

# **Advisory Opinion**

**A need for comprehensive strategic planning  
regarding Japan's Earth satellite observation**



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**Science Council of Japan**

**Earth and Planetary Sphere Subdivision  
Earth and Planetary Science Committee**

This advisory opinion is organized and published by the Earth and Planetary Sphere Subdivision of the Earth and Planetary Science Committee, based on the deliberations of the Earth Observation Satellite Future Planning Subcommittee, under the Earth and Planetary Sphere Subcommittee, Earth and Planetary Science Committee, Science Council of Japan.

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## EXECUTIVE SUMMARY

### 1. Background

On July 14, 2020, the Science Council of Japan issued a Recommendation titled "How Japan's Earth satellite observation should serve as the basis for a sustainable human society". This recommendation regards countering the enormity of human and economic losses suffered by human society as a result of natural disasters associated with the climate change as "national security in a broad sense", and emphasizes the importance of the earth satellite observation as a foundation for a sustainable human society. They called for measures to clarify mechanisms for promoting strategic plans for Earth satellite observations, to promote the establishment and utilization of observation data archive systems, to strengthen human resource development systems, and to improve Earth observation literacy.

Even after the recommendation was issued, the world has been continuously affected by extreme events such as record-breaking floods and droughts. The Intergovernmental Panel on Climate Change Sixth Assessment Report published in August 2021 (IPCC AR6) sounded the alarm about the climate crisis caused by human activities. Furthermore, the recent pandemic of COVID-19 and the prolonged invasion of Ukraine by Russia have complicated global environmental issues.

On the other hand, the large amount of data collected by earth satellite observations is an asset with high economic value as well as scientific value in the modern digital society. In recent years, as scientific understanding of the Earth system has deepened, satellite observation data has come to be used for social and economic decision-making. The government is focusing on digital transformation (DX) and green transformation (GX) aimed at a decarbonized society as efforts to solve social issues and realize economic growth, working to accelerate these efforts and maximize the use of research data, and placing importance on promoting the open science. Against this background, the Science Council of Japan compiled a Reply in December 2022 titled "Regarding deliberations on the promotion of research DX - especially from the perspective of promoting open science and data utilization".

In the 25th Earth and Planetary Science Committee, Earth and Planetary Sphere Subdivision aims to contribute to international cooperation to deal with increasingly complex global environmental issues, and at the same time to promote the multifaceted use of satellite observations against the backdrop of rapidly progressing DX and GX. The subdivision established the "Earth Observation Satellite Future Planning Subcommittee", which discussed the need for integrated strategy planning and human resource



development for Earth satellite observation through collaboration between industry, academia, and government, and compiled this opinion.

## **2.Current Situation and Issues**

In Japan's current earth observation policy, the importance of earth satellite observation is recognized both academically and as a social infrastructure. However, "a long-term satellite observation programming" and human resource development are insufficient. There is a need for an integrated strategy that includes promotion of open science, construction of archive/utilization systems, and human resource development from various perspectives of international contribution, academic progress, social utilization, and industrial utilization.

## **3.Advisory Opinion**

(1) The necessity of earth satellite observation as the scientific basis for climate change countermeasures and the cornerstone of international cooperation

In order to appropriately respond to global environmental issues that are complexly intertwined, such as the climate crisis, the pandemic of COVID-19, and protracted conflicts, humanity needs to constantly explore cutting-edge scientific knowledge and take actions based on scientific evidence. Eighty percent of the Essential Climate Variables (ECVs), which are defined as the basis for understanding and monitoring the Earth's climate system, are observed by satellites. Earth satellite observation is an essential technology for both mitigation and adaptation measures against the climate change. On the other hand, satellite observation is also an essential technology for disaster prevention and measures against aging infrastructure such as roads and bridges. By comprehensively taking adaptation measures and disaster prevention/mitigation measures, we can minimize the damage caused by disasters and build a resilient society.

International cooperation is essential for Earth observation. In addition to enhance observations in which Japan already has technical advantages, the government and the academic community should also discuss items that our country should observe from a political, scientific and technological perspectives, to make appropriate international contributions.

(2) The need for integrated strategy planning for Japan's earth satellite observation

Policy makers need to improve society's understanding that climate change countermeasures are important for "socio-economic security", and that continuous, high-precision Earth satellite observation is an essential infrastructure for the global environmental conservation system. They should take measures to gain support to promote continued progress in observation and utilization technologies. On the other

hand, as society becomes increasingly IT-based, the use of Earth satellite observation big data by private companies is also progressing. The government and the academic community should effectively collaborate with the activities of the Science Council of Japan, the Earth Satellite Observation Task Force (TF), the Future Mission Review Committee of the Japan Aerospace Exploration Agency (JAXA), and the Consortium for Satellite Earth Observation (CONSEO). It is necessary to formulate a comprehensive promotion strategy that takes into account not only research and development activities centered on government agencies such as the Cabinet Office Space Policy Committee and academia, but also activities in industry. In other words, it is necessary to discuss programming that positions earth satellite observation in a long-term strategy that includes DX and GX perspectives, taking into consideration the use of data in society (Reference 3). Discussion of strategies should be promoted on a round table, from observation to utilization, so that all concerned parties can see the entirety of Earth satellite observation and related issues as indicated in the Timetable for Basic Plan on Space Policy.

### (3) Promoting open science

Science is the foundation that supports modern society. Scientific data obtained through public funding should be utilized as a shared asset of society through "open science." Earth observation data is not only academic data, but also an important asset for human society over the long term, and if lost, it can never be reproduced. In particular, Earth satellite observation, which has the characteristics of global observation, can create highly valuable datasets for international collaboration through open science. In consideration of the transformation of the relationship between society and science due to digital platforms and open science, the government should ensure long-term continuity and reliability with the recognition that earth satellite observation data is an asset of society. It is necessary to invest in building a stable data archive system.

### (4) Promoting human resource development from various perspectives to realize integrated strategies

The government should focus on systematic human resource development in order to build a society that efficiently utilizes the earth satellite observation, which is expected in the future. First, it should be noted that dependence on foreign countries for satellite sensor procurement will lead to a stagnation in the training of domestic engineers, and countermeasures should be taken. In addition to hardware development and physical quantity estimation algorithm development, the government should also strategically develop human resources who can support interdisciplinary collaborations, data science, content development for social use, small satellite technologies, collaborative creations with industry and general society, and who can demonstrate international leadership. Furthermore, a training plan that takes diversity into consideration is necessary.

In nurturing the young generation who will lead the future, the government must pay attention to serious problems such as the lack of interest in geology among young people and should make major efforts toward earth science and geography education from the perspective of developing human resources who can take on the challenges of the global environment, natural disasters, and anthropogenically-caused disasters. In doing so, well-organized efforts are needed. In addition, in order to increase the number of people going on to doctoral programs at graduate schools, it is necessary to increase tenure-track positions at universities and research institutes, posts in administrative careers, as well as the number of posts throughout Japan including the private sector, for various career paths of doctoral degree holders can be foreseen. Concrete measures should be urgently taken through various means.