参考資料
科学技術･学術審議会学術分科会
学術情報委員会(第１１回)
平成３０年７月２６日(木)

Ｇ７イタリア・トリノ科学大臣会合（概要）

○　平成29年9月27日(水)から28日(木)にイタリア・トリノにおいて、G7科学大臣会合が開催され、我が国からは、原山優子総合科学技術・イノベーション会議常勤議員が、松山科学技術政策担当大臣の代理として出席。開催国であるイタリアのヴァレリア・フェデーリ教育・大学・研究大臣が議長を務めた。

○　本会合では、次世代産業革命（NPR：Next Production Revolution）により社会・経済が大きく変化する中での、科学技術・イノベーションの役割などについて、研究とイノベーションのための人材育成、未来の技術とイノベーションを推進するための研究の役割とその資金メカニズム、大規模研究施設の国際的共同利用の促進状況などのテーマにより議論された。

○　会合では特に、官民資源を組み合わせた、研究への財政支援のあり方について検討するワーキング・グループの新設が合意された。またオープンサイエンス・ワーキング・グループについて、オープンな研究エコシステムに資するインセンティブや､研究データ最適利用のためのインフラの検討に注力して活動を継続し、次回大臣会合において、各国の取組や優良事例について報告することなどが合意された。

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Ｇ７科学大臣会合コミュニケ（別紙は４のみ）

G7 SCIENCE MINISTERS' COMMUNIQUÉ

Turin, 27 – 28 September

28th September 2017

Introduction

We, the Science Ministers of Canada, France, Germany, Italy, Japan, the United Kingdom, the United States of America, and the European Commissioner for Research, Science and Innovation, met in Venaria on September 28th, for the Ministerial meeting hosted by the Italian Presidency during the G7 Innovation Week. In this meeting, we discussed how our nations could lead efforts to realise the benefits and meet the new global challenges posed to the scientific community by the Next Production Revolution (NPR). The NPR brings unparalleled opportunities to advance not only the means of production of goods and services, but also the ways in which knowledge is generated and exploited.

Science will be at the heart of delivering the NPR. Against this background, we discussed a set of possible common actions and areas of cooperation, to create the conditions for

our researchers at all career stages to provide their best possible contribution to the advancement of knowledge in crucial domains for future prosperity and sustainability.

Research has never been as important and relevant, as it is now. We are at a unique moment in time where the many different technologies that characterise the NPR – from artificial intelligence, nanotechnologies, new materials and genetics to life sciences and various branches of ICT, including big data and data science - are converging in a way that will transform production and society as a whole.

In all these areas public investments in research has played a key role, with many important breakthroughs coming from basic science with applications that were not initially foreseen. This has led to greater access to better health care systems, greater life expectancy and security, more opportunities for social interaction and more widespread diffusion of many technologies, amongst others. Mindful of the need to foster inclusive growth, we are determined to ensure that scientific and technological advancement is put to the benefit of the entire society and of each citizen.

During the Taormina G7 Summit, the Heads of States approved the Action Plan "G7 People-Centered Action Plan on Innovation, Skills and Labour", that puts science, research and innovation at the center of the common political agenda, identifying a set of priorities that provides the general framework within which our discussion unfolded. These are: human capital formation, financing policies and mechanisms, and global research infrastructures.

Today, in recognition of the crucial role that science has to play in the NPR, we approved a statement that moves from the priorities identified by the Taormina Summit and offers to the G7 for consideration a set of specific policy guidelines aimed at translating such priorities into concrete actions.

Human Capital Formation: Investing in Research and Innovation Communities.

1. We recognise that researchers provide a crucial contribution to the socio-economic growth of our societies. We commit to supporting our research communities, in particular women, youth and other underrepresented groups, through training, motivating others to follow. Researchers can help promote the advancement of knowledge and diffusion of new technologies throughout our

societies and economies, so as to allow people and firms from all sectors to take full advantage of the benefits of innovation.

2. We believe that human capital formation for science – namely the process of increasing the number of individuals who have the skills, education, and experience critical for the advancement of science in new knowledge domains, particularly those relevant to the NPR – is a crucial action on which we should direct our coordinated efforts.

3. As clearly stated in the OECD document on "The Next Production Revolution: Implications for Governments and Business", the digital transformation will have an impact on our societies, since it encompasses and cuts across all major NPR-related technologies e.g., robotics, additive manufacturing, materials, big data analytics, precision medicine, synthetic biology, and artificial intelligence. Incorporating digital education into all forms and levels of education and professional training will help to form a new generation of researchers suitably equipped to face the complex challenges of the NPR and will help today's researchers adapt to the challenges posed by the NPR.

4. Researchers can play an instrumental role in shortening the delay between inventions and their uptake. To achieve this we agreed on the need to ensure that researchers have access to training that goes beyond and across strictly disciplinary domains, including complementary and technical skills (such as, basic understanding of data curation, entrepreneurial mind-set, self-direction, creative thinking, problem solving and communication). Researchers also need the resilience to succeed in the face of rapidly shifting economic and policy conditions. We also agree the need to support our research and education institutions and enable them to foster trans-disciplinary and multi-disciplinary research.

5. The creation of 'hybrid spaces', where industries, services, administrations, and researchers can interact with each other, may help to speed up the knowledge and technology diffusion process as well as learning processes, in particular, amongst organizations and institutions that will not be early adopters of new technologies and are at risk of missing opportunities offered by NPR.

6. The NPR will increase the importance of the role researchers already play in helping to strengthen the relationship between the scientific community and wider society. It is our common understanding that our researchers are reliable science advisors, and are crucial to a trusting relationship between the scientific community and our national societies based on the principles of responsible research and innovation and of research integrity.

7. We believe that researchers should be encouraged and supported to carry out this dialogue with society on a permanent basis, taking care to involve them from the start of the technology development pipeline, informing them openly about risks and uncertainties and taking account of discussions with the public as research and policy develops.

8. We recognize the need of expanding women's participation in science and innovation, and reaffirm the importance of the actions agreed at the G7 Science and Technology Ministers' Meeting in Tsukuba in 2016 on this topic. In order to have female researchers further participate and lead in science and innovation, we acknowledge 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.

Financing mechanism and policies for inclusive science, research and innovation.

9. We recognize that the NPR will bring new challenges and changes in the innovation dynamics that will require a focus on financing mechanisms and instruments. In this perspective we strive to support research communities that are heavily engaged in the unprecedented "Big Shifts" as defined in the Summit Leaders' Communiqué and wish to leverage this in order to find solutions to global challenges.

10. In the light of such "Big Shifts", we strive to ensure an appropriate balance between applied and fundamental research, and to this end we encourage private resource funding in both research spheres.

11. We reaffirm the centrality of public investment in science and its potential in achieving the "2030 Agenda for Sustainable Development", and we recommend to address our policy efforts to adequately support the advancement of knowledge and promote trans-disciplinary and multidisciplinary approaches as founding pillars of the NPR.

12. We acknowledge the need to work together and promote parallel and complementary actions directed to scaling up the social impact of science and to ensure social accountability of the results of research activities.

13. We share the common goal of improving the set of instruments dedicated to fostering public-private partnership in large-scale basic research projects, promoting the convergence of transnational public-private cooperation on ambitious scientific ventures. We look at the evolution of scientific philanthropy as an effective way to complement public investment and involve single citizens, private institutions and corporations in large scale basic research projects addressing key societal challenges and targeting the scientific breakthrough that will produce a dramatic shift in the frontier of technological opportunities. To this end, we will act to encourage new, emerging and current philanthropists to dedicate an ever-increasing portion of their philanthropy to basic science and to ensure existing instruments are maintained or, where science needs dictate, put in place new instruments suitable to involve in science-oriented philanthropic initiatives an increasing number of possible contributors.

14. We recognize that knowledge-intensive and technology-intensive social innovation and the related forms of entrepreneurship may represent a very important way to convey the value and the benefits of science to citizens and society at large, magnifying the perceived social benefits of scientific investments and thus contributing to strengthen the relationship between society and the scientific community. In this perspective, we also welcome actions directed to find a better complementarity between science, innovation and social policies, engaging the public with new and emerging technologies.

15. With the aim to carry out science-based activities to support inclusive growth, we agree to explore potential new financing approaches to research and innovation and combining in novel ways public and private resources. It is therefore proposed to establish a new G7 Working Group on Financing Science for Inclusive Growth. In its first year it will be mandated to map and review, with potential support from the OECD, the G7 members' and EU policies, with the objective of looking for potential synergies in financing mechanisms for research. On the basis of the results of this comprehensive review, in the following year the Working Group could analyse a set of financial instruments and mechanisms that could be explored on a transnational cooperation basis. This would investigate the potential of advanced, science-based and technology-intensive forms of social innovation and entrepreneurship and of new funding mechanisms to support disruptive and market-creating innovations. The overarching ambition is to explore effective financial instruments and knowledge-transfer policies common to the G7, by means of which we can celebrate the crucial value of science and research for the prosperity of society.

Global Research Infrastructures.

16. We affirm the principle that efforts should be directed to promote a widespread participation of researchers in the network of global research infrastructures, taking account of the opportunities offered by open science paradigms. Significant contributions to this discussion come from the "Group of Senior Officials on Global Research Infrastructures" (GSO) and the G7 "Open Science Working Group" (OS WG).

17. We acknowledge that a fundamental goal of Global Research Infrastructures (GRIs) is to enable the best scientists in the world to exploit them for performing research at the frontiers of knowledge and on global challenges, and we affirm the relevance of an inclusive approach to RI development at international level. We confirm our support to the concept that access to GRIs should be established based on a merit analysis of the proposals, consistent with the concept of global excellence-driven access (gEA), which GSO developed with reference to the European Charter for Access to Research Infrastructures.

18. As far as the "Group of Senior Officials on Global Research Infrastructures" is concerned, we welcome the overall progress and we acknowledge the work done since 2008 in developing analysis and methodology to facilitate international cooperation on the planning and development of Global Research Infrastructures, and, in particular, in continuously refining and updating the Framework of GRI in addition to identifying relevant opportunities for its application. We acknowledge the work done by the GSO in identifying the first five Case Studies. We welcome the GSO's 2017 report that includes both the evolution of the Framework corresponding to a broader and deeper consensus on global access criteria, the developments on open innovation and open data policies, the updated list of those research infrastructures that the GSO partner countries propose as candidate GRIs and two concrete examples of GRI Projects that are ready to start the implementation phase along the Framework criteria. The summary report of the GSO is attached to this Communiqué.

Open Science.

19. We recognize that ICT developments, the digitisation and the vast availability of data, efforts to push the science frontiers, and the need to address complex economic and societal challenges, are transforming the way in which science is performed towards Open Science paradigms. We agree that an international approach can help the speed and coherence of this transition, and that it should target in particular two aspects. First, the incentives for the openness of the research ecosystem: the evaluation of research careers should better recognize and reward Open Science activities. Secondly, the infrastructures for an optimal use of research data: all researchers should be able to deposit, access and analyse scientific data across disciplines and at the global scale, and research data should adhere to the FAIR principles of being findable, accessible, interoperable, and reusable.

20. We support the work and results achieved so far by the G7 Open Science Working group. The OS Working Group has identified priorities that deserve and require common aligned actions, both in encouraging openness and data skills in scientific research practice, through workforce development and training. We encourage the OS WG to follow-up actions taken by G7 members according to the WG's recommendations and to collect good practices, in order to report to the next G7 Science Minister's Meeting. In particular, we support the OS WG deepening its efforts on the two topics identified above (paragraph 19), namely the incentives for openness of the research ecosystem, including the role of research indicators and metrics relevant to open science, and the infrastructures and standards for optimal use of research. The summary report of the OS working group is attached to this Communiqué.

Working Groups under the G7 Science Ministers.

21. In recognizing the valuable contribution provided by the different Working Groups, we encourage cooperation and avoidance of duplication of efforts among the Working Groups themselves.

22. We reaffirm the importance of the actions agreed at the G7 Science and Technology Ministers' Meeting in Tsukuba in 2016 in support of the sustainable use of the seas and oceans and the achievement of United Nations Sustainable Development Goals 13 and 14. We recognise the key role the G7 Future of the Seas and Oceans Working Group can play in delivering these actions through developing stronger scientific knowledge and realizing a more efficient and

effective network of scientific maritime and ocean observing. We welcome progress made by the Working Group and the recommendations put forward by the G7 Working Group's technical experts. As a next step, G7 political and technical experts should meet before the end of 2017 to agree on action plans for the five action areas to ensure continued strong progress. The summary report of the Future of the Seas and Oceans Working Group is attached to this Communiqué.

23. The G7 Science and Technology Ministers' meeting in Tsukuba defined concrete areas of action for the Working Group on Neglected Tropical Diseases and Poverty Related Diseases (NTD-PRD). We received the related recommendations and we acknowledge that the G7 Working Group has actively promoted the dialogue between major databases that monitor nationally funded R&D activities on NTDs and PRDs. We acknowledge the proposal to launch a pilot project on data extraction as a next step towards the interoperability of these databases. We also acknowledge the suggestion to review and use existing multilateral funding mechanisms for possible future joint or complementary actions. The summary report of the NTD-PRD Working Group is attached to this Communiqué.

24. We wish to acknowledge and thank the G7 Academies for their joint statements.

Conclusion

25. We, the Science Ministers of Canada, France, Germany, Italy, Japan, the United Kingdom, the United States of America, and the European Commissioner for Research, Science and Innovation intend to strengthen the implementation of, and ensure that we make progress on, the outcomes of today's discussion, with the purpose to promote inclusive science and innovation as a key priority.

26. We look forward to our gathering and discussions at the next G7 Science Ministers' Meeting.

Annex 4

G7 EXPERT GROUP ON OPEN SCIENCE

Executive Summary

28th September 2017

The G7 Open Science Working group (OS WG) recognizes that an international approach for some actions can help the speed and coherence of the transition towards Open Science. Overall, the G7 Open Science Working Group recommends that each G7 nation convene and engage with relevant stakeholders who can support moves towards incentivizing the increased adoption of Open Science in their national context.

Alongside these efforts, it would be useful for G7 nations to continue sharing their perspectives and progress on developing policies and fostering adoption of Open Science principles and practices, and working together to find common areas of action to support more effective implementation of Open Science practices. The OS WG focused its efforts on developing recommendations for two important aspects of Open Science: Incentives and Infrastructure, as described below.

Focus: Incentives and the researcher ecosystem
Ambition: Foster a research environment in which career advancement takes into account Open Science activities, through incentives and rewards for researchers, and valuing the skills and capabilities in the Open Science workforce.
Recommendations:
At national levels: G7 nations should each engage with research stakeholders to identify and implement enhancements to research evaluation and reward systems that take into consideration the Open Science activities carried out by researchers and research institutions. Topics that could be discussed include:

- Recognizing Open Science practices during evaluation of research funding proposals, and research outcomes;
- Recognizing and rewarding research productivity and impact that reflect open science activities by researchers during career advancement reviews;
- Including credit for service activities such as reviewing, evaluating, and curation and management of research data; and,
- Developing metrics of Open Science practices.

Potential future discussion at the G7 level: Consider approaches towards developing principles, for measuring the quality and impact of research enabled by Open Science practices. Discussions could also include means to identify, promote and implement best practices for Open Science, for example, through codes of conduct that build on existing procedures. This might lead to international consensus on the roles and responsibilities of researchers, institutions, and funders under Open Science.

Focus: Infrastructures for an optimal use of research data
Ambitions: All researchers are able to deposit, access and analyse scientific data across disciplines and on international scales. Research data management adheres to the FAIR principles whereby data is findable, accessible, interoperable, and reusable.
Recommendations:

At the national level: G7 nations can each work to promote the development of practices and the use of technologies and infrastructure in the research community that foster Open Science principles and data sharing, including:

- Working towards use of data management plans as part of new research projects, and other approaches, as important instruments to ensure data quality along the whole data life cycle, data preservation and access.
- Development of common interfaces and data standards, including software whenever appropriate.
- Supporting development of plans and approaches for maximizing the accessibility, long-term preservation and reproducibility of research data and

results, while protecting privacy, confidentiality, national security, and intellectual property concerns

Potential future discussion at the G7 level: Establish a forum for continued multilateral discussion to share information about major research data infrastructure initiatives in G7 countries and beyond. Discussion objectives could include:

- Development of a common understanding of Open Science and the related infrastructure requirements (e.g. for whom? Under which conditions?), including consideration of best practices in different disciplines of science and technology as well as in social sciences, humanities and the arts.
- Agreement to promote the FAIR principles for data resulting from government-funded research, increase discussion on sustainability and working towards shared guidelines for incorporating FAIR principles into the operations of infrastructure that support Open Science.
- Raising awareness of the necessity of well-qualified human resources and professional expertise for curation, annotation and other management of research data and incorporate them in the research processes.

These actions will help to ensure good communication and coordination, among of the numerous initiatives that are under way in countries around the world that aim at professional research data management and sharing.