

G7 Science and Technology Ministers' Communique

Sendai, May 12-14, 2023

We, the G7 Science and Technology Ministers, affirm our commitment to the shared values of democracy, rule of law, openness, and respect for freedom and human rights, as well as the importance of diversity, equity, inclusion, and accessibility, including gender equality, in research and development (R&D).

We condemn Russia's aggression against Ukraine as a threat to international order based on the rule of law. Considering the damaging and far-reaching impact that Russia's war against Ukraine has on Ukraine's research infrastructure and human capital, we highlight the importance of addressing research and innovation needs for Ukraine's recovery. We also acknowledge that science, technology, and innovation will play a key role in rebuilding Ukraine as a modern and sustainable economy.

We share a growing concern that some actors may attempt to unfairly exploit or distort the open research environment and misappropriate research results for economic, strategic, geopolitical, or military purposes. This undermines the principles and values that underpin open, transparent, reciprocal, and accountable international research cooperation and the integrity of research and may pose security risks. Addressing this concern should be based on informed decision-making and appropriate risk mitigation measures by G7 and other partners to continuously promote safe, secure, and open international cooperation in research and innovation.

G7 members are working together on these issues to reach a common understanding, for example through the Multilateral Dialogue on Values and Principles in Research and Innovation launched under the EU Global Approach on Research and Innovation, and other multilateral and bilateral efforts.

We recognize the importance of nurturing and sustaining a diverse, inclusive, and highly-skilled workforce and of strengthening networks and promoting the international mobility of scientists, technologists, and other experts. This will help drive scientific and technological innovation, deliver next-stage economic growth and aid development of novel tools against widening inequalities. We are committed to supporting the G7 Gender Equality Advisory Council, which has promoted our shared values on diversity and inclusion, to create a welcoming environment for scientific and research activities free from stereotyping.

We will work together to forge a new generation of scientists and experts across industry, government, academia, and civic groups who can raise public awareness of the crucial role of science, technology, engineering, and mathematics (STEM)

education in shaping our future.

Through international cooperation in research and innovation, we can collectively address urgent global health issues such as the need to develop safe and effective medical countermeasures (MCMs) in the event of a future pandemic as promoted through the 100 Days Mission, including vaccines, diagnostics, and therapeutics, to combat infectious disease threats, as well as tools to address other shared health burdens like cancer. This is with a view to strengthening the global health capacities and architecture, as well as achieving universal health coverage.

The development and governance of emerging and breakthrough technologies are key to resolving societal challenges and can lead to social innovation. Technologies such as artificial intelligence, quantum technology, biotechnology, and fusion, and other clean technologies are central to the green and digital transition as well as to economic and national security. With this in mind and in line with regulatory and non-regulatory frameworks and technical standards, we will pursue the following initiatives to realize an open and evolutionary research ecosystem based on trust.

1. Respect for freedom and inclusiveness in scientific research and promotion of open science

The G7 will collaborate in expanding open science with equitable dissemination of scientific knowledge and publicly funded research outputs including research data and scholarly publications in line with the Findable, Accessible, Interoperable, and Reusable (FAIR) principles. This is so that researchers and people throughout the world can benefit from them as well as contribute to the creation of new knowledge, stimulation of innovation, democratization of access to knowledge by society and the development of solutions for global challenges. This will also help to build more reproducible and trusted research results.

We recognize openness, freedom, and inclusiveness should be enhanced globally for the sound development of scientific research. When making decisions about openness, the respect for universal human rights and the protection of national security are essential, and principles and rules related to academic freedom, research integrity, privacy, and protection of intellectual property rights should be applied and upheld.

We acknowledge that open science platforms can allow the rapid sharing of pathogen samples and pathogen genetic sequence data on a global scale. They should also enable early development and more rapid, effective, and equitable access to MCMs for the prevention and control of emerging and re-emerging infectious diseases. Robust multilateral data sharing is needed to ensure continued societal resilience to the global issues of today and the future.

The G7 also supports immediate open and public access to government-funded scholarly publications and scientific data, and supports the endeavors of the scientific community to address challenges in scholarly publishing for broader sharing of appropriate scientific outputs.

To this end, we support the efforts of the G7 Open Science Working Group in promoting the interoperability and sustainability of infrastructure for research outputs, supporting research assessment approaches that incentivize and reward open science practices, and encouraging “research on research”, aimed at helping to shape a more effective evidence-based research policy.

We acknowledge the importance of responsible and effective science communication to develop public awareness, appreciate scientific research and enhance public trust, by promoting the role of scientific evidence as an important consideration in the decision making of governments and the public. To improve the quality and impact of the interactions of science, policy, and society, the G7 supports the future development of science for policy and science communication. We encourage the involvement of society in research and innovation policies. Therefore, we approve the creation of the G7 Working Group on Science Communication to improve the quality and impact of interactions of science, policy, and society through strengthening the exchange of research and communication practices across these spheres. We encourage other partners with similar values to engage with the G7 and to enable mutual learning in science communication and public engagement.

2. Promotion of trustworthy scientific research through research security and research integrity measures

We believe that openness is fundamental, security is essential, and freedom and integrity are crucial. The G7 reaffirms the importance of common values and principles for global research security and research integrity and their dissemination. We continue to support the efforts of the G7 Security and Integrity of the Global Research Ecosystem (SIGRE) Working Group, which has already developed the documents, “G7 Common Values and Principles on Research Security and Research Integrity” and “G7 Best Practices for Secure and Open Research”, and the online Virtual Academy, to promote research security and research integrity initiatives amongst the G7 community and with a view to future global outreach. We thank the SIGRE Working Group for its contribution to strengthening open, fair, and sound international cooperation and protecting sensitive R&D as well as for the successful outcomes it has delivered.

We recognize that more needs to be done to raise awareness among the research community of the risks of unauthorized knowledge and technology transfer and of foreign interference in research and innovation, and in turn to effectively apply risk mitigating measures wherever necessary.

G7 members continue to encourage regular events (e.g., workshops, discussions) at multilateral and bilateral fora that bring together representatives from academic research communities and governments to discuss challenges surrounding research integrity and security, share the progress of actions under way, and consider the development of roadmaps with priorities for continued engagement.

The G7 faces the challenge of how to tackle various issues emerging in domains that traverse security and economics. We will share effective practices on the protection of R&D from foreign interference, including strengthening the protection of technical information while ethically and responsibly applying advanced technologies that could have multiple uses.

3. International cooperation in science and technology to solve global issues

Transparent, accountable, and reciprocal international science and technology cooperation plays a crucial role in finding innovative solutions to global challenges. Such challenges include: climate change; secure, stable, and sustainable energy supplies; biodiversity loss; water crisis; disruption to and depletion of terrestrial and aquatic ecosystems; communicable and non-communicable diseases; food insecurity; disruptions in global supply chains; and large-scale natural disasters including floods and droughts.

In view of the growing pressures in areas beyond national jurisdiction and the geopolitical impacts of emerging technologies, we are committed to fostering science diplomacy, international collaboration for achieving the Sustainable Development Goals and promoting practical solutions that bring together perspectives from across disciplines, including science, policy, society, and social innovation. Interdisciplinary approaches encompassing all disciplines, including but not limited to social sciences and humanities, natural sciences, medicine and engineering and participatory practices (e.g. citizen science) are also essential to inspire renewed solutions to complex global challenges.

Scientific innovation connecting biological and physical science and economics, should support the measurement, within official statistics, of natural capital accounts and the implementation of the System of Environmental Economic Accounting (SEEA). Primary research, discovery, and new technologies are needed to address these challenges.

With its shared values, the G7 should demonstrate leadership in the following areas.

(1) Promoting Safe and Sustainable Use of Outer Space

Outer space plays a significant role in addressing global challenges and in providing substantive benefits in fields such as scientific research, communication, disaster

management and preparedness, and national security, and enables economic growth and innovation. However, as the number and diversity of space activities continue to expand, coupled with the rapid increase in the number of satellites and space debris in Earth orbit, urgent action is needed to ensure safe and sustainable use of outer space. In addition, the conduct of destructive direct-ascent anti-satellite (DA-ASAT) missile testing has accelerated orbital debris creation and endangered the safe and sustainable use of space for peaceful purposes by all actors.

We recall the Joint Communiqué of the G7 UK Carbis Bay Summit in 2021, reiterate our commitment to the safe and sustainable use of outer space, and share the view that orbital debris constitutes an urgent issue. We also share the view that the implementation of international guidelines adopted at the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) is urgent and necessary and we strongly encourage efforts to develop further solutions for orbital debris mitigation and remediation.

In advancing these developments and efforts, we will continue to attach great importance to cooperation with all nations through international bodies like UN COPUOS, the International Organization for Standardization (ISO), and the Inter-Agency Space Debris Coordination Committee (IADC).

To promote debris mitigation efforts, we will:

- Continue to act consistently with the Space Debris Mitigation Guidelines of COPUOS, the Guidelines for the Long-term Sustainability of Outer Space Activities (LTS Guidelines), and the IADC Space Debris Mitigation Guidelines.
- Share experiences and best practices on national orbital debris mitigation efforts including through UN COPUOS and IADC.
- When appropriate, support work to identify potential new guidelines in relevant fora.

To further contribute to the safe and sustainable use of outer space, we will share best practices on Space Situational Awareness (SSA).

We strongly encourage further research and development of orbital debris mitigation and remediation technologies. We also strongly encourage development of national guidelines and regulatory frameworks for remediation that align with guidelines developed within UN COPUOS. We call for international cooperation, including through appropriate international bodies, that could encourage transparency and responsible remediation practices and foster the future development of international guidelines in this area.

We recognize the importance of continued discussion, in the UN COPUOS and In-

ternational Telecommunications Union (ITU) frameworks, as well as with the International Astronomical Union (IAU) on the impact of large constellations of satellites on astronomy for the protection of the dark and quiet sky.

We reaffirm United Nations General Assembly Resolution A/77/41 as an important step to preserving the long-term sustainability of the outer space environment, and reiterate our respective commitments, already made by G7 members, not to conduct destructive direct-ascent anti-satellite missile tests and encourage others to follow suit.

(2) A Better understanding of the functions of the seas and the Ocean in the context of climate change and other anthropogenic stressors

Global climate change and other anthropogenic stressors such as pollution and over-exploitation of resources, including illegal, unreported, and unregulated (IUU) fishing are affecting the Ocean and causing serious threats to human society. Such threats include rising sea levels, loss of land, biodiversity loss, more frequent and damaging weather events, ocean acidification, and increasing ocean temperatures as well as marine heat waves, economic loss, and impacts for global food security. Since the Ocean is continuous and interconnected, it is critical to work internationally and cooperatively to address geographic and temporal data gaps and missing types of ocean measurements. Understanding these data and enabling evidence-based actions are imperative to the health and sustainable use of the Ocean in a changing climate.

Accordingly, the G7 endorses efforts by the G7 Future of the Seas and Oceans Initiative (FSOI) Working Group, which aim to better understand the ocean-climate-biodiversity nexus, and to sustain and enhance the Global Ocean Observing System (GOOS). In order to understand, monitor, and predict the Ocean comprehensively as one global system, it is essential to enhance observations of physical, biogeochemical, and ecological ocean properties and their interactions with socio-economic systems in data-gap areas including both polar and deep seas. We commit to continuing to conduct and improve comprehensive ocean observations, including utilization of research and survey vessels, Argo floats, moorings, satellites, and other ocean observation platforms based on international collaboration and coordination. Furthermore, it is necessary to improve the exploitation of both observations and modelling by steadily developing the Digital Twins of the Ocean so that actionable value-added monitoring and forecast information can be shared.

The G7 recognizes that the Arctic and Antarctic regions have been significantly affected by climate change. Polar research plays an increasingly important role to address this urgent climate issue. The G7 supports international cooperation in the field of Polar research. Observations can be strengthened by capitalizing on technological developments, sharing various data, and developing human resources and capacity through international observation platforms such as Arctic and Antarctic

research vessels. Arctic research should be done in partnership and collaboration with Indigenous Peoples, with long term research relationships built on trust, respect, and mutual interest.

The G7 continues to support the implementation of the United Nations Decade of Ocean Science for Sustainable Development (2021-2030). We also encourage the FSOI Working Group to develop concrete strategies based on policy papers such as the “G7 Ocean Decade Navigation Plan” and the “G7 Ocean Deal” so that the G7 can connect science to policy, translate knowledge into action, pursue and implement innovative science-based solutions to ocean challenges and develop sustainable ocean ecosystems and a blue economy.

(3) Promotion of global utilization of research infrastructures and their output

In developing their missions, research infrastructures should consider relevant options to support responsible science and technology cooperation and be efficiently utilized on a global level as well as by individual countries.

In particular, very large research infrastructures such as synchrotron radiation facilities should aim to provide opportunities for scientists, technologists, and other experts, the public and private sector and innovators across the international research community to enhance their socio-economic impact through cutting-edge research, nurturing highly-skilled human resources and use of data and services as well as contributing to local community development.

Research infrastructures may prioritize their digital transition as a way to promote data accessibility and sharing. Research infrastructures provide the means to manage big data generated through advanced scientific instruments and to make data accessible and shareable globally in a reliable, ethical, secure, reciprocal, and transparent manner. Interconnecting physical and digital functions can bring about impactful innovation to the economy as well as novel research and development methodologies. Successful digitization can allow more researchers and communities to access computational resources, high-quality data, educational tools, and user support.

We look forward to discussions within the Group of Senior Officials on Global Research Infrastructures (GSO) regarding innovation of research and development systems by fully enhancing both physical and digital functions of research infrastructures. These discussions should take into account the G7’s shared values of open science, research security and research integrity, and should reflect appropriate international access frameworks such as the GSO Framework Criteria for international access to research infrastructures. We therefore encourage coordination and exchange between the GSO and the G7 Open Science Working Group to promote the

implementation of open science and FAIR principles to the research outputs and protocols resulting from the use of research infrastructures.

(4) Promotion of international talent mobility and circulation

The research community should develop skills and knowledge to improve the diversity of the research environment for tackling global-scale issues effectively. At the same time, connectivity among G7 and aligned countries should be enhanced, for instance, by bolstering collaboration among world-class researchers to strengthen a global-scale innovation ecosystem.

The G7 encourages international talent mobility and circulation, especially of early career researchers to engage in international cooperation and collaborative research with other partners sharing their values. We respect the freedom in scientific research in accordance with national laws and regulations. Moreover, we will work together to identify and minimize barriers to international research collaboration and mobility which will help to reinforce domestic R&D strengths.

In the field of life science, which is closely linked to innovations to address global issues such as climate change, food insecurity, and global health threats, the Human Frontier Science Program (HFSP), an international research support program established by the G7 at the initiative of former Japanese Prime Minister Nakasone Yasuhiro at the 1987 Venice Summit, has promoted cutting-edge international joint research and human resource development, achieving significant results in the process. G7 members and HFSP countries that share our values will continue this pioneering initiative. We welcome the HFSP's support for Ukrainian researchers.

(End)