

CHAIRMAN'S STATEMENT

1. The 21st Global Annual Meeting of the Science and Technology in Society *forum* took place from October 6 to 8, 2024 in Kyoto, with the participation of about 1,400 global leaders in science and technology, policymaking, business, and media from over 80 countries, regions, and international organizations.

We live in turbulent times where wars and conflicts are raging all over the planet, and never has the need for global cooperation towards peace, human security, and responding to our global environmental and social challenges been greater. Science and technology can do much to feed the hungry, heal the sick, protect the environment, and bring dignity to work, as it helps humanity get back to a sustainable development path. Thus, our discussions reviewing the key issues of our time were particularly timely.

AI

2. AI is a transformative technology with the power to revolutionize industries, enhance decision-making, and improve efficiency. However, its impact on society is twofold, bringing both benefits and challenges. While AI drives innovation, productivity, and customization, it also raises concerns about security risks, possible job displacement, economic inequality, and potential misuse. As AI continues to evolve globally, governments, societies, and businesses face growing challenges in addressing ethical and regulatory compliance. The current human-driven approach is slow, costly, and lacks consistency across jurisdictions. To navigate these complexities, there is a pressing need for automated solutions and transparent audit trails to ensure responsible AI use.

3. The rapid evolution of AI has the potential to transform the healthcare field. AI excels at managing large amounts of structured and unstructured data, extracting valuable insights to improve medical management and organizational efficiency, and facilitating real-time interactions with healthcare providers and patients. AI offers many advantages, but it also raises societal challenges, such as concerns about hidden biases, dehumanized care, privacy issues, and the need for clear ethical and regulatory frameworks. AI is already being utilized to enhance diagnostics, monitor chronic diseases, and accelerate drug discovery. Its potential to improve the quality of care and reduce costs makes it a transformative force in healthcare.

4. AI is also challenging the traditional roles of universities in learning and discovery. To ensure that learners succeed with AI, higher education must reassess its approach, focusing on understanding and utilizing advanced technologies, interpreting data, and evaluating AI outputs. Students need to develop uniquely human skills, such as creativity, critical thinking, cultural agility, and entrepreneurship, through experiential learning. Our discussions explored how AI accelerates university research and strategies for universities to focus on impactful research while ensuring safety and ethics. With the growing need for lifelong learning due to evolving employment needs, universities should prioritize lifelong learning programs and focus on developing AI tools for personalized education.

The Digital Age

5. Scientific progress relies on rigorous verification, including peer review, reproducibility, and open data sharing. With advances in AI and deep learning, assessing the accuracy and hidden biases of new tools is crucial. Effective science communication and public engagement are essential for addressing complex issues and rebuilding trust. Particularly in the face of misinformation and disinformation, strategies to enhance trust and address cybersecurity challenges are vital. Effective, responsible science communication, outreach, and public engagement are crucial. Innovative defense mechanisms against AI-driven threats, along with international cooperation on thoughtful regulation and comprehensive policies that can fit regional realities, are emphasized as key to ensuring a secure digital environment and ethical technological advancement.

Basic Science

6. The intersection of science, innovation, and policy is at a pivotal moment now, driven by rapid advances in basic science, technology, and engineering. Key issues include how basic science and mission-driven research can coexist and interact, the evolving roles of government, philanthropy, and industry in funding basic research, and the effectiveness of international collaboration amidst new geopolitical and security challenges. Additionally, higher education institutions need to enhance their support for scientific talent while balancing their roles in entrepreneurship and societal impact, and ensure career support for emerging scientists.

Global Health

7. In an era of unprecedented global challenges, the complexity and uncertainty surrounding global health have increased as never before. Issues such as climate change, the appearance of new viruses, and antimicrobial resistance are becoming increasingly interconnected, necessitating a comprehensive and collaborative approach. The focus must be on how these global

challenges are reshaping health outcomes, the strategies needed to address them, and the crucial role of international cooperation in safeguarding global health for future generations. Key issues include the interconnections between global health threats, disparities in health equity and access, and the importance of international collaboration amidst rising populism and conflict.

Biotechnology

8. In recent years, biotechnology has significantly transformed society, greatly improving human, animal, and plant health while also providing substantial economic benefits. Despite rapid technological advances, challenges remain, such as ensuring equitable access to costly personalized medicines and therapies and addressing disparities in international venture capital and research support. Harmonizing national regulatory requirements and helping academic researchers develop realistic expectations for commercialization are also crucial.

Food and Water

9. By 2050, the global population is expected to reach 10 billion, requiring a 70% increase in food production, despite a predicted 20–50% reduction in yields. Addressing this challenge will require significant transformations in agriculture to enhance productivity, minimize food losses, and optimize water use and access to safe water. Climate-smart agriculture is essential for ensuring food security, increasing productivity, and reducing agriculture's impact on the climate. The best of science, from ICT to AI, can help optimize farming techniques. And we should mobilize the new biology to explore the possibilities of novel foods and to rapidly produce plants that are drought and salt resistant, that have shorter growing seasons, along with greater yields and a higher nutritional content. All this is eminently and rapidly possible using modern biotechnology techniques, which – despite attacks on “GMOs” – have been shown to be safe with no problems reported after more than 30 years of use. Additionally, it is important to address the impact of rising sea levels on agriculture and fisheries. There is a need for implementing early warning systems accessible to all, securing funding for loss and damage, and launching new programs focused on agriculture and adaptation.

Energy

10. The world urgently needs to achieve net-zero emissions to prevent severe environmental damage. Rising global energy demands and continued use of fossil fuels are major sources of emissions, exacerbating climate change. Effective strategies must include both removing existing CO₂ and rapidly deploying new technologies. International cooperation is essential for coordinated action and must be supported by diverse technologies and investments. Achieving the 1.5°C target by 2050 will require significant investment and innovative financing, with a crucial role for research institutions in supporting policy and investment. Strategies for integrating intermittent renewable energy, balancing grid supply and demand, and transitioning to a low-carbon, flexible grid are essential.

Climate Change

11. As countries advance in decarbonizing their economies, addressing the risks from climate change and extreme weather is crucial. These risks threaten infrastructure, socioeconomic stability, and geopolitical dynamics. Increasingly frequent and severe natural disasters, such as floods and heatwaves, impact global systems and human health, making resilience essential. Policymakers and business leaders need to confront these challenges head-on. Key discussion points included preparing infrastructure for climate hazards, utilizing tools and resources for risk management, effectively communicating climate data, fostering cross-sector collaboration, and the key role of new technologies. Adaptation strategies are particularly important for vulnerable regions facing severe impacts. Concrete measures and policies are needed to enhance resilience and support collective action for the most vulnerable populations.

Collaboration

12. Strong, effective, and global collaboration between academia, industry, and government is more crucial than ever to address major environmental and social challenges. The rapid development of mRNA vaccines during the Covid-19 pandemic demonstrated the power of such collaboration. However, the pandemic also highlighted significant inequities in vaccine access, eroded trust in institutions, and led to increased misinformation and protectionism. It is essential to strengthen cooperation, trust, and openness, with a particular focus on the Global South. Key areas for improvement include fostering trust among partners, and nurturing innovation and supporting start-ups. Improving access to primary data, and learning from past crises is necessary to better support communities worldwide.

13. 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 world. We look forward to convening again next year in Kyoto and have agreed to hold the 22nd Global Annual Meeting of the STS *forum* from Sunday, October 5 to Tuesday, October 7, 2025.