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FORESIGHT REPORT

Exploring Change in Geotechnomics

Geotechnomics—the intersection of geopolitics, technology, and economics—is producing a complex dynamic. Changes in this area are disrupting core assumptions about how the international system works, who the key players are, the nature and sources of power, and how middle powers can secure their national interests.

This report builds on Policy Horizons Canada's *Geotechnomics* (May 2023) foresight brief. It describes six stories of change in geotechnomics. These stories explore plausible futures characterized by the deep interconnections between international power, emerging dual-use technologies, and economic prosperity. It then presents cross-cutting implications of these changes in the following policy areas: international relations, security, economics, and values and ethics.

Exploring this collection of changes, futures, and implications could help policy- and decision-makers meet future challenges and opportunities on the international stage over the next decade. Whether the world evolves towards stability and prosperity, or division and insecurity, will depend largely on how the emergence of new roles and responsibilities are managed.

Canada

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Introduction

Today, a complex new change dynamic is emerging at the intersection of geopolitics, technology, and economics – “geotechnomics”. This dynamic is disrupting core assumptions about how the international system works, who the key players are, the nature and sources of power, and how middle powers can secure their national interests. The full extent of this disruption remains to be seen; however, it is certain to generate significant challenges and opportunities for policy- and decision-makers over the next decade.

Policy Horizons Canada’s (Policy Horizons) Geotechnomics foresight brief (May 2023) offered an initial sketch of the new dynamic shaping the interplay among geopolitics, technology, and economics. It also outlined some preliminary implications across four domains: international relations, security, economics, and values and ethics.

This report aims to amplify and enrich that initial analysis. It describes six stories of change in geotechnomics to explore plausible futures characterized by the deep entanglement of international power, emerging dual-use technologies, and economic prosperity. It then charts the cross-cutting implications of these changes in one or more of the four policy areas identified in the first brief: international relations, security, economics, and values and ethics. Exploring this collection of changes, futures, and implications, could help policymakers meet future challenges and opportunities on the international stage.

Readers are encouraged to use this report to test their assumptions about the future. It can also be used to consider what actions could be taken today to mitigate future challenges and maximize future opportunities. The insights offered below may pertain to the following policy areas: international relations, security, economy, work, industry, education and training, research and development, governance, social cohesion, information ecosystem, environment, rights and social justice, and privacy and identification.

Context

The new dynamics at the intersection of geopolitics, technology, and economics are shaped by a larger context of change in the world. How the geotechnomics landscape evolves in the coming years, and therefore the implications it generates, will depend on factors such as:

1. **Pace of technological development.** A broad suite of new dual-use technologies is developing, maturing, and combining. It is bound to redraw power maps, reshape international economic competition and cooperation, and create new dimensions for conflict. Such technologies include artificial intelligence (AI), drones, metaverses, biodigital innovations, geoengineering, and additive manufacturing.

2. **Increase in global conflicts.** Violent conflicts have increased nine-fold since 2004,[1] and some, including those in Ukraine, Sudan, and in Israel, the West Bank, and the Gaza Strip,[2] have the potential to provoke larger regional conflicts. Beyond the human toll, this increase disrupts economies and global cooperation on a range of significant issues, such as the environment and human rights.

3. **Reconfiguration of the world order.** Washington- and Beijing-led blocs have moved further apart in areas such as economics, security, technology, and social policy.[3] While some nations have forged closer links to one of the superpowers, others are charting a more independent course, leveraging their growing economic power to establish ties on both sides.[4] The international order is transforming, making relationships more fluid and destabilizing norms around trade, human rights, and climate change.

4. **Digitalization of critical infrastructure systems**. A new class of vulnerabilities to essential services such as electricity, transportation, healthcare, and water and food supplies has arisen as critical infrastructure becomes increasingly dependent on digital technologies.[5] Cyberattacks, legacy hardware, and natural or man-made disasters could cause more frequent, more impactful, and less predictable interruptions to this infrastructure.

5. **Breakdown of democratic systems.** Authoritarian regimes now outnumber democracies worldwide[6] and some established democracies appear to be sliding toward authoritarianism.[7] Should globally or regionally significant democracies descend into anocracy or civil conflict, disruptions to trade and diplomacy could cascade through the international system.

6. **Demographic shifts.** Countries such as Japan, South Korea, and China have rapidly ageing populations.[8] Meanwhile, on the African continent, a large generation of young people is coming of age.[9] Such changes are likely to impact individual states' economic success, social cohesion, and political stability. These changes could also shift global patterns of trade and migration.

7. **Climate change.** The transition to renewables may be uneven and many people may face energy uncertainty. Extreme climate events may cause mass migration, which could become a source of international tensions and conflict. Continued lack of real progress in addressing climate change may also further erode trust in multilateral institutions, weakening their capacity to mitigate conflict.

8. **Uncertainty around economic models.** Economic approaches that challenge market-based structures in favour of Indigenous perspectives, de-growth, well-being, and peer-to-peer models are gaining momentum.[10] Organizations such as the European Union (EU) and the Association of Southeast Asian Nations (ASEAN) have proposed new circular economy action plans and frameworks.[11] These approaches may involve more centralized economic planning than is typical of free-market economies. Widespread uptake could shift states' economic power and diplomatic behaviour.

Areas of change in Geotechnomics: Key insights

There are six key areas of change at the intersection of geopolitics, technology, and economics. Taken together, they signal a seismic shift in established international

systems. Change of this magnitude typically raises new opportunities and complex challenges for leaders and decision-makers.

1. New players: Technology companies and their leaders are challenging the primacy of states as geopolitical actors.	**2. Rules:** Multilateral institutions are struggling to regulate technology.	**3. Sources of strength:** Select smaller states with access to strategic natural and human resources increasingly enjoy outsized influence in the international system.
4. Supply chains: Geopolitics and technology are reforging supply chains with heightened emphasis on reliability and security.	**5. Inequality:** Social and economic inequalities are deepening as the primary benefits of new technologies go to powerful individuals, groups, and states.	**6. State and citizen:** Notions of statehood and citizenship are evolving as technologies create new spaces for those with shared interests, values, and aspirations to connect**.**

1. New players: Technology companies and their leaders are challenging the primacy of states as geopolitical actors. Big technology companies with global operations and interests in a web of technologies, consumer products, services, data, and digital infrastructure represent a new kind of international actor. They – and their billionaire CEOs – have emerged as major players in geopolitical arenas traditionally reserved for states, such as outer space.[12]

After Russia invaded Ukraine in 2022, for example, major companies including SpaceX and Microsoft – as well as small US-based AI startups, such as Primer.AI and Clearview AI – provided critical support to Ukraine. They did so on their own initiative, rather than under instructions from any government.[13]

The rising geopolitical influence of big tech companies reflects their control of critical infrastructure and systems essential to economic and strategic power. Most communications infrastructure – including submarine cables, the data centres that form the cloud, and low earth orbit satellites – are in the private ownership of companies such as Google, Meta, Oracle, Microsoft, Amazon, SpaceX, and Huawei.[14]

Strategic technologies are often dual-use, with implications for kinetic and non-kinetic warfare capabilities – including control over narratives. Cables running along the seafloor, for example, carry over 95% of all international internet traffic, including everything from private citizens' data to intellectual property and military secrets. They are vulnerable to sabotage, data theft, and espionage.[15]

The size and reach of leading tech companies – coupled with the potentially erratic influence of their enormously wealthy CEOs – represent a novel development on the world stage. Unlike firms such as Lockheed Martin and Boeing, which have long been part of military-industrial complexes largely controlled by governments, big tech actors are less dependent on government contracts. They may not prioritize state concerns, such as security, sustainability, and economic resilience. It can be difficult to untangle their motives.

Reflecting this new power, international organizations are inviting private corporations to provide policy recommendations to global leaders.[16] Some states have designated "tech ambassadors" to interface with them.[17] Questions are increasingly being raised about how these companies can be held accountable and integrated into global governance structures.

In the future:

- Big technology firms, or their CEOs, could decide to undertake unilateral diplomatic or military action. This could make them sources of disruption – especially if they choose corporate interests over national priorities or international stability. Or their independence might enable them to become drivers of collective security and stability.
- Private owners of communications technology and infrastructure could limit essential services for those who depend on them as a means of leverage during conflicts or negotiations.

2. Rules: Multilateral institutions are struggling to regulate technology. As digital technologies with dual-use potential become more powerful, the task of regulating them becomes both more urgent and more difficult. Current international regulations are not always easy to apply,[18] and multilateral institutions have typically been limited to issuing statements or guidelines rather than new binding rules. Industry self-regulation efforts are proving inadequate. Regions and states are taking their own, often incompatible, approaches.

Regulations conceived in an analog age – for example, to protect privacy, security, and human rights in contexts of warfare or surveillance – often do not map clearly onto the dual-use affordances of new digital technologies.[19] Analog approaches that focus on constraining state actors, such as nuclear non-proliferation treaties, are not useful for new threats which can be deployed by a growing range of actors – for example, cyber-attacks, armed drones, and AI robots.[20]

Governments and technology companies recognize the need to update standards and regulations – and some progress has been made, such as the International Criminal Court's willingness to prosecute cyber-crimes.[21] However, multilateral institutions have so far largely been unable to broker agreements on new binding measures.[22] Few companies are willing to take unilateral measures that could threaten their competitive edge,[23] and industry self-regulation initiatives have been limited.

In the absence of more effective global leadership**,** conflicting values around innovation, profit maximization, human rights, and security are becoming embodied in approaches to technology regulation that differ across countries and regions. The EU, for example, is defining rights and principles in areas such as AI, social media, and disinformation.[24] The United States (US) favors a more hands-off approach.[25] China follows a politically driven strategy of limiting certain technologies and expanding others to uphold social control.[26]

In the future:

- The accelerating pace of innovation in AI may make it even harder for international institutions to regulate potentially harmful dual-use technologies through familiar mechanisms. New international consultation and collaboration mechanisms may be needed.
- The separation of digital ecosystems due to different regulatory environments could harm international trade and collaboration on developing technological solutions to wicked problems such as climate change.
- Unregulated – or inconsistently regulated – technological development could amplify fear and distrust between states, increasing the likelihood of conflict, and lead to the emergence of new existential threats to humanity from uncontrolled technologies.

3. Sources of strength: Select smaller states with access to strategic natural and human resources increasingly enjoy outsized influence in the

international system. The resources needed to develop cutting-edge technology – including critical minerals, manufacturing capability, capital, and talent – represent new sources of geopolitical power. As the world becomes more multipolar, new opportunities are opening for smaller states.

Critical minerals essential to frontier technologies are becoming more geo-strategically significant, in a similar way to gold and oil. Australia, Chile, Argentina, Brazil, and the Democratic Republic of the Congo are among countries with rich reserves of critical minerals that have explored supply management on the OPEC model as a means of maximizing profits and power.[27]

Manufacturing capability in technologies now considered strategic resources – including semiconductors, biotechnology, clean energy, and pharmaceuticals – is a growing source of power.[28] Beyond the US and China, regions with influence include Taiwan, Japan, Malaysia, South Korea, the Netherlands, and India. Capital-rich countries such as Saudi Arabia and the United Arab Emirates (UAE) are using their sovereign wealth funds to pioneer advanced technologies, such as Abu Dhabi's open-source AI model, Falcon 40B.[29]

The relative scarcity[30] of tech talent gives a competitive edge to countries with existing human capital or the ability to attract and retain skilled foreign workers. Canada's immigration policy targets skilled workers, including technology talent.[31] Other notable examples of forward-thinking policies include Estonia's Digital Nomad visa program, Singapore's smart city initiatives, South Korea's technology startup ecosystem, Switzerland and Sweden's research facilities, and the UAE's Future Office.[32]

With increasing isolationism among established powers, there are more opportunities for small and middle powers to assert independence and leadership in a multipolar world order.[33] Examples include Turkey's growing influence in defense, energy, humanitarian aid, and mediation, and South Africa's role in advancing regional integration in Africa.[34] Middle powers, which thrived under the Western rules-based order, such as Australia and New Zealand, may be losing influence by comparison.

Emerging alliances – such as the Shanghai Cooperation Organization and the I2U2 group of India, Israel, the UAE, and the US – and expansion of existing alliances, such as BRICS and the G77, may also offer smaller states more geopolitical

influence.To date, 36 countries have expressed an interest in joining BRICS, and the inclusion of oil-rich countries such as Saudi Arabia, the UAE, and Iran could fundamentally alter its internal dynamics and international behaviour.[35]

In the future:

- Fluctuations in the strategic value of resources, whether from market forces or market manipulation by influential players, may shift global power dynamics in unexpected ways.
- States committed to diversity, inclusion, and social welfare may be more successful in cultivating talent for human resources to support technological innovation – and in weathering the labour and social disruptions that accompany it – leading to more international influence.[36]
- More influential small and middle powers with greater room to manoeuvre could produce new and more flexible alignments around economic, human-rights, environmental, or strategic issues.

4. Supply chains: Geopolitics and technology are reforging supply chains with heightened emphasis on reliability and security. Shocks such as COVID-19 made clear the vulnerabilities of lengthy supply chains that integrate lowest-cost suppliers from around the globe. Efforts towards de-risking and self-sufficiency – friendshoring, nearshoring, diversifying supply chains, and increasing use of technology – are leading to new geopolitical challenges for some and new economic opportunities for others.

In the post-Cold War era it was widely hoped that globalization of trade and the economic integration of China would secure global prosperity and stability.[37] However, recent events have exposed the vulnerabilities of long global supply chains: the COVID-19 pandemic disrupted manufacturing and logistics, the invasion of Ukraine disrupted raw materials and food supply chains, and climate change has also contributed to disruptions.[38]

Dependencies on single sources under such circumstances have made supply chains tools of coercion in diplomatic disputes. At the same time, concern has been growing that outsourcing components of advanced technologies raises security-related risks such as espionage.

As a result, the concept of efficiency has been reassessed to place a premium on resilience and security, emphasizing partnerships with dependable and politically

aligned actors. Rich countries, emerging powers, and multinationals seek to “derisk” their supply chains by creating networks of trusted allies, controlling critical technologies, or becoming more self-sufficient in strategic sectors.[39]

In the semiconductor industry, for example, governments’ efforts to bolster domestic capacity include the 2022 US CHIPS and Science Act,[40] the European Chips Act, and significant investment by India and Japan.[41] In clean energy technology, which depends on minerals such as lithium and cobalt,[42] companies such as Tesla are pursuing vertical integration by acquiring suppliers.[43]

Many supply chain challenges are being addressed through technologies. For instance, AI is optimizing inventory management and logistics.[44] Blockchain technology can ensure transparency and traceability, reducing the risk of counterfeit products.[45] IoT (Internet of Things) sensors that track the movement of goods provide real-time data, facilitating more informed decision-making.[46] 3D printing enables more local and on-demand production, simplifying supply chains and reducing the need for large inventories.[47]

Skepticism remains about the economic viability of efforts to build more resilient supply chains.[48] For example, Western attempts to reduce dependence on China[49] may benefit countries such as India, Vietnam, Thailand, and Mexico with ample labour supplies and favourable geographical locations.[50] However, when these trading partners are themselves extremely reliant on Chinese exports, the result can be a net increase in indirect imports from China to the West.[51]

In the future:

- Reconfiguration of supply chains could risk descending into protectionism that increases resilience but worsens inflation.
- Shifts in global trade patterns could have a stabilizing effect on geopolitics – if they result in a more robust and interconnected world economy – or a destabilizing effect, by reducing some states’ access to economically and militarily important technologies.
- Technology may further enhance the transparency, efficiency, and security of global supply chains, reducing the likelihood of a dramatic reorganization.

5. Inequality: Social and economic inequalities are deepening as the primary benefits of new technologies go to powerful individuals, groups, and states.
The development and deployment of cutting-edge technologies, such as AI, is

concentrating wealth and power in the hands of states, companies, and individuals that are already wealthy and powerful. AI also risks undermining democratic societies by enabling new forms of government control, worsening misinformation, and amplifying racial biases.

Technology development perpetuates global inequalities as it requires significant up-front investments from governments or the private sector, so it mostly happens in a few rich countries in the global north. Meanwhile, the labour-intensive, low-value tasks of data sorting and cleaning tend to occur in the global south.[52]

Technology deployment likewise perpetuates unfair systems of extraction and control. A few private and state-backed enterprises control energy and communications infrastructure around the world. This allows them to extract direct profits from users. It also gives them access to data, which can be monetized or used to derive actionable insights about users. These firms have the power to manipulate or even shut down a country's grid or communications network and to deny local rivals access to the systems that could make them viable competitors.

China encourages such behaviour by state-backed private enterprises to increase its soft power in strategically and economically important regions. This is especially notable in Africa,[53] where Huawei components comprise 70% of communication infrastructure such as 4G networks.[54]

Private and state-owned surveillance systems can further enable control by making it easier for governments to identify and target critics. These systems allow them to search social media platforms for signs of dissent, implement more accurate and subtle methods of online censorship, and identify and monitor individuals participating in anti-government demonstrations.[55]

AI is being used to subvert democratic norms and institutions in some states.[56] The rapid progress in AI-powered tools to generate text, audio, and imagery makes truth more challenging to identify and manipulation much easier.

New ethical challenges are also emerging with the potential of AI to exacerbate existing forms of discrimination and injustice.[57] Algorithmic decision-making in financial and medical contexts has been shown to have unintentional racial bias.[58] This could amplify antagonisms rooted in historical inequalities, with implications for domestic stability as well as foreign relations.

In the future:

- Inequitable technological development and deployment may reverse global progress on the Sustainable Development Goals. Privacy, security, and the ability to disconnect may become luxury goods available primarily to people in wealthy countries, while those in poorer countries rely on low-to-no cost networks with minimal protections.
- Control of critical infrastructure and related technologies could give some private and state-controlled actors new degrees of direct and indirect influence over foreign states and nationals.
- AI could undermine democratic norms around open and informed debate, exacerbating ideological divides in ways that complicate international negotiations and goal setting.

6. State and citizen: Notions of statehood and citizenship are evolving as technologies create new spaces for those with shared interests, values, and aspirations to connect. Technology has enabled people to interact and organize with like-minded others, both within their own countries and in other countries. As a result, new ideas are emerging – such as network states, digital nations, digital nomads, and global citizenship – that are challenging traditional notions of statehood and citizenship.

"Network states" are values-based, online communities that crowdfund the purchase of territory and hope to gain diplomatic recognition from an existing state. Thousands of members of Praxis, for example, have made financial investments with the aim of identifying a host country and becoming a Special Economic Zone.[59] Afropolitan hopes to build a society grounded in ancestral African mindsets, histories, and mythologies.[60]

The idea of the "digital nation" is emerging as a means to protect citizens of countries that may disappear due to climate change. For example, Tuvalu – expected to be the first country to be submerged by rising sea levels – has asked the United Nations to recognize it as a digital state to preserve its fishing rights.[61]

Traditional ideas of citizens' rights and responsibilities vis-à-vis states are being challenged by the rise of "digital nomad" visas. Currently, over 50 countries allow foreigners to move and work remotely for up to two years.[62]

Conventions around national citizenship are likewise evolving as immersive online spaces emerge as places to educate, engage, and deliberate on transnational priorities. They are expanding ideas of "global citizenship", as well as opening space for groups to organize and express themselves in novel ways within states. In Canada, for example, an Anishinaabe-led consortium has developed Biskaabiiyaang (an Indigenous Metaverse) as a space to resist colonial systems and use storytelling to educate and reclaim ways of being.[63]

In the future:

- Digital nations and communities could revise understandings of the social contract, reframing ideas about the rights and responsibilities of citizens, national attachment, and civic participation.
- Global governance structures may need to adapt to include networked states and digital nations, which may encompass states annexed in war as well as those that disappear due to climate change.

Cross-cutting policy implications

The changes outlined above are reshaping the interactions of geopolitics, technology, and economics. These shifts are poised to disrupt assumptions about the future that underpin core policies in security, international relations, economics, and values and ethics. To meet future challenges and opportunities, policy- and decision-makers may have to reconsider conventional approaches to trade-offs among technology regulation, innovation, human rights, economic growth, and international influence.

The policy implications presented below were selected for the range of plausible futures they illustrate, as well as their relevance to policy making. They are not predictions, and do not represent expected or desired futures—nor is this list exhaustive.

International relations

- Governments may be expected to take a more active role in protecting national interests from big tech companies with the power to shape geopolitical conflicts.

- Multilateral institutions may request additional support to create new mechanisms to regulate technology development and deployment.
- Unregulated competition over new tech, new resources, and new arenas could exacerbate international tensions while harming the environment.
- Global governance structures may enter a period of upheaval as they seek to integrate new players, spaces, and entities such as tech firms, metaverses, network states, and digital nations.

Security

- Advanced communication technologies connect different facets of global society in ways that promote innovation and understanding, but also increase state vulnerabilities to cyberattacks, espionage, and system failures.
- Building global capacity to overcome existential risks may prove impossible if rampant mis- and disinformation or ideological divides prevent consensus on ground truths.
- Essential services could be jeopardized by foreign or unpredictable owners of critical internet infrastructure.

Economics

- Countries may need to conduct a complex balancing act among their strategic interests, their core values, and their ability to remain globally competitive.
- A less open and cooperative global trade environment may arise if international tensions, ideological movements, or attempts to secure supply chains drive the widespread adoption of protectionist industrial and trade policies.
- Significant revision of global supply chains could also open doors to new markets for businesses based in states with advantageous geographic positions, skilled labour pools, and stable social conditions.

- Inefficient allocation of resources, market distortions, and rent-seeking behavior among businesses may arise if governments take a more active role in prioritizing certain sectors and technologies.
- As more jobs become automated, there may be increased international competition for skills that are both difficult to automate and traditionally undervalued – e.g., those of care workers.
- If disruptions to work become so frequent that workers struggle to meet their basic needs, some states may find their international position weakened by social disruptions or mass outmigration.

Values and ethics

- A new source of international tension may emerge if global governance structures for emerging technologies that reflect human-centric, sustainable, and democratic values core to some states alienate key actors with different priorities and values.
- Reliance on biased AI or data in future decision-making processes may lead to choices that perpetuate exclusion and undermine states' social cohesion and economic potential.
- Difficulties aligning values and ethics formulated for a physical world with the realities of emerging digital worlds may force decision-makers to rethink a range of assumptions around economic growth, immigration, social cohesion, intelligence gathering, democratic processes, and national security.

Conclusion

The term “geotechonomics” draws attention to how the interactions of geopolitics, economics and technological development are reshaping the world in increasingly profound and unpredictable ways. As a result of these interactions, governments may need to be open to fundamentally rethinking three kinds of relationships:

First, **their relationship with big technology companies.** These companies are not only critical to economic performance, but also increasingly able to influence the trajectory of diplomatic and military encounters. Maverick tech CEOs may come to rival national leaders as players on the international stage.

Second, **their relationships with other governments.** Technology is opening new ways for states to collaborate on cross-border problems, and new ways for them to attack each other. It is rendering old international agreements obsolete, while widening ideological divides that make it hard to reach new agreements.

Third, **their relationship with their own citizens.** Technology allows people to spend time in virtual communities that mean more to them than their local, physical communities. For some, it opens the option to work in different countries to their employers. For others, it undermines the ability to meet their basic needs.

Whether the world evolves towards stability and prosperity, or division and insecurity, will depend largely on how decision-makers manage the emergence of new roles and responsibilities in each of these relationship types.

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Endnotes

[1] Win Aung, "Conflict Trends in 2023: A Growing Threat to Global Peace," *Vision of Humanity*, Institute for Economics & Peace,
[2] Comfort Ero and Richard Atwood, "10 Conflicts to Watch in 2024", 1 January 2024,
[3] Sheena Chestnut Greitens and Isaac Kardon, "Playing Both Sides of the U.S.-Chinese Rivalry", *Foreign Affairs*, March 15, 2024,
[4] Heather Conley et al, "Alliances in a Shifting Global Order: Rethinking Transatlantic Engagement with Global Swing States", German Marshall Fund of the United States, May 2, 2023, Cliff Kupchan, "6 Swing States in the Global South Will Decide Geopolitics", *Foreign Policy*, June 6, 2023.
[5] Stephen Webber, "Threats to America's Critical Infrastructure Are Now a Terrifying Reality," RAND, February 12, 2024,
[6] "Authoritarian Rule Challenging Democracy as Dominant Global Model", Freedom House, February 24, 2022.
[7] Ishaan Tharoor, "Russia's farce election sums up a grim moment in global democracy", *Washington Post*, March 18, 2024,
[8] Madeleine North, "Life Expectancy: Countries Addressing Ageing Populations," *World Economic Forum*, September 2023,
[9] "Africa's population explosion is a ticking time bomb – African Development Bank Governors", African Development Bank Group, March 7, 2018,
[10] "Amsterdam City Doughnut", Doughnut Economics Action Lab, July 7, 2020,
[11] "Circular economy action plan", *European Commission*,
[12] Eric Schmidt, "Innovation Power: Why Technology Will Define the Future of Geopolitics", *Foreign Affairs*, February 28, 2023,
[13] Jill Lepore, "The X Man: *How Elon Musk Went from Superhero to Supervillain", The New Yorker*, September 11, 2023,
[14] Lori Gordon and Karen Jones, "Global Communications Infrastructure: Undersea and Beyond", Center for Space Policy and Strategy, February 2022,
[15]Sabine Siebold, "NATO says Moscow may sabotage undersea cables as part of war on Ukraine", *Reuters*, May 3, 2023,
[16] Dan Milmo and Kiran Stacey, "It's not clear we can control it': what they said at the Bletchley Park AI summit", *The Guardian*, November 1, 2023,
[17] Laurie Clarke, "Tech ambassadors are redefining diplomacy for the digital era", Tech Monitor, February 16, 2021,
[18] Amy Studdart, "How Technology is Unravelling the Global Order", German Marshall Fund of the United States,
[19]Amy Studdart, "How Technology is Unravelling the Global Order".
[20] Michèle A. Flournoy, "AI Is Already at War", Foreign Affairs, October 24, 2023,
[21] Andy Greenberg, "The International Criminal Court Will Now Prosecute Cyberwar Crimes", *Wired*, September 7, 2023,
[22] Amy Studdart, "How Technology is Unravelling the Global Order", German Marshall Fund of the United States,
[23] James Clayton, "'Overwhelming consensus' on AI regulation – Musk", *BBC News*, 14 September, 2023,
[24] Mercy A. Kuo, "'Digital Empires': The China-EU-US Competition Over Tech Regulations", The Diplomat, October 12, 2023,

[25] Mercy A. Kuo, "'Digital Empires'".
[26] Mercy A. Kuo, "'Digital Empires'".
[27] Ludovic Subran, "Will Critical Minerals Get Their Own OPEC?", Project Syndicate, August 16, 2023,
[28] Raj Varadarajan, Gary Wang, Michael McAdoo, and Marc Gilbert, "The Unwinding of Global Tech Supply Chains" *BCG*, March 22, 2023,
[29] "Abu Dhabi's TII unveils its Falcon 40B AI model open source", *Gulf Business*, May 25, 2023,
[30] Mike Bechtel, "Reimagining tech talent", Deloitte Insights, December 6, 2022,
[31] "Attracting tech talent to Canada", Government of Canada,
[32] "e-Residency vs digital nomad visa", Government of Estonia, Sharmishta Sivaramakrishnan, "3 reasons why Singapore is the smartest city in the world", World Economic Forum, November 14, 2019."The UAE's Future Roadmap", UAE, Saemoon Yoon, "This is how South Korea can become a global innovation hub", *World Economic Forum*, January 31, 2022,
[33] Cliff Kupchan, "6 Swing States in the Global South Will Decide Geopolitics", June 6, 2023, Foreign Policy,
[34] Ivan Kratsev, "Middle Powers are reshaping geopolitics", *Financial Times*, November 18, 2022,
[35] Mohammed Al Asoomi, "UAE and Saudi Arabia joining in BRICS will be game changing", *Gulf News*, November 23, 2022. Antony Sguazzin and S'thembile Cele, "BRICS Membership Expansion Plan Draws Interest From More Than 40 Nations", *Bloomberg*, July 20, 2023, Ivan Kratsev, "Middle Powers are reshaping geopolitics". Cliff Kupchan, "6 Swing States in the Global South Will Decide Geopolitics", June 6, 2023, Foreign Polic.
[36] "Inclusion and respect for diversity", Government of Canada. Eric Rosenbach Katherine Mansted, "The Geopolitics of Information", Belfer Center for Science and International Affairs, May 28, 2019. "Canada's Tech Talent Strategy", Government of Canada. Emily Glassberg Sands and Vinod Bakthavachalam, "Ranking Countries and Industries by Tech, Data, and Business Skills", *HBR*, May 27, 2019,
[37] Sujai Shivakumar, Gregory Arcuri, and Charles Wessner, "The Great Rewiring: How Global Supply Chains Are Reacting to Today's Geopolitics", *Center for Strategic and International Studies,* July 25, 2022,
[38] Oliver Telling and Christine Murray, "Global pre-Christmas trade at risk from twin canal crises", *Financial Times*, December 8, 2023. "The tricky restructuring of global supply chains", *The Economist*, June 16th 2022. Peter Iglinski-Rochester, "Global supply chains face the worst disruptions in decades", *World Economic Forum*, July 5, 2022, Amitendu Palit, "The Geopolitical Imperative for Reorganising Global Supply Chains", *Observer Research Foundation*, August 14, 2022. Ling S. Chen and Miles M. Evers, "Wars without Gun Smoke": Global Supply Chains, Power Transitions, and Economic Statecraft", *MIT Press*, October 1, 2023. "Africa Rising: Niger Bans Uranium and Gold Exports To France", *Covert Geopolitics*, August 2, 2023,
[39] Michael Wolf, "China's disruption in global supply chains", *Deloitte Insights,* 4 December 2020,
[40] "One Year after the CHIPS and Science Act, Biden-Harris Administration Marks Historic Progress in Bringing Semiconductor Supply Chains Home, Supporting Innovation, and Protecting National Security", The White House, August 9, 2023,

[41] Sujai Shivakumar, Gregory Arcuri, and Charles Wessner, "The Great Rewiring: How Global Supply Chains Are Reacting to Today's Geopolitics", *Center for Strategic and International Studies,* July 25, 2022,
[42] Jane Nakano, "The Geopolitics of Critical Minerals Supply Chains", *Center for Strategic and International Studies*, March 2021,
[43] Mark Emmer, "Why Vertical Integration Is The Path To Strategic Advantage", Forbes, January 29, 2024,
[44] Pepe Rodriguez, Stefan Gstettner, Ashish Pathak, Ram Krishnan, and Michael Spaeth, "Why AI-Managed Supply Chains Have Fallen Short and How to Fix Them", *BCG*, September 1, 2022,.
[45] "Using Blockchain to Drive Supply Chain Transparency and Innovation", *Deloitte US*,
[46] Anna Iuchanka, "Feature IoT in Supply Chain Management: Uses and Examples", *Automation.com*, January 22, 2024,
[47] "How 3D Printing is Shaping the Supply Chain of the Future", *HDI Global*, 27 May, 2021,
[48] "Attempts to make supply chains "resilient" are likely to fail", *The Economist*, October 2, 2023,
[49] "'Five Eyes" intelligence leaders warn of China's global espionage campaign", *CBS News,* October 23, 2023.
[50] Hiroyuki Suzuki, "Building Resilient Global Supply Chains: The Geopolitics of the Indo-Pacific Region", *Center for Strategic and International Studies*, February 19, 2021,. Francesco Guerrera, "Globalization woes create new winners and losers", Reuters, October 17, 2023,
[51] "Attempts to make supply chains "resilient" are likely to fail", *The Economist*, October 2, 2023,
[52] Florence Jaumotte, Subir Lall, Chris Papageorgiou, and Petia Topalova, "IMF Survey: Technology Widening Rich-Poor Gap", *IMF*, October 10, 2007, "Technology and Innovation Report 2021", *UNCTAD*,
[53] Sujai Shivakumar, Gregory Arcuri, and Charles Wessner, "The Great Rewiring".
[54] David Ehl, "Africa embraces Huawei tech despite security concerns", *DW,* February 8, 2022.
[55] Allie Funk, Adrian Shahbaz and Kian Vesteinsson, "The Repressive Power of Artificial Intelligence", *Freedom House,* 2023. Veenu Rani and Munish Kumar, "Human gait recognition: A systematic review", *Multimed Tools Appl* 82, 37003–37037, March 17, 2023.
[56] "Recommendation on the Ethics of Artificial Intelligence", *UNESCO*, 23 November 2021, p. 10.
[57] "Recommendation on the Ethics of Artificial Intelligence", UNESCO, 23 November 2021
[58] Crystal Grant, "Algorithms Are Making Decisions About Health Care, Which May Only Worsen Medical Racism", *ACLU*.
[59] Praxis.
[60] Afropolitan: A Digital Nation.
[61] Nick Kelly and Marcus Foth, "Here's why Tuvalu is planning to upload itself to the metaverse", *World Economic Forum*, November 25, 2022.
[62] Ward Williams, "Countries Offering Digital Nomad Visas", *Investopedia*, December 20, 2023.
[63] Biskaabiiyaang: The Indigenous Metaverse.