

**Urgent Statement by the President of Science Council of Japan
on Climate Change and Call for Action**

To all citizens of Japan,

We have all greatly benefited from modern civilization, but we are now at a crossroads.

If we continue down the current path, by around 2040 temperatures will increase more than 1.5°C compared to pre-industrial levels. Weather and water-related natural disasters will increase, biodiversity loss will progress, and our livelihoods, health, and safety will be at risk.

To avoid this path, we must start decreasing global CO₂ emissions immediately, and must steer our course drastically to achieve net carbon neutrality by mid-century.

The path of action to take is not simply one of discomfort and burden, but rather one where we can achieve a prosperous society through changing our economic and social systems such as our energy, transportation, urban, and agricultural systems. The world, including Japan, is starting to take action, but at a much-too-slow pace.

We hope that you will join the movement to speed up change, be it by making choices in the economy related to production, consumption, investment, and distribution, and/or by proactively speaking out and taking action. We researchers are also committed to collaborating closely with citizens.

Urgent Statement

- 1. Climate change, which could pose a risk to human existence, is definitely happening.**
- 2. We must move forward quickly to strengthen international and domestic cooperation toward slowing down climate change.**
- 3. To slow down climate change, we need to integrate management of our basis for survival, including the atmosphere and water, energy, and food.**
- 4. Terrestrial and marine ecosystems are a prerequisite for maintaining the biosphere on Earth that includes us humans. Protecting our ecosystems plays an important role in slowing down climate change.**
- 5. We need a new economic and social system for future generations now.**

The Science Council of Japan has been discussing actions to take against climate change in the following committees: Committee on Promotion and Cooperation of Future Earth, FE-WCRP Joint Subcommittee of Environmental Studies Committee and Earth/Planetary Sciences Committee, HD Subcommittee of Environmental Studies Committee and Regional Studies Committee, Future Design Subcommittee of Environmental Studies Committee and Economic Studies Committee, and Planet Human Biosphere Subcommittee of Earth/ Planetary Sciences Committee, in close cooperation with the Future Earth Japan Global Hub (The University of Tokyo, National Institute of Environmental Studies, Science Council of Japan and others), and Future Earth Asia Regional Centre (Research Institute for Humanity and Nature).

We created this Urgent Statement to coincide with the timing of the UN Climate Action Summit 2019 that will be held in New York on September 23rd.

We will continue to proactively contribute toward the solution of global issues including climate change, while collaborating closely with international academic institutions and United Nations organizations.

September 19, 2019
Juichi Yamagiwa
President, Science Council of Japan

1. Climate change, which could pose a risk to human existence, is definitely happening.

- The increase in greenhouse gas (GHG) emissions due to human activity is causing the earth's climate to warm (known as climate change or global warming). Warming since the second half of the 20th century is more pronounced. If global GHG emissions continue to rise, there will be an increase in global average temperature of over 4 degrees Celsius (compared to pre-industrial times), and it is predicted that the Arctic sea ice will disappear in the summertime, average global sea level rise will reach 1m, part of the land and much of the coral reefs will disappear, and coastal fishing will be hit hard [IPCC, 2013].
- Another point of concern is that a number of elements in the climate system will suddenly change due to climate change, affecting each other, and reaching a tipping point whereby the climate system's equilibrium suddenly and drastically changes. Scientists say that this could lead to a transition into a hot house climate of the earth, as happened 15 million years ago, over the course of a few hundred years [Future Earth and Earth League, 2018]. Since humanity has never experienced such a hot house climate before, there is a real possibility that it would have a serious impact on our current global production activities and economies.
- One effect from climate change is of particular concern in Japan; more than rising temperatures, an expected higher frequency and intensity of rainfall is worrying. This is due to increased water vapor from higher air and sea surface temperatures. For example, experts predict that if we do not take action, the frequency of heavy rain in East Asia (including Japan) which currently only happens about once every 20 years, will increase to once every 2 years by the end of this century [IPCC, 2012]. According to research observing rainfall since the Meiji Era for more than 100 years, the frequency of heavy rainfall is undeniably increasing.
- Due to increases in heavy rain frequency in Japan, water-related natural disasters (such as floods and landslides), show a trend of increasing frequency and scale in recent years [Japan Academic Network for Disaster Reduction, 2018].

2. We must move forward quickly to strengthen international and domestic cooperation toward slowing down climate change

- Global average temperature has already risen 1°C since the Industrial Revolution, and is predicted to reach 1.5°C by around 2040 [IPCC, 2018]. The Paris Agreement, which was adopted in December 2015 with the participation of 196 countries and became effective the next year, is an international framework on climate change that aims to keep temperature rise well below 2°C. In this agreement, each country is obligated to prepare, submit, and maintain successive GHG

emission targets, and to pursue domestic mitigation measures to achieve them.. However, there is no international framework for penalizing countries that do not meet the targets. Moreover, there are issues in international cooperation such as President Trump of the United States-the second largest emitter country- declaring to withdraw from the Paris Agreement. Achieving the Paris Agreement targets will be difficult under the current situation.

- To avoid a situation in which we continue to increase GHG emissions at current trajectories and cross over tipping points, we must take as much action as we can. Moreover, the Intergovernmental Panel on Climate Change (IPCC) reported in 2018 that if we keep the rise in temperature within 1.5°C (and not 2°C) by the end of this century, the impacts of climate change will greatly decrease (compared to if temperatures rise 2°C). Differences will be especially apparent in extreme weather events, global sea level rise, Arctic sea ice melting, terrestrial/marine ecosystems, water resources, grain production volume, and coastal fishing. But to achieve that goal, we must realize net zero global CO₂ emissions by 2050 and decrease emissions of other GHGs as much as possible [IPCC, 2018].
- To achieve this 1.5°C target, each country must implement rapid and strong mitigation measures of GHG emissions reductions, and adaptation measures to minimize the impacts at a regional and national level. In addition to international cooperation, national and local governments, and businesses should take leadership in acting toward this target.

3. To slow down climate change, we need to integrate management of our basis for survival, including the atmosphere and water, energy, and food.

- The important thing to note here is that it is not simply a matter of decreasing GHGs such as CO₂. In addition to GHGs, human activity has released a great amount of atmospheric pollutants such as aerosols, including PM_{2.5}. These substances act to suppress the greenhouse effect by reflecting sunlight. On the other hand, there are atmospheric pollutants that have a strong warming effect called short-lived climate pollutants (SLCPs). These are substances such as black carbon, tropospheric ozone and methane. We need to simultaneously reduce health hazards and counteract climate change by implementing measures to reduce SLCPs.
- There is a close reciprocal relationship between water, energy, and food, which are the basis for human survival. For example, to achieve the 1.5°C target, we need countermeasures such as increasing the production of biofuels. However, this could have a serious impact on the ecosystem, as well as decrease food grain production in certain regions [IPCC, 2019]. When constructing hydropower dams, we need to take care, at the same time, of conservation of water resources, flood control, and biodiversity protection.
- Many of the granary regions in the world are dependent on groundwater, and thus food production

is causing groundwater depletion. For example, Japan's food self-sufficiency rate is the lowest among developed countries at 37%, and we import large quantities of grains from the United States and other countries. As a result, not only does it cost a lot of transportation energy for importing, but also the groundwater of the Great Plains in the US is experiencing depletion due to grain production. Increasing our food self-sufficiency rate could lead both to slowing climate change and protecting water resources.

- Climate change solutions require not only reduction of GHGs, but also the consideration of atmospheric protection, while supplying water resources and food at the same time. To do this, we need to establish a new economic and social system that can conduct integrated management of resources of water, energy, and food, both for global and local perspectives.

4. Terrestrial and marine ecosystems are the prerequisite for maintaining the biosphere on Earth that includes us humans. Protecting our ecosystems plays an important role in slowing down climate change.

- Biodiversity protection should not be a stand-alone issue separate from climate change. Planting trees is considered a good measure to absorb CO₂ from the atmosphere and a healthy forest ecosystem is an essential factor in long-term CO₂ reduction. Diverse terrestrial ecosystems, including forests, play a significant role (ecosystem services) in maintaining the surface environment of the Earth through water and soil conservation, provision of food, and atmospheric stability. Using these renewable resources produced from ecosystems will greatly contribute to a sustainable society. However, rapid climate change leads to the degradation of ecosystems and ecosystem services, and weakens the basis of survival for us humans. Moreover, ecosystems can play a role in risk reduction for natural disasters that are caused by climate change, as was pointed out in the reconstruction efforts of the Great East Japan Earthquake disaster [UNEP, 2015].
- A healthy marine ecosystem can maintain CO₂ absorbing functions. Increase of ocean surface water temperature due to the climate change, however, diminishes the absorption of CO₂ by ocean surfaces, and decreases dissolved oxygen levels necessary for the survival of marine life. At the same time, a rapid increase in atmospheric CO₂ levels increases dissolved CO₂ in ocean surface water, leading to acidification of the waters and degradation of coral reefs in tropical oceans. This causes a deterioration of the whole marine ecosystem, and risks the sustainability of coastal fisheries [IPBES, 2019].

5. We need a new economic and social system for future generations now.

- The Paris Agreement goal to keep global average temperature rise below 1.5°C by the end of this

century needs to be achieved to keep the earth surface system (including climate and biosphere) in a state close to the present one. However, to achieve this condition, we need to utilize renewable energy to its maximum potential and achieve almost zero CO₂ and other GHGs emissions by around 2050 [IPCC, 2018].

- To achieve this target, not only do we need to cut GHG emissions, we also need to establish a new economic and social system that can maintain, secure, and manage, in an integrated manner, humanity's basis for survival - food, energy, and water- with ecosystem conservation as the basis.
- This new economic and social system should be created with and for the next generation that will live in the latter half of the 21st century and afterward. To promote this transformation of society, we need not only to change governance at the international and national levels, but also to raise awareness at regional/local communities, business communities, and citizen levels.
- The Sustainable Development Goals (SDGs), to be achieved by 2030, should be considered as a first step for the next ten years for nations, local governments, and business communities, to create a new economic and social system that can slow down climate change.
- Existing academic disciplines will also need to be renewed and transformed toward this direction of creating new economic and social systems. Schools and education systems should also explicitly be oriented in this direction.
- We humans have come to understand the history and dynamics of our planet Earth, and we are the only species that can consider the sustainability of its future. Yet, we still do not know fully how to design and create a new economic and social system for achieving a sustainable planet. Nevertheless, the time has come for all of us living on planet Earth to put all our efforts toward solving this critical issue.

***About Future Earth**

Future Earth is an international platform that works toward sustainability through the promotion of research, in cooperation with society. It was established in 2013 under the support of organisations such as the International Science Council, five United Nations organisations (UNEP, UNESCO, WMO, UNU, SDSN), STS forum, and the Belmont Forum (international association of national research funders).

Future Earth website: <https://futureearth.org/>

Future Earth Japan Global Hub website: <https://ifi.u-tokyo.ac.jp/en/units/futureearth/>

Future Earth Asia Regional Centre website: <http://old.futureearth.org/asiacentre/>

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