Science and Technology in Society *forum* (STS *forum*)
19th Annual Meeting
Kyoto, Japan, October 4, 2022

STATEMENT

1. The 19th Annual Meeting of the Science and Technology in Society *forum* took place from October 2 to 4, 2022 in Kyoto, with the participation of nearly 1,000 global leaders in science and technology, policymaking, business, and media from over 80 countries, regions, and international organizations.

Challenging times:

2. We met in the shadow of conflict and the shifting tectonic plates of the global international order, at a time when humankind faces great and complex global challenges. Science must play a central role to help the world move on beyond the pandemic and get back to the path of sustainable development. This will require that science, government and the private sector, working with communities and within a global-regional-national and local framework of multi-disciplinarity and collaboration to achieve the transformation of our economies to carbon neutrality. We must also keep the human being at the center of our concerns. We must remain committed to human rights and human dignity. Globally, more equality and inclusion are needed for all humans. We also have to understand the complexity of the individual human being, to comprehend a person's mind, not just their brain.

Analysis and Synthesis in Science–The Human Body and Mind

3. Humans are a physical-biological entity whose bodies include the brain with its myriads of neural cells and their connections. But what makes us human is the, apparently, non-physical entity–the mind, which includes our consciousness, way of thinking, and emotions. Many people, including scientists and policymakers, are realizing that a central challenge confronting science in the 21st century is understanding the human mind in biological terms. Biology and neuroscience have generated an astonishing amount of information, but great effort must still be invested in analyzing and synthesizing that information. Furthermore, we also need to link advances in biology and neuroscience to research in psychology, social sciences and other related fields. This requires a clear vision in policymaking, funding schemes, and training of young scientists.

Breaking Down Silos in Research

4. As the world moves on to the post-pandemic stage, unprecedented challenges are arising. COVID-19 highlighted the presence of many existing global issues, such as the vulnerability of the global supply chain and social inequality between the Global North and South in terms of access to the necessary vaccines and medical treatment. As these issues are by nature interdisciplinary, spanning fields from science and technology to the social sciences and humanities, researchers in various disciplines must collaborate to address them. Effective collaboration between research institutes and the public and private sectors is necessary, as is the creation of an environment that supports interdisciplinary research and fosters communication between researchers in different fields.

Lights and Shadows of AI

5. Rapid advances in computing and robotics are opening new vistas. Artificial Intelligence (AI) is fast developing into one of the most transformative technology advances in history. AI is rapidly increasing in power, precision, and scope of possible applications. It is helping humans undertake many complex tasks from optimizing network traffic to cataloguing images from newspaper archives. But more importantly, it is already helping solve many difficult scientific problems, such as 3D protein folding, which will accelerate the development and deployment of new technologies and increase the speed of scientific advance across a wide range of disciplines. But concerns have increased about the extent to which AI may be amplifying existing human biases and other weaknesses in decision making, and what to do about the risks of autonomous action by AI, especially in the area of weapons. A whole new domain is developing around the ethics of work on and with AI. What AI does must be explainable and understandable. AI is definitely one of the areas where the lights and shadows of science and technology in society is most compelling. Collaboration between governments, policymakers, and researchers is important to ensure that the development of AI is trustworthy, transparent, and responsibly deployed.

Energy and Environment

6. Recent IPCC working group reports point to a future where the likelihood of restraining the global mean temperature to a rise of 1.5 degrees seems increasingly improbable. We need to go from promises to action now. We also need to prepare for unavoidable climate-related impacts and provide concrete analysis of the steps needed to avoid worse outcomes. Climate change and disruptions in the hydrological cycle along with loss of biodiversity, deforestation, and increased pollution as well as densification of human settlements through increasing urbanization constitute converging risks, that require actions at the global, regional, national and local levels. Such programs for adaptation and resilience require adequate funding for the poor countries as well as collaboration between knowledge providers and networks that can take and support action, above all, to avoid suffering due to poverty in Low and Middle Income Countries (LMICs), we also must take special measures to protect women, children, minorities, refugees, and other especially vulnerable groups.

7. With the increasingly rapid advance of the impacts of climate change, we face the urgent global need to shift from our fossil fuel-based energy economy to a new, sustainable system. The time remaining to address this existential problem is frighteningly short, and we need a clear and practical roadmap for this crucial transition. The expansion of renewable energy sources is fundamental. This roadmap could also include the utilization of natural gas and nuclear energy as transitional energy sources. The development of technology should also accompany expansion of novel approaches to clean energy. However, as we monitor CO_2 emissions, we must also look at the inadvertent or even willful release of greenhouse gases, especially methane. Over 100 countries have already decided to slash methane emissions by 30% by 2030.

Food and Water Security

8. The world's food and water supplies are set to face increasing pressure. Climate change, urbanization, and resource scarcity are expected to have severe long-term effects on agriculture production yields and will also put more pressure on global food and water supplies, especially in the arid and semi-arid zones. Food and water security are inextricably linked. Achieving food and water security has always been challenging and will require us to transform our water use and agricultural practices. Food and nutrition security goes beyond adopting technology to taking a systemic approach, from environmentally-sound production by smallholder farms to distribution and outreach. Countries need to consider the synergies across the food, nutrition, water, energy, and waste nexus while simultaneously doing this in a sustainable way. All this needs strong political will and wide public support.

Preparing for the Next Pandemic

9. While we continue coping with the ongoing COVID pandemic, it is also necessary to prepare for the next. A pandemic affects large parts of the world at the same time, and the world's ability to cope depends on the policies and practices of local, national, and international institutions. Success depends on deeper scientific understanding of everything from virology and immunology to epidemiology and the psychology of human behavior. Collaboration, including expanded public-private partnerships, are needed to develop, produce, and distribute new tests, therapeutics and vaccines in an equitable and efficient manner. Success also depends on maintaining proper monitoring, which requires investment in public health capabilities all around the world. To produce the needed plans and preparations will need political will and public understanding. Success must also avoid inequities in resources, services, access, vulnerabilities, and outcomes arising within and across national borders.

10. By its nature a pandemic is global, and hence the WHO must have a stronger science-based central role in coordinating global monitoring and action. It should also have the means to help those who need help most. Existing health funds should be restructured into a new Global Health Fund, maintaining past programs but adding new funding for financing commodities for disease control, pandemic preparedness and response, and primary health system strengthening in LMICs.

Collaboration

11. Today, some of the biggest challenges affecting innovation and development revolve around coping with post-pandemic effects and redesigning work-life arrangements, supply chains, inclusive growth, rapid demographic change, rural-urban transitions, increasing demand for natural resources, globalization and economic liberalization, climate change, and technological disruption. Academia and the public and private sectors will need to work together nationally and regionally to build and accelerate science and technology and innovation. Collaboration in such endeavors can bring many benefits, including cost savings through sharing administrative expenses, expanding value propositions, improving efficiency, strengthening programs, and making use of compatible skills and abilities.

STEAM Education

12. Addressing real-world problems will require integrating education in arts subjects (including social and economic sciences and business) into STEM education, resulting in what is now commonly known as STEAM education. The use of inquiry-based science education pedagogical platforms for integrated STEAM education promotes the critical thinking, creativity, and problem-solving skills of students and young researchers. International collaboration is essential for building capacity, solving global problems, exchanging best practices, and promoting diversity and inclusion.

Challenges in the Digital Society

13. The revolution in the scale and speed of communication and the massive growth of information and the proliferation of social media platforms have created a new digital society and have changed where and how people access news and information about scientific, political, and societal issues. However, these same attributes have also created a crisis of confidence where misinformation and disinformation spread rapidly, which is extremely detrimental to people and even more seriously, erodes trust in science, institutions, and government. Citizens need to be empowered to protect their privacy and reputation and to exercise critical judgment to recognize fact-based reporting. A properly informed citizenry is necessary for adoption of science-based policies and evidence-based regulations.

Conclusions:

14. Our explorations of these and other issues are far from over. We will continue our interactions and discussions to accompany the evolving lights and shadows of science and technology in the societies of the world. And we look forward to convening again next year in Kyoto and have agreed to hold the 20th Annual Meeting of the STS *forum* from Sunday, October 1 to Tuesday, October 3, 2023.