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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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1 Prospective research

A framework to answer the challenges posed by migration

Migration Policy Framework for Africa and Plan of Action – Migration for Development in Africa. (au.int)

The Migration Policy Framework for Africa (MPFA) is the result of a consultation held by the Organisation of African Union Council of Ministers in July 2001. Its aim was to respond to the new challenges posed by globalization and migration. Ten years after its implementation, the African Union Commission reviewed the results, challenges, and potential improvements of the MPFA, resulting in the "Migration Policy Framework for Africa and Plan of Action (2018-2030)," discussed in this executive report.

The main objective of this new version was to respond to the dynamic and changing nature of migration in Africa while taking into account the Sustainable Development Goals (SDGs) as well as AU priorities. The MPFA 2018- 2030 offers application paths, as well as tools and resources to better manage migration on the continent. Indeed, "better migration governance is the overarching objective of the MPFA."

This report covers, among other things, eight key migration issues:

1. Migration Governance as a starting point for the MPFA, which works for the good of migrants and societies while respecting international laws and standards.

2. Labor Migration and Education, which encourages structures, legislation, and policies to facilitate the movement, integration, and development of workers and students, resulting in "brain gain" and "brain circulation."

3. Diaspora Engagement, which provides institutional and environmental frameworks to better involve diaspora members on the continent, for example by offering them facilities in terms of dual citizenship, investment protection, or facilitating knowledge exchange.

4. Border Governance, which restores the importance of border management actors such as states, companies, and non-state actors by establishing rules, techniques, and procedures to regulate the movement of goods and people across borders.

5. Irregular Migration, such as migrant smuggling, is a major scourge that involves a variety of crimes harmful to the continent's stability and security. A series of measures will be taken to eradicate human trafficking, including prevention and awareness-raising, protection and assistance, and increased cooperation and partnerships between states.

6. Forced Displacement, which is also addressed through integration and reintegration strategies, crisis prevention, and conflict resolution management through dialogue and cooperation, in order to ease the situation of refugees, asylum seekers, internally displaced persons (IDPs), and stateless people.

7. Internal Migration, addressed in order to leverage the economic and social development potential represented by globalization, by strengthening the local dimension of migration policies.

8. Migration and Trade, which will be by the implementation of the Continental Trade Area and the AU Free Movement of Persons Protocol.

Other issues are addressed by the MPFA, such as health, research, environment, and gender. Finally, the MPFA gives member states a clear action plan to build and maintain intra-state synergy on the continent and respond more effectively to the challenges of tomorrow.

"Migration is dynamic, and migration trends and patterns in Africa have changed."

"Better migration governance is the overarching objective of the MPFA."

Should AI be embodied?

Embodying Artificial Intelligence – July 2024 – Josh Sims, Farsight (cifs.dk)

As machine learning systems rapidly accelerate in their advancement, the need to ground their computational understanding in our physical world only increases. This article, published on Farsight by the Copenhagen Institute for Future Studies (CIFS), Denmark, reflects on the idea of "embodied AI," which suggests that "as cognitive science and psychology indicate, human-level intelligence in AI programs cannot be fully realized unless they are able to interact with and learn from their physical and linguistic environments, much as human babies do."

Up until now, AI has been part of our lives without many of us even realizing it. It's present just about everywhere, all the time, but virtually invisible, in the form of algorithms and other digital processes. AI as we know it isn't physically tangible. So, Josh Sims asks about the need to embody AI in order to improve not only its use but also its interaction with humans. The author believes that "embodied AI will gradually learn about [the] environment through its exposure to it; it will have to explore to make its own map." In short, a way of improving AI's efficiency is by exposing it to the world around it, just as humans are exposed to more or less harmful environments.

Quoting Josh Bongard, professor of computer science at the University of Vermont, US, the article affirms that "AI can't understand cause and effect very well without being embodied (...), without embodiment, AI is unsafe."

If the reader naively imagines an embodied AI in the form of a supersonic robot or a bloodthirsty Terminator, the author points out that self-driving cars or certain agricultural equipment are examples of embodied AI. For Bongard, one of the best illustrations of what embodied AI could resemble is the "micro-bot swarm" depicted in Big Hero 6.

Andrew Philippides, professor of bio-robotics at the University of Sussex, UK, believes that "natural intelligence is embodied, and if we want to understand that, then we need to think of AI in the context of embodied systems." Big companies like Meta, Amazon, BMW, and Mercedes-Benz have already set this in motion, but major challenges remain. "Think of the energy efficiency of our biological sensors alone," reminds Philippides, who asserts that the AI embodiments we have right now "aren't very good yet."

Finally, the article recalls a crucial point: the ethical considerations that such technological innovations must entail, to which Bongard responds, "Bring it on! The robots [of sci-fi] unsettle us and that's a good thing. (...) Humans need help, and safe AI is possible."

> As machine learning systems rapidly accelerate in their advancement, the need to ground their computational understanding in our physical world only increases.

> tFUS, which is a non-invasive neuromodulation therapy, could give access to and improve levels of communication between models and humans.

How will neural technology be used in the future?

Podcast: Humanity's Next Leap: Thoughts on the Frontiers of Neural Technology - Dean Woodley Ball

This podcast, presented by the Foresight Institute, a research organization supporting the development of high-impact technologies, is part of a series of seminars given online about neurotechnology and its application in improving cognition. The guest, Dean Woodley Ball, a research fellow in the Artificial Intelligence & Progress Project at George Mason University's Mercatus Center (Virginia, US), focuses on how digital technology might become the first widespread consumer of neural technology in the coming decades.

Ball initiates the conversation by mentioning the lack of positivity in the vision of AI use in the future. He mentions the deep connection between AI and humans and how that relationship should become increasingly symbiotic. For him, it is essential to improve the way users communicate with AI.
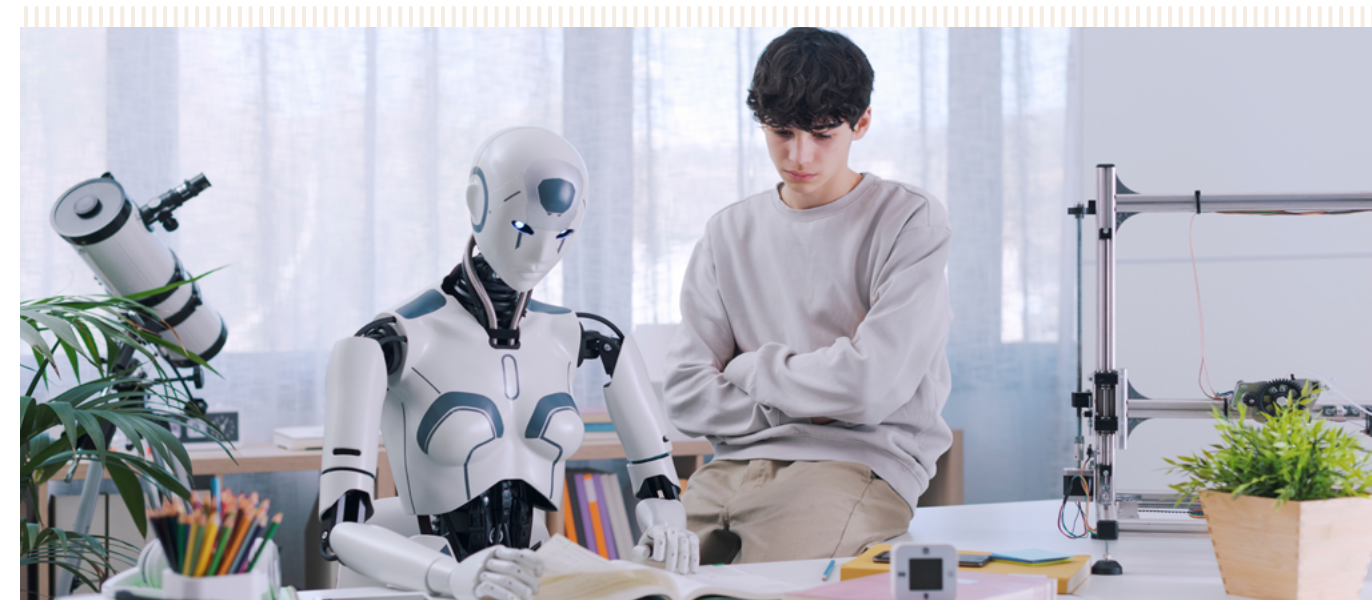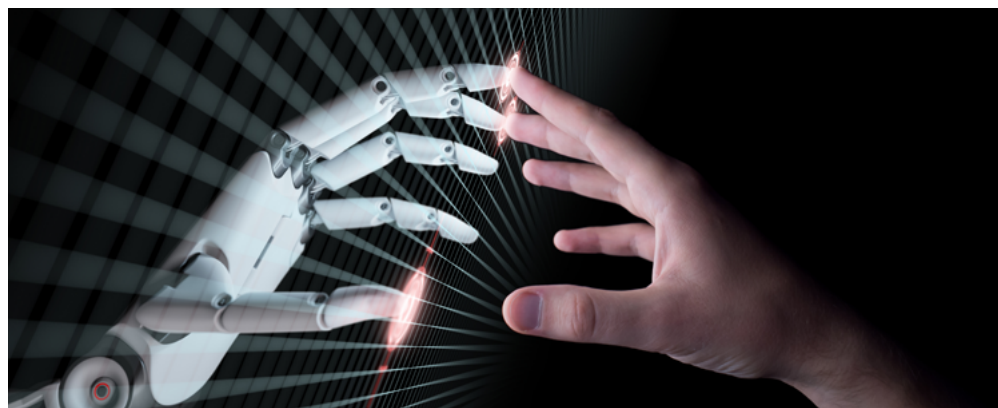
Therefore, he asks if language, as it is now, is sufficiently developed. His answer is negative, and he even insists that language, or rather the lack of it, is the major limit to the application of AI today. Language, being the product of a variety of thought processes, which remain hidden or internal, raises the question of how we can implement this thought process into AI use. This has been explored in a few recent papers, such as Zelikman et al. (2024), who present Quiet-STaR, "a generalization of Self-Taught Reasoner (StaR) in which Language Models (LMs) learn to generate rationales at each token to explain future text, improving their predictions." Essentially, the authors discuss a model that reads between the lines and creates a rationale that can help generate data and improve communication.

This podcast, rooted in the world of neuroscience, gives access to questions surrounding the use of certain technologies in the future, such as Transcranial Focused Ultrasound (tFUS), which, according to the guest, could embody the future of technological tools enhancing the user experience. For Ball, the communication models should "go both ways: we can discuss with AI models, but they should be able to communicate with us, at a faster and more efficient rate." Indeed, Ball thinks that on an intuitive level, brain-computer interfaces might improve this matter. Therefore, tFUS, which is a non-invasive neuromodulation therapy that uses ultrasound waves to stimulate deeper brain regions, could give access to and improve levels of communication between models and humans. The use of non-invasive technology is, to the guest, non-negotiable, or at least it would avoid certain challenges posed by invasive technologies, such as ethical, regulatory, cybersecurity-related, or logistical issues. While Ball confesses that the literature currently available is largely impervious to the general public, he uses accessible examples to illustrate his point. For example, the use of already existing devices, such as glasses, headphones, or VR headsets, which would be sufficiently powerful to analyze the user's brain activity, could enhance their experience.

> "I do think that the next couple of decades will be the most technologically transformative times of any time in human history."

> "AI can't understand cause and effect very well without being embodied. Without embodiment, AI is unsafe."

Zelikman, E., Harik, G., Shao, Y., Jayasiri, V., Haber, N., & Goodman, N. D. (2024). Quiet-star: Language models can teach themselves to think before speaking. arXiv preprint arXiv:2403.09629.

Livestock farming in the future?

Torpman, O., Röös, E. Are Animals Needed for Food Supply, Efficient Resource Use, and Sustainable Cropping Systems? An Argumentation Analysis Regarding Livestock Farming. Food Ethics 9, 15 (2024). https://doi.org/10.1007/s410559-00147-4 02-

The authors, affiliated respectively with the Institute for Future Studies (Stockholm, Sweden) and the Swedish University of Agricultural Sciences (Uppsala, Sweden), address the question of the need for livestock farming to feed the world's population, use land more efficiently, and produce manure, thereby improving the sustainability of cropping systems.

The paper focuses on analyzing data in light of arguments in favor of livestock farming in relation to food production. Three main arguments are presented: the nutrition argument, the resource use argument, and the crop production argument.

The **nutrition argument** is divided into two sub-arguments: 1) that livestock farming is needed to supply all the different nutrients required for humans to live healthy lives, and 2) that livestock farming is needed to supply the amounts of food required to feed a growing human population. The first sub-argument is demonstrated to be weak. Above all, the authors point out that it is entirely possible to obtain all the nutrients needed for a healthy life from a diet free of animal products. They do note, however, that it is necessary to provide proper education, support, and sometimes supplementation of some nutrients. The second sub-argument is also demonstrated not to be acceptable in general, based on how livestock farming is performed today. They argue that some livestock farming may be used to address certain specific needs, such as food supply in terms of fat, but not in the way it is currently done.

The **resource use argument** is also divided into two sub-arguments: 1) that livestock farming provides a way of producing food from land that is not suitable for growing crops for human consumption, and 2) that livestock farming provides a way of producing food from crop residues and agri-food byproducts. The first sub-argument is concluded to be acceptable and relevant for justifying livestock farming

"given that it provides the only way to use these areas for food production" (p.10). However, the authors mention that this argument can still be questioned, as some of the discussed land could be used for other, non-food-related purposes. The sub-argument related to crop residues and agri-food byproducts is more or less acceptable since, on the one hand, humans could consume more of these residues and byproducts, but on the other, the quantity of animals reared in current livestock systems is not necessary.

The third and final argument, the **crop production argument, is also divided into two sub-arguments: 1)** that livestock farming contributes to more sustainable cropping systems through the inclusion of perennial crops in crop rotations, and 2) that it produces manure needed as fertilizer in crop-based food production. The first sub-argument is valid "only for grass-eating species such as ruminants and horses, and only given that the perennial forage crops are integrated with the cultivation of annual crops in mixed cropping systems" (p.16). The last sub-argument, related to manure, is not acceptable to the authors, especially because livestock farming does not produce phosphorus, nitrogen, or potassium, or at least not in sufficient quantities.

> If the nutrients in the crops produced currently worldwide are divided upon the global population, these contain the equivalent of approximately 5810 kcal energy, 143g protein, and 152g fat per person per day. (Ritchie et al. 2018)

Trending 2024 – reckoning with reality – Foresight Factory - (foresightfactory.co)

The report published by the Foresight Factory, entitled Reckoning with Reality, focuses on four main fields: humanity, health, sustainability, and belonging. For each topic, the team of researchers introduces definitions and presents current available data, a case study, and a strategic imperative.

In the first part, the report reflects on what makes us human while we see other forms of intelligence evolve. Introducing trends such as "beyond human," "choice partners," "tech anxiety," and "human encounters," the authors remind us that AI is becoming part of life, even as the conflict between nature and technology continues to grow. The case study listed under the "humanity" chapter shows examples of companies already enhancing human interaction with AI, while others choose to reject AI entirely.

25% of US consumers would be comfortable turning to AI for brand/advisory interactions (e.g., to get customer service help or financial advice), 15% would be comfortable using it for more personal tasks (e.g., to talk to a therapist or get relationship advice), and 13% would be comfortable with both.

In response to the ethical issue's raised by the growing presence of AI, the report offers a number of suggestions, including the establishment of rules and guidelines within organizations, discussions on AI governance, and openness with customers and employees on how to embrace new technologies.

In the part dedicated to health, the report questions the utility of accepted truths and the need to refer to a "back-to-basics" approach. The data presented explore the links between income and wellness. Even though access to resources is still a problem, data show that those with higher income tend to feel healthier. The strategic imperative supported by the researchers is to increase the accessibility of wellness-related activities in order to "reach those more in need" (p.15).

In terms of sustainability, the Foresight Factory questions the responsibility of consumers and brands in protecting the environment. The data presented on p.18 show that globally, many consumers support climate activists, but this feeling is far from universal. Innovations in commercial activities, such as in the car industry, show that companies tend to recalibrate their sustainability shifts, sometimes "scaling back on environmentally friendly products" (p.19). The report advises that attention should be focused on finding ways to reach consumers who might be more resistant to adopting sustainability-friendly behaviors.

The last section is dedicated to the sense of belonging. It questions the ways consumers can feel "part of something bigger than themselves" (p.22) while constantly having to "dance between individualism and community." According to the data presented, it seems that consumers are blaming the increasing influence of social media and technology for decreasing social connection. The authors advise their clients to find ways to engage with their consumers while giving them opportunities to better connect with each other.

Although the report mainly promotes the Foresight Factory's activities, it provides food for thought regarding what should be at the center of companies' priorities in order to deal with future challenges.

> **25% of US consumers would be comfortable turning to AI for brand/advisory, 15% would be comfortable using it for more personal tasks, and 13% would be comfortable with both.**

> **Globally, many consumers support climate activists, but this feeling is far from universal.**

2 Applied research

A label for the ecological transition? Reflections on a government tool.

Penser la transition dans les collectivités locales : les ressources des acteurs du label territorial Cit'ergie – 2022 – M. Pinguat-Charlot - Les réformes de santé en Suède : quelles leçons pour le Québec (usherbrooke.ca)

This article examines the resources available to the French state in the creation and implementation of a targeted "environment and energy" territorial label, entitled "Cit'ergie," aimed at facilitating environmental transition within local authorities. The approach of this paper is interdisciplinary, as the author is affiliated with a geography department (Université de Pau et des Pays de l'Adour, France) but uses a framework drawn from political science.

The Cit'ergie label is the French version of the European Energy Award, a tool introduced by ADEME (Agence de la Transition Écologique) in 2008 to motivate local authorities' commitment to the energy transition.
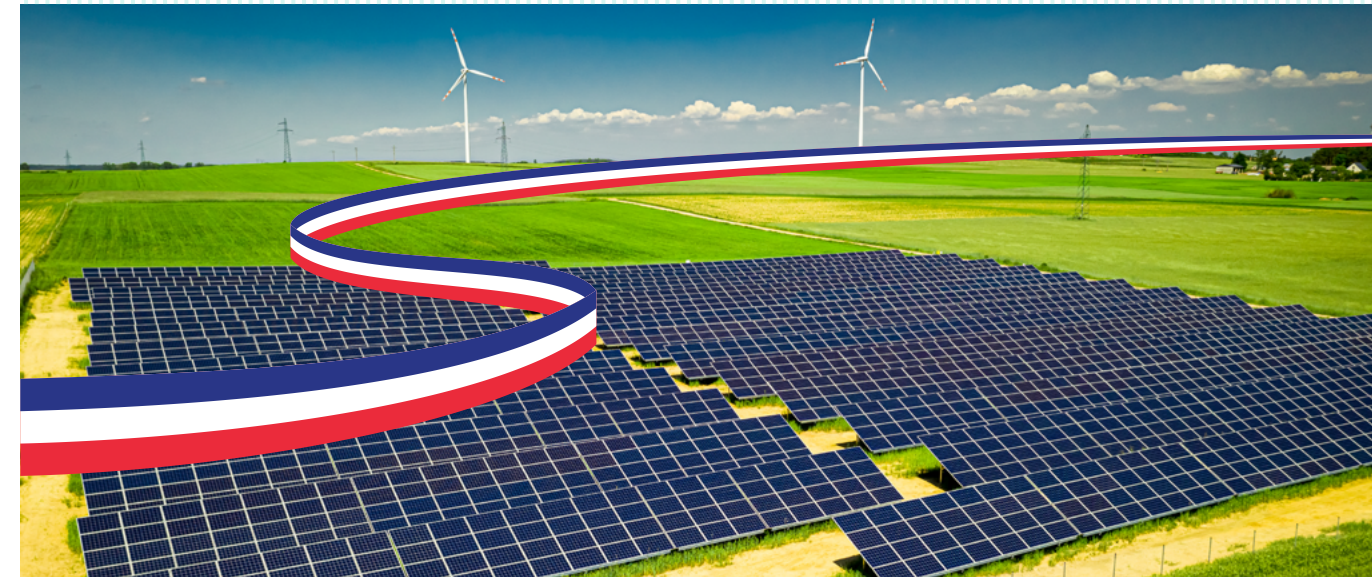
While the author refers to Foucault (1993) to define the use of the label as a tool of remote governance, she also points out that the processes of decentralization of power by the French state, underway since the 1980s, have given more and more power to the private sector, thereby establishing a logic of territorial competition and rivalry. If the Cit'ergie label is indeed a tool of remote government, it implies a "competitive regulation of territorial cooperation" (Epstein, 2015).

The label provides a framework for local authorities while ensuring that energy transition is put on the political agenda. According to the author, the use of such labels implies and maintains a competitive territorial context, with local authorities committing themselves to ever more projects in order to obtain more funding. A real lever for the state, the Cit'ergie label adds constraints to public action while seeking to reduce negative impacts on the environment. Based primarily on quantitative measures, the label attempts to operationalize the transition by combining technical and sustainability innovations. It acts as a benchmark by assessing solutions for limiting energy consumption by local authorities, for example, through a list of priority indicators such as production rates.

According to the author, the "label serves not only to set limits for supposedly autonomous local agents but also to remind them that decision-making is the responsibility of others" (p.10). Label actors have little room for action and must contend with structural limits. The article focuses on the role of reflexivity in such a situation. According to Pinguat-Charlot, the answer lies in training and the opportunities it can offer, enabling people to evolve in other knowledge systems and thus become vectors of innovation.

> "The idea of transition is also the idea of movement. To set oneself in motion is to mobilize, to question."

Epstein, R. (2015). La gouvernance territoriale: une affaire d'État. La dimension verticale de la construction de l'action collective dans les territoires. L'Année sociologique, 66(2), 457- 482.
Foucault, M (1993), Surveiller et punir : naissance de la prison, Paris, Tel Gallimard.

Metaverse & extended reality in higher education: analysis

Pregowska, A., Osial, M., & Gajda, A. (2024). What will the education of the future look like? How have the Metaverse and Extended Reality affected higher education systems? Metaverse Basic and Applied Research, 3, 57- 57.

What are the possibilities offered by Metaverse applications in higher education? This is what the authors of this article attempt to answer, on the basis of available data (86 studies were analyzed), as well as their own experiences.

New technologies, ever more present in our lives, have revolutionized many sectors, including education. This article discusses the impact of two of these new technologies: the Metaverse and Extended Reality (XR). The Metaverse, "defined as an open system which contains both augmented objects and mapped objects in the created human scene" (p.2), is based on Web 3.0 technologies, called the successor of the mobile Internet. This paper analyzes the pros and cons of the implementation of the Metaverse and its XR-based system in the education sector, as well as its threats and limitations.

The COVID-19 pandemic accelerated the use of the Metaverse in higher education. Engineering courses are an example of the use of Metaverse and Virtual Reality (VR), especially as a tool to help students understand the theory of introducing machine tool operations. Another example is civil engineering studies, which until recently gave students little or no opportunity to experience real-life environmental disasters (earthquakes, hurricanes, etc.), thus depriving them of an in-depth understanding of resilient building construction systems. The Metaverse application allows students to create a virtual building and expose it to extreme weather conditions, enabling them to better understand margins of error and effectively plan their projects.

The healthcare and medical education sector is by far the most inclined to use technological innovations such as the Metaverse and XR. With these tools, students can simulate real-life situations such as procedures or operations, sometimes combining the virtual and real worlds. For example, XR is a tremendous IT tool for anatomy training. Some training courses have been completely created using these tools, such as 3D Organon and Stanford Virtual Heart, which provide "tools for understanding both human anatomy, including organ anatomy, and their abnormalities in the artificially created virtual world" (p.6).

The authors also mention the ethical aspects of the Metaverse and XR, a subject hitherto relatively little covered by the scientific literature. The ethical balance should above all concern the respect for human and fundamental rights, freedoms, and dignity, while avoiding the pitfalls embodied by potential problems linked to gender, race, religion, or national affiliation. User privacy and digital identities should be the main ethical issues on which to base future considerations.

In conclusion, the Metaverse and XR are undeniably useful tools in education. Their ability to be customized to the individual needs of students and to represent sensory and embodied experiences makes them increasingly interesting for the education sector. They imply an improvement in students' problem-solving and critical thinking skills. However, the authors point out that "nothing can replace human contact" (p.7), and that for the time being, the use of these tools remains limited by their cost and carbon footprint.

> "Metaverse technology is in constant development. It is essential to ensure a development that is compatible with the respect for human and fundamental rights, freedom, and human dignity of so-called ethical design."

> "Education has been proclaimed one of the main foundations of the sustainable development of societies by UNESCO."

Ethical hazards of health data governance in the metaverse | Nature Machine Intelligence s. f. www.nature.com/articles/s4225600658--023-w

How to improve supply chain workforce? A need for skill development and innovation

Adebayo, V. I., Paul, P. O., Jane Osareme, O., & Eyo-Udo, N. L. (2024). Skill development for the future supply chain workforce: Identifying key areas. International Journal of Applied Research in Social Sciences, 6(7), 1346- 1354.

The traditional paradigms of supply chain operations are being reshaped by factors such as automation, artificial intelligence, sustainability concerns, and changing consumer expectations. (Dagnaw, 2020; Muthuswamy & Ali, 2023) This article discusses the skill development needed for the future supply chain workforce by highlighting the role of various stakeholders, such as employers, educational institutions, and policymakers.

Adebayo and his colleagues observe that with the rapid advent of new technologies and the digital transformation of industry, the demand for super-skilled labor is becoming increasingly unavoidable. Firstly, the authors aim to demonstrate that the qualification of the workforce and the learning of in-demand skills are indispensable. Secondly, they explore ways to enhance talent strategies for organizations and stakeholders.

While the classic supply chain has long been defined by a linear model, advances in digital production and new technologies have required a rethink of a model that has been static for too long. Globalization (e.g., trade disputes, pandemics), evolving demand (e.g., e-commerce, personalized products), and geopolitical factors (e.g., tariffs, regional instability) all imply new dynamics. Among other things, automation technologies, artificial intelligence (AI), blockchain technology, and sustainability hold the key to rethinking the future of supply chain management.

As a result, the need to develop new skills is growing all the time. The needs of the supply chain are diversifying, and all have the same objective: to respond to incessant innovation with adapted and renewed skills and knowledge. Whether these skills are technical or soft, they need to be urgently prioritized if organizations are to keep pace with advances. The authors identify three types of skills that require constant renewal: 1) Technical skills, such as data analytics or automation proficiency (robotics, machine learning, etc.); 2) Soft skills, such as adaptability to an ever-changing sector or collaboration skills; 3) Domain-specific knowledge, which demands adopting more responsible strategies, especially due to the new demands in terms of carbon footprint, for instance.

Thus, the authors propose a skill development plan where stakeholders take direct responsibility for developing the skills of their employees. For example, in-house training programs, workshops, seminars, and the facilitation of certified courses are all ways to improve the skill chain. Traditional learning methods must give way to experiential learning, e-learning, and partnerships between private industry players and academic institutions. Last but not least, learning and improving skills must become a skill in itself, one that is always being improved. The authors urge stakeholders to prioritize investment in skill development activities to respond to the challenges and opportunities of the future.

> **AI-powered solutions, including machine learning algorithms and predictive analytics, are empowering supply chain professionals to make data-driven decisions, optimize demand forecasting, enhance inventory management, and mitigate risks.**

How to take better care of our students?

Jacob, R., Li, T. Y., Martin, Z., Burren, A., Watson, P., Kant, R., & Wood, D. F. (2020). Taking care of our future doctors: a service evaluation of a medical student mental health service. BMC Medical Education, 20, 1-11.

This research focuses on the well-being of medical students, based on a mixed methodology, including a cross-sectional analysis of 89 responses obtained from students, as well as observations of clinical effectiveness.
"Studies suggest the prevalence may be higher amongst medical students, particularly with respect to anxiety (25.7%), burnout (49.6%), and stress (31.2%)" (Dyrbye et al. 2008, Dahlin et al. 2005, Rotenstein et al. 2016).
It is common knowledge that the emotional and mental state of higher education students is a public health concern worldwide. Numerous studies have been carried out on this issue, highlighting the most widespread stress factors, such as difficulties in dealing with hierarchy, problems of humiliation and bullying, exposure to patient stress, sleep disorders, and pressure to succeed (p.2).

This article attempts to evaluate the effectiveness and lived experience of students attending the Clinical Student Mental Health Service (CSMHS) in Cambridge (UK), created in 2015 and aimed at providing "easy and rapid access to support from a consultant psychiatrist and clinical psychologists" (p.2). The authors evaluated the service provided, outcome measures, as well as students' involvement.
Service coverage, participant demographics, treatments offered, and student feedback are discussed by the authors, who are all affiliated with the Departments of Liaison Psychiatry at Cambridgeshire and Peterborough NHS Foundation Trust and Addenbrooke's Hospital, both based in Cambridge, UK.
One of the strengths of the study is that it covers both quantitative and qualitative data. In addition, the fact that the healthcare professionals involved did not have a superiority relationship with the students helped to reduce the potential concerns of students about confiding in their feedback. The authors also point out that students are not accustomed to seeking help for their mental health, for fear of being stigmatized or jeopardizing their career development. However, the study discussed here shows that a psychiatrically led assessment service, which then provides accurate treatment, is not only beneficial but also welcome.
In conclusion, studies such as these help envision how we can better support students, and thus underpin their future well-being, by improving their mental health, resilience, and indeed, the trajectory and success of their academic careers.

> "Studies suggest the prevalence may be higher amongst medical students, particularly with respect to anxiety (25.7%), burnout (49.6%) and stress (31.2%)."

> "The nature of medical education in itself, may be a factor in students developing mental disorders." (Brazeau, 2014)

Brazeau CM, Shanafelt T, Durning SJ, et al. Distress among matriculating medical students relative to the general population. Acad Med. 2014;89:1520–5.
Dyrbye LN, Thomas MR, Shanafelt TD, Power DV, Eacker A, Harper W, et al. Burnout and suicidal ideation among U.S. medical students. Ann Intern Med. 2008;149(5):334341-. Available from: https://doi.org/10.732600008-200809020-5-149-4819-0003/.
Dahlin M, Joneborg N, Runeson B. Stress and depression among medical students: a cross-sectional study. Med Educ. 2005;39: 594604-. Available from: https://doi.org/10.1111/j.13652929.2005.02176-.x.
Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. JAMA. 2016;316(21):2214–2236. Available from: https://doi.org/10.1001/jama.2016.17324.

Are chatbots the future of customer experience?

Lahouij, M. A., & Ferchakhi, W. (2024, March). L'Intelligence Artificielle (IA), accélérateur de l'expérience client? cas des chatbots dans le secteur des assurances et des banques. In Congrès National de la Recherche des IUT.

Who hasn't interacted with a chatbot in the last five years? These "virtual conversational agents," a pure product of the era of digital innovation in which we live, are increasingly present in our lives, whether we want to chat with our bank, keep track of our phone usage, or converse with an airline.

This article, written by two members of marketing technology departments affiliated respectively with the Institut Universitaire de Technologie (IUT) de Robert Schuman Illkirch and the IUT de Colmar (both in France), presents an exploratory qualitative research project designed to better understand the customer experience with chatbots, and the positive and negative points that emerge from it.

The authors base their study on a literature review focused on AI and its applications. For instance, they reference Volle, a professor at Université Paris Dauphine (France), who defines AI as 'a form of human-like intelligence that machines are capable of when performing cognitive functions such as understanding, learning, or problem solving' (in Frimousse & Peretti, 2019). Recent studies on chatbots, in particular, have highlighted the human-like behaviors attributed to these tools by marketing and psychology. Emotions, bodily characteristics, and virtual personalities are all features that companies are trying to integrate into chatbots to enhance the interaction between customers and these AI tools.

The research presented here, carried out with customers in the banking and insurance sectors, is intended to be qualitative and exploratory. The authors' initial aim was to understand the obstacles represented by the use of chatbots in the customer experience. Some forty semi-structured interviews were conducted with French customers. The aim of the research was to answer the question: "To what extent can chatbots improve the customer experience?" (p.2).

The results, analyzed thematically, concern the customer experience as a whole, categorized here into four elements: 1) the hedonic-sensory dimension; 2) the socio-cultural rhetorical dimension; 3) the temporal dimension; and 4) the praxeological dimension. According to these results, the chatbot's anthropomorphic dimension remains indispensable: the more human it seems, the better the customer experience. The bond between the customer and the chatbot is created with greater ease. However, there remains an area of limitation in that the customer is not always confident, particularly when it comes to entrusting personal data (banking data, for example) to a conversational agent.

To conclude, the authors mention "technological anxiety" (p.3) among customers, which is becoming more and more of an issue in a world that tends to be increasingly digitalized and dematerialized. While chatbots are becoming a tool for personalizing the customer experience in many cases, according to Lahouij and Ferchakhi, anthropomorphism could partly address this lack of trust by giving a more solid basis to the interaction between the technological tool and the human customer.

> "The global chatbot market is expected to reach 1.25 billion USD by 2025, with an growth rate of 24.3%."

> **The chatbot's anthropomorphic dimension remains indispensable: the more human it seems, the better the customer experience.**

Frimousse, S., & Peretti, J. M. (2019). «Expérience collaborateur» et «Expérience client» comment l'entreprise peut-elle utiliser l'Intelligence Artificielle pour progresser? Question(s) de management, (1), 135-156.

Artificial intelligence in 2024: a comprehensive report

Nestor Maslej, Loredana Fattorini, Raymond Perrault, Vanessa Parli, Anka Reuel, Erik Brynjolfsson, John Etchemendy, Katrina Ligett, Terah Lyons, James Manyika, Juan Carlos Niebles, Yoav Shoham, Russell Wald, and Jack Clark,

The Artificial Intelligence Index Report 2024, published by Stanford University's Human-Centered Artificial Intelligence, covers essential trends in AI such as technical advancements, public perceptions, and geopolitical dynamics around its increasing use.

The report, which is defined by an exceptional variety of topics, gives a particularly detailed picture of the current state of AI. Research and development, technical performance, issues of responsibility, economics and diversity, and the use of AI in medicine and education are all covered in the report.

The first chapter, dedicated to research and development, shows that the industrial sector dominates AI research and that the USA remains the leading source of the top AI models, with 61 models originating in US institutions, compared to 21 in Europe and 15 in China.

The study of patents, as well as research publications and conferences held in 2023, shows that AI research continues to grow, with, for example, 2.6 times more conference publications in 2022 than in 2015.

The next chapter, dedicated to technical performance, gives an overall picture of the technological progress that has taken place in the AI sector in 2023. One of the highlights of this section concerns performance: "AI beats humans on some tasks, but not on all," mention the authors (p.77), with visual commonsense reasoning and planning being examples of where humans are still outperforming technologies. This chapter also gives insights into the flexibility offered by LLMs (Large Language Models), which improve robotic capabilities as well as interactions.

Chapter 3, entitled "Responsible AI," is concerned with the responsible development and deployment of AI systems, aimed at mitigating the risks posed by the growing use of AI. Privacy and data governance, transparency and explainability, safety and security, and fairness are the four key areas of responsible AI analyzed in the report. While some of the highlights are rather pessimistic, such as the lack of standardization or the difficulty of detecting political deepfakes, the chapter provides a solid basis for rethinking a more responsible approach to AI.

The chapter dedicated to the economy addresses the questions surrounding the growth of AI, especially in the industrial sector. The authors discuss the surge in investments in generative AI, as well as the increase in revenues implied by AI.

The fifth chapter focuses on science and medicine, exploring the scientific achievements in this sector, as well as the innovations it saw in 2023. The authors observe that the scientific sector has benefited greatly from AI, and so has medicine, with remarkable improvements such as the MedQA benchmark, a key test for assessing AI's clinical knowledge.

The chapter on education looks at learning dedicated to AI and computer sciences, as well as the very use of AI as a learning tool. Through data analysis, including the Computing Research Association's Taulbee Survey, the authors demonstrate that both Canadian and American students are interested in studying AI and CS.
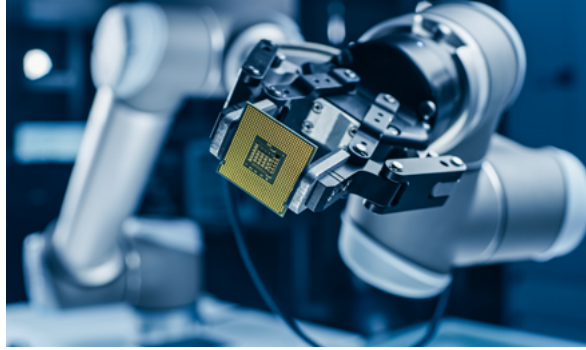
> **"In 2023, industry produced 51 notable machine learning models, while academia contributed only 15."**

> **A new McKinsey survey reveals that 42% of surveyed organizations report cost reductions from implementing AI (including generative AI), and 59% report revenue increases.**

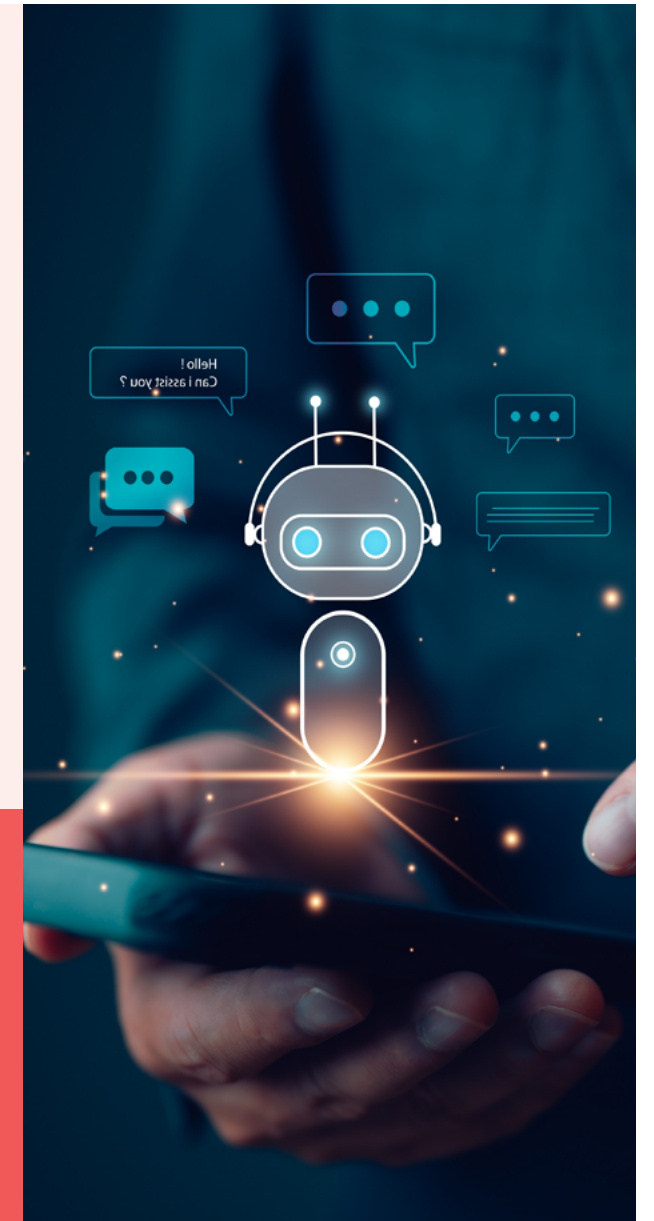# Artificial intelligence in 2024:
a comprehensive report

"The AI Index 2024 Annual Report," AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA, April 2024.

Chapter 7, which reflects on policy and governance issues, demonstrates that policymakers around the world are increasingly aware of the need to develop AI-related policies. In fact, the report states that "policymakers around the world can't stop talking about AI" (p. 369), and that more and more regulatory agencies are focusing on AI regulation, such as the US Department of Transportation, the Department of Energy, and the Occupational Safety and Health Administration. The next chapter focuses on the diversity issues raised by AI. The initial observation is rather alarming since it indicates that, as a considerable number of companies and datasets are based in Western countries, they reflect Western perspectives, thereby implying a lack of diversity that can lead to dangerous biases and inequalities. The report raises a warning to stakeholders to "intensify their endeavors to track diversity trends associated with AI" (p.413).

Finally, Chapter 9 on public opinion points out that it is essential to understand public opinion in order to better anticipate the impact of AI on society. Several data sources are called upon in this chapter, such as survey data from the University of Toronto, which explores the public perception of ChatGPT. The chapter highlights that people around the world have increasing anxiety toward AI, thinking "AI will dramatically affect their lives" (p.438).

The report, which is extremely comprehensive and well put together, gives a clear idea of what AI looks like in 2024. It provides an invaluable source of data on the subject, which can be used by policymakers, researchers, executives, and the general public alike.

3- The future in numbers

Global Attitudes Towards AI

PUBLIC SENTIMENT TOWARDS

ARTIFICIAL INTELLIGENCE

A recent survey by Ipsos shows the % of respondents who agree to the question:

Q: Do products and services using AI have more benefits than drawbacks?

% of people who agree

Country	
China	
Saudi Arabia	
India	
Peru	
Malaysia	
Mexico	
Colombia	
Chile	
S. Korea	
Türkiye	
Brazil	
S. Africa	
Argentina	
Russia	
Spain	
Italy	
Hungary	
Poland	
Japan	
Sweden	
Belgium	
UK	
Australia	
Germany	
U.S.	
Netherlands	
Canada	
France	

People living in wealthier economies view AI products and services less positively

Color code: GDP per capita

$10k $30k $50k $70k

As of 2022. Based on the survey results of 19,504 adults aged 16-74 across 28 countries. Source: Ipsos, World Bank

VISUAL CAPITALIST

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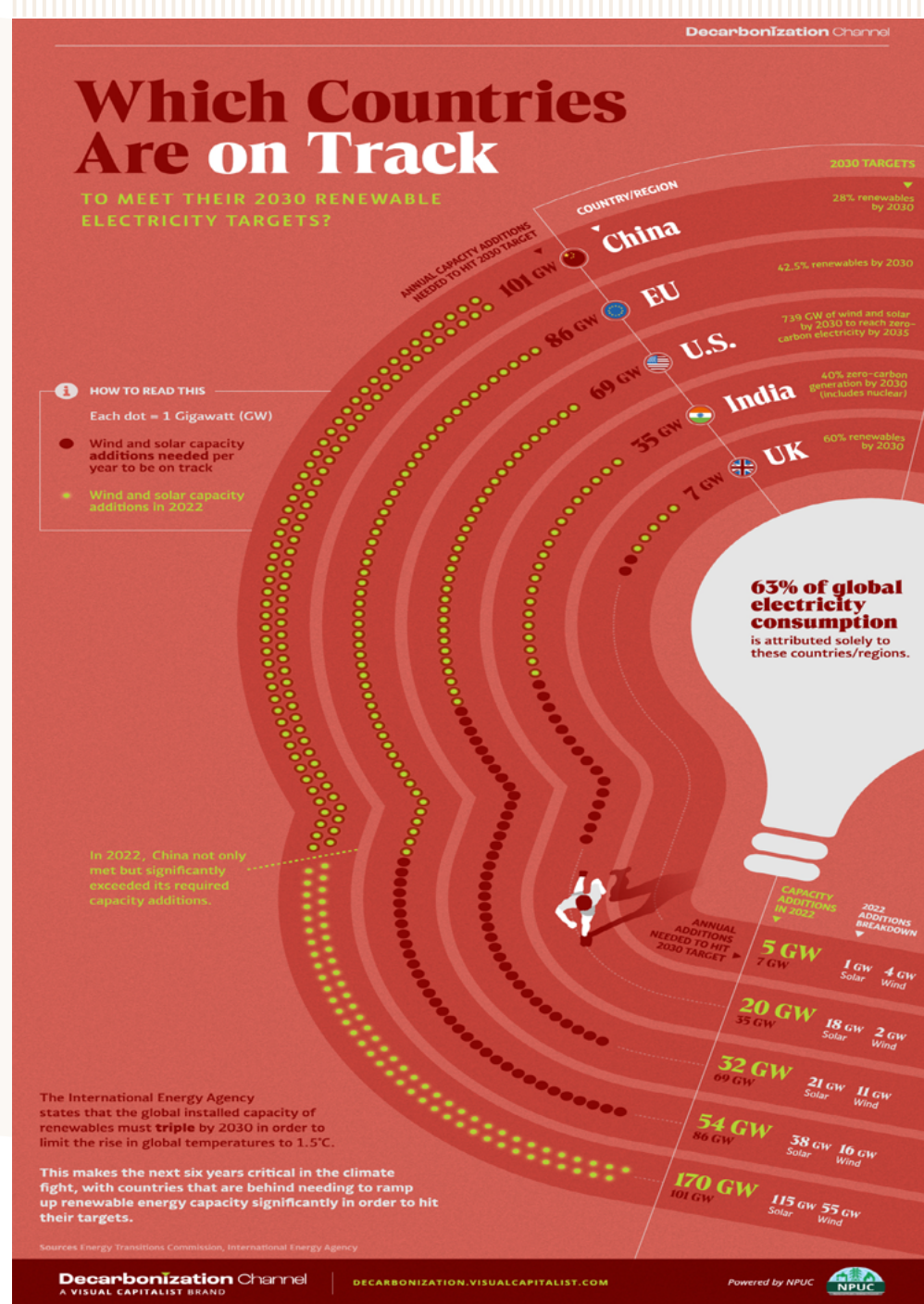
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Visualizing the Future Global Economy by GDP in 2050
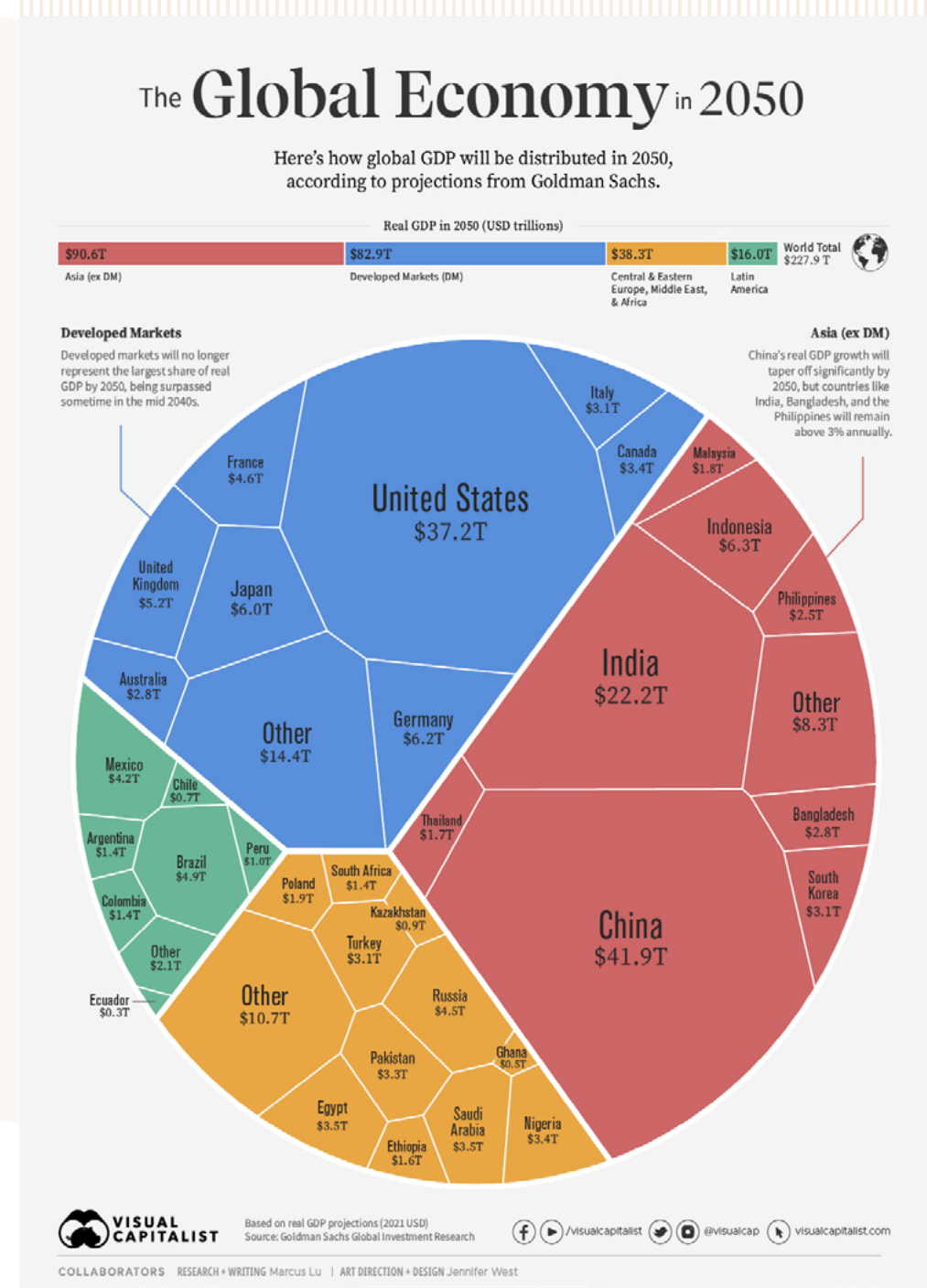
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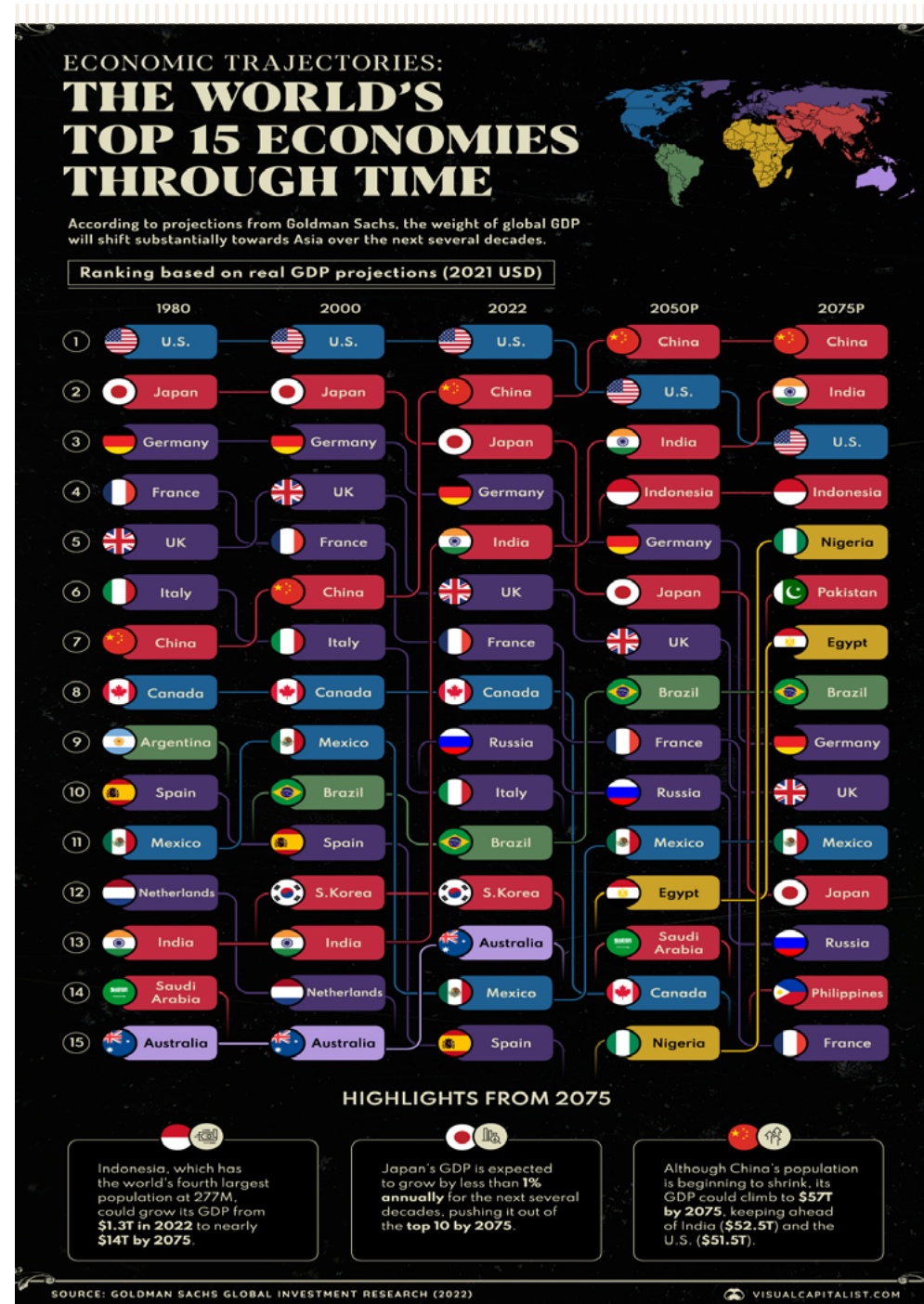
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Mapped: Global Temperature Rise by Country (2022- 2100)
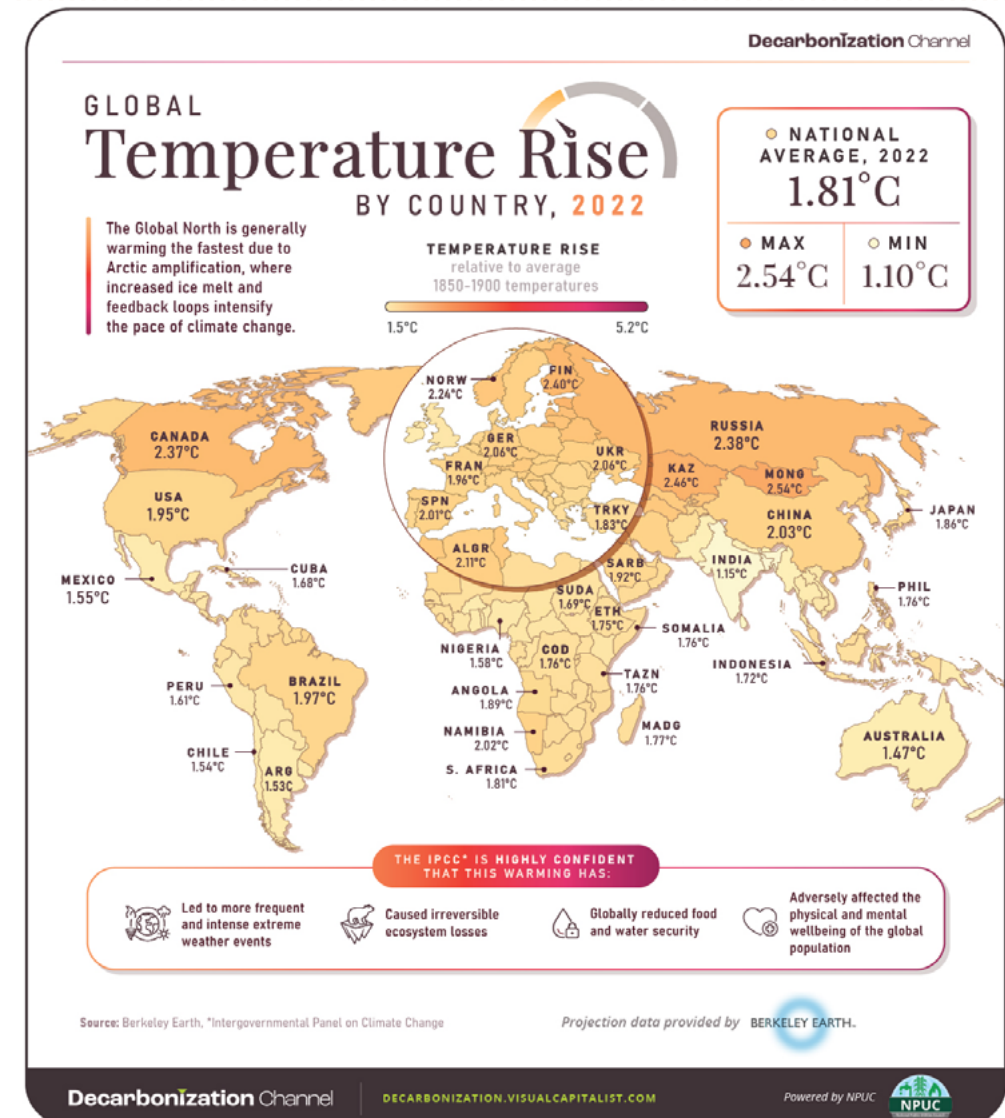
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Mapping the World's Urban Population in 2050

No data | Majority rural | Majority urban
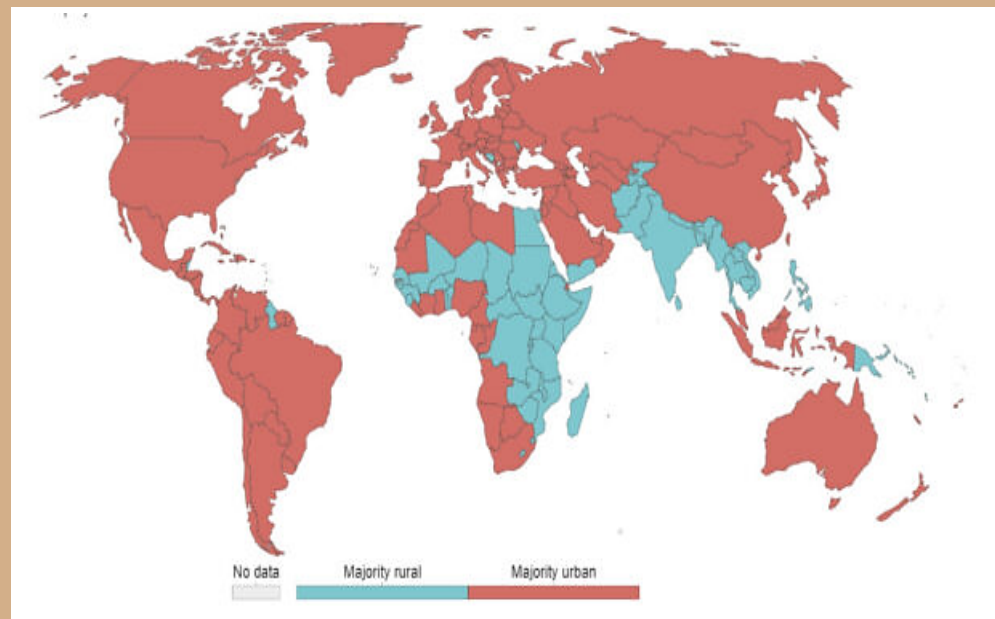
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Projected GDP in PPP in 2050
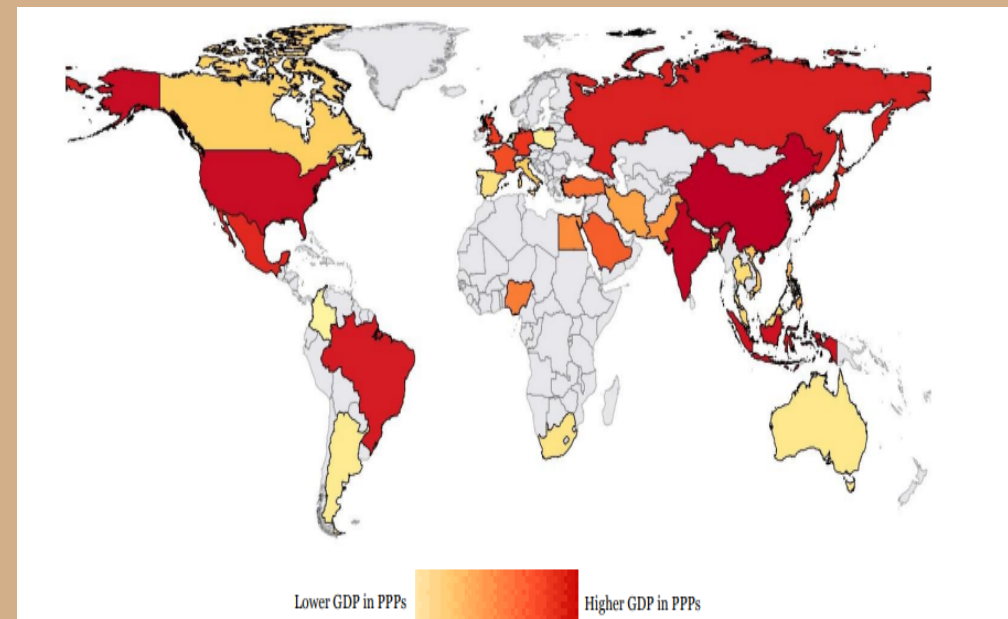
Lower GDP in PPPs | Higher GDP in PPPs

The World in 2050, The long view: how will the global economic order change by 2050?, PwC,
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Ranked: The 25 Poorest Countries by GDP per Capita
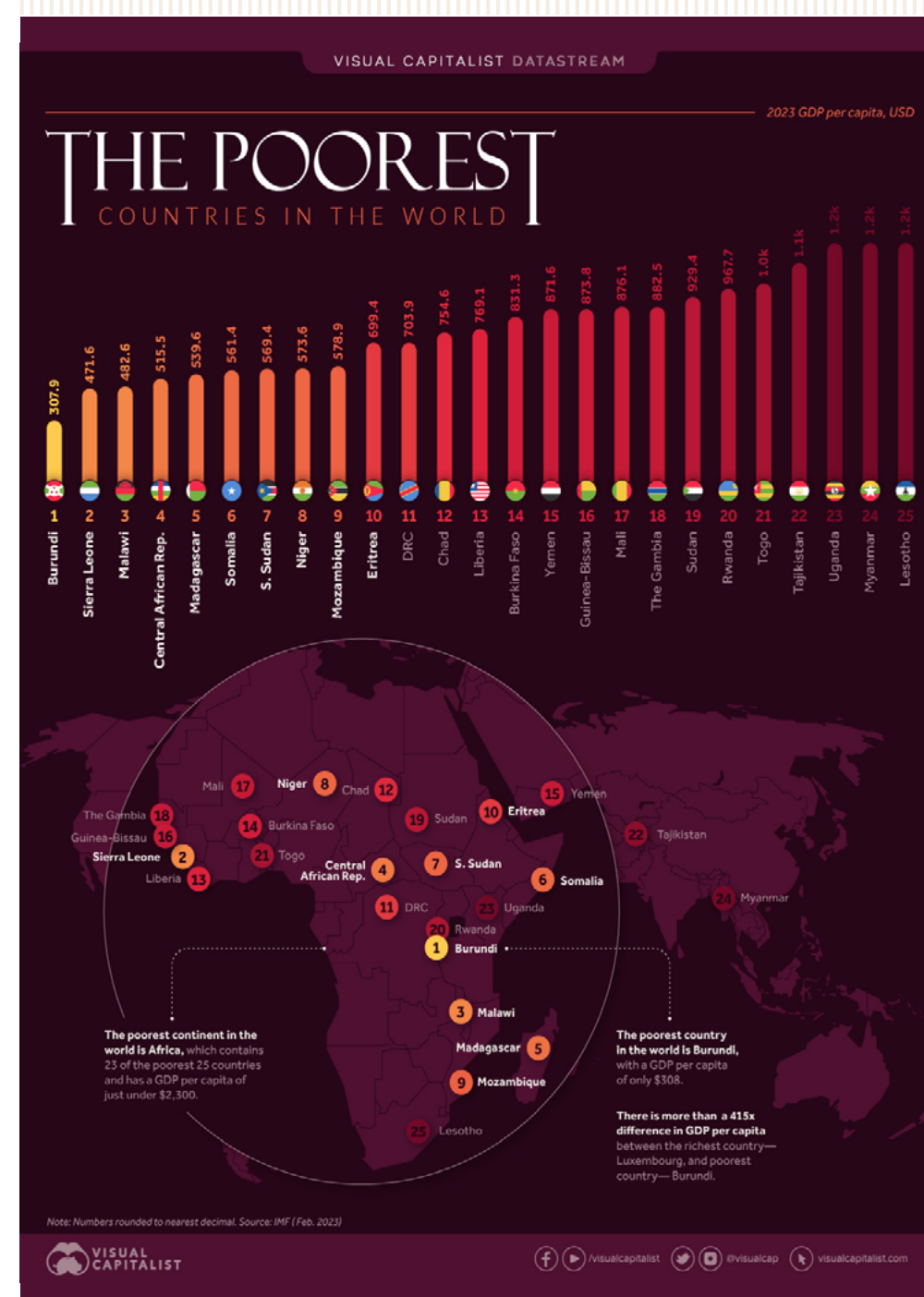
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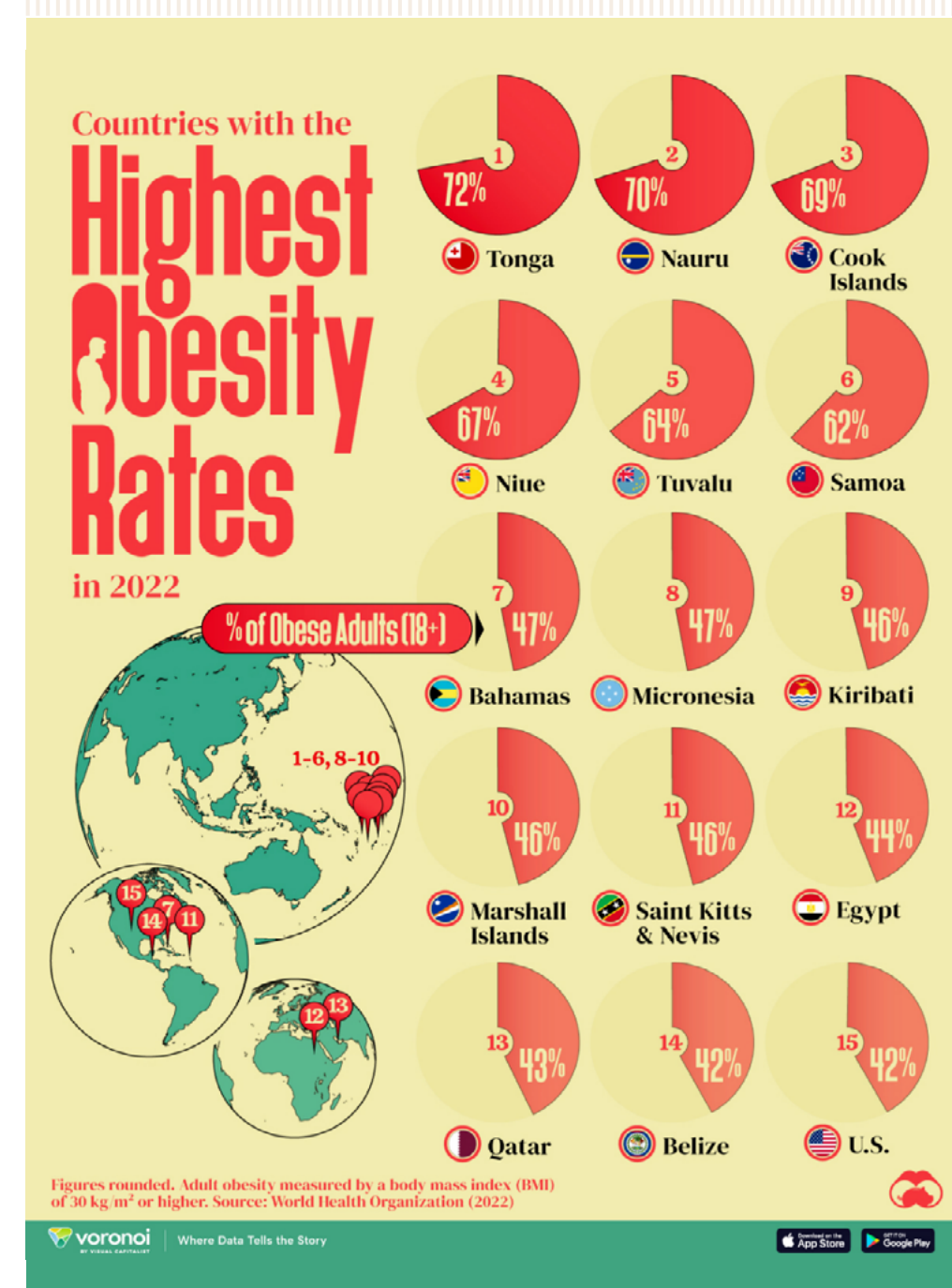
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Projected Rankings
of Economies Based on GDP in PPP
(in constant 2016 $bn)

GDP PPP rankings	2016 rankings		2030 rankings		2050 rankings	
	Country	GDP at PPP	Country	Projected GDP at PPP	Country	Projected GDP at PPP
1	China	21269	China	38008	China	58499
2	United States	18562	United States	23475	India	44128
3	India	8721	India	19511	United States	34102
4	Japan	4932	Japan	5606	Indonesia	10502
5	Germany	3979	Indonesia	5424	Brazil	7540
6	Russia	3745	Russia	4736	Russia	7131
7	Brazil	3135	Germany	4707	Mexico	6863
8	Indonesia	3028	Brazil	4439	Japan	6779
9	United Kingdom	2788	Mexico	3661	Germany	6138
10	France	2737	United Kingdom	3638	United Kingdom	5369
11	Mexico	2307	France	3377	Turkey	5184
12	Italy	2221	Turkey	2996	France	4705
13	South Korea	1929	Saudi Arabia	2755	Saudi Arabia	4694
14	Turkey	1906	South Korea	2651	Nigeria	4348
15	Saudi Arabia	1731	Italy	2541	Egypt	4333
16	Spain	1690	Iran	2354	Pakistan	4236
17	Canada	1674	Spain	2159	Iran	3900
18	Iran	1459	Canada	2141	South Korea	3539
19	Australia	1189	Egypt	2049	Philippines	3334
20	Thailand	1161	Pakistan	1868	Vietnam	3176
21	Egypt	1105	Nigeria	1794	Italy	3115
22	Nigeria	1089	Thailand	1732	Canada	3100
23	Poland	1052	Australia	1663	Bangladesh	3064
24	Pakistan	988	Philippines	1615	Malaysia	2815
25	Argentina	879	Malaysia	1506	Thailand	2782
26	Netherlands	866	Poland	1505	Spain	2732
27	Malaysia	864	Argentina	1342	South Africa	2570
28	Philippines	802	Bangladesh	1324	Australia	2564
29	South Africa	736	Vietnam	1303	Argentina	2365
30	Colombia	690	South Africa	1148	Poland	2103
31	Bangladesh	628	Colombia	1111	Colombia	2074
32	Vietnam	595	Netherlands	1080	Netherlands	1496

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 https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html#data