

# What Can Finance and Academia Do For the Future?

Report on "Workshop: The Dialogue between Academia and the Financial Sector on Global Environment"

Organized by National Institute for Environmental Studies and Future Earth Japan Hub

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# Introduction

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## Why is the Dialogue between Finance and Academia/Science Important?

The understanding of global environmental crises, including climate change is spreading. From that, policies, businesses, and citizen-level actions responding to them are becoming increasingly active. At the 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) held in Glasgow in November 2021, it was reconfirmed that the rapid global warming and climate change is one of the greatest risks to human society. To avoid it, the world needs to achieve **carbon neutrality (net zero)** by the middle of this century and maintain the global temperature increase below 1.5°C. The understanding that climate change is inextricably linked to the state of ecosystems represented by biodiversity, and that it is difficult to resolve climate change without its conservation, is also widely spreading. Furthermore, the development of science and technology to avoid the crisis and the consideration of industrial, economic and policy responses are being inquired. However, human society cannot be sustained unless these findings are further utilized, expanded and accelerated with the transformation of socio-economic systems.



Logo of COP26 held in November 2021

Science has played an extremely important role in global environmental issues. The basis for understanding and responding to the current global environmental crisis is provided by constant scientific inquiry, like from observation of various changes on earth, elucidation of the causes and functions of the earth system, science and technology and research on institutions and policies that reduce the environmental load while protecting society.

On the other hand, to avoid the imminent crisis, it is absolutely vital to make the most out of these scientific findings to transform actual socio-economic activities into wider, faster and more sustainable ones. In response, expectations for the role of finance are rising, and in practice, there are various initiatives by private financial institutions, efforts to disclose corporate information on sustainability, rapid expansion of **ESG investment/finance**, and development of policies/systems by governments and authorities.

**Carbon neutral (net zero):** The total should be virtually zero by subtracting the "intake\*" from tree planting, forest management, and others from the "emissions\*" of carbon dioxide or greenhouse gases (GHG). (\*human-caused)

**ESG investment:** An investment that takes into consideration the Environment, Social, and Governance elements in addition to the conventional investment decision-making criteria.

To begin with, climate change and global environmental crisis is not a problem of individual countries or companies. It is a common problem that threatens the sustainability of whole human society, that is, all actors, and in financial terms, it is a systemic risk. It cannot be solved by the efforts of individual actors alone, and cannot be avoided by diversified investment. Overcoming this crisis requires all actors to work together towards the common goal. Financial institutions must also function as a whole for the common goal of avoiding systemic risk for the society, beyond the sustainability of the financial system. The realization of a net zero society by 2050 is one of its common goals.

Financial markets seek to instantly capture vast amounts of information (forecasts), price various financial assets, and achieve rational and efficient allocation of funds/economic resources. In addition, this function of fund allocation can affect the behavior of all economic agents, including corporations. The function of globalized financial markets transcends geographical and political boundaries such as national borders, and works on the capital cost of industries and companies around the world, as well as the adjustment of profits between current and future generations. Evidently, finance alone cannot change everything. In order for the financial sector to exert its full potential for sustainability, it is indispensable to improve policies and institutions, and transform the real socio-economy, which is inextricably linked with finance. In other words, transformation of the real socio-economy, specifically initiatives such as development of science and technology, transformation of industrial structure, internalization of externalities like [carbon pricing](#), environmental regulations, and correction of disparities are needed. Furthermore, updating and disseminating available information is necessary.

This is why we consider greater collaboration between finance and academia/science to be important. For science, finance is one of the most important channels to connect its knowledge to the realization of a sustainable socio-economic system. At the same time, it can be a valuable source of information on industry and economy necessary for the development and implementation of knowledge. For financial sector, science is not only information that helps them to consider the risks and opportunities of individual investments/loans, but it is also the very sustainability of the global economy, including the financial system. In other words, it is the basis for obtaining action guidelines for avoiding systemic risk and ensuring sustainable investment and lending performance.

Based on the recognition from above, this workshop aimed to share problem awareness, issues, and the latest scientific knowledge with the financial sector and researchers, and to deepen discussions on activities that will be needed in the future in various fields. And the workshop was planned and prepared by volunteers and realized with many aspiring supporters. It is hoped that the discussions will inspire more financial and academia people, leading to a chain reaction. This report is a compilation of the topics introduced in the workshop and the opinions of the participants. Throughout, participants were required to express their views not on behalf of the organization, but as individuals. In addition, the content of this report is not the consensus of all the participants, but a record of the main points of each statement.

# Suggestions obtained in the workshop

The main suggestions obtained in this workshop are as follows:

## 1 Opportunities of collaboration between financial sector and academia regarding Japan's climate change/global environmental crisis initiatives;

- Creating socio-economic scenarios for decarbonization and pathways to achieve net zero.
- Evaluating the understanding, response, and information disclosure of the impact of climate change on each corporation and industry.
- Narrowing the gap in awareness and knowledge between urban and rural areas.
- Reaching out to the Asian financial world and seek for areas where contribution by Japanese leadership could be made.
- Conducting appropriate assessment of physical and transitional risks for corporations or industries.

And finally,

- Realizing game change for the entire financial system.

## 2 Significance of dialogue between financial sector and academia (the workshop);

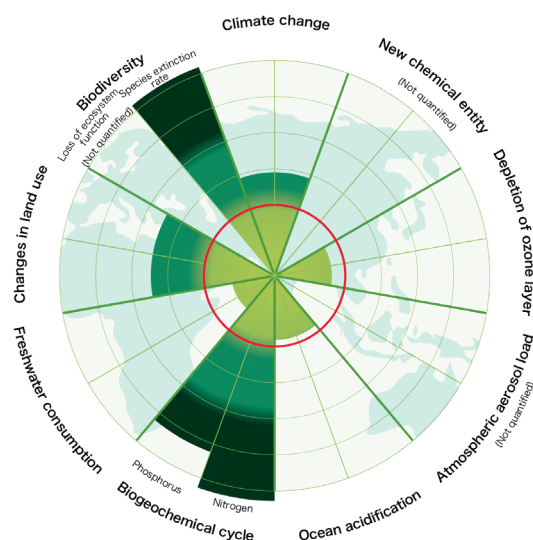
- Sharing the latest knowledge between financial sector personnel and researchers, and gaining new awareness of issues.
- Recognizing the need for mutual cooperation in future initiatives.

## 3 Future direction, next step;

- Further discussion and consideration on future collaboration in order to lead it to actual impact on society.
- Accumulation of scientific knowledge to understand [planetary boundaries](#). In addition to the climate change and biodiversity introduced this time, there are various issues regarding the global environment and sustainability. It may also be applicable to exchange opinions from the perspective of climate justice, such as what to leave for future generations.
- Examining effective methods for preparing, disclosing and updating data, as well as public relations activities to the outside.

Below boundary (safe) ■  
In zone of uncertainty (increasing risk) ■  
Beyond zone of uncertainty (high risk) ■

Source: Adapted from "Planetary boundaries: Guiding human development on a changing planet" by Will Steffen et al.



**Planetary boundaries:** One of the methods to objectively evaluate the impact of human activities on the global system. Regarding each item related to changes in the global environment, human society can develop and prosper if stayed within the range of safe act, but when it transcends boundaries, it can cause irreparable changes to the natural resources on which humans depend. A concept proposed in 2009 by Johan Rockström and others at the Stockholm Resilience Center. Of the nine environmental factors covered by this study, species extinction rates and nitrogen-phosphorus circulation are in high-risk areas beyond uncertainty. It is also analyzed that climate change and land-use change have reached areas of uncertainty where risk increases.

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# 1.

## Background Issues

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At the beginning of the workshop, the project team raised the following points to kick-off discussion:

Climate change, unlike other [ESG risks](#), has a scientific deadline of 2050, and if it cannot be resolved by then, the sustainability of the economy will be lost.

Climate change is the systemic risk to the entire economy and it must not occur.

The current financial market evaluates companies based on the dualism of "the shareholders or the environment." One of the reasons of the dualism is that value of social returns (decarbonization) is not factored into the accounting system.

In the financial sector, the initiatives working on "net zero finance" has been starting. There are many practical issues such as the possibility of having a post-effect on corporate value by aiming for net zero.

Carbon pricing is necessary in order to fully integrate the effects of greenhouse gases into corporate performance.

When [back-casting](#) the goals of "net zero society in 2050", is there any part where Japan can lead the world by making use of the scientific knowledge and strengths of Japan?

# 2.

## The Earth is at its Limits Now

### - The Science and Current Situation of Climate Change

1. Research trends on climate change
2. The situation and challenges of the financial sector regarding climate change

# 2.

## The Earth is at its Limits Now

### The Science and Current Situation of Climate Change

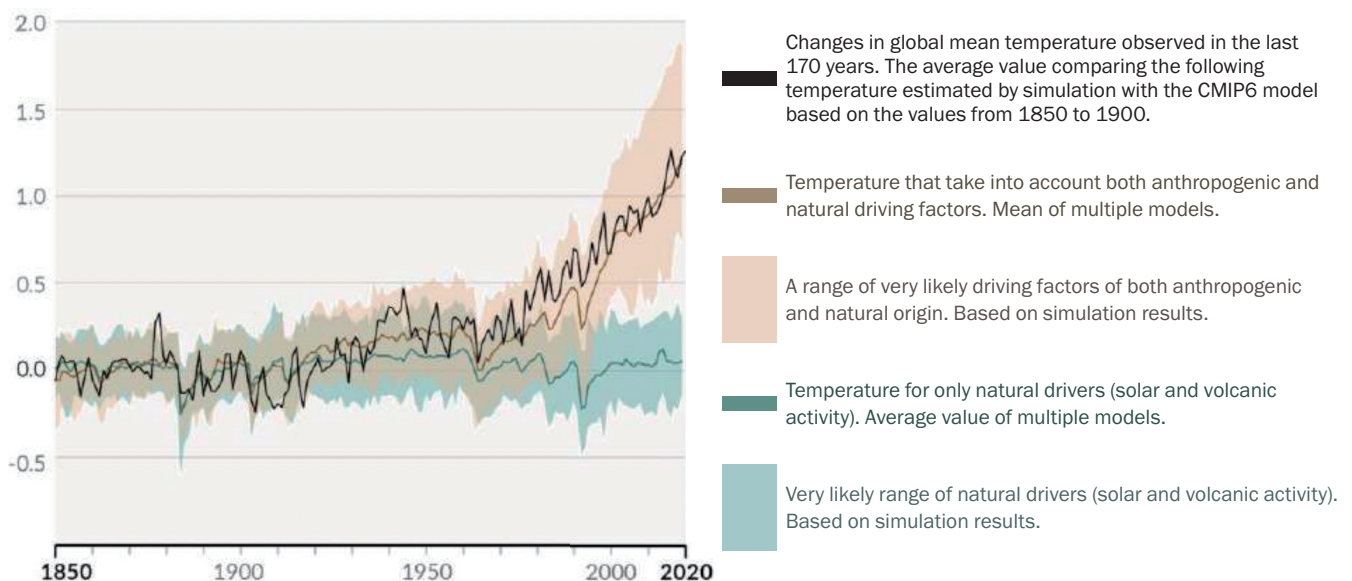
#### 1. Research trends on climate change

Regarding the current state and forecast of climate change, the [Intergovernmental Panel on Climate Change \(IPCC\)](#) has been publishing assessment reports based on the latest scientific findings. Researchers at the National Institute for Environmental Studies have been contributing by publishing research papers and study results cited in the IPCC and participating in writing activities as authors of the reports.

In August 2021, the IPCC Working Group I's Sixth Assessment Report, *Climate Change 2021: The Physical Science Basis*, was published. In past assessment reports, it has been stated that there is a high probability of global warming due to human activities, but this time, it gave a clear message by asserting that "it is unequivocal that human influence has warmed the atmosphere, ocean and land".

Compared to pre-industrial era, the average temperature has risen 1.1 °C, and the frequency of abnormally hot weather that used to only occur once every 50 years has increased 4.8 times today. Furthermore, it is said that it will increase 8.6 times when the temperature rises by 1.5 °C and 13.9 times when the temperature rises by 2.0 °C. The rate of sea level rise has a natural delay from the atmospheric temperature and is expected to continue rising gradually for hundreds to thousands of years. Even in low-emission scenarios, a rise of sea level from 0.5 to 3 meters is expected by 2300.

#### History of Global Temperature Change and Causes of Recent Warming



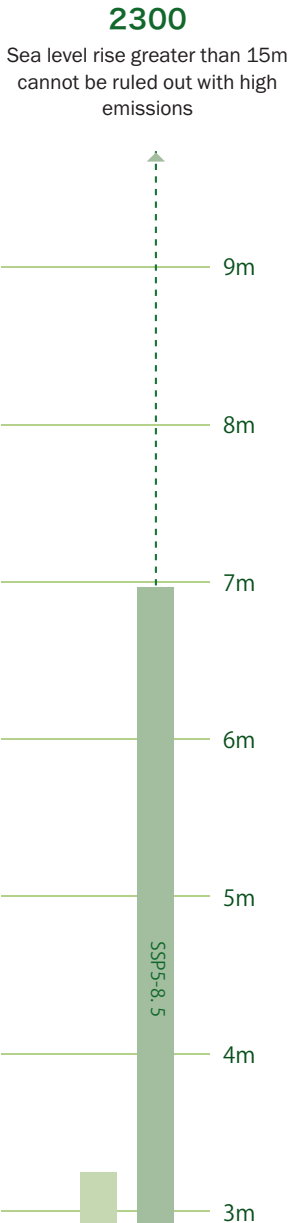
Source: IPCC (2021) Sixth Assessment Report, *Climate Change 2021: The Physical Science Basis*, contributed by the Working Group I, Figure SPM.1

**Intergovernmental Panel on Climate Change (IPCC):** With the participation of 195 countries and regions, it aims to produce a report summarizing the latest scientific findings on climate change and to provide a scientific basis for governments' policies on climate change. The assessment of the scientific knowledge on climate change is made every 5 to 7 years, which is then published as "IPCC Assessment Report".

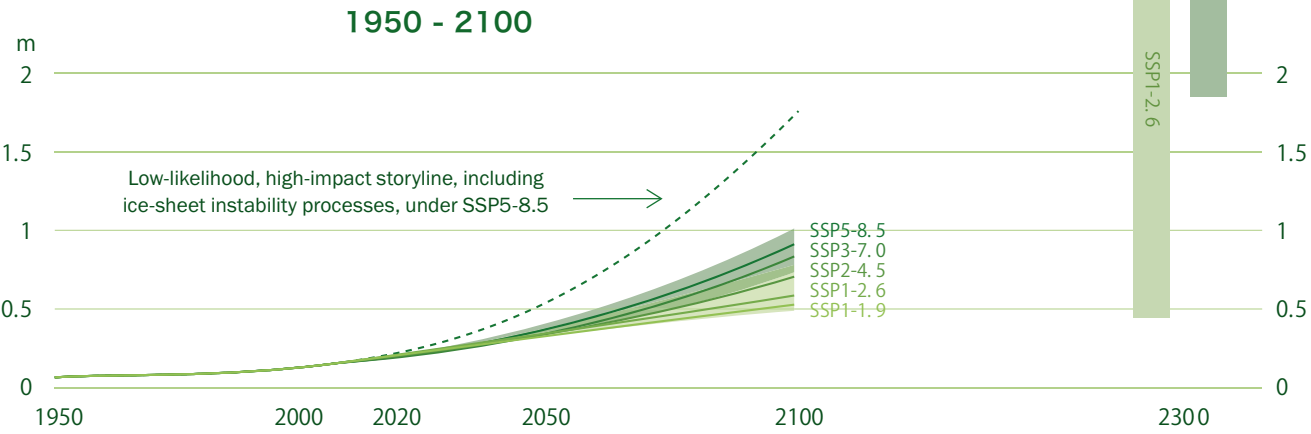


From the researcher's point of view, even if it is no longer possible to prevent these expected phenomena, keeping the temperature rise to 1.5 °C is effective in minimizing the impact globally (climate change mitigation). To do so, the world needs to be decarbonized by 2050. A combination of bold **decoupling** of economic growth and energy consumption, the rapid spread of zero emission energy, and the mass introduction of carbon dioxide removal technology is needed. The question is whether this can be achieved while taking into consideration of biodiversity, social disparities, international affairs, etc.

Furthermore society adapting to the effects of climate change, which is expected to become increasingly severe in the future, is very important. (Note that adaptation includes not only mitigating the adverse impacts of climate change, but also effectively utilizing these impacts.) In Japan, the issues of adaptation include those that are related to the impact on crops, impacts of typhoons and localized torrential rains onto regions and houses, and the effects on human health such as heat stroke. These have a significant impact on business activities as well, and it is necessary for companies to mitigate the risks. Researchers have focused on predicting climate change impacts and are currently expanding into adaptation. For this, we need to understand what kind of knowledge is required for the adaptive behavior of companies with increasing needs, what is the scientific information related to adaptation that is especially useful for finance-related activities, and what is required to mainstream adaptation in financial sector.



**Global Mean Sea Level Change Relative to 1900**



Source: IPCC (2021) Sixth Assessment Report, Climate Change 2021: The Physical Science Basis, contributed by the Working Group I, Figure SPM.8

**Decoupling:** The original meaning is "to separate". In environmental fields, it refers to a situation in which the economic growth rate is positive when the growth rate of environmental load is negative. In other words, the economic growth without the environmental damage.

## 2. The situation and challenges of the financial sector regarding climate change

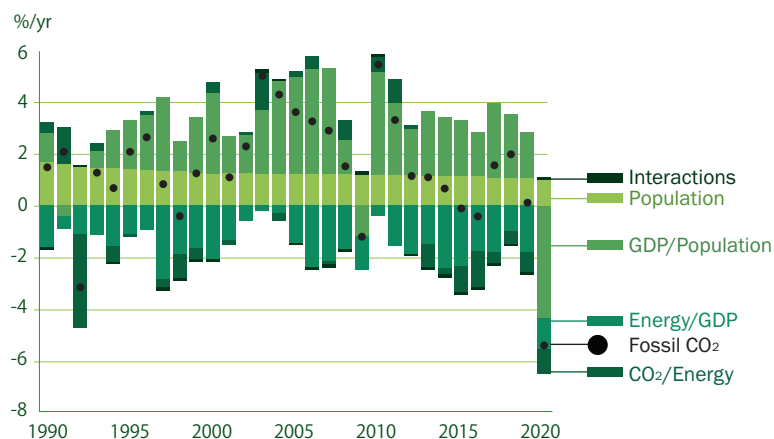
With such scientific knowledge, the understanding of importance of climate change countermeasures has been spreading in the financial sector in recent years. On the other hand, however, the market has not reached the point where financial returns and social returns by climate change countermeasures are equally valued. In the financial market, financial returns are still a top priority, and financial institutions and investors are expected to live up to their expectations. Instead of having to choose between “shareholders or the environment”, shouldn't future finance change so that the value of social returns and social welfare is reflected in the financial markets?

Among the various ESG risks, climate change is particularly noteworthy. It has a scientific deadline of 2050 where if net zero society is not established by then, even the sustainability of the economy will be lost. Moreover, the effects of climate change are systemic risks, as they extend to the whole economic activity and people's life. Financial methods cannot prevent this and therefore, the ultimate risk must be prevented by the whole society. In the past, we have pushed economic growth without paying the external costs of greenhouse gas emissions, but now, it may be said that we are at a stage of having to pay those costs all at once. Some could argue that carbon pricing is effective and desirable to be introduced as a method for internalizing externalities.

Concerning these issues, investors still prioritize economic returns, and there were opinions that government support is essential for the financial sector to promote net zero. The issue is not solely that economic returns are valued from the perspective of legal fiduciary responsibilities. For example, in the case of pension funds in Japan, it seems that the policyholders do not yet have a consensus that social returns are equal to or greater than economic returns. There were opinions that, if it is scientifically clear that the survival of the earth is in jeopardy unless social returns are prioritized, more enlightenment to the people, including policyholders, should be done by both finance and academia. Others said, aiming for net zero is in line with returns at least in the long run, as long as it is known that climate change will ultimately have a great impact on Japan's socio-economics. Some others said that if the realization of net zero is no longer unavoidable, keeping up with it will reduce future risks for both customers and the company itself, and will lead to increased competitiveness in the new industrial structure. Some others said that "a paradigm shift is occurring" for such consciousness.

### Changes in Carbon Dioxide Emission and Their Factors from the Previous Year

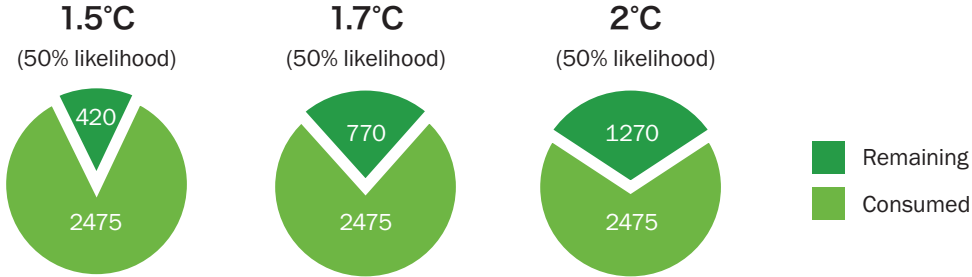
Globally, decarbonization of energy and lower energy expenditures per GDP have contributed to the decline in emissions growth over the last decade. The decline in emissions in 2020 is clearly due to a significant decline in GDP per capita. (Leap year adjusted)



Source: Global Carbon Project (2021)

# The Remaining Carbon Budget

The remaining carbon budget to limit global warming to 1.5°C, 1.7°C and 2°C is 420 GtCO<sub>2</sub>, 770 GtCO<sub>2</sub>, and 1270 GtCO<sub>2</sub> respectively, equivalent to 11, 20 and 32 years from 2022. 2475 GtCO<sub>2</sub> have been emitted since 1750.



Source: Global Carbon Project (2021)

There was also an indication about the delay in understanding in Japan, particularly in response to individual investors (beneficiaries) prioritizing returns in the short term. Shareholders, individual investors and consumers in Europe criticizes companies that are not aiming to decarbonize. Recently, companies in Asia have started to delve into decarbonization following Europe, and there have been expressions of concern that Japan will be left behind amongst other Asian pioneering countries. Some opinions expect researchers to disseminate about these world trends to individual investors in Japan.

**CVaR (Climate Value-at-Risk)** analysis, a method for assessing climate change risk, was introduced from the financial side, relating to the question from the researchers, "what are the scientific information that is particularly useful for financial sector? What is needed to mainstream adaptation for the sector?" In order to improve the level of such analysis, there were suggestions such as, it is necessary to accumulate knowledge and databases that analyze various incidental effects of climate change to scrutinize the risks of each company, and that the provision of information to supplement physical risks with finer particle size may be included by the private sector as a "climate service corporation."

**Carbon budget:** Emission budget. The upper limit of the cumulative greenhouse gas emissions calculated when the temperature rise of the earth caused by human activity is suppressed to a certain level.

**CVaR (Climate Value-at-Risk) analysis:** Calculates the present value of costs and profits caused by climate change, and analyzes the changes of corporate value in the future. It analyzes the impact of (i) policy risk, (ii) technical opportunity, and (iii) physical risk and opportunity on corporate value, and quantitatively integrates the risks and opportunities of TCFD (refer to p.12) disclosure.

# 3.

## Response by the Financial Sector

### - Communication from the Financial Sector

1. Providing topics related to responses and issues in the financial sector
2. Questions from researchers, and exchanges of views

# 3.

## Response by the Financial Sector

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### Communication from the Financial Sector

The financial sector is divided into various business sections. Discussions were held on the responses and issues regarding the main functions of the financial sector.

#### 1. Providing topics related to responses and issues in the financial sector

Institutional investors are required to manage investment funds entrusted to them by investment beneficiaries (individuals, companies, etc.) to improve economic performance, and some of them also tackle on climate change. While holding a wide range of assets from mid-long term perspective, the speaker's affiliated company actively engages in ESG investment and, particularly, climate change response are positioned as pillars of asset management, aiming to achieve both earning investment income and solving social issues. In addition, institutional investors aim for virtually zero greenhouse gas emissions in their investment portfolio, setting intermediate targets every five years, and engaging with the top 50 companies in portfolio emissions. They also work to shift to a decarbonized society through investment and financing, and support the creation of environmental innovation.

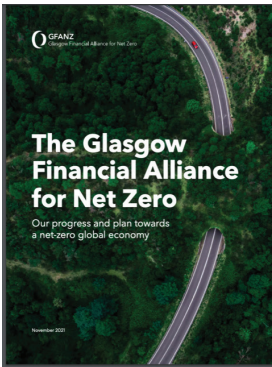
Similar initiatives are underway in the banking group. Another speaker's affiliated bank has declared its commitment to the realization of net zero externally and aims to decarbonize with their investment and loan portfolio by 2050. In this, the 2030 target for each sector is set. In this regard, information disclosure is important in determining corporate risks and opportunities. With [the Task Force on Climate-related Financial Disclosures \(TCFD\)](#) as an opportunity, Japanese companies are recognizing the importance of information disclosure, and working to expand sustainability finance to provide funding to promote decarbonization. For this case too, engagement is important to promote decarbonization, especially with borrowers in the high-emission industry. At the same time, financial institutions need to reduce their emissions to zero. Net zero by 2030 is aimed through first making contracted electricity 100% renewable.

The Japanese financial sector as a whole is also trying to keep up with the fast-changing society through its participation in international networks, and tries to play an active role by joining the Net-Zero Asset Owner Alliance (institutional investor) and the Net Zero Banking Alliance (bank). Moreover, the [Glasgow Financial Alliance for Net Zero \(GFANZ\)](#), which was established at the timing of COP26 in November 2021, is a cross-sectional organization that brings together six financial alliances including these, and is expected to accelerate the flow of climate change response in the financial world.

**Task Force on Climate-Related Financial Disclosures (TCFD):** In response to the global request for climate-related information disclosure, TCFD was launched led by private sectors. Published the final report summarizing the recommendations in June 2017. The TCFD recommends disclosure in four areas of governance, strategy, risk management, and metrics and targets.

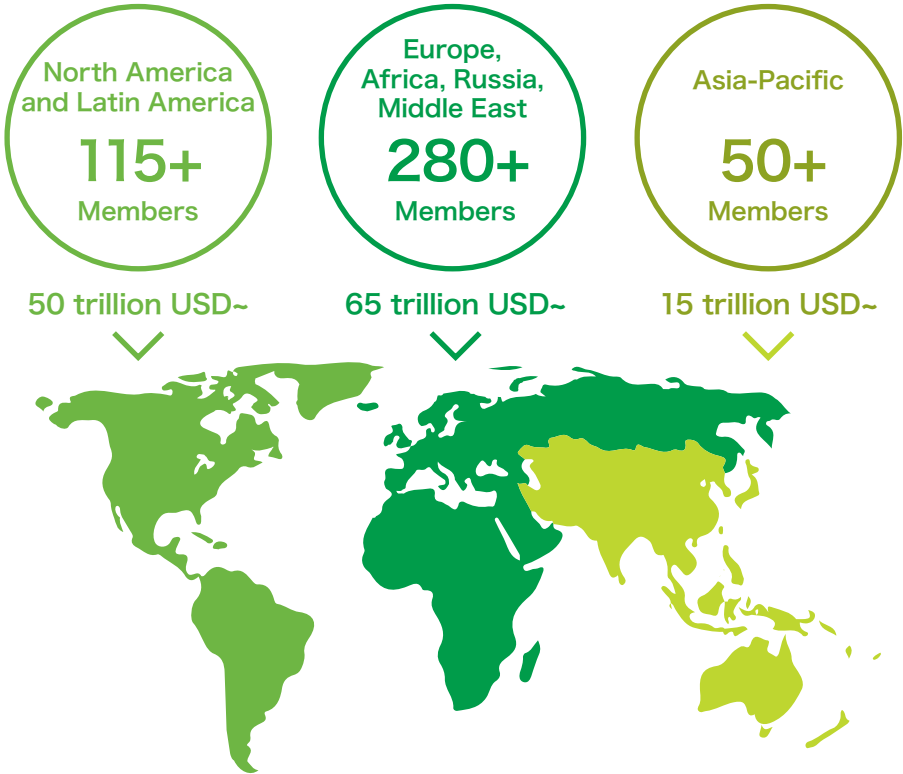
**Glasgow Financial Alliance for Net Zero (GFANZ):** A global coalition of institutional investors and financial institutions. Their policy is to strengthen the supply of funds for developing countries working to decarbonize. As of November 2021, when established, approximately 450 institutions from banks, insurance companies, and asset management companies agreed with the incentive of achieving net zero by 2050.

Pension funds being as a universal owner, the need to help mitigate the systemic risk of climate change is acknowledged. On the other hand, priority for the interests (investment performance) of beneficiaries is obligatory, and various initiatives are being made from that perspective. For investment, various indexes and valuation methods for corporate and stock portfolios are being utilized. Regarding greenhouse gas emissions, the aim is to evaluate the entire supply chain by analysis including Scope 3. It analyzes migration risks and the transfer of opportunities between industries, presents greenhouse gas reduction requirements by industry, and attempts to visualize transition risks and opportunities. By industry, it can be seen that there are great new opportunities centered on energy, social infrastructure, electrical equipment, machinery, and so forth.



Source: GFANZ (2021)

### GFANZ Global Reach — Members and Assts Represented by Region



Source: Adapted from GFANZ (2021)

## 2. Questions from researchers, and exchanges of views

In response to the topic provided by financial personnel mentioned above, researchers first raised surprises and support for the rapid initiatives of the financial sector in Japan. There were questions such as, what are the issues that researchers can contribute to and how they can contribute.

In order for the whole economy to achieve net zero, all industries must aim for net zero, and finance plays as a driver in this initiative. For this, it is necessary to give due consideration to high-emission industries, and it has been pointed out that otherwise, the economy could be damaged and the initiatives of the industrial sector, which has the greatest potential for reduction, could be hindered. It was added that it is important for various recently established international initiatives and coalitions in the financial sector to devise ways to not stop after improving one's portfolios.

In support of and supplementing the opinions from above, some said that engagement, not divestment, is important to promote the initiatives of companies with such high reduction potential. Then, the questions, such as, who should do the engagement, whether it should be done as part of the business of the financial institution, whether there is something like a guideline, or whether there is a researcher's turn, were raised.

There was an opinion that there is an issue of how to evaluate a company's emission reduction plan when finance evaluates from the perspective of net zero. For example, at the recent COP26, it is said that some countries have set new net zero targets and the world is closer to the 1.5 °C target. But for this, there were questions about what does this mean for each company's target. Moreover, especially for high-emission industries, even if the transition is finally made to net zero, there is a possibility that emissions will increase temporarily at the beginning of the process. The question of how to deal with such a situation in finance-related activities was also raised

NGFS ([Network for Greening the Financial System](#)), a group of international financial authorities, provides a scenario for transition to a carbon-free society and recommends it as an international standard. However, there were questions being raised whether it is capable to apply this to Japanese companies. In addition, universities and research institutes often collaborate with financial personnel in Europe and the United States in the process of creating such international standards. However, Japanese researchers are rarely seen in such places, and there were voices of awareness of the problem that such collaboration is not yet seen in Japan.

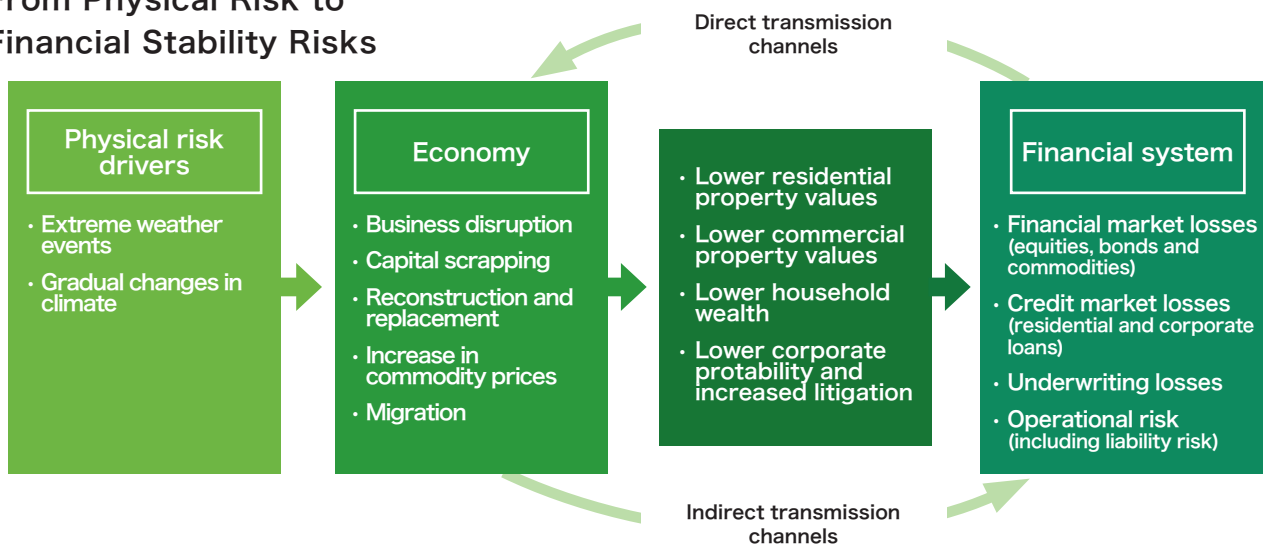
From another point of view, there was an opinion that, although many of the participants of this workshop are sensitive to international movements, knowledge and recognition are not shared throughout the local companies and SMEs in Japan.

Another participant suggested three points regarding the expected roles of the government: (1) to send clear message to Japanese economy that the world is heading for decarbonization, (2) to support Japanese companies to shift for decarbonization and to price for the externality of carbon, and (3) to supervise risk analysis of the country's economy as well as risk analysis at the enterprise level.

Biodiversity and social disparities must be incorporated in the decision making for carbon reduction. For example, when solar power generation is introduced, various problems, such as land use, will arise. For the electricity purchase system, there was a suggestion that the interlinkage with SDGs is important to be taken into consideration, for example if the electricity price is raised uniformly, it will have an impact to the income gap.

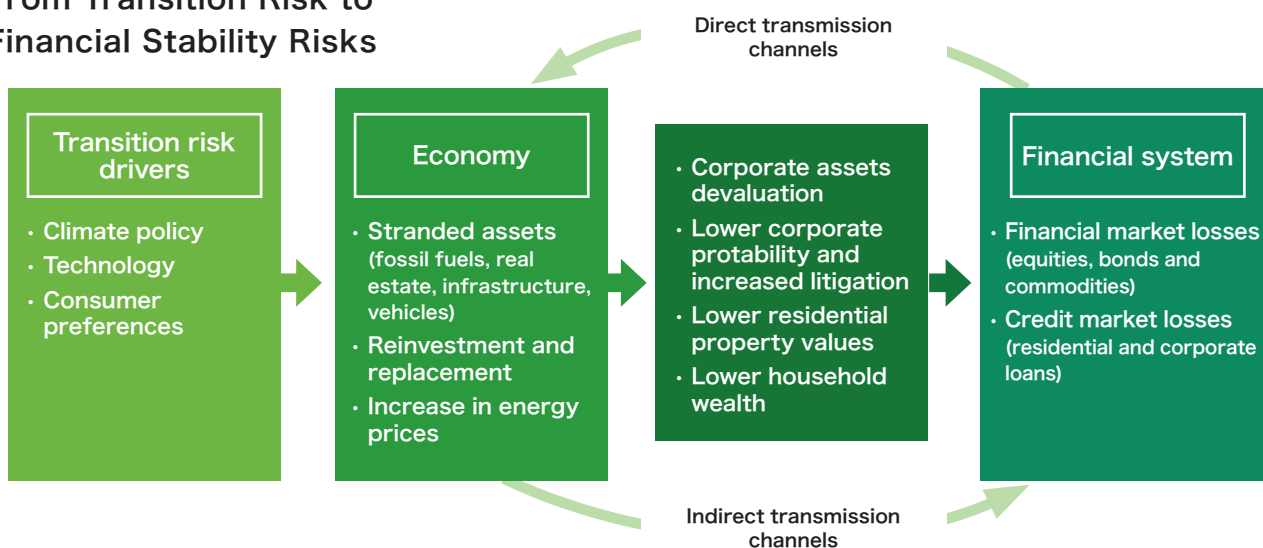
In addition, some voices expressed concern that biodiversity and social disparities, which should also be considered for ESG, may be undermined when net zero finance is emphasized. In this regard, for example, in the [EU taxonomy](#), it has been disclosed that it consists of things that contribute to climate change mitigation and adaptation, and other requirements such as “Do No Significant Harm” for the environment and society.

### From Physical Risk to Financial Stability Risks



Source: Adapted from Fig. 4, 5 in “Guide on climate-related disclosure for central banks” NGFS (2021), December 2021

### From Transition Risk to Financial Stability Risks



Source: Adapted from Fig. 4, 5 in “Guide on climate-related disclosure for central banks” NGFS (2021), December 2021

**EU taxonomy:** The formulation of “taxonomy” is listed as a policy measure to induce investments that are environmentally sustainable. Based on the list of economic activities considered to be environmentally sustainable, operating companies are obliged to disclose the ratio of sales from those economic activities, and financial institutions are obliged to disclose the ratio of financial assets, such as loans, from those economic activities.

**Do No Significant Harm (DNSH):** Criteria that “does not cause serious damage” to the surrounding environment



# 4.

## Linkage between Climate Change Measures and Other Issues

- Topic Provided by Research  
on Climate Change and Global  
Environmental Crises

1. Topics from frontiers of science related to nexus between climate change and other global environmental crises
2. Opinions from the financial sector

# 4.

## Linkage between Climate Change Measures and Other Issues

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### Topic Provided by Research on Climate Change and Global Environmental Crises

In order to curb the adverse effects of climate change, we must aim for net zero and fundamentally change our human activities. However, it is necessary to give due consideration to various issues and values other than net zero simultaneously. The topic was provided by the frontier of research on climate change and global environmental crises.

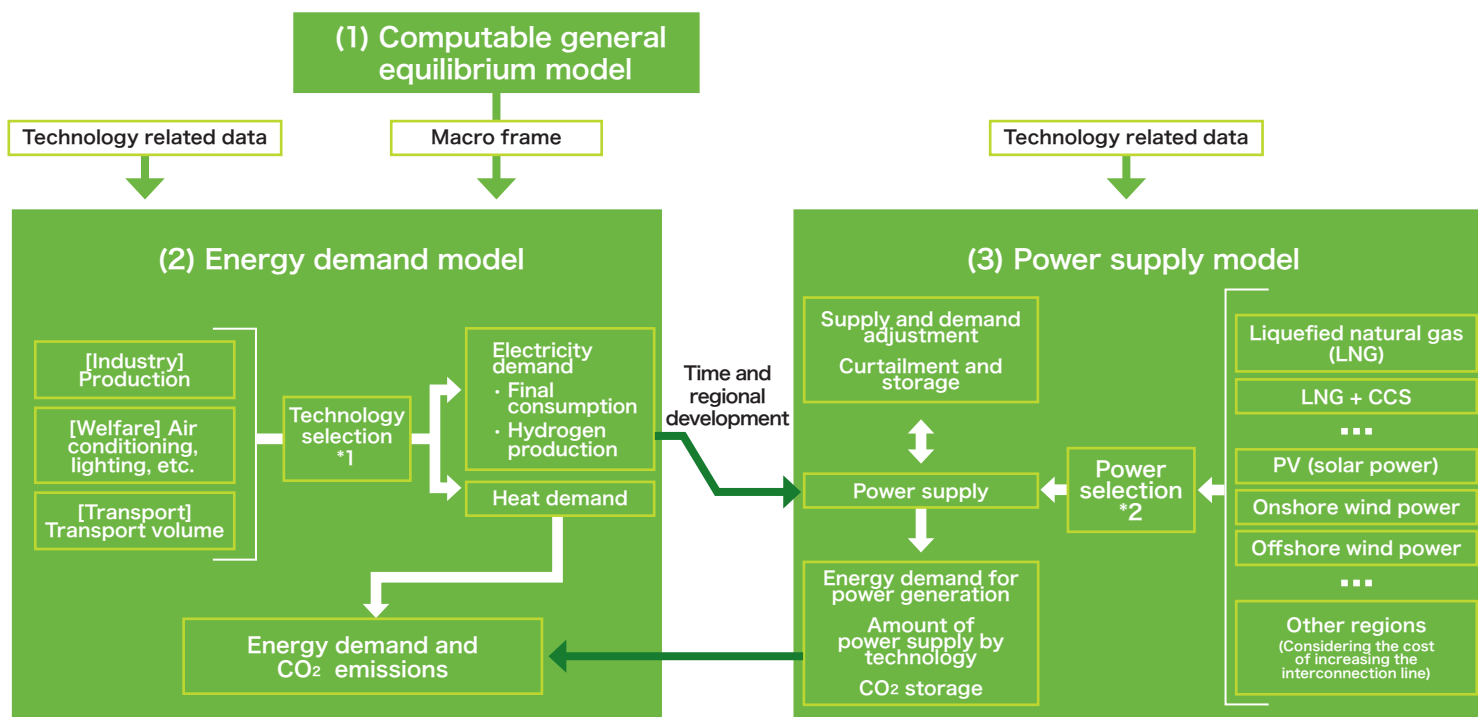
#### 1. Topics from frontiers of science related to nexus between climate change and other global environmental crises

First, there was an explanation about the scenario analysis of net zero. Japan is aiming for net zero by 2050 and a 46% reduction by 2030 in emission compared to 2013. The measures to realize this are analyzed using the [integrated assessment model AIM](#). In AIM, the applied general equilibrium model (AGEM) is first used to set the macro frame in the future, given the economic growth rate and population assumptions. Next, the energy demand model is used to estimate the energy demand corresponding to the future macro frame based on the countermeasure technology.

The estimated annual power demand will be expanded to the hourly demand by region, and the power generation facility configuration and supply configuration will be estimated using the cost-optimized power supply model. The cost-optimized power supply model can consider simultaneous equal quantity constraints and interregional interconnection constraints based on the supply potential of renewable energy on the same space/time scale. The results can be fed back to the energy demand model to calculate Japan's total energy supply and demand and GHG emissions. As a result, the amount of energy supply and demand and the amount of GHG reduction are shown for each of the household sector, business sector, transportation sector, and industrial sector.

Next, the frontier of research introduced the linkage with the international resource supply chain. A characteristic of Japan's economic structure is that it imports many resources from abroad and is susceptible to the impact of climate change on the international supply chain. In relation to the physical risks of changing the frequency of climate disasters, oil, gas, coal, and others, which have a large import value in Japan, tend to be greatly affected by floods and storms abroad. On the other hand, regarding the transition risk, greenhouse gas emissions associated with metal production have been on the rise to this day, so it is necessary to reduce not only fossil fuels but also metal consumption in order for

## Structure of AIM



\*1: Technology selection based on economic rationality considering capital costs, operating costs, energy and carbon costs

\*2: A power supply model for 10 regions in Japan that optimizes the introduction and operational resolution of power generation equipment, power storage equipment, and interregional interconnection lines under hourly coincidence constraints.

○Items considered in the power supply model: interregional power interchange, output curtailment, power storage using pumped storage and storage battery, transmission/charge loss, hydrogen production using surplus power, etc.  
 ○Items not considered in the power supply model: Energy storage equipment such as electric vehicles and electric heat pump water heaters, and demand side energy management using dynamic pricing, intra-regional power transmission and distribution networks, etc.

Source: [https://www-iam.nies.go.jp/aim/projects\\_activities/prov/2021\\_2050Japan/20210630\\_NIES.pdf](https://www-iam.nies.go.jp/aim/projects_activities/prov/2021_2050Japan/20210630_NIES.pdf)

the world as a whole to reach net zero. Under future carbon constraints, primary production (resource mining) will peak out by 2030, and secondary production (resource recycling) will need to exceed primary production by 2050. That is, we must understand that the supply of major metals can be limited by carbon constraints before they face physical depletion.

Subsequently, it was reported that there was widespread awareness of the link between the importance of biodiversity/natural capital and climate change. The national capital stock includes manufactured capital (which is generally regarded as "capital"), human capital, natural capital, and "negative" capital, which is a stock of greenhouse gases. These capitals are the source of services (income), but the income captured by GDP is limited. In addition, these capitals can be expressed like a balance sheet in financial statements, and maintaining them leads to sustainable development, which is also the goal of net zero finance. So far, most countries have increased their wealth while damaging their natural capital. In the future, in order to realize sustainable development, it is essential to consider not only decarbonization but also natural capital such as ecosystem conservation.

The Post-2020 Biodiversity Framework will be adopted at COP15 of the Convention on Biological Diversity in the spring of 2022. At the same time that biodiversity conservation is said to contribute to climate change mitigation, biodiversity is rapidly deteriorating due to climate change, and awareness of its feedback linkage is spreading. Biodiversity is also affected in terms of migration risk. One of them is the introduction of a large amount of renewable energy, and it was found that in Japan, the impact of large-size solar power generation facilities on the ecosystems and plants of rural areas such as agricultural lands and wetlands is particularly large. The existing protected area policy alone has little effect on reducing the impact of panel construction, and it is required to utilize **OECM**.

### Mutual Relationship between the Global Environment and Human Society



Climate change has led to the deterioration of biodiversity and natural capital through various routes, and has a devastating impact on human society. Cooperation and comprehensive approach across social sectors and specialties is essential in order to solve the complex problems that arise from this interrelationship.

Photo: UN Photo (2018) / IPBES (2019)

## 2. Opinions from the financial sector

How is biodiversity conservation dealt in the financial sector? Researchers and finance-related business persons around the world have begun to work together to make rules concerning those to measure natural carbon absorption using the **GHG Protocol** and the **Science-based Targets (SBT) initiative**, but it has been pointed out that Japanese people are not included in these activities. There was an opinion that Japan needs to speak out about its unique climate and the valuation of nature hence the movement of the **Taskforce for Nature-related Financial Disclosures (TNFD)**.

**OECM (Other Effective area-based Conservation Measures):** Areas where biodiversity is being conserved through private initiatives.

**GHG Protocol:** Standards for calculating and reporting greenhouse gas emissions. Co-founded by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) in 1998.

**Science-based Targets (SBT) initiative:** A partnership by WWF, CDP (formerly the Carbon Disclosure Project), World Resources Institute (WRI), and the United Nations Global Compact. Encourages companies to set reduction targets that are consistent with scientific knowledge, aiming to limit the increase of the global average temperature due to climate change to 1.5 °C compared to before the Industrial Revolution.

**Taskforce for Nature-related Financial Disclosures (TNFD):** An initiative aimed to disclose information about ecosystems. After commencing information disclosure on climate change at TCFD (refer to p.12), TNFD was launched in July 2020 by four organizations: the United Nations Development Programme (UNDP), the World Wildlife Fund for Nature (WWF), the United Nations Environment Programme Finance Initiative (UNEP FI), and the Global Canopy, after the demand for biodiversity information was pointed out.

Others voiced out that the world's greatest common denominator rule is prioritized in international rule-making. This is not a problem in case of greenhouse gases reduction, which has same effects around the world, but causes problems in case of biodiversity. For instance, loss of biodiversity in great rain forests are recognized as bases for discussing impact of land-use change, but it would not be applicable to local value judgment in Japan. Biodiversity is different from carbon reduction because carbon may be deducted by carbon capture technology, but biodiversity would not be restored once it is lost.

In addition, although it is easy for companies to set key performance indicators (KPIs) for climate change, it is difficult to determine what to target for biodiversity. For that, there was an opinion that standardization of monitoring measurements is necessary. It was pointed out that the lack of monitoring indicators made it difficult to achieve the Aichi Targets under the Convention on Biological Diversity, and the importance of monitoring indicators was reaffirmed.

Some participants suggested that they want a quantitative guidance on how to achieve 2050 decarbonization, that is, break down by industry to show what each sector should do to achieve decarbonization, as it is easy to use for engagement. From the researcher side, there were voices that it is surprisingly difficult to break down into the industry in detail. When researchers asked industry personnel for information related to emission reduction potentials, industry groups are likely to respond by showing the least ambitious goals that could be achieved by any company with small effort. Others mentioned that the results of the model study vary greatly depending on how the preconditions are selected, therefore discussions on emission reduction potentials require a process in which all the concerned stakeholders participate in selection of preconditions.

There was an exchange of views on the meaning of "science-based," which is often used in discussions. Researchers feel a sense of uneasiness with this word, which has the idea of political decisions being relied entirely onto science, which should not always be the case. On the other hand, there was an opinion from financial sector that there is a request for clear scientific knowledge for those who make economic decisions, and that highly transparent discussions are important.

# 5.

## What Can We Do Now?

1. Challenges in Japan's climate change and global crisis initiatives; expectations for the collaboration of finance and academia
2. Significance of dialogue between finance and academia - the aim of this workshop
3. Future direction, next step

# 5.

## What Can We Do Now?

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In the discussion above, we have recognized that there is an urgent need to respond to climate change and other global environmental crises. We have also acknowledged that the financial sector is rapidly responding to it, especially in Japan, but there is still a lot of room for scientific academia to collaborate with financial sector. So what should the financial sector and academia do from here onward?

### 1. Challenges in Japan's climate change and global crisis initiatives; expectations for the collaboration between finance and academia

The necessity to create socio-economic scenarios and pathways for decarbonization. This exercise should include scenarios and pathways of the entire world, Japan as a whole, and each sector, policy implications, etc. It is important for the parties concerned to participate from the stage of setting the prerequisites of the models and to make the estimation process transparent.

Understanding the impact of climate change on each company and industry, considering what to do, and improving the level of information disclosure evaluation (including comparisons between companies). Regarding information disclosure, there are high attention to the trends of the [International Sustainability Standards Board \(ISSB\)](#). It is necessary to take measures not only for climate change but also for information disclosure TNFD regarding ecosystems. Sharing industry-based analysis contents, decarbonization plans and necessary technologies, and collaborating with financial analysts and the business world. In addition, future cooperation is desired regarding activities such as regular updates of progress regarding net zero finance in Japan and abroad.

Elimination of disparities in awareness and knowledge between metropolitan areas and rural areas, and between large companies and SMEs. While the role of finance is important in working on the disparities between large companies and SMEs, researchers will be responsible for disseminating knowledge about climate change for more people to understand the meaning of ESG investment and decarbonization.

Involvement of Asian financial and economic sectors. Discussions on sustainable finance are becoming more active in Asia as well. Japan should lead related discussions in the future by taking advantage of places such as the Asia-Pacific Economic Cooperation (APEC) where Japan has an influence.

Information development to enable the financial sector to properly assess a company's physical and transitional risks. This requires detailed risk assessment indicators by industry sector and region. As it may be difficult for researchers solely to provide detailed information, there is room for further development of private companies to establish assessment as their new business.

Transforming the entire financial system toward decarbonization, not only the initiatives of individual financial institution's portfolio. For that purpose, the initiatives of individual financial institutions are not enough, and policy support and guidance are required. It is also required to initiate public debate.

A shift to a financial and economic system in which the pursuit of economic profits (requirements for investment and loan performance) and decarbonization/global environmental conservation initiatives are not in conflict or inconsistent. Issues to be considered include internalization of externalities such as carbon pricing, redefinition of stewardship responsibility, and management of financial markets with views to both individual risk and systemic risk.

In order for all stakeholders to start full-scale activities toward net zero, it is necessary to initiate public debate.

## 2. Significance of dialogue between finance and academia -the aim of this workshop

Financial sector insiders and researchers in Japan, who have few opportunities to discuss directly, were able to share their initiatives, worries and challenges.

At the same time, we realized that the dialogue and collaboration between the financial world and science & academia has not always been sufficient in various situations in Japan or abroad, and it needs to be strengthened in the future.

Furthermore, the participation of stakeholders who were not present at this meeting could be meaningful.

## 3. Future direction, next step

In order to further deepen the discussion on the expected collaboration situations mentioned above and to lead to actual collaboration that has an impact on society, we will create a framework for continuous discussions and collaboration, and hold discussions and work to explore specific possibilities, taking this workshop as an opportunity.

To achieve the above, we will hold small group review meetings and share the outcomes to the participants of this workshop.

Accumulation of scientific knowledge to understand the planetary boundaries. In addition to the climate change and biodiversity introduced this time, there are various issues regarding the global environment and sustainability. It is also possible to exchange opinions from the perspective of climate justice, such as what to leave for future generations. Future step includes sharing of recent research findings on the linkage between biodiversity and climate change, concept of setting goals for biodiversity based on rulemaking, examination of possible indicators, exchange of views on regional characteristics and the diversity inherent in land, forest, ocean, and research on the impact on the primary industry and consumer behavior.

About effective methods for preparing, disclosing, and updating data. By disclosing the prepared data and updating it regularly, it will lead to fostering public debate on climate change countermeasures and coordinating with policies. In addition, we will promote a paradigm shift by deepening discussions on the conventional economic growth model and the future of finance.





# Appendix

# Appendix 1: Program of the “Workshop: The Dialogue between Academia and the Financial Sector on Global Environment”

The workshop was held totally online. We would like to thank the workshop preparation team members as well as those participants who kindly took roles as speakers and facilitators.

## Day1 : Thursday, November 25, 2021, 14:30 - 18:00

14:30-14:45	Opening Remarks / Participants self-introduction / Explanation of the aim
14:45-16:00	Session1: Sharing Risk Perceptions
14:45-15:00	Climate change issues in the economy and finance
15:00-15:15	Current situation of prediction and mitigation of climate change
15:15-15:30	Climate change impacts and adaptation
15.30-16:00	Discussion
16:00-16:10	Break
16:10-17:25	Session2: Responses to Net Zero Finance
16:10-16:25	Decarbonization efforts in the financial sector (investors)
16.25-16:40	Decarbonization efforts in the financial sector (banks)
16:40-16:55	Decarbonization efforts in the financial sector (pension funds)
16:55-17:25	Discussion
17.25-17:35	Wrap-up
17:35-18:00	Summary of Day1

## Day2: Tuesday, November 30, 2021, 13:00 - 16:30

13.00-13:15	Self-introduction of participants for the second day only. Review of the Day 1
13:15-14:30	Session3: Challenges in Climate Change Response
13.15-13:30	Pathways to achieve net zero (AIM Model)
13:30-13:45	Climate change risk abroad using trade models
13:45-14:00	Compatibility with nature conservation: An economic perspective / The spread of renewable energy and ecosystem conservation
14:00-14:30	Discussion
14:30-14:40	Break
14:40-14:50	Wrap-up
14:50-15:20	Summary of Day2
15:20-16:25	Discussion of draft report key messages, potential for future collaboration between finance and academia
16:25-16:30	Closing remarks

## Appendix 2: Workshop participants

All the participants in this workshop participated as individuals without representing the organization to which they belong. Also, although the names are not mentioned here, more people participated as observers. We would like to express our sincere gratitude to all the participants and observers for attending this meeting, and for giving us many valuable opinions.

### <Financial sector>

<b>Hiroko Ishii</b>	The Dai-ichi Life Insurance Company, Limited
<b>Tadahiro Kaneko</b>	Sumitomo Mitsui Banking Corporation
<b>Fumito Kubo</b>	Mitsubishi UFJ Financial Group, Inc.
<b>Katsunari Kurumizawa</b>	The Norinchukin Bank
<b>Mihoko Matsui</b>	JAPAN POST INSURANCE Co.,Ltd.
<b>Masaaki Nagamura</b>	Tokio Marine Holdings, Inc.
<b>Koji Nakamura</b>	Bank of Japan
<b>Koji Omachi</b>	Citigroup Global Markets Japan Inc.
<b>Kenji Shiomura</b>	Government Pension Investment Fund
<b>Toru Terasawa</b>	Asset Management One Co., Ltd.
<b>Seiichiro Uchi</b>	Invesco Asset Management (Japan) Limited
<b>Hiroko Urashima</b>	MS&AD Insurance Group Holdings, Inc. / Mitsui Sumitomo Insurance Company, Limited
<b>Yuichi Wada</b>	FTSE Japan Limited
<b>Akira Watanabe</b>	Mitsubishi UFJ Financial Group, Inc.

### <Academia>

<b>Seita Emori</b>	National Institute for Environmental Studies (NIES)
<b>Yuko Fujita</b>	NIES / Saraya Co., Ltd. / Future Earth Japan Hub
<b>Akira Hibiki</b>	Tohoku University
<b>Yasuaki Hijioaka</b>	NIES
<b>Ryozo Himino</b>	The University of Tokyo
<b>Fumiko Ishihama</b>	NIES
<b>Yasuko Kameyama</b>	NIES
<b>Fumiko Kasuga</b>	NIES / Future Earth Japan Hub
<b>Toshihiko Masui</b>	NIES
<b>Keisuke Nansai</b>	NIES
<b>Kazutaka Oka</b>	NIES
<b>Masachika Suzuki</b>	Sophia University
<b>Junya Tani</b>	The University of Tokyo (Center for Global Commons) / Future Earth Japan Hub
<b>Rintaro Yamaguchi</b>	NIES
<b>Keiko Yoshikawa</b>	NIES

### <Government>

<b>Satoshi Ikeda</b>	Financial Services Agency
<b>Ryosuke Imai</b>	Ministry of the Environment
<b>Takashi Kondo</b>	Ministry of the Environment

The list is in alphabetical order of participants' family names.

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