



**ICEF2023**

**10th Annual Meeting**

**Autumn, 2023**  
(Tentative)

**Official Website**  
<https://www.icef.go.jp/>

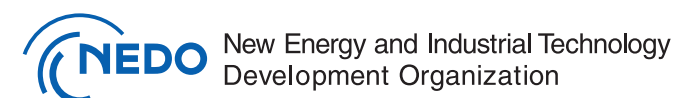


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# Innovation for Cool Earth Forum

## ICEF2022 Report







## What's ICEF?

Innovation for Cool Earth Forum (ICEF) is a platform of wisdom for discussing among industry-academia-government leaders around the world in order to promote "INNOVATION", the key to solving global warming.

Since 2014, the ICEF Annual Meeting has been held every year by the Government of Japan's Ministry of Economy, Trade and Industry (METI) and New Energy and Industrial Technology Development Organization (NEDO) of Japan.

Distinguished experts from industry, academia and governments are gathered to engage in lively discussions and explore innovation-based solutions to address climate change, the most pressing challenge facing the 21st Century.

ICEF hopes to share the latest knowledge with the world, increase public awareness of the threat of climate change, and to facilitate a change in behaviour. ICEF is taking into consideration gender equality and youth engagement based on the awareness that diversification is the origin of innovation.

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# 9th Annual Meeting

## Overall theme

Low-Carbon Innovation in a Time of Crises

## Hybrid Forum (Hotel Chinzanso Tokyo and On-line)

Wednesday, October 5, 2022 – Thursday, October 6, 2022

## Co-Hosts



## Institutional Partners



BloombergNEF



## Participants

About 1,600 participants from governments, international organizations, the business sector, and academia representing 87 countries and regions

## Outcome of ICEF2022

- Roadmap Projects on "Low-Carbon Ammonia" and "Blue Carbon"
- Statement from the Steering Committee

## ICEF Official YouTube Channel

<https://www.youtube.com/channel/UC7ouNL9NbvDomDTfubi8iw>



# Program

## DAY 1 (Wednesday, October 5)

### 8:30 - 10:30 Side Event

Moonshot R&D Program (NEDO Project-related Event)  
"CO<sub>2</sub> balance and outlook of the Moonshot DAC-U projects"

### 9:30 - 10:15 Opening Session

Video Message from Mr. NISHIMURA Yasutoshi  
(Minister of Economy, Trade and Industry, Japan)

Opening Remarks

Keynote 1  
Dialogue between Dr. Fatih Birol  
(Executive Director of International Energy Agency (IEA))  
and Mr. TANAKA Nobuo  
(Chair of ICEF Steering Committee)

### 10:25 - 11:40 Plenary Session 1

Policy Innovation

### 11:50 - 12:50 Side Event

Roadmap Project "Low-Carbon Ammonia"

### 13:30 - 14:15 Side Event

Non-CO<sub>2</sub> GHG Reduction

### 13:35 - 13:40 Keynote 2

Video Message from Mr. Gerd Müller  
(Director General of the United Nations Industrial Development Organization (UNIDO))

### 13:50 - 15:00 Technology Session 1

Demand-driven Energy Transformation

### 14:30 - 16:30 Side Event

The Co-hosted Event by UNIDO  
"Facilitative decade of action towards just industrial decarbonisation responding to growing demands in developing/emerging countries"

### 15:15 - 16:15 Technology Session 2

Actions Needed for Realizing Carbon Neutrality in Heat and Transport Sectors with Hydrogen and E-fuel/  
E-methane

### 16:30 - 17:45 Plenary Session 2

Energy Transition Leaving Nobody Behind

### 17:50 - 18:35 Side Event

Conversation between ICEF Steering Committees and Youth experts

## DAY 2 (Thursday, October 6)

### 9:00 - 9:30 Keynote 3

Dialogue between Mr. Francesco La Camera  
(Director-General of International Renewable Energy Agency (IRENA))  
and Mr. TANAKA Nobuo  
(Chair of ICEF Steering Committee)

### 9:40 - 10:40 Technology Session 3

Carbon Dioxide Removal Technologies

### 11:00 - 12:15 Keynote 4

Speech by H.E. Rahm Emanuel  
(Ambassador Extraordinary and Plenipotentiary of the United States of America to Japan)

### Technology Session 4

Sustainable Nuclear Systems

### 12:10 - 13:10 Side Event

Roadmap Project "Blue Carbon"

### 13:30 - 15:30 Side Event

NEDO Green Innovation Fund Projects Symposium  
"A Challenge toward Global Supply Chain Carbon Neutrality"

### 14:00 - 15:15 Technology Session 5

How to Secure a Sustainable Value Chain in the Age of Resilience: Critical Metals and Minerals?

### 15:30 - 16:30 Summarising Plenary Session

Summarising Plenary Session  
- Overlooking the Outcome of ALL sessions at ICEF2022 -

### 16:30 - 17:05 Closing Session

Closing Remarks  
Roadmap Announcement  
Statement from the Steering Committee  
Final Thoughts on the Event



## Opening Remarks

It is our great pleasure to hold the ICEF 9th Annual Meeting as one of the meetings in TOKYO GX WEEK, where we are welcoming some participants back to the in-person venue after 3 years' absence. I would like to extend my warmest welcome to all of you who are participating in person and online. I appreciate the efforts of the Steering Committee Members and all those who are involved.

With the aim of realizing Green Transformation, METI is holding TOKYO GX WEEK, an intensive program made up of international conferences related to energy and environment, from September 26th. Climate change is an issue that the whole world must urgently confront together, and we must achieve worldwide carbon neutrality as soon as possible. However, each country's economic and geographic circumstances are different, and it is essential that we accelerate energy transitions without leaving anyone behind while also promoting innovations and social implementation.

This ICEF is a platform of wisdom intended for industry-academia-government leaders around the world to have discussions that lead to promoting innovation: the key to solving global warming. We are in the midst of crises such as climate change, the pandemic, and regional conflicts. As energy prices rise and energy security becomes a challenge, innovation is the key to solving the problems we face. Based on this understanding of our current situation, at ICEF2022, we will focus on how to accelerate innovations that can help achieve carbon neutrality and have various discussions on not only the demand and supply sides of energy, but also on the technologies of carbon dioxide removal and for utilizing critical minerals.

Many experts from various generations and with backgrounds such as government, international organization, industry, and academia will be onstage. One point to note is that we have young experts taking the stage who will be part of the working generation in 2050, the year carbon neutrality is to be achieved. Since this young generation will play a leading role in society in the future, I hope that they will actively join discussions.

We are facing various global crises. I hope that the attendees discuss how we can make strong progress toward achieving carbon neutrality, and that the results will be widely shared. Thank you.



Minister of Economy,  
Trade and Industry

**NISHIMURA  
Yasutoshi**

## Keynotes

### Keynote 1

Dialogue between Dr. Fatih Birol (Executive Director of International Energy Agency (IEA)) and Mr. TANAKA Nobuo (Chair of ICEF Steering Committee)



### Keynote 2

Video Message from Mr. Gerd Müller  
(Director General of the United Nations Industrial Development Organization (UNIDO))



### Keynote 3

Dialogue between Mr. Francesco La Camera  
(Director-General of International Renewable Energy Agency (IRENA)) and Mr. TANAKA Nobuo (Chair of ICEF Steering Committee)



### Keynote 4

Speech by H.E. Rahm Emanuel  
(Ambassador Extraordinary and Plenipotentiary of the United States of America to Japan)





# Plenary Sessions

## Plenary Session 1 Policy Innovation

In this session, it was emphasized that in the midst of crisis in the current global affairs and energy security, the impact of the energy transition on the geopolitical landscape has been massive. While innovation technologies for decarbonization have been developing, the need for governments' intervention to create incentives and industrial policies that promote scale-up and acceleration was mentioned. In addition, it was discussed that the competitive environment between the United States and China could provide opportunities to promote innovation and development, and that bilateral cooperation was essential. Moreover, some discussed that different kinds of issues needed to be addressed for "just transition" since the energy transition creates winners and losers. Others argued that the transition to clean energy was the issue that needed acceleration now, rather than addressing it after resolving non-climate change issues such as human rights and ideology.



**TANAKA Nobuo** (Moderator)  
Chair, Innovation for Cool Earth Forum (ICEF) Steering Committee



**Adnan Z. Amin** (Moderator) Non-attendance  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Meghan O'Sullivan** (Speaker)  
Jeane Kirkpatrick Professor,  
Practice of International Affairs;  
Director, Geopolitics of Energy Project,  
Harvard University's Kennedy School



**Matt Carpio** (Speaker)  
Head of Transaction Advisory,  
Climate Smart Ventures



**Pia Andres** (Speaker)  
Researcher, Oxford Martin School



**Claudio Facchin** (Speaker)  
Senior Vice President and Executive Officer,  
CEO of Power Grids Business Unit,  
CEO of Hitachi Energy Ltd.,  
Hitachi, Ltd.



## Plenary Session 2 Energy Transition Leaving Nobody Behind

In this session, it was emphasized that there was no trade off between economic growth and decarbonization and that sustainable economic growth needed to be green. In the energy transition, the importance of having no one left behind was stressed. The session also pointed out the necessity of careful consideration of different groups of people who are affected by decarbonization including unemployment in high-emitting business sectors. Therefore, it was discussed that taking an inclusive and people-centric approach would be crucial. It was also argued that in order to realize energy transition, further cooperation between the government and private sector, and local government at the national level as well as the international cooperation between developed and emerging economies/developing countries are essential.



**Jon Moore** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Hoesung Lee** (Moderator) Non-attendance  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Vikram Singh Mehta** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Rob Macquarie** (Speaker)  
Policy Analyst and Research Advisor to  
Lord Nicholas Stern, Grantham Research Institute  
on Climate Change and the Environment,  
London School of Economics and Political Science



**Shalu Agrawal** (Speaker)  
Senior Programme Lead, Council on Energy,  
Environment and Water (CEEW)



**Wang Nan** (Speaker)  
Vice President, Sustainable Business Origination  
Team, Sustainable Business Office,  
Solution Products Division, MUFG Bank, Ltd.





# Summarising Plenary Session

## - Overlooking the Outcome of ALL sessions at ICEF2022 –

As a summarising session, each ICEF Steering Committee member gave remarks overlooking all sessions and discussions that were held in ICEF2022, as well as the agenda ideas for the next year, ICEF2023.

As the reflection of all sessions, geopolitical tension was a recurring theme throughout the discussions, and it was mentioned that climate change actions required a global strategy. It was also agreed that food and agriculture deserved more attention due to its nontrivial (30%) contribution to the total GHG emissions.

As for the important agenda items for ICEF2023, the most recurring item was geopolitics. The most mentioned topics after geopolitics were the continuous and deeper involvement of youth and food systems. In addition, other perspectives for the next year included situations in China and India, digital technology including artificial intelligence, water/hydrological cycle and climate, systemic view/approach, and the use of social media.



**TANAKA Nobuo** (Moderator)  
Chair, Innovation for Cool Earth Forum (ICEF) Steering Committee



**Jon Moore** (Speaker)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Georg Erdmann** (Speaker)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Changhua Wu** (Speaker)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**YAMAJI Kenji** (Speaker)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**David Sandalow** (Speaker)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



# Technology Sessions

## Technology Session 1 Demand-driven Energy Transformation

This session focused on energy transformation of the demand side by encouraging behavioral changes in energy consumers. Behavioral and lifestyle changes of the energy demand side will help energy consumption to decrease, which will contribute to substantial greenhouse gas emission reductions. Efficient economic activity and behavioral and lifestyle changes necessitate access to appropriate policy measures, information, technology, and infrastructure. Innovations such as digital transformation will be critical to facilitate the energy transformation of the demand side.



**KURODA Reiko** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**YAMAJI Kenji** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Leila Niamir** (Speaker)  
Research Scholar, Energy, Climate, and Environment Program, International Institute for Applied Systems Analysis (IIASA)



**Joyashree Roy** (Speaker)  
Director, Centre for South and South-east Asia Multidisciplinary Applied Research Network on Transforming Societies of Global South, School of Environment, Resources and Development, Asian Institute of Technology



**Nebojsa Nakicenovic** (Speaker)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Siva Gunda** (Speaker)  
Vice Chair, California Energy Commission



**KONISHI-NAGANO Tomoko** (Speaker)  
Manager, Environmental Design Department, Environment Division, Sustainability Unit, Fujitsu Limited

## Technology Session 2 Actions Needed for Realizing Carbon Neutrality in Heat and Transport Sectors with Hydrogen and E-fuel/E-methane

In this session, the importance of hydrogen, ammonia, e-methane, etc. in the industrial and heat areas was mentioned. In addition, the decarbonization in areas where electrification is difficult, as well as the utilization of existing infrastructure were mentioned as the advantages of e-fuel.

In the discussion, the importance of investment incentives for e-fuel, technological development and support for CO2 recovery technology, and policy support was discussed. The potential of reducing CO2 emissions and the possibility of reducing the cost of hydrogen, e-fuel, and e-methane production through scale-up and institutional design were also discussed.



**Georg Erdmann** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Vikram Singh Mehta** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**YABE Akira** (Speaker)  
Fellow, Sustainable Energy Unit, Technology Strategy Center (TSC), New Energy and Industrial Technology Development Organization (NEDO)



**YAKABE Hisataka** (Speaker)  
Executive officer, Director of Hydrogen and Carbon Management, Technology Strategy Department, Digital Innovation Division, Tokyo Gas Co., Ltd.



**Ruben Furi** (Speaker)  
Head of Government Affairs & Berlin Site Operations Manager, Enapter GmbH



**Monika Griefahn** (Speaker)  
Speaker and Member, Board of the eFuel Alliance



### Technology Session 3 Carbon Dioxide Removal Technologies

This session discussed the importance of increasing policy support for Carbon Dioxide Removal (CDR) technologies. All moderators and speakers recognized that no more CO<sub>2</sub> could be emitted into the atmosphere to achieve the 1.5-degree goal, therefore, capturing CO<sub>2</sub> from the atmosphere would be more essential. Also, upscaling for CDR technologies from a demonstration-scale needs to be sped up and private investors worldwide need to be encouraged. To deploy CDR technologies around the world, developed countries would support developing countries, especially in the agriculture sector that has enormous potential. At the same time, a dialogue through engagement with stakeholders and communities to deploy would be important.



**David Sandalow** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Ismail Serageldin** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Sally M. Benson** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**S. Julio Friedmann** (Speaker)  
Senior Scientist & Head Carbon Wrangler, Carbon Direct



**Jennifer Wilcox** (Speaker)  
Principal Deputy Assistant Secretary, Fossil Energy and Carbon Management, US Department of Energy



**MIZUNASHI Wataru** (Speaker)  
Director General, Bioeconomy Unit, Technology Strategy Center (TSC), New Energy and Industrial Technology Development Organization (NEDO)



**Giana Amador** (Speaker)  
Cofounder and Managing Director, Carbon180

### Technology Session 4 Sustainable Nuclear Systems

This session focused on the research and development of advanced nuclear reactors and sustainable nuclear systems for realizing carbon neutrality by 2050. US-Japan sociotechnical cooperation is important to develop advanced reactor technology and to promote sustainable nuclear systems, which will contribute to energy security, debris treatment in Fukushima and carbon neutrality. To realize sustainable nuclear systems in the future, we should adopt four points including SMR for risk reduction, ARC's type technology for Fukushima debris solution with processes such as pyroprocessing, successful HLW disposal process in Finland, and nuclear affordability.



**Richard K. Lester** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**TANAKA Nobuo** (Moderator)  
Chair, Innovation for Cool Earth Forum (ICEF) Steering Committee



**Eija-Riitta Korhola** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Irfan Ali** (Speaker)  
Senior Vice-President, Strategic Development & CIO, ARC Clean Energy, Inc.



**FUJITA Reiko** (Speaker)  
Former President, Atomic Energy Society of Japan



**Aditi Verma** (Speaker)  
Assistant Professor, Nuclear Engineering and Radiological Sciences, University of Michigan



**SHIMOGORI Kei** (Speaker)  
Senior Researcher, Global Energy Group 1, Strategy Research Unit, The Institute of Energy Economics, Japan (IEEJ)

### Technology Session 5 How to Secure a Sustainable Value Chain in the Age of Resilience: Critical Metals and Minerals?

This session focused on innovations for securing a stable supply of critical metals and minerals in the energy transition with the theme "No Minerals, No Clean Energy Transition." The experts from various areas of government, business, academic and international organizations shared their views on how to secure a sustainable supply chain, such as geopolitical diversity and ethical and environmentally conscious mining and long project timelines. In order to conquer these issues, alternative resource exploration in the deep sea, global cooperative networks, and human resource development were actively discussed as solutions and opportunities.



**Changhua Wu** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**David Sandalow** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Valli Moosa** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Dolf Gielen** (Speaker)  
Director, Innovation and Technology Center, International Renewable Energy Agency (IRENA)



**Robert J. Johnston** (Speaker)  
Senior Research Scholar, Columbia Center for Global Energy Policy; Founder and Managing Director, Eurasia Group's Energy, Climate, and Resources Practice



**ASANO Yukie** (Speaker)  
Mineral Resources Diplomacy Staff, Metals Strategy Department, International Affairs Division, Japan Oil, Gas and Metals National Corporation (JOGMEC)



**KATO Yasuhiro** (Speaker)  
Vice Dean, Professor, School of Engineering, The University of Tokyo



**Natascha Viljoen** (Speaker)  
Chief Executive Officer, Anglo American Platinum Ltd.; Member, The Anglo American plc group management committee



**Jane Nakano** (Speaker)  
Senior Fellow, Energy Security and Climate Change Program, Center for Strategic and International Studies (CSIS)





## Side Events

### Side Event

### Moonshot R&D Program (NEDO Project-related Event) “CO<sub>2</sub> balance and outlook of the Moonshot DAC-U projects”

In this session, Mr. Cooney and Dr. Sick, who are known as famous researchers of LCA and CCU, presented their thought of negative emission. Then, six project managers implementing Direct Air Capture and CO<sub>2</sub> utilization projects (DAC-U projects) under the NEDO Moonshot R&D Program presented an overview of each project and system boundary of each DAC-U system. In the panel discussion moderated by Mr. Inaba, an expert in LCA, keynote speakers and project managers discussed the effectiveness of small/large and urban/suburban systems and the role of private companies in relation to DAC-U.



**YAMADA Hiroyuki** (Greetings)  
Director General, Moonshot Research and Development Program Office;  
Director General, Frontier and Moonshot Technology Department, New Energy and Industrial Technology Development Organization (NEDO)



**YAMAJI Kenji** (Greetings)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**MURATA Jo** (Introductory)  
Chief Officer, Moonshot Research and Development Program Office, Frontier and Moonshot Technology Department,  
New Energy and Industrial Technology Development Organization (NEDO)



**INABA Atsushi** (Moderator)  
President, Japan Life Cycle Assessment Facilitation Centre (LCAF)



**Gregory Cooney** (Speaker)  
Senior Engineer, Office of Carbon Management,  
U.S. Department of Energy



**KODAMA Akio** (Speaker)  
Professor, Institute for Frontier Science Initiative,  
Kanazawa University



**NOGUCHI Takafumi** (Speaker)  
Professor, Department of Architecture, Graduate School of  
Engineering, The University of Tokyo



**FUKUSHIMA Yasuhiro** (Speaker)  
Professor, Department of Frontier Science for Advanced  
Environment, Graduate School of Environmental Studies,  
Tohoku University



**Volker Sick** (Speaker)  
Professor, Department of Mechanical Engineering,  
University of Michigan



**SUGIYAMA Masakazu** (Speaker)  
Director and Professor, Research Center for Advanced Science and  
Technology (RCAST), The University of Tokyo



**NORINAGA Koyo** (Speaker)  
Professor, Institute of Innovation for Future Society, Research Center  
for Net Zero Carbon Society, Nagoya University



**FUJIKAWA Shigenori** (Speaker)  
Distinguished Professor, International Institute for Carbon Neutral  
Energy Research, Kyushu University

### Side Event

### NEDO Green Innovation Fund Projects Symposium “A Challenge toward Global Supply Chain Carbon Neutrality”

At the presentation session, experts from each country took the podium and introduced the development status and vision of the construction of hydrogen and fuel ammonia supply infrastructure and next-generation mobility such zero-emission vessels, including the related activities of Japan's Green Innovation Fund projects. At the panel session, the need to transform the industrial structure of the international logistics system in order to achieve carbon neutrality in the supply chain was discussed, and to that end, international cooperation that transcends countries and industries is important, and the need to support bold challenges by companies was emphasized.



**TANAKA Tetsuya** (Greetings)  
Deputy Director-General, Industrial Science and Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)



**HIEKATA Kazuo** (Moderator)  
Professor, Graduate School of Frontier Sciences, The University of Tokyo



**IIMURA Akiko** (Speaker)  
Director General, Green Innovation Fund Projects Coordination  
Office and Technology Strategy Center (TSC), New Energy and  
Industrial Technology Development Organization (NEDO)



**Rebecca Thomson** (Speaker)  
Manager, Hydrogen Strategy Team, Department of Climate Change,  
Energy, the Environment and Water, the Australian Government



**NISHIMURA Motohiko** (Speaker)  
Executive Officer, Hydrogen Strategy Division, Kawasaki Heavy  
Industries, Ltd.



**YOKOYAMA Tsutomu** (Speaker)  
General Manager, Green Business Group, NYK LINE



**AKAMATSU Takeo** (Speaker)  
General Manager, Green Innovation Business Unit, Plant Project,  
Marine & Aerospace Division, Machinery Company,  
ITOCHU Corporation



**TAMURA Akihiro** (Speaker)  
Director, Ocean Development and Environment Policy Division,  
Maritime Bureau, Ministry of Land, Infrastructure, Transport and  
Tourism (MLIT)



**Wei Jie Lau** (Speaker)  
Director, Partnerships, Global Centre for Maritime Decarbonisation



**Komatsu Yu** (Speaker)  
Director - Asia, Yara Clean Ammonia



**Peter Kirkeby** (Speaker)  
Principal Specialist, Technical promotion, Two-Stroke Promotion &  
Customer Support, MAN Energy Solutions SE





## Side Event

**Non-CO<sub>2</sub> GHG Reduction**

In this session, the potential for the reduction of non-CO<sub>2</sub> greenhouse gas emissions, including methane which accounts for approximately 30% of global greenhouse gas emissions, in agriculture (livestock, rice cultivation, etc.) and food systems (waste, etc.) was emphasized. In emerging countries (such as China, India, Africa, etc.) where agriculture is one of the main economic activities, the importance of improving productivity was confirmed. In addition, the introduction of climate-smart agriculture to small-scale farmers (introduction of digitalization, genetic improvement, etc.) was emphasized. Conversely, it was further indicated that it is important to adopt a case-by-case solution tailored to the specific farmer or local area and also to adopt an approach based on the premise that the local people can enjoy the benefits.



**Ismail Serageldin** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**Uma Lele** (Speaker)  
Executive, International Association of Agriculture Economists (IAAE);  
Officer, Institute of Economic Growth, University of Delhi



**Francesco N. Tubiello** (Speaker)  
Senior Statistician, Food and Agriculture Organization of the United Nations (FAO);  
Team Leader, Agri-Environmental Statistics, Food and Agriculture Organization of the United Nations (FAO)



**YUKI Chika** (Speaker)  
Division 3 of Africa Department, Japan International Cooperation Agency (JICA)



## Side Event

**The Co-hosted Event by UNIDO**

**“Facilitative decade of action towards just industrial decarbonisation responding to growing demands in developing/emerging countries”**

Industries play a pivotal role for the achievement of the United Nations Agenda 2030. They provide various goods and services, which are essential part of the economy while also being responsible for major global GHG emissions. For example, the energy intensive two heavy industries, namely steel and cement, which produce the highly versatile and integral products in the modern life style, represent around 15% of global energy related CO<sub>2</sub> emissions. Steady growth of the demands for the products in developing and emerging countries is expected to hike further in particular in post crisis period. Moving ahead, we need to find practical yet ambitious ways to decouple energy use and production growth, appropriately filling gaps in supply and demand while mobilizing technology and finance. This will require innovative policy instruments and approaches towards 2030 and beyond. The side event gathered leading companies as well as government officials and researchers from across the globe and discussed possible measures and enabling conditions as well as facilitative roles which international partnership and cooperation can play to make just transitions towards industrial decarbonisation without compromising economic growth and environmental integrity.



**Tareq Emtairah** (Speaker)  
Director, Division of Decarbonization and Sustainable Energy,  
United Nations Industrial Development Organization (UNIDO)



**HOSHINO Takeo** (Speaker)  
Project Professor, Department of Material Engineering, Graduate  
School of Engineering, The University of Tokyo



**Ayman Fathy** (Speaker)  
Executive Manager, Product Development & Quality Control,  
EZZ Steel



**YASUNAGA Yuko** (Speaker)  
Managing Director, Directorate of Corporate Services and  
Operations (COR), United Nations Industrial Development  
Organization (UNIDO)



**Valli Moosa** (Speaker)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**KAWAGUCHI Yukihiro** (Speaker)  
Director, Industrial Green Transformation, Manufacturing Industries  
Bureau, Ministry of Economy, Trade and Industry (METI)



**Tiffany Vass** (Speaker)  
Senior Industry Energy Analyst, Energy Technology Policy Division,  
International Energy Agency (IEA)



**Anupam Badola** (Speaker)  
Deputy CSO, Corporate ESG, Dalmia Cement (Bharat) Ltd.





## Side Event

## Conversation between ICEF Steering Committees and Youth experts

ICEF2022 paid particular attention to the young voices at "Conversation between ICEF steering committee and youth experts." Seven speakers stressed appreciation for direct connecting with world-class experts. They shared that education and communication are essential tools to tackle climate change and that we must consider the equal transition carefully. A highlighted discussion issue was social media use. Young experts acknowledge that social media is a powerful communication tool but can lead in the wrong direction. Regarding a recommendation to improve the ICEF operation, the conversation noted the more geographically diverse participants and the PR opportunities.



**TANAKA Nobuo** (Moderator)  
Chair, Innovation for Cool Earth Forum (ICEF) Steering Committee



**KURODA Reiko** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



**ASANO Yukie** (Speaker)  
Mineral Resources Diplomacy Staff, Metals Strategy Department, International Affairs Division, Japan Oil, Gas and Metals National Corporation (JOGMEC)



**Ann-Kathrin Merz** (Speaker)  
Research Assistant, Carbon Management Research Initiative, Center on Global Energy Policy, Columbia University;  
Research Associate, First Ammonia;  
Master's Student, School of International and Public Affairs, Columbia University



**Wang Nan** (Speaker)  
Vice President, Sustainable Business Origination Team, Sustainable Business Office, Solution Products Division, MUFG Bank, Ltd.



**YUKI Chika** (Speaker)  
Division 3 of Africa Department, Japan International Cooperation Agency (JICA)



**Ruben Furi** (Speaker)  
Head of Government Affairs & Berlin Site Operations Manager, Enapter GmbH



**Leila Niamir** (Speaker)  
Research Scholar, Energy, Climate, and Environment Program, International Institute for Applied Systems Analysis (IIASA)



**Aditi Verma** (Speaker)  
Assistant Professor, Nuclear Engineering and Radiological Sciences, University of Michigan



## Closing Session



### ① Closing

**Mr. ISHIZUKA Hiroaki**

Chairman, New Energy and Industrial Technology Development Organization (NEDO)

### ② Roadmap Announcement

**Mr. David Sandalow**

Innovation for Cool Earth Forum (ICEF) Steering Committee

**Mr. TAGAMI Takahiko**

Senior Coordinator and Manager of Climate Change Group, Climate Change and Energy Efficiency Unit, The Institute of Energy Economics, Japan (IEEJ)

### ③ Statement from the Steering Committee

**Prof. Dr. YAMAJI Kenji**

Innovation for Cool Earth Forum (ICEF) Steering Committee

### ④ Final Thoughts on the Event

**Mr. TANAKA Nobuo**

Chair, Innovation for Cool Earth Forum (ICEF) Steering Committee



# Statement

## ICEF2022 Statement from the Steering Committee

October 6, 2022

Under the main theme of “Low-Carbon Innovation in a Time of Crises”, the ninth annual meeting of the Innovation for Cool Earth Forum (ICEF2022) was held in a hybrid format on October 5 and 6, 2022 as an initiative of "Tokyo GX Week", a series of 10 conferences that discussed on a wide range of energy and environmental issues. More than 1,600 people from governments, international organizations, industry, and academia participated in this event, representing 87 countries and regions. At the conclusion of ICEF2022, the Steering Committee is releasing the following statement based on a series of discussions.

### 1. Crises we face

- This year people in many parts of the world experienced record high temperatures, as well as devastating wildfires, floods and droughts, threatening human lives and nature. The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR6) pointed out that we are not on track to limit warming to 1.5°C. Unless there are immediate and deep emissions reductions across all sectors, 1.5°C is beyond reach, increasing the danger of exceeding more tipping points. Even 2°C has become increasingly challenging.
- In addition, the COVID-19 and the war in Ukraine have not only shocked but also dramatically disrupted our energy and food systems. The war has impacted various energy markets and threatened energy security of many economies.
- As a result, both the use of coal and emissions are rising. We also face the imminent issue of inflation, in particular energy and food price hikes, and supply-chain disruptions.
- All these crises revealed weakness of international and national institutions to address global issues.
- Furthermore, social unrest and political violence in some parts of the world have been rising, due to the public's dissatisfaction and anger in the difficult socio-economic situation.

### 2. Opportunities we have: diversified approaches

- Since its start in 2014, ICEF has promoted innovations as a solution to climate change. Innovation becomes even more significant and crucial under these uncertainties and cascading challenges. The current rapid cost declines and massive deployment of renewables demonstrated that transformational change is possible. Now we need to transform other areas and sectors. Momentum for public and private R&D incentives and investment in clean energy technologies is now higher than ever before. Countries' pivotal measures away from dependence on fossil fuels can accelerate clean and secure energy transition in the medium and long term.
- Diversification in approaches is essential to materialize opportunities. Diversified approaches will create sound competition among different technologies, and therefore constitute an origin of innovation and contribute to their deployment.
- Diversification is also an important principle of resilience that helps enhance capability to grapple with risks and uncertainties. It is thus indispensable for tackling energy security issues and moving towards the post-COVID-19 era, which are now transforming our society.
- ICEF embodies diversification and inclusiveness. We not only facilitate discussions and debates among countries and regions with different pathways, various technological areas, sectors of industry, academia and government, and many other stakeholders, but also ensure cross-generational representation and gender diversity.

### 3. Need for accelerated action before 2030

- While the number of countries and regions pledging carbon neutrality and with climate legislation is increasing, CO2 emissions in 2021 rebounded at the highest level after a temporary decrease in 2020 with the COVID pandemic

lockdown. The short-term emissions unfortunately continue to increase. In the meantime, the IPCC AR6 assessed that the remaining carbon budget from 2020 onwards is 500 Gt CO2 to have a 50% chance of limiting warming to 1.5°C, while existing fossil fuel infrastructure is expected to emit cumulatively 610 GtCO2 from 2018 until the end of its lifetime. We simply cannot keep this pace forward and must reverse the trend as soon as possible.

- It becomes crystal clear that this decade up to 2030 is critical in order to deliver carbon neutrality by mid-century, and that we need to accelerate innovation and deployment.

### 4. Action-oriented innovation

- In the midst of surging discussions on energy security and geopolitics, at ICEF2022, leading experts discussed (1) how innovation can contribute to delivering both carbon neutrality and energy security, and (2) what practical action-oriented approaches are required to accelerate transition leading up to 2030.
- Policymaking shall also adopt innovation. When energy geopolitics is so much heightened, energy security and energy transition must be pursued in a more balanced and rational manner. Fair market conditions and mechanisms for decarbonization need to be established. A new industrial policy for deployment is needed.
- Transition must take into consideration of socio-economic impacts and ensure to leave no one behind. Thus, how innovation contributes to increasing compatibility between economic development and carbon neutrality shall be addressed. As many countries still depend on fossil fuels for economic growth, we seek answers to how to pursue wise use of fossil fuels in the challenging energy transition.
- Technology innovation offers perspective and options to choose. In ICEF, we dive deep into a wide range of technological options for both the supply-side and demand-side. On the supply-side, carbon dioxide removal and utilization, nuclear, hydrogen and synthetic fuels in heat and transport sector, and critical minerals are examined in depth; and on the demand-side, enhancing energy efficiency and utilizing renewables in all sectors are emphasized.
- Given that carbon neutrality requires all sorts of carbon dioxide removal technologies, we discussed how to ensure the environmental integrity of those technologies, in particular around increasing R&D and good governance.

### 5. In closing

- ICEF has diversity and inclusiveness in its DNA by design. We always embrace and celebrate the participation of speakers who represent and embody diversity. This year we have paid particular attention to increasing the representation and voices of younger generation who will lead and define a sustainable, resilient and inclusive society of 2050. We at ICEF remain firmly committed to engaging diverse stakeholders and thereby creating stronger momentum for technological and social innovation for carbon neutrality.





# Business Pavilion







## Overview

Technology implementation is getting more and more important.



"Business Pavilion" is an innovation showcase where challenges to tackling climate change from all over the world are exhibited. "Business Pavilion" must help your understanding of innovations related to the ICEF's Technology Sessions.

## Business Pavilion attendees





### TS1: Demand-driven Energy Transformation

<b>Powershare</b>  <b>PowerShare</b> Energy & Battery AI technology at its core, providing professional digitized energy services with more than 100 AI algorithms in the areas of battery performance, charging and discharging technology	<b>Innowatts</b>  <b>innowatts™</b> SaaS PF offering leverages AI and machine learning capabilities to help energy providers unlock grid edge opportunities and accelerate energy transformation
<b>Bosch</b>  <b>BOSCH</b> Using a wide range of fuels, such as natural gas and hydrogen, as well as generating electricity in high efficiency	<b>Natel Energy Inc.</b>  <b>NATEL ENERGY</b> An independent power producer, Natel acquires and upgrades operating hydropower plants and develops new, low-impact hydro installations that are fish-safe, enhance river connectivity and deliver reliable renewable energy
<b>Industrial Technology Research Institute (ITRI)</b>  <b>ITRI</b> Industrial Technology Research Institute This Artificial Intelligence of Things Energy Management System (AIoT-EMS) can effectively monitor energy real-time consumption, improve energy performance and maximize energy savings particularly in convenience stores and super markets where are closely interacted with societal daily activities	<b>Synectify</b>  <b>SYNECTIFY</b> Built a high-performance computing infrastructure powered by surplus electricity and renewable energy
<b>Illumate Energy Nepal Pvt. Ltd.</b>  <b>illumate</b> ENERGY INDIA PVT LTD Unique features of HILUMS multi watt LED Lights 1.High Luminance, 2.Energy saving, 3.Lower Heat transfer, 4.Safe even at 440 volts, 5.Lower carbon foot print etc.	






### TS2: Actions Needed for Realizing Carbon Neutrality in Heat and Transport Sectors with Hydrogen and E-fuel/E-methane

<b>Camfridge Ltd.</b>  <b>Camfridge</b> New metal alloys and magnetic fields dramatically reduce energy consumption and develop low-carbon cooling systems	<b>NYK Line</b>  <b>NYK LINE</b> NIPPON YUSEN KAISHA Introducing alternative fuels that are effective in reducing GHG emissions and taking the lead in social implementation, mainly in the shipping industry
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### TS2: Actions Needed for Realizing Carbon Neutrality in Heat and Transport Sectors with Hydrogen and E-fuel/E-methane

<b>Industrial Technology Research Institute (ITRI)</b>  <b>ITRI</b> Industrial Technology Research Institute The features of this fuel cell system is the novel metal bipolar plate combined with high-performance membrane and gas diffusion layer. With the high corrosion-resistant carbon layer coating, it can extend the service life of the fuel cell system, and the modular design makes it easy to be installed in factory and heavy-duty transportation vehicles	<b>Raven SR</b>  <b>RAVEN</b> Raven SR is a clean fuels company that transforms waste into high-quality hydrogen and Fischer-Tropsch synthetic fuels through our uniquely patented Steam/CO2 Reforming technology.
<b>Holtec International</b>  <b>HOLTEC INTERNATIONAL</b> A world leader in providing innovative solutions to the energy industry and beyond, including the SMR-160 small modular reactor, spent nuclear fuel dry storage systems and shutdown nuclear power plant decommissioning.	<b>FuelCell Energy</b>  <b>fuelcellenergy</b> Hydrogen production by electrolysis using the ultra-high efficient Solid Oxide technology. High efficiency electrolysis will allow for greater production of hydrogen while reducing the cost of hydrogen production

### TS3: Carbon Dioxide Removal Technologies

<b>Verdorex</b>  <b>VERDORX</b> Developed electrical carbon removal technology to eliminate emissions associated with aluminum production	<b>Carbon Engineering Ltd.</b>  <b>Carbon Engineering</b> Focusing on the global deployment of large-scale Direct Air Capture (DAC) technology that captures carbon dioxide (CO2) out of the atmosphere so it can be permanently stored deep underground or used to produce clean, affordable transportation fuels
<b>JFE Steel Corporation</b>  <b>JFE</b> Selected by the GI (Green Innovation) Fund for a project to utilize hydrogen in the steelmaking process	<b>NovoNutrients</b>  <b>novonutrients</b> food and feed from CO2 Working to convert carbon dioxide emissions into high-value, low-cost proteins and for food and feed applications
<b>Transform Materials</b>  <b>TRANSFORM MATERIALS</b> Producing green chemicals using natural gas	

### TS4: Sustainable Nuclear Systems

<b>ARC Clean Energy</b>  <b>ARC CLEAN ENERGY</b> Developed the ARC-100, an advanced small modular reactor (SMR) that provides carbon-free power	<b>TS5: How to Secure a Sustainable Value Chain in the Age of Resilience: Critical Metals and Minerals?</b> <b>PJP Eye LTD</b>  <b>PJP Eye LTD.</b> Mass-producing cotton-based carbon batteries that are non-combustible, can be charged 10 x faster and last for more than 30 years.
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# Roadmap Projects

## Roadmap Project 1 Low-Carbon Ammonia

The ICEF have been developing roadmaps with regard to how key innovative technologies can contribute to a transition to clean energy from 2015. At the ICEF2022 event, the draft version of the 10th anniversary roadmap on Low-Carbon ammonia was presented. The ICEF Low-Carbon Ammonia Roadmap explores the importance of blue and green ammonia with regards to its production method, its emission reduction effect, its potential as an alternative fuel for ships, etc., as well as policies for infrastructure development such as refueling, storage facilities and for cost reduction. In this event, the impact of ammonia on the environment, such as air pollution by nitrogen oxides was mentioned, and it was indicated that it is important to have a system to control and reduce ammonia emissions in all sectors. In addition, it was emphasized that low-carbon ammonia production could be carbon negative, which removed carbon from the atmosphere, and that we should give enough incentives for that. The draft was released for public comments in addition to the discussion at ICEF2022. After consideration of the comments, the definitive version is to be presented at COP27.



**David Sandalow** (Moderator)  
Innovation for Cool Earth Forum (ICEF) Steering Committee



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## Roadmap Project 2 Blue Carbon

During the ICEF2022, an event was held to present an overview of the roadmap on the "Blue Carbon" at the 11th roadmap in total since 2015. This ICEF Blue Carbon Roadmap summarizes the potential of blue carbon as one of the negative emission technologies to achieve net-zero emissions. In the roadmap, blue carbon is defined as the CO<sub>2</sub> captured and stored by mangroves, tidal marshes and seagrass beds, as well as macroalgal farming such as kelp and sargassum. The roadmap summarizes the scientific knowledge currently available in relation to the areas of research and development expected in the future, as well as institutional, policy and environmental considerations that may arise in the future and present pathways to increase the blue carbon absorption and reduce emissions from the loss of the ecosystems. During the discussion, it was emphasized that seaweed aquaculture contributes not only to CO<sub>2</sub> reduction but also to employment promotion in developing countries, and that a sociological local community perspective is needed in order to promote blue carbon.



**David Sandalow** (Moderator)  
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# Steering Committee Members



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# Messages from Co-Hosts



Ministry of Foreign Affairs

**AKIMOTO Masatoshi**

Parliamentary Vice-Minister for Foreign Affairs, Japan

At COP26 last year, “the Paris Rulebook” was completed and the international community has entered a phase in which the Paris Agreement should be steadily implemented to pursue efforts to limit the temperature increase to 1.5 °C . Towards COP27 this fall, it is important to focus on actions to accelerate global efforts toward decarbonization. I would like to express my sincere congratulations to the holding of ICEF, in which leaders from industry, government, and academia will discuss low-carbon innovation. The international community is currently facing a big challenge in how to strike a balance between stable energy supply and climate change measures in the situation in Ukraine. However, our long-term goal to achieve net-zero by 2050 will never change. Japan will continue to endeavor to contribute to realizing sustainable development and to addressing climate change issues on a global scale through utilizing Japan's technology.



Ministry of Education, Culture, Sports, Science and Technology

**YAMAMOTO Sakon**

Parliamentary Vice-Minister of Education, Culture, Sports, Science and Technology, Japan

On behalf of MEXT, a co-sponsor of this event, I would like to express my congratulations to the organizers on the holding of this ICEF2022, where leaders from industry, academia, and government will discuss climate change issues. In order to achieve carbon neutrality, it is incumbent on industry, academia and governments around the world to pool their capabilities to produce innovative solutions through research and development. Today I hope that the leaders, all with their different backgrounds, from government, international organizations, industry, academia and elsewhere gathered here from across the globe will have active discussions on innovations in the environmental energy field and convey to the world their importance. I wish to thank all of you for your great contributions and sincerely hope that today's meeting will be very fruitful. Thank you.



Ministry of Agriculture, Forestry and Fisheries

**TSUNODA Hideo**

Parliamentary Vice-Minister for Agriculture, Forestry and Fisheries, Japan

I would like to express my deep appreciation and respect to the leaders from industries, governments, and academia of the world who have gathered to discuss innovations in addressing global warming issues. The Ministry of Agriculture, Forestry and Fisheries (MAFF) launched the MeaDRI strategy in May last year. It aims for improving production potentials of food and agriculture, forestry and fisheries sectors, and also ensuring their sustainability together through innovation. The entire Japanese government is now promoting measures to reduce environmental impacts. We believe that the MeaDRI strategy can be a model for sustainable food systems in the Asia Monsoon countries, which have similar climatic conditions. Japan will actively contribute to achieving carbon neutrality by 2050.



Ministry of the Environment

**KUNISADA Isato**

Parliamentary Vice-Minister of the Environment, Japan

Last year, negotiations came to an agreement on the implementation rules of the Paris Agreement at COP26. It was an important year as the world moved from the “negotiations” to the “implementation” phase toward decarbonization. At the same time, we are facing a new challenge, which is the crisis in Ukraine. Despite such turbulences, we cannot afford to slow down our actions for decarbonization. Our Ministry strives to achieve net-zero by 2050, and to solve social issues and simultaneously achieve regional revitalization and decarbonization through the promotion of Decarbonization Leading Areas. Japan has already begun to draw up a grand design to achieve decarbonization in regions, lifestyles, and industry. I sincerely hope that the global insights collected in this edition of ICEF will provide a strong support to the global trend toward decarbonization, which is now facing difficulties.