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Principles for Quantum Governance: Kananaskis and Beyond

Michael P. A. Murphy and Tracey Forrest

Key Points

- Quantum science and technology (S&T) is at a crucial point of development, with a short window for policy frameworks to be implemented before the rollout of a class of disruptive technologies.
- Academic and industry communities have a long track record of international collaboration to advance research and development (R&D). An emerging consensus in these communities holds that governments have a role to play in providing a framework for continued collaboration.
- As noted in the "Kananaskis Common Vision for the Future of Quantum Technologies," multilateral institutions can support responsible policy development within and between states by promoting international dialogue and collaboration.

Introduction

The development of quantum S&T has reached a pivotal moment. Industrial expansion, technological breakthroughs and a growing awareness of the present-day threat that quantum computing poses to conventional encryption have combined to clarify the high stakes of quantum S&T policy. Progress in researching the technologies has advanced sufficiently that a sense of use cases and impacts can be explored, but time remains before all tools are operationalized (Coates et al. 2022). Governments around the world are starting to take a more active role in regulating against threats[1] while also supporting the growth of their own domestic quantum ecosystems in hopes of maximizing prosperity gains from high-value industrial development. The recent disruptive impacts of generative artificial intelligence (AI) tools across multiple sectors — and a widespread recognition that regulations came too little, too late, and too disjointed (see, for example, Quaid 2023) — continues to build pressure on world leaders to seize the opportunity to develop smart policy around quantum S&T.

1 For more on the implications of list-based regulation and threat-based framing in quantum policy, see Dekker and Martin-Bariteau (2023) and Murphy and Parsons (2024).

About the Authors

Michel P. A. Murphy is the director of the Centre for International and Defence Policy at Queen's University and president of the Canadian region of the International Studies Association. He holds a Ph.D. from the University of Ottawa, where his dissertation won the 2022 Joseph De Koninck Thesis Prize for making an outstanding contribution to interdisciplinary knowledge.

He is a former Digital Policy Hub fellow at the Centre for International Governance Innovation (CIGI) and was a Banting post-doctoral fellow at Queen's. Michael's current research interests include quantum S&T policy, security studies and international relations theory.

He is the author of *Quantum Social Theory for Critical International Relations Theorists* (Palgrave, 2021) and *Weak Utopianism in Education* (Routledge, 2024), more than 40 peer-reviewed articles and numerous book reviews and chapters, receiving more than 2,000 citations. Michael is an international award-winning educator with a range of teaching experience in international relations, Canadian politics, political theory and public administration.

Tracey Forrest is research director of transformative technologies at CIGI. Her experience spans renewable energy to quantum technologies and has included working with multi-sectoral partners to accelerate the transition from a laboratory curiosity to an impactful device. At CIGI, she leads a network of researchers focused on opportunities and challenges relating to the evolving interface of transformative technologies and international governance.

Tracey is a professional engineer, adjunct professor at the University of Waterloo and former board member of technology and environmentally focused organizations. Over the course of a career in both academia and industry, Tracey has become an authority on thoughtfully bridging emerging technology to high-value applications. She formerly served as a member of the Federation of Canadian Municipalities Green Municipal Fund Council, director of the Transformative Quantum Technologies program at the University of Waterloo, and advisory board chair of the National Research Council of Canada's Nanotechnology Research Centre.

Tracey completed a B.A.Sc. in environmental (chemical) engineering at the University of Waterloo, and a master's degree in energy and environmental economics at the Scuola Mattei, Italy. She completed professional training in topics such as quantum, data science and sustainable business strategy at Harvard University and Massachusetts Institute of Technology.

These events are happening against the backdrop of the United Nations' declaration of 2025 as the "International Year of Quantum Science and Technology" and on the shifting sands of an increasingly uncertain geopolitical environment. The quantum sector is particularly vulnerable to these tensions as an area requiring collaboration between research, industry and government actors to facilitate the realization of promising technologies and the stabilization of complex supply chains. International fora such as the Group of Seven (G7) have an important opportunity at this pivotal moment to find common terms for engagement in the sector (Forrest, Samson and Laflamme 2024; Murphy 2025). The recent "Kananaskis Common Vision for the Future of Quantum Technologies," the communiqué released following the G7 Kananaskis Leaders' Summit in May 2025, recognizes the significance of the issue area, including both the potential for innovation to drive new economic development as well as the potential risks of new cyber threats (G7 2025b).

As the G7 leaders' statement makes clear, there are two competing frames present in discussions of quantum S&T policy. The first frame portrays quantum as a source of new security threats. Policy debate in this frame is likely to focus on defence against the actions of "bad actors" who access quantum technologies, or perhaps on the ability of a country to acquire quantum technologies that can serve as offensive capabilities for military or intelligence purposes. A second frame foregrounds the economic potential of quantum S&T to launch high-value industrial development. Work in this frame is more likely to approach quantum S&T as a policy question, not unlike in other research-intensive domains where start-up/scale-up support can drive economic development. When one frame becomes dominant, policy can miss the critical issues raised in the other half of the quantum story (Murphy and Parsons 2024). The G7 cycle during Canada's presidency in 2025 has offered an important case study for the importance of finding a balance between the two frames.

In order to achieve a robust policy approach, this brief sets out a series of principles that can help policy makers consider both economic and security frames. This project draws on a key informant survey conducted as part of CIGI's Vision for the Future of Quantum Technologies project (Forrest and Murphy 2025) — a closed-door expert roundtable on quantum policy held during the Think7 or T7[2] summit in Waterloo, Ontario, Canada, in April 2025 — as well as related T7 publications, communiqués and priority statements from the G7 cycle, and academic literature. The first section of the brief discusses the balance of policy frames in the lead-up to the June 2025 G7 leaders' summit in Kananaskis, Alberta, Canada, while the second places these meetings in the broader context of international cooperation and consensus in quantum S&T. The middle sections of the brief present the core governance principles related to clarity and collaboration in the sector, which provide a background for the recommendations offered. The conclusion places the moment of the Kananaskis G7 summit in the broader context of future-facing conversations on quantum governance.

Security, Prosperity and Balance

The competition between security and economic frames for quantum policy poses a challenge for decision makers. Quantum S&T is a complex policy domain with risks and opportunities to consider, including incentives to spur economic growth, regulation to protect societal well-being, coordination of complex supply chains, accessibility of critical technologies internationally, and the tension between open-access and intellectual property (IP) protection incentives. Key moments up to and including the Kananaskis leaders' summit demonstrate the shifting balance between security and prosperity frames: among them, the April T7 summit and communiqué, the finance ministers and central bank governors' meeting and communiqué, Canada's G7 priority statement and the G7 Leaders' Summit and communiqué.

The T7 process discussed quantum S&T policy through policy briefs as well as discussions at the T7 summit; the latter content was reflected in the summit communiqué. In their T7 policy brief, Ludovic Perret and Grégoire Ribordy (2025) argue for greater global collaboration to accelerate the transition to

2 The T7 is an official engagement group of the G7 that brings together think tanks and research centres to bring forward expert policy advice to the G7 president and other nations. During Canada's G7 presidency in 2025, CIGI served as the organizing body for the T7 and hosted its summit. Comments made during the expert sessions were made on a not-for-attribution basis and are summarized below.

quantum-safe communication. Specifically, Perret and Ribordy criticize the lack of coordinated dates for transition timelines, with dates varying among allied nations and many regulators lacking clear milestones (ibid., 4–5). They propose the creation of a G7-based observatory that would promote the coordination and harmonization of standards among other efforts, the establishment of a code of conduct for G7 engagement with quantum technologies, and the investment into hybrid quantum-safe systems (ibid., 5–6). The second T7 policy brief on quantum technologies was written by Tina Dekker, Lisa Lambert and Florian Martin-Bariteau (2025); they argue that current export control policies are hindering the progress of quantum technology development and that a risk-based regulatory framework should replace current list-based controls (ibid.; see also Dekker and Martin-Bariteau 2023). Further, the authors propose the creation of a G7 point-of-contact group to support ongoing collaborative efforts around trade, market access and supply chains (Dekker, Lambert and Martin-Bariteau 2025, 8). The T7 summit communiqué provided two direct recommendations relating to quantum policy in line with the policy briefs, in addition to referencing quantum technologies as a key example of how "governance must evolve in step with complexity" (T7 Canada Task Forces Chairs and Co-Chairs 2025, 3). The first recommendation specifically argued that "the G7 should establish a Quantum Points of Contact group…to facilitate structured information exchange, coordinate mapping of supply chain interdependencies and promote shared benchmarks and indicators to guide collective action," while the second suggested that "the G7 should establish a Quantum-Safe Transition Observatory to promote coordinated actions to mitigate quantum-related risks, track implementation progress, benchmark national efforts and identify gaps across jurisdictions" (ibid., 4). Across the policy briefs and summit communiqué, the T7 process demonstrated a balance between security frames — notably in terms of the need for quantum-safe encryption — and economic opportunity, especially around the strengthening of cooperative frameworks and supply chains.[3]

The following month, finance ministers and central bank governors of the G7 nations met in Banff, Alberta, Canada, to discuss issues of interest, and the B7 group of senior industry leaders met in Ottawa, Ontario, Canada. After the finance ministerial meetings, a joint communiqué was issued by the attending parties; for Canadian Finance Minister François-Philippe Champagne, this document was a "proof of unity" between G7 members, despite geopolitical and macroeconomic uncertainty (Scace 2025). There is only one direct mention of quantum technologies within the communiqué, appearing in the discussion of emerging issues in the financial sector. Specifically, paragraph 18 notes that "the potential effects of quantum technologies on the global financial landscape are becoming increasingly visible. Our central banks will explore how we can identify, categorize and mitigate potential risks to data security and financial stability and promote economic resilience" (G7 2025a, 3). Other references in general to new technological tools may apply to some quantum technologies, such as potential applications of quantum computing to counter illicit financial activities (ibid., 8; see, for example, Department for Science, Innovation and Technology and The Rt Hon Peter Kyle MP 2025). In Ottawa, the B7 summit's final communiqué employed a similar framing for quantum technologies, which appear only in the context of cybersecurity. B7 leaders called for collaboration between industry, academia and government to "combat next generation cyber threats from AI and quantum computing" (Canadian Chamber of Commerce 2025, 57). In both of these instances, it is notable that the only direct mention of quantum technology takes an entirely security-focused framing, highlighting the threat posed by quantum technologies without acknowledging the potential for these same technologies to support global prosperity.

Between the finance ministerial and the Kananaskis Leaders' Summit, Canadian Prime Minister Mark Carney announced the priority agenda items that Canada has set as host to the G7 meetings. The second "core mission" in the statement directly addresses quantum technologies by stating the priority of "using artificial intelligence and quantum to unleash economic growth" (Prime Minister of Canada 2025c). The statement also outlines broader points about the intended approach. The statement notes that the discussions will constitute "a forward-looking agenda that engages partners beyond the G7, recognizing that our long-term security and prosperity will depend on building coalitions with reliable partners and common values" (ibid.). This emphasis on building coalitions and working to bolster global prosperity is an important context for the economic opportunity framing of quantum technologies. In

3 In particular, emphasis on the importance of collaboration to set clear guidelines and maintain dialogue through multinational institutions aligns directly with the CIGI stakeholder survey and the Kop et al. guidelines discussed above (Forrest and Murphy 2025; Kop et al. 2024).

contrast to the focus of the finance ministers on the potential threats to the financial system posed by quantum technologies, the prime minister centres this commentary in terms of the economic opportunities provided by emerging technologies.

The "Kananaskis Common Vision for the Future of Quantum Technologies," released at the G7 Leaders' Summit, was a landmark document in setting out a path forward for international cooperation (G7 2025b). The statement sets out a series of

Box 1: Commitments in the "Kananaskis Common Vision for the Future of Quantum Technologies"

- **Promote public and private investment in quantum science and technology** R&D, responsible innovation and commercialization; and support partnerships between researchers, industry and other stakeholders to accelerate commercialization and attract private investment.
- **Promote the development and adoption of beneficial applications of quantum technologies** in a variety of sectors, including those developed by small- and medium-sized enterprises (SMEs).
- **Support opportunities for all stakeholders to meaningfully participate** as creators, stakeholders, leaders and decision-makers at all stages of the R&D and implementation of quantum technologies.
- **Support initiatives, exchange best practices and promote workforce development policies** for all, including women as well as communities left behind by globalization, to equip individuals with the skills needed for new jobs in the quantum sector. These include apprenticeships; science, technology, engineering and mathematics (STEM) and computer science education; and mentorship.
- **Support an open and fair market environment and trusted ecosystem among likeminded partners** through measures such as international exchanges between academia and industry, preventing the leakage of sensitive technologies, protecting intellectual property rights, and promoting greater interoperability.
- **Promote trust in quantum technologies** through public and international dialogues, based on scientific expertise and aligned with democratic values, freedom and fundamental rights, recognizing that, at this early stage of innovation, a global regulatory framework is not yet appropriate.
- **Increase understanding of risks associated with quantum technologies** across different sectors; secure quantum supply chains; ensure the security and integrity of research; and promote the timely adoption of quantum-resilient security measures and solutions for protecting data and communications networks.
- **Intensify collaboration between trusted national measurement institutes**, including via the NMI-Q initiative, to drive forward essential measurement and testing work amongst likeminded partners.
- **Collaborate through a G7 Joint Working Group on Quantum Technologies**, with industry, experts and academia to inform cooperation on research, development and commercialization including through voluntary joint calls for projects between different members; advance policy dialogues on approaches to innovation and adoption; and assess the potential societal impacts of these technologies as they progress towards commercial and defense applications. (Emphasis added; G7 2025b)

commitments, presented in Box 1. The commitments include both economic and security signals, with a greater emphasis on the former through promises to promote R&D, commercialization and application, market development and other efforts. Recognizing the importance of broad, multi-stakeholder support, the common vision also emphasizes the importance of raising public awareness and trust, coordinating standards[4] and fostering an open dialogue. However, this economic focus does not overshadow the existence of risks; there is a direct call, in line with that of the finance ministers, to "increase understanding of risks associated with quantum technologies across different sectors" (ibid.). Significantly, the statement also set in motion a G7 Joint Working Group on Quantum Technologies, tasked with continuing a multi-stakeholder dialogue and supporting international cooperation and access for research and commercialization, among other priorities. The recognition of ongoing engagement as a necessary element to successful quantum strategy may help ensure a platform for regulation or standard setting at a later date.

The public statements from the first half of the 2025 G7 cycle have raised a number of important issues relating to the security and economic implications of continued development in quantum S&T. Moving forward, discussions at multilateral tables must maintain this scope and balanced framing. The following sections outline three principles that can support this holistic perspective.

Principle One: International Collaboration

Collaborative work has always been central to the development of quantum S&T, from the academic networks that helped research reach experimental breakthroughs to the industry associations that have built supportive communities of practice. Many of these cooperative endeavours have been multinational in scope, crossing borders to facilitate the exchange of ideas between academic and industry leaders. Respondents to the CIGI key stakeholder survey on a vision for the future of quantum technologies showed a strong consensus that government leaders should come together to state shared principles and commit to furthering collaboration in the quantum sector (Forrest and Murphy 2025).

Bilateral agreements to promote cooperative R&D efforts have been a frequent governmental framework to support this work. For example, the Canada-UK transatlantic quantum communication initiative provides a framework for public and private sector actors to collaborate in the development of resilient and secure communications infrastructure (Prime Minister of Canada 2025b). Similarly, the recent EU-Canada "Strategic Partnership of the Future" further outlines a commitment to research and industrial cooperation on quantum S&T within the context of a broader EU-Canada Digital Partnership (Prime Minister of Canada 2025a). Within the defence context, the North Atlantic Treaty Organization's (NATO's) recent "Hague Summit Declaration" signals further support for industrial cooperation across allied nations to support the development of emerging technology, noting the importance of the "spirit of innovation to advance our collective security" (NATO 2025, para 4). Signals such as these to support R&D will de-risk the formation of innovative international partnerships between public and private institutions alike.

The next phase of development for the quantum S&T ecosystem will see these existing partnerships continue, with other critical collaborative efforts required (Kop et al. 2024; Forrest and Murphy 2025). The development of international talent pipelines will help highly qualified personnel connect with the firms where their particular skills can be best put to use.[5] Complex supply chains will require the coordination of raw materials, components and the expertise of processing to be fine-tuned in order that technologies may be assembled at fieldable scale.

4 With a notable caveat that the statement declares that the sector is at too early a stage for global regulation.

5 This is not a straightforward policy question, as mobility will have to be weighed against the possible threat of a "brain drain" phenomenon from countries unable or unwilling to invest in domestic technological sovereignty.

Principle Two: Clear and Common Timelines

Governments and multilateral institutions have a role to play in establishing clear and common timelines that anticipate quantum technology progress. This is true particularly in the context of the broader transition to quantum-safe communications, but also in terms of signalling dependable investment in dual-use technologies within the context of expanding defence spending.

The CIGI key stakeholder survey found a strong consensus in favour of promoting an accelerated transition to quantum-resilient cryptographic protocols to ensure continued data security and system interoperability (Forrest and Murphy 2025), a priority shared by thought leaders in academia (Kop et al. 2024, 4). These include setting start dates for the transition of critical digital infrastructure and dates by which new government procurement processes will require quantum resilience (whether post-quantum cryptography or quantum key distribution). Timelines should also provide more granular details around interim milestones for implementation of quantum-safe systems. For example, the recent EU roadmap on post-quantum cryptography defines three milestone dates that support member states' preparations and enactment of post-quantum cryptography transition programs (European Commission 2025, 17). The development of clear and common timelines through multinational institutions can help support the work of both government and industry in the quantum-safe transition. Common timelines can help to benchmark national progress against international yardsticks and better target domestic regulations and incentives through efficient policy. From the perspective of industry, a common commitment across like-minded nations can help guide investment into the sector. This could be especially beneficial for SMEs, which would then encounter less uncertainty in targeting their investment. While often framed as a policy matter concerned with resilience against new security threats, clear and common timelines around quantum-safe transitions can serve as economic development via market signalling.

At the same time, international agreements and national commitments to increase rates of defence spending and investments in emerging technology can support industrial development of quantum technologies. Although not directly naming quantum, allied nations signing onto "The Hague Summit Declaration" "reaffirm [a] shared commitment to rapidly expand transatlantic defence industrial cooperation and to harness emerging technology and the spirit of innovation to advance our collective security," and specifically commit 1.5 percent of GDP spending to — among other purposes — "protect our critical infrastructure, defend our networks, ensure our civil preparedness and resilience, unleash innovation, and strengthen our defence industrial base" (NATO 2025). Given the widespread recognition of the dual-use nature of quantum computing, sensing and communications, these high-level commitments to increased defence spending to acquire cutting-edge technological capabilities could reasonably be interpreted as a sign of future public investment in quantum technologies. However, achieving clarity in priorities and developing common timelines across the alliance will help amplify and focus this market signal, further helping to spur private investment in the sector.

Principle Three: Ongoing Multilateral and Multi-stakeholder Dialogue

There are multiple roles for government actors to play in supporting the continuation and expansion of these collaborative endeavours to foster the quantum sector. Robust consultation with industry to better understand the intricate supply chains and talent pipelines in the domestic quantum sector — not only big tech firms but also SMEs — will ensure that policy and regulatory decisions are informed by current needs of the domestic industry. This collaborative approach to regulatory design can build on existing goodwill in the industry, such as IonQ's discussion of regulation for the quantum industry "not as constraints, but as guideposts."[6] Governments can support cooperation by establishing R&D agreements with like-minded nations and negotiating mutual market access guarantees for fieldable technologies.

CIGI stakeholder survey respondents and academic experts alike note the value of multilateral institutions as platforms for ongoing multi-stakeholder dialogue (Forrest and Murphy 2025; Kop et al. 2024). With a fast-moving industry situated in an uncertain geostrategic environment, effective frameworks for

6 See https://ionq.com/globalexportcompliance.

information sharing are essential. The development of robust institutions would build on the path-breaking work of focused multi-state efforts such as the Multilateral Dialogue on Quantum[7] or the Organisation for Economic Co-operation and Development's Global Forum on Technology focus group on quantum (Organisation for Economic Co-operation and Development 2025). Similarly, the World Economic Forum's work on quantum governance principles has been particularly notable in exploring the tension between open innovation to promote accessibility and IP protections to promote industrial development and prosperity (Coates et al. 2022). The joint working group announced by G7 leaders is a promising initiative (G7 2025b), although diverse membership will be critical to its success in practice.

Robust multilateral and multi-stakeholder dialogue can help promote clear regulatory design and facilitate international cooperation, including public-private partnerships. The development of multiple options for participation can permit the development of concentric circles of collaboration, where nations with closer ties can cooperate more intently. Stakeholders in quantum policy are necessarily diverse, including governments, universities, international organizations, private sector actors developing and using technologies, developers, and consumers (Coates et al. 2022, 7–8). Dialogue between a wide range of partners can help ensure that policy decisions reflect emerging issues identified by stakeholders. Indeed, the acknowledgement by G7 leaders that "achieving quantum technologies' full potential will require international collaboration between governments, researchers and industry" (2025b) is an important signal to this end. As this work carries forward — within countries and in multilateral contexts such as the joint working group — support for international collaboration will be essential for the continuation of momentum toward quantum technological discoveries.

Recommendations

- Multilateral institutions and their member states, who are already recognizing the necessity of quantum-resilient security measures,[8] should set clear and common timelines for beginning and progressing through the transition to quantum-safe networks. This commitment should be supported through ongoing knowledge-sharing between government actors in partner states, ongoing consultation with industry partners and other forms of international collaboration.
- Institutions such as the G7 should also consider how to foster ongoing quantum policy conversations.[9] States, industry and academic actors, and civil society organizations can further consider what new multilateral, minilateral and bilateral partnerships can be developed to channel the momentum of a growing consensus into policy decisions. Ensuring a diverse range of stakeholders can avoid the potential blind spots created by overreliance on either a security or economic framing of the issue area.
- Informed by their international commitments and consultations with their domestic industry, governments can clarify and sharpen their policy and regulatory frameworks related to quantum S&T and build anticipatory capacity. This includes incentives and investments, tax policy, higher education and training programs, and export policy.

Conclusion

Quantum S&T policy is at a critical moment. Technologies are close enough to realization that their potential impacts are recognizable, but it is not yet too late to take action. The recent example of AI demonstrates that patchwork policy produces suboptimal results and can stifle the economic promise of technology innovators. "The Kananaskis Common Vision for the Future of Quantum Technologies" is a strong signal that G7 leaders recognize the significance of continued cooperation between governments to support responsible innovation in the sector. Continued work at G7 and other tables must consider how it can support the principles of international collaboration, clear and common timelines and multilateral and multi-stakeholder dialogue.

7 See www.quantumwithoutborders.org/multilateral-dialogue-on-quantum.

8 See, for example, the discussions at the summit of G7 finance ministers and central bank governors (G7 2025a).

9 Including, but not limited to, the use of formal joint working groups, such as the one promised in the Kananaskis common vision document (G7 2025b).

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