



THE CAROLINA PRINCIPLES FOR EMERGING TECHNOLOGIES

We, Ministers of the G20 who assembled in Chapel Hill, believe that emerging technologies have the potential to unlock prosperity and expand opportunities for all our peoples by driving productivity and economic growth, creating new jobs, and improving quality of life.

Realizing these benefits will require all levels of government to design and adopt policy frameworks that intentionally promote innovation by accelerating scientific and technological development, encouraging private sector investment, and promoting collaboration across public, private, academic, and other sectors to enable secure, reliable, trustworthy, and widespread deployment and adoption.

In crafting policy frameworks for emerging technologies, governments should draw lessons from how mature technologies evolved under prior policy frameworks across our respective economies. History demonstrates that, although technologies differ, governments repeatedly confront common policy considerations and priorities in their development and deployment, including how to incentivize investment, provide policy clarity and predictability while enabling innovation, and build public trust to support broad, beneficial adoption and commercial deployment. Many of these considerations arise at distinct stages of the science and technology development lifecycle, from early research and development (R&D) through commercialization and deployment.

Identifying robust policy principles and approaches that address these recurring considerations can provide a foundation for governments to develop adaptable policy frameworks that unlock the benefits of current and future technologies. Recognizing each member's respective legal frameworks and unique national circumstances, and that emerging technologies may differ in their pace of development and level of maturity, these principles should be applied in a flexible manner. These principles respect and uphold members' commitments to fundamental freedoms. We call on members to develop their own policies and preserve national sovereignty in the governance of emerging technologies, while allowing for engagement in international discussions.

Accordingly, we, Ministers of the G20 who assembled in Chapel Hill, support the following shared *Carolina Principles for Emerging Technologies*:

I. Advancing Discovery and Strengthening Technology Development

We aim to:

1. **Invest in and promote foundational research with the aim of attracting private sector investment**, including through different types of public-private cooperation mechanisms, recognizing its importance in driving scientific breakthroughs and commercialization, to support the growth of local innovation ecosystems and advance prosperity for all our peoples.



2. **Encourage blended financing mechanisms across technology readiness levels (TRLs)**, leveraging, where appropriate, public, private, and venture capital to support full innovation pipelines from basic research through technological development, scaling, and deployment. Efforts should be made to coordinate research funding in a manner that strengthens scientific knowledge, enhances efficiency, and maximizes impact, to ensure that innovation promotes prosperity and opportunity for all our peoples.
3. **Support enabling research, technology, and data infrastructure** for institutions, researchers, and the private sector, where necessary, to accelerate responsible experimentation and testing, thereby strengthening the broader R&D ecosystem.
4. **Streamline administrative requirements for government R&D funding** by simplifying application, reporting, and grant management processes to reduce administrative burden while ensuring transparency and accountability, and broad participation in publicly supported R&D initiatives.
5. **Inform government R&D priorities through dialogue with the private sector and academia** to better align public investment and priorities with the scientific and technological breakthroughs needed to enable commercialization and adoption.
6. **Incentivize the translation of government-funded technologies, projects, and knowledge** toward commercially relevant applications to accelerate market development for emerging technologies by establishing integrated lab-to-market pipelines linking research, micro, small, and medium enterprises (MSMEs), industry, and investors.
7. **Leverage lessons learned to accelerate future scientific and commercial breakthroughs** by preserving and sharing intermediate results and knowledge from discontinued projects with individuals, researchers, and the private sector, while respecting applicable legal frameworks on privacy, security, data protection, and intellectual property (IP) rights.

II. Accelerating Validation and Commercialization

We aim to:

1. **Provide flexible regulatory sandboxes and experimental exemptions from select regulatory provisions** where appropriate in supervised environments, while maintaining appropriate risk management as permitted under applicable legal frameworks, to reduce unnecessary barriers to scientific and technological research and accelerate scientific discovery.



2. **Deploy results-based funding mechanisms** where conventional funding structures inadequately incentivize targeted technical breakthroughs, accelerating validation and deployment of emerging technologies.
3. **Support real-world testing environments** including regulatory sandboxes, testing infrastructure, data infrastructure, and technical facilities, and opportunities to integrate relevant voluntary, market-driven, and industry-led standards early in the technology development process, where existing pathways are insufficient to assess feasibility or performance of emerging technologies.
4. **Incorporate data and feedback from real-world testing and regulatory sandboxes** to establish the appropriate policy framework conditions and inform the revision or development of effective and appropriate regulations.
5. **Support the streamlining of permitting and approval processes** for pilot projects or demonstration activities related to emerging technologies, recognizing that supervised environments carry lower risk and therefore warrant consideration of expedited review.
6. **Establish clear pathways and guidelines for early adopters** to facilitate initial operational deployment of emerging technologies where additional real-world validation is needed to assess performance, usability, or operational feasibility.
7. **Leverage innovation-focused public procurement to create early markets for emerging technologies**, stimulate private investment, expand and strengthen public services, and support the scaling and adoption of innovative solutions, subject to applicable conditions, while ensuring transparent, competitive, and innovation-friendly procurement practices.
8. **Promote the dissemination of research outcomes for commercialization** by providing services that connect researchers with the private sector, identify their respective needs, and support pathways to commercialization.

III. Enabling Technology Adoption

We aim to:

1. **Apply existing sector-specific regulatory frameworks to emerging technologies**, where appropriate, to leverage domain expertise, enforcement tools, and contextual understanding of risks to govern their use, incorporating lessons learned across technology applications.
2. **Focus any new regulation on novel considerations** that existing legal frameworks cannot adequately address, and scope new rules to address gaps rather than duplicating existing protections.



3. **Provide regulatory clarity** by relying on existing legal frameworks where possible, while engaging closely with regulators and providing them with flexibility to determine the appropriate pathway where existing frameworks do not fit neatly, and ensuring that, once established, the pathway remains clear, stable, transparent, evidence-based, and predictable for those relying on it.
4. **Promote performance-based and outcome-oriented standards**, including international standards in standards development organizations, in order to allow regulatory goals to be met through different technical approaches and continuous improvement. This should be informed where appropriate by a balance of risk considerations and opportunities.
5. **Review and adapt regulatory approaches** and update existing frameworks where evolving technical capabilities or operational evidence demonstrate that existing regulatory requirements are no longer appropriately calibrated to deployed technologies.
6. **Consider the opportunity cost of delayed or forgone adoption**, among other factors, when evaluating regulatory approaches for emerging technologies, recognizing that trustworthy, secure, and timely approaches to adoption can maximize the benefits for our peoples.
7. **Support the widespread deployment of secure, accessible, trustworthy, and interoperable enabling infrastructure** for the development and adoption of emerging technologies.
8. **Support the uptake of emerging technologies** among our peoples by building trust through digital literacy programs, technical workforce development, and technical education and training initiatives developed in partnership with the private sector and other relevant stakeholders.
9. **Promote voluntary international cooperation**, best practice knowledge sharing, capacity building, and voluntary technology partnerships to support the development, accessibility, and adoption of emerging technologies, taking into account the range of innovation ecosystems and stages of technological development, and supporting domestic technological capabilities.