

Conference Report

Monday, 31st January, Day 1

Introduction

KAMEYAMA Yasuko

Director, Social Systems Division, National Institute for Environmental Studies / Chairperson, International Conference on Science and Technology for Sustainability 2021 Sub-Committee, Science Council of Japan

Extreme weather events are increasing around the world due to climate change. The IPCC Working Group reported that global temperature rise in the last 200 years could not have happened without human-induced factors. We are already about 1.1 degrees Celsius above pre-industrialization. If we are to stay within a safe level, we need to limit the temperature rise to well below 2 degrees. In the COP26 meeting last fall, the world agreed to pursue efforts to limit the temperature increase to 1.5 degrees. To reach this goal, we need to halve our carbon dioxide emission by 2030 and reach net zero by 2050. The widespread use of renewable energy, the closure of coal-fired power plants and the conversion of fuels in the transportation sectors, as well as the practical application of almost all types of technology and systems that are currently in the development stage will be required for that purpose.

Opening Address

KAJITA Takaaki

President, Science Council of Japan / Distinguished University Professor, The University of Tokyo / Director, Institute for Cosmic Ray Research (ICRR), The University of Tokyo

Professor KAJITA mentioned the special report issued by the Intergovernmental Panel on Climate Change (IPCC), in which the new goal was established to reduce greenhouse gas emission to net zero by around 2050. In order to achieve net-zero emissions, many critical issues should be resolved through collaboration among various academic fields. After introducing efforts by the Science Academies of the G7 nations and the Science Council of Japan, he emphasized the importance of the role of the academic community in the transition toward a decarbonized society, and expressed his hope that this conference could contribute to solution.

Guest Speech

KOBAYASHI Takayuki

Minister of State for Science and Technology Policy

Mr. KOBAYASHI expressed his gratitude to the Science Council of Japan for organizing the conference, and introduced several measures the Government of Japan had taken against climate change. He pointed out that today's global challenges including carbon neutrality could be solved only through humans' concerted efforts. He stated that academia could play a role in establishment of comprehensive knowledge, which would be a key to address global challenges. He further stated how he hoped for synergies and collaboration inspired by dialogue between the government and academia, which may make the government better positioned to achieve net zero emissions.

Short Speech 1

Johan ROCKSTRÖM

Director, The Potsdam Institute for Climate Impact Research / Professor, Earth System Science, The University of Potsdam

Many countries are not delivering on their pledge of achieving net zero no later than 2070 that was made in Glasgow at COP26. But even if they are, it will not be good enough to eliminate the risk of triggering tipping points, which means irreversible changes that can warm the Earth even further. Science has succeeded in identifying the tipping elements that regulate the Earth system's climate. Now 9 out of the 15 tipping elements are showing signs of instability, meaning that they're showing signs of potentially moving fast towards tipping points. These elements are interconnected. Thus, many of them have risks of crossing tipping points even at low temperatures. In order to retain a stable and resilient Earth system, a combination of scientific advancements and interdisciplinary research, governance of the global commons, and transdisciplinary research collaboration with stakeholders outside of academia should accelerate the transformation towards a net zero future.

Short Speech 2

JIANG Kejun

Senior Researcher, Energy Research Institute (ERI), National Development and Reform Commission, CHINA

Mr. Xi Jinping, President of the People's Republic of China announced China will make efforts to top out its CO₂ emissions before 2030 and be carbon neutral before 2060. According to that guideline, much progress was made in China in 2021. For example, in terms of policies, the green electricity market was established, the peak and off-peak electricity pricing regime was regulated, and additional renewable energy outside the mandated quota started to be excluded from the energy cap. The progress of technologies was amazing, too. Wind and solar power generation capacity was greatly improved, and the number of electric vehicles increased. China is working on many areas, including transportation and steelmaking, to achieve carbon neutrality by 2050. In some of those areas, Japan, Korea or the EU is still taking the lead, but China is progressing fast. We believe that if carbon neutrality is achieved, it will have a positive impact on the economy and increase our GNP.

Short Speech 3

Miranda SCHREURS

Professor of Environment and Climate Policy, Technical University of Munich

The problem of climate change must be taken very seriously not only by countries that have contributed the most to the problem, but also by other countries even if they have few emissions. After 30 years of warnings by the science community, including the special report on 1.5 degrees Celsius put out by the IPCC and reports from the United Nations Environmental Program in 2018, which caution that even if the reduction targets of each country are added up, the increase cannot be reduced to less than 2°C, the political dimensions seem to be starting to take some steps in the right direction. Some of the biggest emitters, especially China, have started initiatives in important areas such as switching away from coal, the greening of finance, carbon pricing and electric cars. India also has established its own net-zero targets for 2070 and is now a world leader in the area of renewable energy. These big transitions are a good sign.

Panel Discussion 1

Moderator: Dr. KAMEYAMA Yasuko

Panelist: JIANG Kejun, Miranda SCHREURS, TANABE Shin-ichi

In this Panel Discussion 1, three panelists discussed the progress and challenges related to realization of net zero emissions. First, Dr. KAMEYAMA introduced Professor TANABE Shin-ichi who gave a presentation to start off a discussion.

TANABE Shin-ichi

Professor, Faculty of Science and Engineering, Waseda University

The industrial sector accounts for about 35% of Japan's carbon dioxide emissions, and commercial and household sectors account for 31–32% in total. To reduce CO₂ emissions, both energy consumption and the CO₂ emission intensity per energy should be reduced. Considering that fossil fuels such as coal, oil and natural gas are used directly without being converted into electricity in Japan, the electrification of automobile and buildings and the use of renewable energy will help reduce CO₂ emissions. Solar and wind power fluctuate over time, so grid energy management is required. At the same time, what we call "demand-side flexibility" in buildings and houses is required. Such technologies will lead to efficient use of renewable energy. However hard we may try, it is difficult to reduce CO₂ emissions to zero, so negative emission technologies such as Carbon dioxide Capture, Utilization and Storage (CCUS) and Direct Air Carbon Capture and Storage (DACCS) are also required for offsetting purposes.

Research Professor JIANG Kejun discussed on the rapid development of nuclear and solar power in China. Nuclear hydroelectric power and coal-fired power are used to generate electricity at night, when solar power is not available. Coal-fired power plants are used only during the off-peak period, so their use is expected to decrease over time. Furthermore, He pointed out that the production of solar PV in China had remarkably increased, partly because it is very beneficial for manufacturers. The transition to renewable energy is a very big business opportunity, and decarbonization is compatible with economic growth.

Professor Miranda SCHREURS stressed the necessity of sustainability education at university. Given the seriousness of biodiversity losses, climate change, pollution of the oceans and soil, sustainability education should be mandated of all students. She insisted that universities should offer far more interdisciplinary degrees and possibilities related to sustainability and climate change, and do much more networking with one another, so as to offer the most innovative solutions.

Professor TANABE Shin-ichi pointed out the relative scarcity of flat land space in Japan. Due to the mountainous terrain, it is impossible to install many solar power plants. Thus, he pointed out, nuclear power is expected to play a major part in Japan's energy mix, but Japanese people are very sensitive about nuclear plants after the Fukushima accident. He mentioned the development of zero-energy houses in Japan, and the importance of further technical collaboration with other Asian countries.

During the discussion time for this session, the panelists further discussed the green hydrogen, biofuels, stabilization of renewable energy, electrification of transportation, and the cost of new green technologies. The Moderator concluded the discussion by declaring that she optimistically believed that net zero could be reached by 2050, and mentioning again the important role academia should play.

Conference Report

Tuesday, 1st February, Day 2

Introduction

KAMEYAMA Yasuko

Director, Social Systems Division, National Institute for Environmental Studies / Chairperson, International Conference on Science and Technology for Sustainability 2021 Sub-Committee, Science Council of Japan

The same introductory presentation given on January 31 was delivered.

Short Speech 4

Robin GRIMES

Vice President and Foreign Secretary, The Royal Society / Steele Professor of Energy Materials, Department of Materials, Imperial College London

The Royal Society is trying to understand what best solutions science can bring to the sort of societal problems that include net zero. We are considering what the incentives are that we need to convince industry-based funding processes to make progress on ideas that are already available to us, but need to be demonstrated at scale (such as hydrogen). We have got it working in the lab. We have even got it working in small plants, but we have not demonstrated it at a scale needed to make a real difference. As a specialist of civil nuclear energy, I would like to mention that we think about how nuclear energy fits into a systematic approach to delivering net zero. We are considering using waste heat from nuclear energy to do the low-temperature processes, using existing nuclear technologies for intermediate temperature processes, and adopting new reactors which use those very high temperatures for doing some of the high-temperature requirements.

Short Speech 5

HASHIMOTO Shizuka

Associate Professor, Graduate School of Agricultural and Life Sciences, The University of Tokyo / Associate Professor, Institute for Future Initiatives, The University of Tokyo

Humans have greatly expanded their activities with modernization, but these expansions have also caused massive environmental degradation, such as the loss of tropical rain forest and species extinction. Climate change is one of the major direct drivers of biodiversity decline. Controlling climate change and protecting biodiversity are interdependent and essential for sustainable futures. However, meeting climate targets will not halt biodiversity decline. According to the report jointly published by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), measures that focus only on climate change mitigation may have negative effects on biodiversity. On the other hand, many biodiversity conservation measures are compatible with climate change measures.

Japan's dietary habits have become increasingly Westernized and the country's dependence on overseas sources of food supply has increased. Consumption in developed countries has been causing a decline in biodiversity in other countries through trade. Changing our consumption behavior can make a significant contribution not only to biodiversity, but also to climate change.

Short Speech 6

Diane COYLE

Bennett Professor of Public Policy, University of Cambridge

The Bennett Institute at Cambridge University is a relatively new public policy institute. We have focused on sustainability and on fairness and equitable society. Carbon accounting is a well-known way of measuring carbon impacts. In this highly globalized world, we need to start accounting not only for where goods are produced, but also where they are consumed. We should focus on who is paying the price for choices made in this society because the damages of climate change are being spread very unfairly. As we emerge from the pandemic, governments have started to talk about green recovery. The point is how policymakers should understand which policies enable environmental recovery or sustainability, and which policies might actually harm it. I believe there are “win-win” policies which are good for the climate and for economic growth and jobs, such as flood defenses, and research and development spending.

Panel Discussion 2

Moderator: Dr. KASUGA Fumiko

Global Secretariat Hub Director-Japan, Future Earth / Senior Fellow, National Institute for Environmental Studies

Panelist: Robin GRIMES, HASHIMOTO Shizuka, Diane COYLE

In this Panel Discussion 2, three panelists discussed a wide range of topics. First, they shared their personal experiences of working with other social scientists, particularly economists. Then they actively discussed two approaches to inter-academia collaboration (top-down and bottom-up), insect-eating practices, de-growth, the synergies and trade-offs for achieving net zero emission in the socio-economic aspects, how economics can involve the younger generation, societal tipping points (turning points or leverage points of the society in shifting to net zero direction), interaction with policymakers, and the difficulty with communicating and cooperating with stakeholders who uses “different languages”. At the last of the discussion, Professor Robin GRIMES suggested that the Royal Society and the Science Council of Japan should explore more how they can support each other. Associate Professor HASHIMOTO Shizuka stated that one of academia’s roles for achieving Net Zero was to work as a knowledge broker to bridge the gap between science and policy. Professor Diane COYLE, with regard to responsibilities of academics, stressed the importance of interdisciplinarity and recommended communicating broadly, and developing mutual understanding among groups in our societies and between different countries.

Closing Remarks

TAKAMURA Yukari

Vice President, Science Council of Japan / Professor at the Institute for Future Initiatives, The University of Tokyo

Professor TAKAMURA expressed gratitude to all individuals and organizations engaged in this conference on behalf of the Science Council of Japan, and summarized discussions at the conference. To tackle climate crisis, science and technology are expected to provide the evidence and solution, solution not limited to technology development, but also its deployment and diffusion and the policy for enhancing it. She cited the keywords: “interdisciplinary collaboration”, “education” (educating not only the general public but also each other), and “transdisciplinary collaboration with various stakeholders in the society.” She wished this conference to be a kickoff opportunity for more intensive collaboration in the society.

* The SCJ Secretariat takes responsibility for the wording and content of this report.