



Tsukuba Communiqué

G7 Science and Technology Ministers' Meeting in Tsukuba, Ibaraki

15-17 May 2016

Introduction

We, the Science and Technology Ministers of Canada, France, Germany, Italy, Japan, the United Kingdom, the United States, and the European Commissioner for Research, Science and Innovation, met in Tsukuba City, Ibaraki Prefecture from May 15 to 17, 2016.

We recognized that science, technology, and innovation (STI) are essential for social and economic development, and for addressing global challenges such as health, energy, agriculture and the environment. We highlighted that STI should contribute to the development of sustainable and inclusive societies.

We acknowledged that the benefits of STI should be shared by society as a whole, and that their impact should be accelerated through the digitalization and deployment of the Internet of Things (IoT) and the advancement of enabling technologies such as Information and Communication Technology (ICT) and Artificial Intelligence (AI). Capturing the vision of STI working for the benefit of all, Japan has developed the concept of "Society 5.0" which aspires to an inclusive, prosperous society where citizens are at the center of scientific and technological development.

Currently, we are facing long term and persistent global challenges such as an increasingly aging population, gender inequality, and major energy and environmental threats. Based on the experience of the Great East Japan Earthquake, we recognize, in particular, the importance of strengthening the resilience of societies to hazards and disasters. In addition, the gap between those who are flourishing in society and those who are left behind, both within societies and among countries, is expanding. We recognized that STI, especially when empowered by ICT, has great potential to bring prosperity to all, regardless of age, gender, language or region. We are therefore committed to work toward inclusive innovation.

Furthermore, we acknowledged that Open Science can change the way research and development (R&D) is undertaken, with emerging findings leading to far greater global collaboration and encouraging a much broader range of participants and stakeholders. We also recognized the importance of Open Science as a driver for greater inclusion in R&D, for example with the emergence of citizen science.

To address these issues, we decided that the principles of Inclusive Innovation and Open Science should be reflected within each of our specific STI areas of focus: Global Health, Gender and Human Resource Development for STI, The Future of the Seas and Oceans and Clean Energy. To have greatest impact for the benefit of our societies, we also committed to work across G7 ministerial groups and develop our work in close collaboration with other ministries.

We welcome the holding of the G7 Science and Technology Ministers' Meeting next year in Italy.

Today, we approved this communiqué and issue it for Leaders' consideration of the G7 Summit to be held in Ise-Shima on 26-27 May 2016.

1. Global Health - Health Care and Science and Technology

Promotion of "Active Aging" in an Aging Society and the Advancement of R&D in Neglected Tropical Diseases (NTDs) and Poverty-Related infectious Diseases (PRDs).

We acknowledged that health matters pose some of the most pressing global challenges and that STI should play a major role in addressing these challenges.

Along with G7 countries, many emerging economies are facing the challenges of rapidly aging societies. We recognized that science-based innovation has an important role to play in addressing some of the most urgent of these challenges, including promotion of social systems that support healthy long life and good quality elderly care.

In addition, with greater awareness of the global health risks caused by infectious diseases, we decided to accelerate the establishment of collaborative policies and actions, such as collaboration on R&D to tackle NTDs and PRDs.

We also reaffirmed the importance, highlighted at the G8 Science Ministers Meeting in London in 2013, of acting concertedly to develop the scientific input for addressing the major health security challenges posed by antimicrobial drug resistance (AMR).

◆ 1-1: Promotion of R&D for aging and elderly care

We recognized the importance of helping promote a society with active aging, where elderly citizens continue to be fully engaged within their societies in ways befitting their capacity and interests. We also recognized the role of STI in contributing to this through well-designed health systems for elderly care, including prevention, timely diagnosis, treatment, assistance and care of age-related health issues, and the social and physical infrastructure that enhanced inclusion. Also, we aim to promote and raise awareness of mid-life approaches to healthy lifestyles that support people to remain independent, healthy and active for longer in later life.

We reaffirmed the importance of research on brain science that can help us understand and address the mechanisms of aging-related brain disorders such as dementia. Greater international collaboration on this research should be encouraged. We also considered that fundamental research and the development of innovative technologies for a more dynamic understanding of brain function should be supported. Furthermore, we recognized that a more integrated approach to medical care and the utilization of robotics could contribute not only to the wellbeing and quality of life of the elderly, but also importantly to alleviate the burdens of the caregiver. We therefore decide to:

- i. Endorse the recommendation of G-Science Academies' Joint Statement on the Brain, developed at their meeting in 2016, to promote sustained research and international collaboration addressing fundamental aspects of brain functions, including brain disorders such as dementia, through mapping of R&D programs, and furthermore accelerate international interdisciplinary research efforts and develop new technologies;
- ii. Promote open science and sharing of the results of publicly funded research e.g. data and publications in the field of brain science linked to age-related problems; and
- iii. Encourage mutual learning by sharing good practices on active aging aimed at keeping the elderly socially active and reducing the burden on family and society through integrating social science research with medical care, ICT, and robotics assistance.

◆ **1-2: Promotion of R&D in the field of NTDs and PRDs**

At the Meeting of the G7 Ministers of Science in Berlin in 2015, it was acknowledged that a collaborative framework was needed to address NTDs and PRDs. We welcomed the recommendations from the G7 group on NTDs/PRDs outlining concrete action for moving forward on G7 commitments (see Attached 1) to enhance coordination of NTDs and PRDs R&D. We welcome the progress made by the group and, expressly, we decide to:

- i. Work on R&D mapping activities on NTDs and PRDs as a basis for facilitating coordination and sharing information and data;
- ii. Make freely available and accessible to the public information and data on relevant publicly funded research on NTDs and PRDs;
- iii. Enhance interoperability of relevant data and information on R&D activity; and
- iv. Maintain the group as a future Working Group to advance G7 action in this domain, e.g. by examining ways to support capacity building for R&D in endemic countries.

2: Gender and Human Resource Development for STI:

Toward Expanding Women's Participation in STI and Preparing the Next Generation of Global Leaders

◆ 2-1: Expanding the Women's Participation in STI

We recognized the importance of the "G7 Principles on Women's Entrepreneurship" adopted during the G7 Elmau Summit. In order to have female scientists, researchers, and engineers further participate and lead in STI fields, we affirmed the importance of promoting institutional changes and policy environments where women enjoy equal opportunities to develop and make full use of their abilities and advance their career prospects. In addition, we recognized the importance of enhancing the international networks of female researchers, engineers and students. We decide to:

- i. Support international networking of female researchers, scientists, engineers, and students;
- ii. Monitor and take actions against gender stereotyping and bias that too often exist within Science, Technology, Engineering and Mathematics (STEM) disciplines and workplaces;
- iii. Share good practices in encouraging female entrepreneurs, researchers, and engineers in science and technology oriented businesses and organizations; and
- iv. Develop policy and working environments in which equal opportunity allows women to exert their abilities, advance their career prospects and play a full role in STI fields.

◆ 2-2: Preparing the next generation of STI global leaders

We reaffirmed the importance of supporting and encouraging the talent and capabilities of the young generation working in the field of STI. In light of the discussion of the G7 Kurashiki Education Ministers' Meeting in Okayama, we shared the commitment to promote excellence within STEM education and recognized the importance of international exchanges and mobility programs for all students and researchers in order to foster leaders with a global perspective. We therefore decide to:

- i. Share good practices in STEM education;
- ii. Identify opportunities to coordinate leadership programs which address equally the needs and interests of both male and female researchers and to provide future leaders with global experiences; and
- iii. Increase the opportunities for all students and researchers to participate in global teams that work towards addressing social and global challenges, for instance, by promoting joint programs among G7 countries.

We expect that our actions will help and advance the activities of international scientific councils such as Global Young Academy (GYA).

3: The Future of the Seas and Oceans:

Toward Science-Based Management, Conservation and Sustainable Use of the Oceans, Seas and Marine Resources

The seas and oceans are changing rapidly, with overuse and destruction of marine habitats, warming, increased ocean acidity and depleted oxygen. The health of the oceans has rightly been recognized as a crucial economic development issue and was included as the United Nations sustainable developments goal 14 (SDG 14).^{*} Despite this progress, many parts of the ocean interior are not sufficiently observed. Acknowledging all the above, we believe that it is crucial to develop far stronger scientific knowledge necessary to assess the ongoing changes and their impact on economies. We must also develop appropriate policies to ensure the sustainable use of the seas and oceans. Therefore, we welcome the progress and recommendation by the G7 expert working group on the Future of the Seas and Oceans (see Attached 2).

In support of the achievement of the SDG14 and other relevant goals and of the objectives of related conventions, we support taking the following actions:

- i. Support the development of an initiative for enhanced global sea and ocean observation required to monitor inter alia climate change and marine biodiversity, e.g. through the Global Argo Network and other observation platforms, while fully sustaining and coordinating with ongoing observation;
- ii. Support an enhanced system of ocean assessment through the UN Regular Process to develop a consensus view on the state of the oceans, working to a regular timescale which would enable sustainable management strategies to be developed and implemented across the G7 group and beyond;
- iii. Promote open science and the improvement of the global data sharing infrastructure to ensure the discoverability, accessibility, and interoperability of a wide range of ocean and marine data;
- iv. Strengthen collaborative approaches to encourage the development of regional observing capabilities and knowledge networks in a coordinated and coherent way, including supporting the capacity building of developing countries; and
- v. Promote increased G7 political-cooperation by identifying additional actions needed to enhance future routine ocean observations.

We agree to maintain the expert group as a future Working Group to advance G7 action in this domain.

Meanwhile, we reviewed and discussed the follow-up status of research on marine litter (including plastic litter) and the environmental impacts of deep sea mining, as consented to at the Meeting of the G7 Ministers of Science in Berlin in 2015. In particular, we reaffirmed the importance of our scientific work to better understand the extent and impacts of marine litter, which contributes to the implementation of the priority measures identified by the G7 Toyama Environment Ministers' Meeting.

^{*} SDG14: "Conserve and sustainably use the oceans, seas and marine resources for sustainable development."



4: Clean Energy - Developing Innovative Energy Technology:

Promoting Initiatives to Develop and Adopt Innovative Technology That Look Toward 2050

At the Meeting of the G7 Ministers of Science in Berlin in 2015, we confirmed our intention to raise the efforts, cooperation, and transparency of energy research in order to accelerate the urgently required technological progress towards clean energy. We reaffirmed that we need to achieve low carbon economies and societies for sustainable development. Thus, we must accelerate the development and adoption of innovative clean energy technologies. In the Paris Agreement adopted at the 21st Session of the Conference of the Parties to United Nations Framework Convention on Climate Change (COP 21), it was confirmed that “accelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development.” We recognized that the Mission Innovation is an appropriate vehicle to accelerate the realization of this objective.

Taking into account the discussion at the G7 Kitakyushu Energy Ministerial Meeting, we decided to exchange information about R&D in the field of clean energy and to promote international research cooperation in the future.

Thus, we support taking the following actions:

- i. Foster R&D and exchange information on clean energy technology in line with Mission Innovation;
and
- ii. Utilize international structures in place to share the information on technology and discuss possible future R&D collaborations.

5: Inclusive Innovation - Mainstreaming Inclusiveness Among Innovation Policies:

Reconciling Economic Growth and Social Equality

Science and technology should be key tools for the development of sustainable economic growth in developing and emerging countries, but too often we come across instances where initiatives that have been supported through external aid and taken forward with the best of intentions have not resulted in socially sustainable development. In addition, within developed countries there is a widening gap between those who benefit from innovation and those who do not. In addition, science and technology should contribute to the resilience of societies to hazards and disasters.

At our meeting we addressed the importance of 'inclusive innovation' as an approach to address these challenges, recognizing diversity and access to digital skills as critical factors to spur inclusive innovation. If we achieve this, innovation could provide and accelerate many economic and social benefits as well as improve resilience to hazards and disasters around the world.

To realize inclusive innovation, we decide to promote and encourage new initiatives and approaches and discuss means of international cooperation. We also committed to ensuring that the next generation of researchers, engineers and entrepreneurs would be conscious of inclusiveness in their future activities.

We support taking the following actions:

- i. Share good practices in policy tools (e.g., prizes and challenges) for inclusive innovation, in particular those aiming at addressing global challenges, such as infectious diseases, seas and oceans, energy, food security, disaster risk reduction and prevention, through the adoption of shared innovation principles;
- ii. Specify needs for inclusive innovation solutions and support the development of sustainable business models to mobilize academia and the private sector in G7 countries and developing countries;
- iii. Expand opportunities for students and researchers to work in global teams with the aim of promoting inclusive innovation;
- iv. Develop digital skills and improve access to digital services (including public services) in order to remove social barriers to innovation; and
- v. Promote sharing of knowledge and international collaboration in the use of science and technology to strengthening the resilience of societies to hazards and disasters.



6: Open Science - Entering into a New Era for Science:

Putting into Practice New Framework of Research and Knowledge Discovery, Sharing, and Utilization through Openness

Open science enables broad and straightforward access to and use of the results of publicly funded research (e.g. scholarly publications and resultant data sets) not only for academics, but also the private sector and the general public more broadly. Fundamental to the progress of open science is the continued investment by governments and others, such as the Group on Earth Observations' Global Earth Observation System of Systems (GEOSS), in suitable infrastructures and services for data collection, analysis, preservation and dissemination. These systems and services offer a new approach to research, creating the possibilities for new scientific developments and increasing the returns from government investment in research. We endorsed this approach and decided to promote open science, taking in to account the particular characteristics of individual research fields.

There has been an abundance of open science practices in many countries and organizations and in many different fields of science in recent years. We recognized a growing need to share common international principles for open science and to put these principles into practice through open access to scholarly publications and open data. Furthermore, we recognized the importance of stronger foundations for the support of open science, such as incentives for researchers and institutions, support systems and human resources. We recognize the need to promote access, taking into consideration privacy, security, and legitimate proprietary rights, and different legal and ethical regimes, as well as global economic competitiveness and other legitimate interests.

We support taking the following actions:

- i. Establish a working group on open science with the aims of sharing open science policies, exploring supportive incentive structures, and identifying good practices for promoting increasing access to the results of publicly funded research, including scientific data and publications, coordinating as appropriate with the Organisation for Economic Co-operation and Development (OECD) and Research Data Alliance (RDA), and other relevant groups; and
- ii. Promote international coordination and collaboration to develop the appropriate technology, infrastructure, including digital networks, and human resources for the effective utilization of open science for the benefit of all.