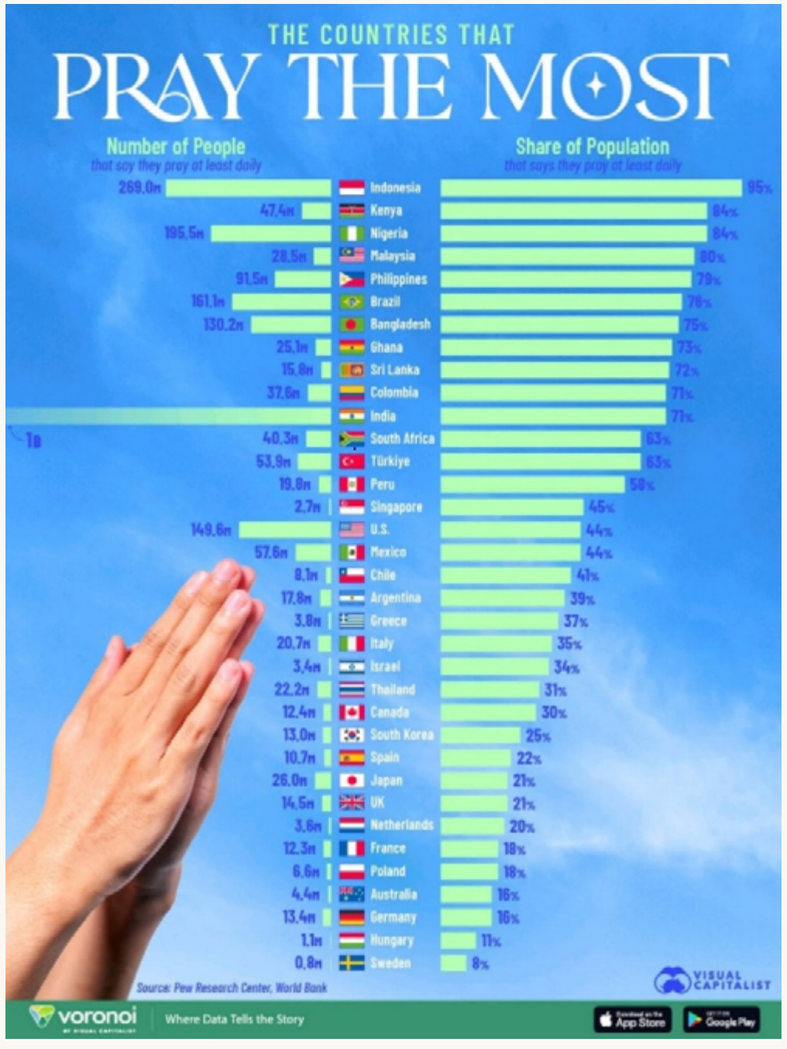
As a conclusion, Audran emphasizes that the arrival of generative AI is not a passing trend but a structural shift in education. Rather than reacting in fear or denial, he urges the education sector to proactively transform evaluation practices, invest in personnel training, and maintain a strong commitment to equity and pedagogical integrity.

New strategies must ensure learning and evaluation remain student-centered and authentic.

An open dialogue among all stakeholders is needed on the ethical foundations to guide AI usage in education.

3 The future in numbers






Peace
Agreements
1990-94
397
1995-99
357
2000-04
283
2005-09
250
2010-14
275
A large increase in local peace treaties in places like Syria, Yemen, and Myanmar drove 2015-2019's jump.
2015-19
372
2020-24
210
A leading factor behind fewer peace deals from 2020-24 may be a divided UN Security Council.
Source: Source: University of Edinburgh via SIPRI. Includes interstate and intrastate peace agreements
VISUAL CAPITALIST
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Where Data Tells the Story
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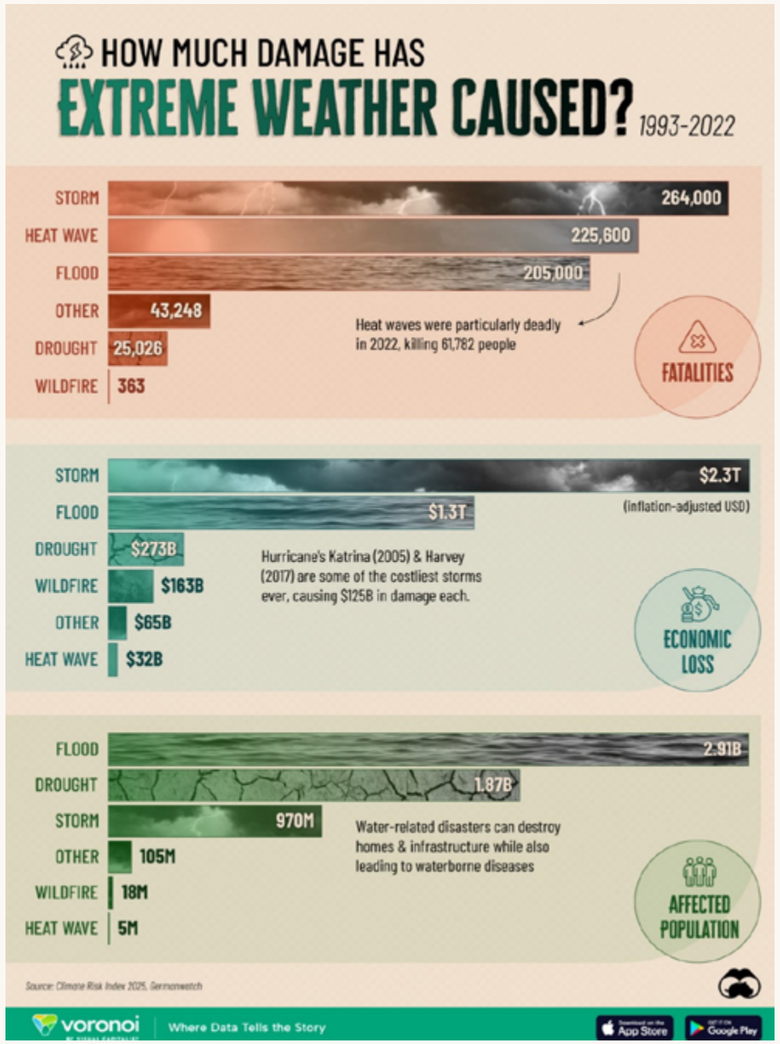
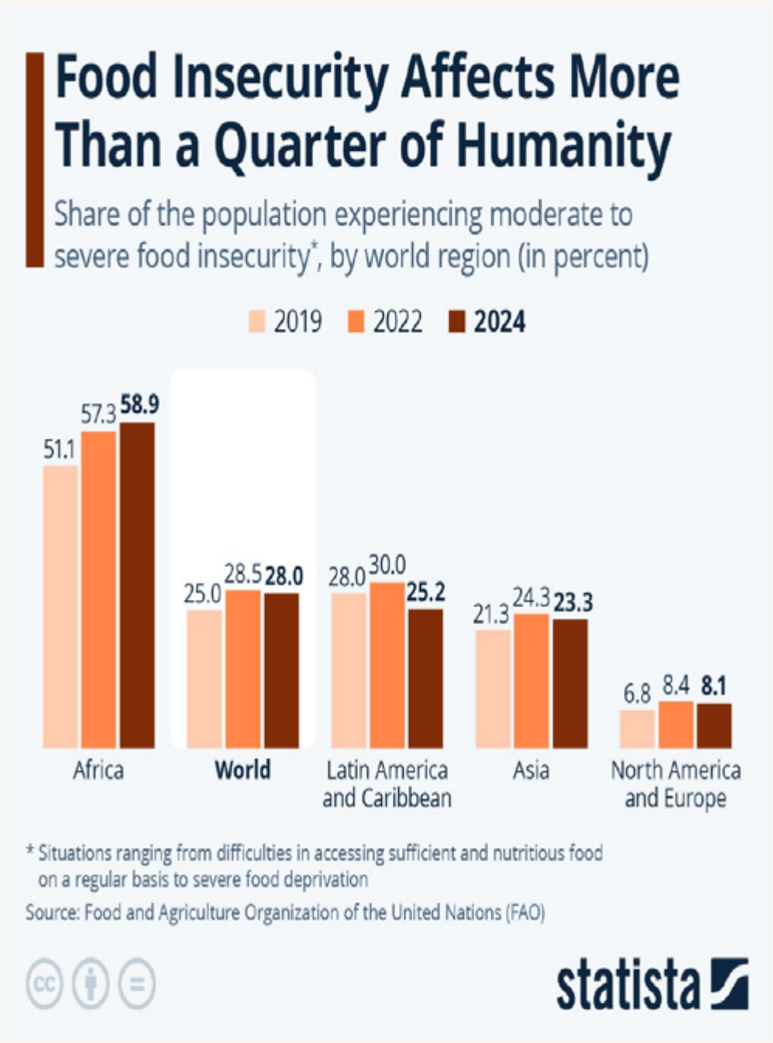
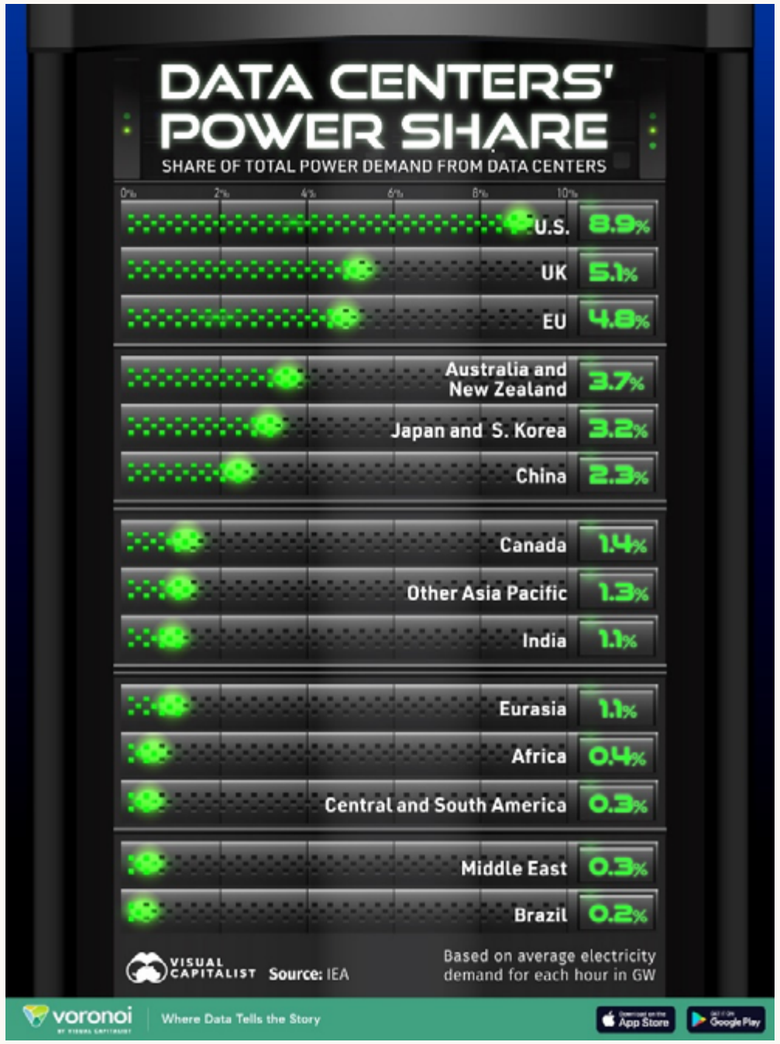
Google Play


HOW MUCH DAMAGE HAS
EXTREME WEATHER CAUSED? 1993-2022
STORM 264,000
HEAT WAVE 225,600
FLOOD 205,000
OTHER 43,248
DROUGHT 25,026
WILDFIRE 363
Heat waves were particularly deadly in 2022, killing 61,782 people
FATALITIES
STORM $2.3T
FLOOD $1.3T
(inflation-adjusted USD)
DROUGHT $273B
WILDFIRE $163B
OTHER $65B
HEAT WAVE $32B
Hurricane's Katrina (2005) & Harvey (2017) are some of the costliest storms ever, causing $125B in damage each.
ECONOMIC LOSS
FLOOD 2.91B
DROUGHT 1.87B
STORM 970M
OTHER 105M
WILDFIRE 18M
HEAT WAVE 5M
Water-related disasters can destroy homes & infrastructure while also leading to waterborne diseases
AFFECTED POPULATION
Source: Climate Risk Index 2025, Germanwatch
voronoi
Where Data Tells the Story
App Store
Google Play


Food Insecurity Affects More Than a Quarter of Humanity
Share of the population experiencing moderate to severe food insecurity*, by world region (in percent)
2019
2022
2024
51.1
57.3
58.9
Africa
25.0
28.5
28.0
World
28.0
30.0
25.2
Latin America and Caribbean
21.3
24.3
23.3
Asia
6.8
8.4
8.1
North America and Europe
* Situations ranging from difficulties in accessing sufficient and nutritious food on a regular basis to severe food deprivation
Source: Food and Agriculture Organization of the United Nations (FAO)
statista


DATA CENTERS' POWER SHARE
SHARE OF TOTAL POWER DEMAND FROM DATA CENTERS
0%
2%
4%
6%
8%
10%
U.S. 8.9%
UK 5.1%
EU 4.8%
Australia and New Zealand 3.7%
Japan and S. Korea 3.2%
China 2.3%
Canada 1.4%
Other Asia Pacific 1.3%
India 1.1%
Eurasia 1.1%
Africa 0.4%
Central and South America 0.3%
Middle East 0.3%
Brazil 0.2%
VISUAL CAPITALIST Source: IEA
Based on average electricity demand for each hour in GW
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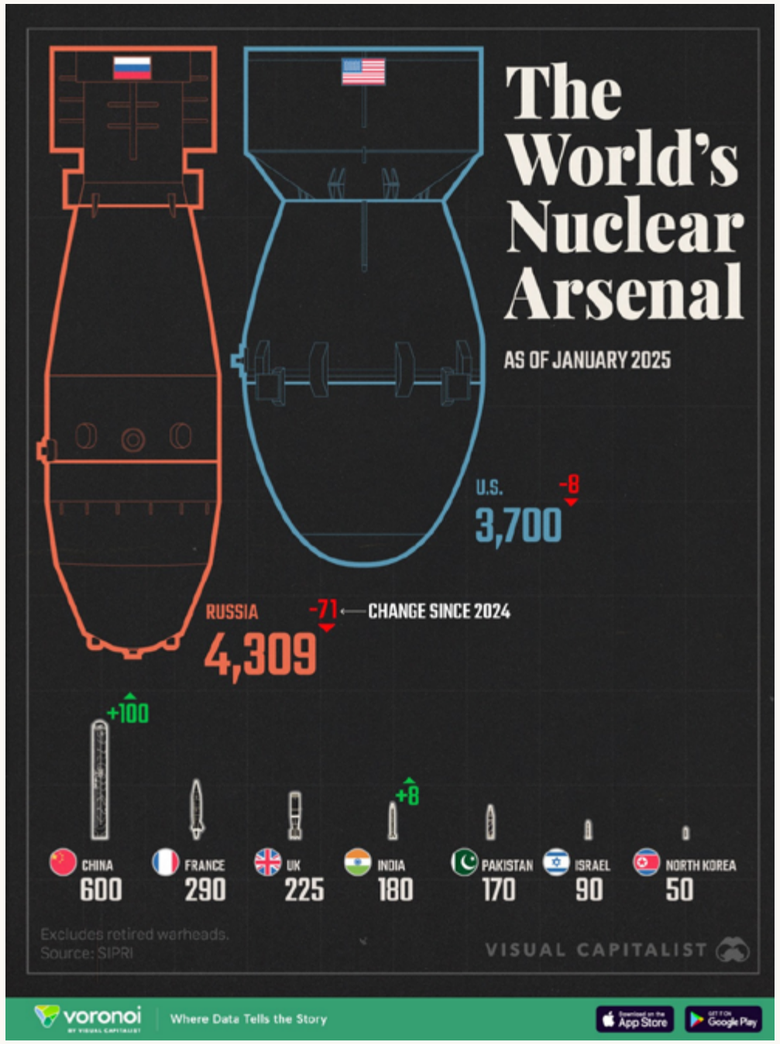
The World's Nuclear Arsenal
AS OF JANUARY 2025
U.S.
-8
3,700
RUSSIA
-71
CHANGE SINCE 2024
4,309
+100
+8
CHINA
600
FRANCE
290
UK
225
INDIA
180
PAKISTAN
170
ISRAEL
90
NORTH KOREA
50
Excludes retired warheads.
Source: SIPRI
VISUAL CAPITALIST
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THE BEST UNIVERSITIES
OUTSIDE THE U.S. 2025
Times Higher Education
QS World
Academic Ranking World Universities
1 OXFORD
2 CAMBRIDGE
3 IMPERIAL
4 ETH zürich
5 清華大学
6 北京大学
7 NUS
8 TORONTO
9 UCL
10 TUM
11 UTokyo
12 EDINBURGH
13 EPFL
14 EPFL
15 香港大学
16 復旦大学
17 KING'S
18 MU
19 MELBOURNE
20 UBC
21 PSL
22 KU LEUVEN
23 香港科技大学
24 McGill
25
IMPERIAL
OXFORD
CAMBRIDGE
ETH zürich
NUS
UCL
香港大学
香港中文大学
清華大学
北京大学
MELBOURNE
UNSW
EPFL
TUM
SYDNEY
McGill
PSL
TORONTO
復旦大学
KING'S
Australian National University
香港科技大学
EDINBURGH
MANCHESTER
MONASH University
CAMBRIDGE
OXFORD
université PARIS-SACLAY
UCL
ETH zürich
清華大学
北京大学
IMPERIAL
TORONTO
ZHEJIANG UNIVERSITY
UTokyo
UNIVERSITY OF COPENHAGEN
PSL
MELBOURNE
上海交通大学
EDINBURGH
SORBONNE UNIVERSITÉ
中国科学技术大学
Karolinska Institutet
MU
京都大学
TUM
BRITISH COLUMBIA
復旦大学
Tied rankings: Fudan University and King's College in Times Higher Education; Australian National University and The Chinese University of Hong Kong in QS World rankings; Technical University of Munich and the University of British Columbia in ARWU; Fudan University and Heidelberg University in ARWU. Top 25 non-U.S. universities per publication are shown; ranks may differ from overall rankings. Source: Academic Ranking of World Universities (2024), Times Higher Education (2025), QS World University Rankings (2026)
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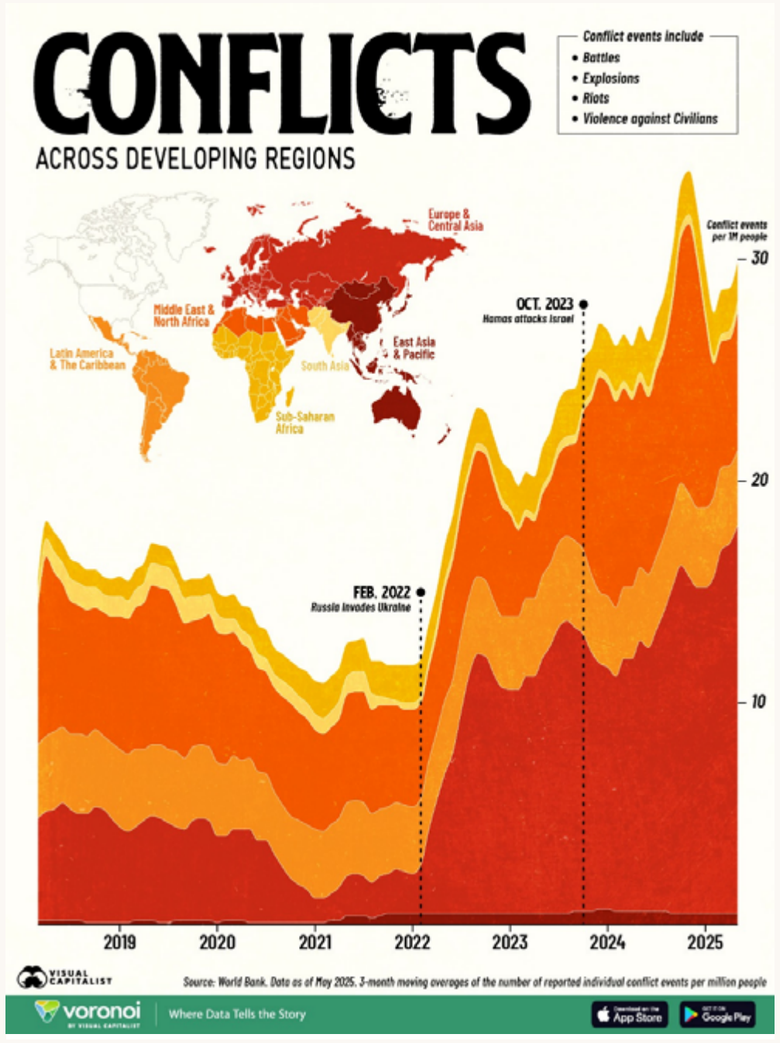
CONFLICTS
ACROSS DEVELOPING REGIONS
Conflict events include
• Battles
• Explosions
• Riots
• Violence against Civilians
Europe & Central Asia
Middle East & North Africa
Latin America & The Caribbean
South Asia
East Asia & Pacific
Sub-Saharan Africa
Conflict events per 1M people
30
20
10
OCT. 2023
Hamas attacks Israel
FEB. 2022
Russia invades Ukraine
2019
2020
2021
2022
2023
2024
2025
VISUAL CAPITALIST
Source: World Bank. Data as of May 2025. 3-month moving averages of the number of reported individual conflict events per million people
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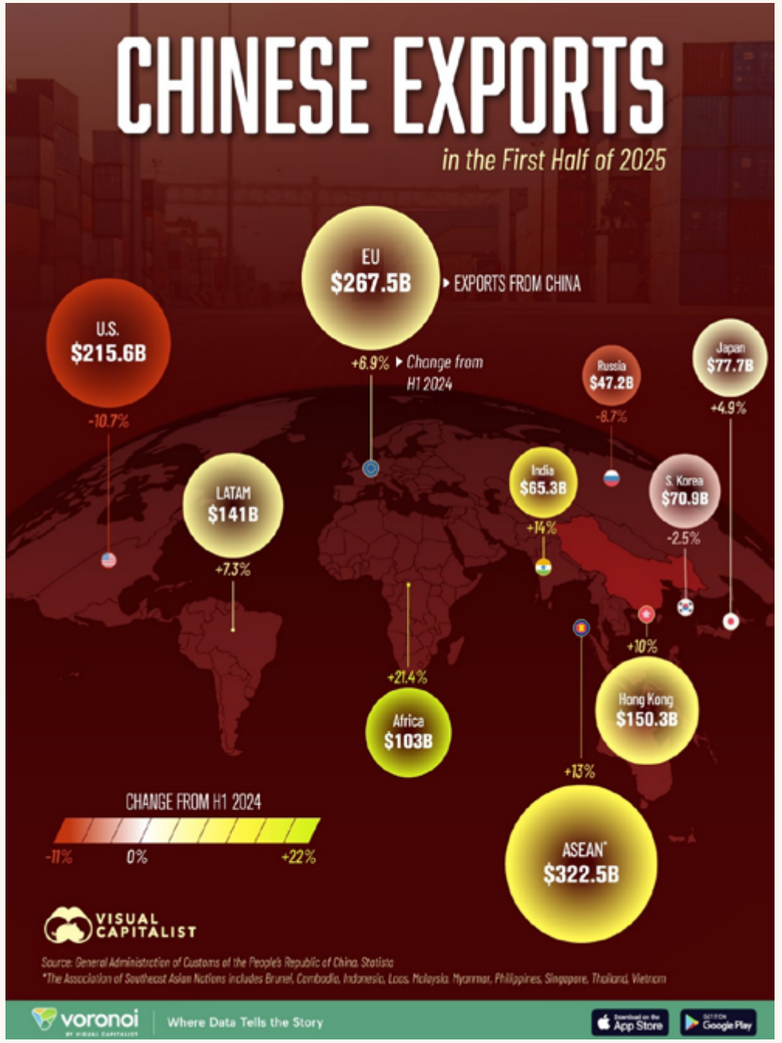
CHINESE EXPORTS
in the First Half of 2025
EU
$267.5B
EXPORTS FROM CHINA
U.S.
$215.6B
-10.7%
+6.9%
Change from H1 2024
Russia
$47.2B
-8.7%
Japan
$77.7B
+4.9%
LATAM
$141B
+7.3%
India
$65.3B
+14%
S. Korea
$70.9B
-2.5%
+10%
+21.4%
Africa
$103B
Hong Kong
$150.3B
+13%
CHANGE FROM H1 2024
-11%
0%
+22%
ASEAN*
$322.5B
VISUAL CAPITALIST
Source: General Administration of Customs of the People's Republic of China, Statista
*The Association of Southeast Asian Nations includes Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam
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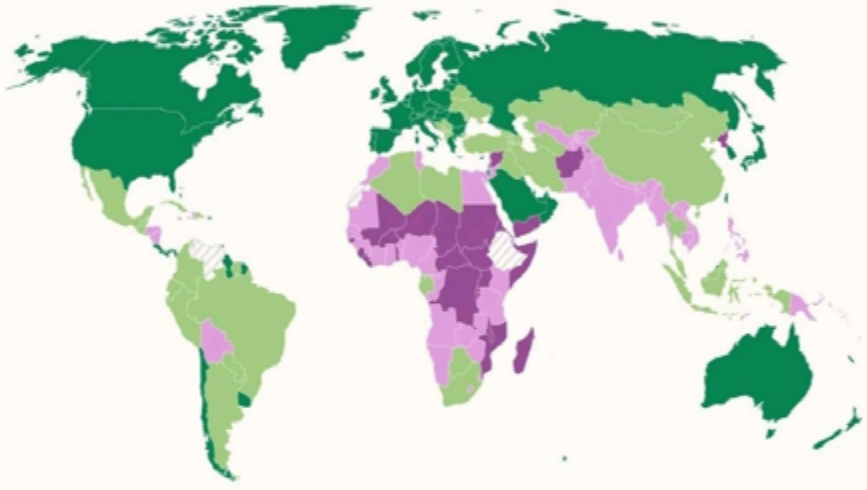
How does the World Bank classify countries by income?

Our World in Data

Countries are grouped into four categories based on their gross national income (GNI) per capita, measured in US dollars.



- **High income** — More than $13,935 GNI per capita in 2024
- **Lower-middle income** — $1,136 to $4,495
- **Not classified**
- **Upper-middle income** — $4,496 to $13,935
- **Low income** — $1,135 or less

Note: The World Bank revises income thresholds and releases a new classification each year.

Data source: World Bank (2025)