



Japan Aerospace Exploration Agency (JAXA)  
Sustainability Report 2021



JAXA

## Introduction

JAXA's Sustainability Report was compiled focusing on (1) our relationship with stakeholders, (2) the seven core subjects specified in ISO 26000, and (3) the SDGs (Sustainable Development Goals). This report includes the main topics that we would like to share with our stakeholders as well as links to related websites so that you can find more information.

We hope that readers will become interested in aerospace and the global environment and use it as a starting point for communication with us.

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In order to realize our vision, plans, and projects, the following are JAXA's philosophy and management policies, as well as the code of conduct for JAXA employees.

## Management Philosophy

To realize a safe and affluent society using space and the sky. By utilizing leading technological developments, we will succeed and deliver our achievements along with broader wisdom to society.

## Action Declaration

[Details](#)

**Jubilation for human society** | We will provide enjoyment and surprise to people by evolving our lives.

**Aspiration for creation** | We will always aim for higher goals and continue to be aspired for creation by facing up to and overcoming any difficulties.

**Responsibility and pride** | We will faithfully act with responsibility and pride to confidently meet the expectations of society.

# JAXA

# Reaching Space Frontiers



## "Revitalize Japan through space and aeronautics"

Having a strong sense of contribution to Japan through space and aeronautics field.

## "Improve ability to execute in space and aeronautics"

Enhancing our capabilities in elements such as planning, R&D, project implementation, and organization management.

## "Be proud in being involved in space and aeronautics"

Taking pride in our endeavors in the exploration of space and aeronautics, and thus showing our international presence in this field.

## "Increase the number of our companions in space and aeronautic field"

Promoting space and aeronautics as an integral part of society by making it more valuable and closely involved with everyday life.

## "Make space and aeronautics field the ideal workplace"

Aiming diversity and maximizing the potential of individuals.

In fiscal year (FY) 2020, the third year of the Phase 4 Medium/Long-Term Plan, Japan Aerospace Exploration Agency (JAXA) was able to accomplish many important missions while taking thorough countermeasures against the continuing spread of COVID-19. Our achievements include the return of samples from the asteroid Ryugu by the asteroid explorer Hayabusa 2, supply mission to the International Space Station (ISS) by the final KOUNOTORI (HTV), and the flight of Astronaut Soichi Noguchi boarding on the first U.S. commercial crewed spacecraft Crew Dragon. In the field of space transportation, which supports Japan's independent space activities, we achieved 50 consecutive successful launches of our current core rockets, the H-IIA, H-IIB, and Epsilon. We have cultivated the international confidence over the years as an international partner of the ISS program, which definitely contributes to maintain and enhance Japan's presence in the Artemis program and Gateway (a crewed base around the moon) proposed by the United States. In June 2020, the Basic Plan for Space Policy (Japan's basic space policy) was revised for the first time in five years, with the aim of becoming a self-reliant space-using nation to contribute to diverse national interests by realizing a virtuous cycle of strengthening infrastructure and expanding utilization. In response to the revision, as the core implementing agency to support the Japan's development and utilization of space with technology, we have continued to take on challenges in all aspects of R&D, including various projects, as well as the operations that support them, with all officers and employees working together.

At the same time, we are steadily giving considerations for the environment, energy consumption, and paperless operations. We have just started our efforts to contribute to carbon neutrality, which was announced as a government policy in October 2020.

Japan is one of the few countries in the world that can conduct autonomous space activities. In FY 2021, we will continue to make steady progress in various projects and will boldly take on the challenge of creating new value and leading R&D in Japan's space and aeronautic field to revitalize Japan amid the uncertainty of the end of the COVID-19 pandemic while giving consideration to environment and striving to give back to society.

September 2021

President



We, JAXA, will reform the management system and change the mindset of executives and employees, while emphasizing public nature, transparency, and autonomy as a national research and development agency, with the aim of effective and efficient operations to maximize the fruits of R&D in Japan. Based on the Basic Plan for Space Policy, etc., the competent minister instructs JAXA on the Medium/Long-Term Goals for the next seven years, which specifies the goals for business operations and business efficiency improvement. We prepare Medium/Long-Term Plan and Annual Plan based on the Medium/Long-Term Goals to steadily proceed with operations and achieve goals.

We prepared Medium/Long-Term Plan for the seven-year period from April 1, 2018, to March 31, 2025. Based on the Basic Plan for Space Policy and R&D Plan, we will reliably implement projects and promote fundamental R&D. In addition, we will strengthen cooperation with industry, academia, and government, keeping an eye on the accelerating progress of advanced technologies and will focus on giving back the achievements to the public. Thus, we aim to create outcomes in line with the following three action policies outlined in the Medium/Long-Term Goals.

## Priorities for Phase 4 Medium/Long-Term Goals

### 1. Contribution to diverse national interests

#### (1) Ensuring space security

- ▶ Technical support for government studies on functional assurance of the entire space system in cooperation with security organizations
- ▶ R&D to meet the needs of space utilization in the security field, such as space debris
- ▶ Advanced R&D to improve technologies to support Japan's positioning system, and continuous R&D for optical satellite communication technologies, etc.
- ▶ Continuous operation of core launch vehicles and development of H3 and Epsilon S launch vehicles to secure and improve independent space transportation capabilities
- ▶ Demonstration of world-leading technologies to remove space debris at low cost in cooperation with private companies, and contribution to early establishment of international rules

#### (2) Contribution to disaster countermeasures, national resilience, and solutions for global issues

- ▶ R&D on improving the frequency, accuracy, and speed of satellite observation in cooperation with disaster prevention organizations, aiming at the widespread use of satellite data as decision-making information for disaster countermeasures
- ▶ Promoting utilization of satellite data for national land management and oceanographic observation, including application to maintenance and management of aging infrastructure
- ▶ Providing satellite data and promoting international cooperation to promote the use of satellite data as an indicator for decision-making and evaluation of actions on climate change
- ▶ Advanced R&D on earth observation satellites and upgrading of core technologies for satellites to provide satellite data continuously and stably and promote its utilization

#### (3) Creation of new wisdom through space science and exploration

- ▶ Strengthening partnerships with domestic and international research institutions. Formulating and implementing long-term, strategic scenarios with the aim of creating world-class research achievements. Promoting efficient and effective space exploration with programming.
- ▶ Strategic development of technologies that can contribute to Japan's superiority in international space exploration and/or that have a significant ripple effect on other fields.
- ▶ Promoting creation of new wisdom and international contributions through utilization of the space environment in low-Earth orbit activities including the International Space Station (ISS)
- ▶ Utilizing the ISS as a technology demonstration site for international space exploration and promoting open innovation and other systems for collaboration with private companies and universities, including those in non-aerospace industries.

#### (4) Realization of economic growth and innovation utilizing space

- ▶ Efficient processing of satellite data and creating new businesses through multidisciplinary utilization of satellite data in collaboration with private companies, which have strength in advanced technologies in different fields such as AI
- ▶ Realizing a wide range of utilization of the Japanese Experiment Module "Kibo", and launching some self-sustaining businesses by private companies, etc. Promoting participation of private companies in international space exploration
- ▶ Business planning and technology development/demonstration through partnership with private companies to create businesses utilizing space with new ideas by the private sector. Strengthening the human resource base through personnel interchange with external parties.
- ▶ Developing the open innovation system to promote entry of different industries and venture businesses and to expand opportunities for R&D and demonstration of technologies useful for business. Promoting activities related to intellectual property.

### 2. Strengthening the overall infrastructure to support Japan's space activities, including industrial, scientific, and technological infrastructure

- ▶ R&D with private companies that commit to commercialization aiming to increase market share
- ▶ Innovative R&D for future business creation, such as flight demonstration using technologies for reuse of space transportation systems
- ▶ R&D on advanced and innovative technologies related to future satellites, such as optical and digital technologies for low-cost, high-capacity, high-speed satellite communication network, and high-precision large optical sensor technologies
- ▶ Personnel interchange with private companies to strengthen the human resources base of the aerospace industry, and incorporation of diverse human resources into the aerospace field to enhance the function of JAXA
- ▶ Support for government's investigations on the ISS as well as low-Earth orbit activities and manned space activities in international space exploration after the ISS project

### 3. Enhancing the aeronautics industry and strengthening its international competitiveness

- ▶ Putting priority on R&D to improve environmental compatibility, economic efficiency, and safety of aircraft in cooperation with the private sector, such as technology development for international joint development of next-generation engines
- ▶ Advanced R&D on noise reduction for supersonic aircraft to contribute to improvement of international competitiveness of Japan's aeronautics technologies and establishment of international standards



### 01 > Ensuring space security

The core launch vehicles launched in 2020 were H-IIA No.42 and No.43, and H-IIB No.9, all of which were successfully launched. We consecutively succeeded 46 launches (total of H-IIA and H-IIB), and the current success rate is 98.1%. With regard to Epsilon S launch vehicles, which were developed expecting synergy effects of Epsilon launch vehicles and H3 launch vehicles to strengthen international competitiveness, we concluded a basic agreement on the transportation service business with a company, aiming to change the business structure of the space transportation system to be independent and sustainable. Furthermore, we were entrusted with overseas satellite launch for the first time for the Epsilon series.



H-IIB Launch Vehicle No.9 with KOUNOTORI No.9 onboard (before launch)

### 02 > Contribution to disaster countermeasures, national resilience, and solutions for global issues

For disaster countermeasures and national resilience, we worked on social implementation of the research, development and operation results of remote sensing satellites in cooperation with related ministries. In FY 2020, we were able to demonstrate the effectiveness of remote sensing satellites in a wide range of fields, such as disaster prevention and countermeasures, infrastructure maintenance and management, and monitoring of global warming, and showed actual cases of expansion and spreading of their utilization; for example, analysis using the terrestrial water cycle simulation system "Today's Earth (TE)" for "Heavy Rain Disaster in July 2020 (Kumamoto Floods)" and the typhoons in October and November 2020 (which affected the Philippines, Vietnam, etc.); realization of the world's first "5-day weather forecast" using precipitation observation data directly in numerical weather forecast with the Global Satellite Mapping of Precipitation "GSMaP"; starting to provide real-time precipitation forecasts to the public; contribution to establishment of Japan's Satellite Monitoring system for Agrometeorological Information "JASMAI" led by the Ministry of Agriculture, Forestry and Fisheries. In addition, for COVID-19, we cooperated with the National Aeronautics and Space Administration (NASA)

and the European Space Agency (ESA) to understand the global environment and economic activities before and after the pandemic (changes in carbon dioxide concentration in large cities, changes in car/aircraft parking at airports, etc.), and released the analysis results.



An example of JAXA's web page providing precipitation data "GSMaPxNEXRA Global Precipitation Forecasts". It shows the distribution of predicted precipitation for the next three hours from 22:00 on July 5, 2020. Heavy rainfall associated with "Heavy Rain Disaster in July 2020" was predicted in southern Kyushu.

[Details](#)

### 03 > Creation of new wisdom through space science and exploration

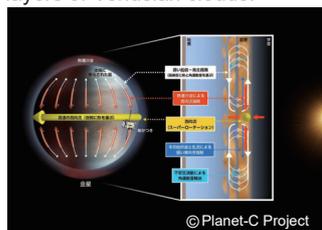
In FY2020, we succeeded in recovering the re-entry capsule detached from the asteroid explorer "Hayabusa2" that returned to Earth orbit and collected a large amount of rock samples as well as gas samples from the capsule. This is the world's first recovery of samples from a C-type asteroid, and also the world's first return of gas samples from outside the Earth's atmosphere. Yoshihide Suga, the Prime Minister at that time, presented the Prime Minister's Award to the Hayabusa2 Project Team. The Venus Climate Orbiter "AKATSUKI" produced world-class scientific achievements in the field of space science, including a paper published in Science on the elucidation of the maintenance mechanism of the super-rotation, high-speed west wind in the upper layers of Venusian clouds.

In the field of international space exploration, we provided technical support for intergovernmental initiatives such as the Joint Exploration Declaration of Intent (JEDI) for cooperation in lunar exploration, the Artemis Accords (a political declaration on international space exploration), and the Japan-U.S. Gateway Memorandum of Understanding. With regard to the ISS, the KOUNOTORI No.9, a cargo transporter to the ISS launched in FY2020, played a key role in transporting a large battery for the ISS. The KOUNOTORI has been launched successfully in all nine of its missions in 11 years, contributing to the stable operation of the ISS. Astronaut Soichi Noguchi was the only international partner aboard the first



"Hayabusa2" ejecting the entry capsule (illustration)

[Details](#)



Overview of maintenance mechanism of super-rotation in the Venusian atmosphere

[Details](#)



Cargo transporter "KOUNOTORI" No.9 gripped by the ISS robotic arm

[Details](#)

U.S. commercial crewed spacecraft, and led ISS operations through various on-orbit experiments and extra-vehicular activities.



### 04 > Realization of economic growth and innovation utilizing space

In FY 2020, we continued to promote co-creation for commercialization through the R&D program "JAXA Space Innovation through Partnership and Co-creation (J-SPARC)," to support the creation of businesses utilizing space with new ideas by the private sector. Some projects made considerable progress in the business demonstration phase toward commercialization. In the Space Frontier Studio KIBO project, we created new opportunities for utilization of low-Earth orbit, including entertainment, and expanding the use by involving non-aerospace industries.



It was the first time in the world that an astronaut communicated with people in real time with a live video feed.

### 05 > Strengthening the overall infrastructure to support Japan's space activities, including industrial, scientific, and technological infrastructure

We have developed autonomous flight safety software, which will lead to lower costs for space transportation systems, as a project commissioned by the Ministry of Economy, Trade and Industry (METI) and we are working to install and demonstrate the software on rockets manufactured by ventures and other systems in the J-SPARC program. The software is expected to reduce the maintenance cost of future transportation systems and promote the entry of the private companies into rocket launch businesses.

In our research on innovative lattice structure of carbon composite material (Carbon Fiber Reinforced Plastics: CFRP) aimed at drastic

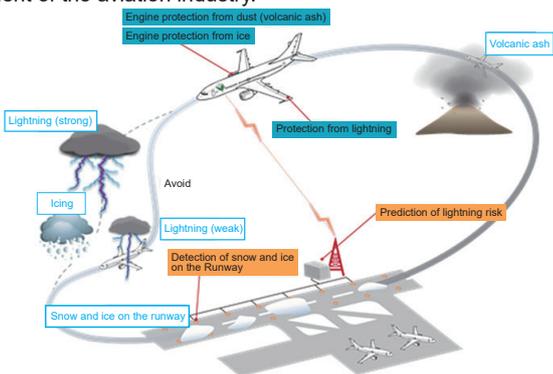
cost reduction, we established a low-cost manufacturing method, such as reusable manufacturing jigs, and reduced the mass and cost to less than half that of conventional metal structures. It will be adopted for the kick stage of the deep space exploration technology demonstrator DESTINY+.

Furthermore, we developed a GPS receiver that can receive weak and fluctuating GPS signals and established continuous and stable GPS navigation in geostationary orbit. This technology has attracted the attention of overseas satellite manufacturers, and a Japanese manufacturer decided to launch products in the domestic and overseas markets.

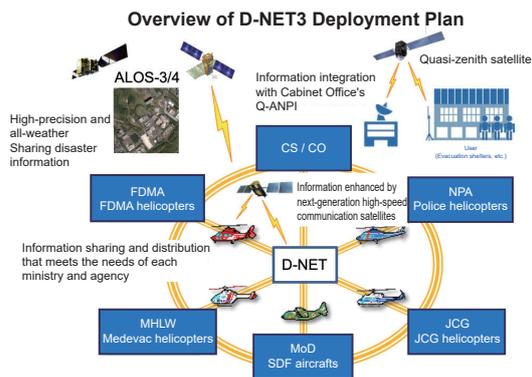
### 06 > Enhancing the aeronautics industry and strengthening its international competitiveness

In FY 2020, we succeeded in developing and testing a combustor with low NOx (nitrogen oxides) superior to overseas competitors, which will play a central role in next-generation jet engines. We also developed the world's first weather impact management system for aircraft and conducted demonstrations at airports where we plan to implement the system, aiming for technological innovation that will lead to dramatic changes in society. Thus, we contributed to improvement of the Japan's international competitiveness in aeronautics and establishment of international standards through our activities for aviation environment and safety technologies, advanced technologies that will open up the next generation, and fundamental technologies that will lead to the sustainable development of the aviation industry.

With regard to the integrated operation system for disaster relief and crisis management (D-NET3), we transferred technologies for each function of the system to three companies: a meteorological service provider, an aviation equipment company, and an aviation software company. As a result, the system will be commercialized in the next fiscal year and was prepared for social implementation. In addition, the D-NET has been highly evaluated by government agencies and is expected to be adopted as an aircraft operation system for efficient and safe operation of aircraft engaged in initial response to natural disasters.



Concept of operation of weather impact management system for aircraft



Integrated operation system for disaster relief and crisis management (D-NET3), which can respond not only to natural disasters but also to security and warning for national events



## Sustainable Development Goals (SDGs)

[Details](#)

As the core implementing agency to support the development and utilization of space with technology, we utilize SDGs as a common global language for solving social issues and as opportunities for innovation, and work to realize a sustainable, safe, and prosperous society through the development of leading-edge technologies and the application of the achievements in cooperation with various partners. Science and technology innovation (STI), including space technology, is expected to play a significant role in achieving SDGs. We are promoting the following actions to contribute to SDGs.

Actions contributing to SDGs	Overview	Related goals
Sentinel Asia	An international cooperation project to monitor natural disasters such as typhoons, floods, earthquakes, tsunamis, volcanic eruptions, and wildfires in the Asia-Pacific region using earth observation satellites, with the aim of reducing and preventing damage.	11 SUSTAINABLE CITIES AND COMMUNITIES
JICA-JAXA Forest Early Warning System in the Tropics (JJ-FAST)	A service that uses the Advanced Land Observing Satellite-2 "Daichi-2" (ALOS-2) in cooperation with the Japan International Cooperation Agency (JICA) to provide information on deforestation and change of tropical forest in about 80 countries.	13 CLIMATE ACTION, 15 LIFE ON LAND
Application of earth observation satellites to oceanography and marine environment monitoring	Use earth observation satellites to observe maritime disasters such as red tides and oil spills, and to monitor damage to ensure the safety of marine transportation.	14 LIFE BELOW WATER
Global Satellite Mapping of Precipitation (GSMaP)	Predict floods in downstream areas several days before occurrence and reduce the damage by integrating data from multiple earth observation satellites and ground data.	6 CLEAN WATER AND SANITATION, 11 SUSTAINABLE CITIES AND COMMUNITIES, 13 CLIMATE ACTION
Monitoring cultivated land by earth observation satellites	Use earth observation satellites to collect and analyze valuable information for agricultural development, such as types of land use, types of crops, and crop growth, contributing to a stable supply of agricultural products.	2 ZERO HUNGER
Monitoring air pollutants by earth observation satellites	Observe smog and PM2.5 from space and enhance the ground-based observation network to identify the place of occurrence and provide accurate information on pollution forecasts, contributing to prevention of health hazards caused by air pollution.	3 GOOD HEALTH AND WELL-BEING, 11 SUSTAINABLE CITIES AND COMMUNITIES
Utilizing the microgravity environment of space	Aim to promptly realize innovative drugs targeting infection, cancer, and lifestyle disease, and to significantly shorten the time required for drug discovery.	3 GOOD HEALTH AND WELL-BEING, 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Realization of human- and eco-friendly society utilizing aeronautics	Aim to realize human- and eco-friendly and sustainable society utilizing aeronautics by promoting development of technologies necessary for advancement of sustainable air transportation, contribution to society, and commercialization.	7 AFFORDABLE AND CLEAN ENERGY, 8 DECENT WORK AND ECONOMIC GROWTH, 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE, 11 SUSTAINABLE CITIES AND COMMUNITIES, 12 RESPONSIBLE CONSUMPTION AND PRODUCTION, 13 CLIMATE ACTION, 17 PARTNERSHIPS FOR THE GOALS
KiboCUBE: joint project with the United Nations Office for Outer Space Affairs (UNOOSA)	In cooperation with UNOOSA, provide opportunities of small satellite launches to emerging and developing countries in aerospace field and support small satellite development technologies.	4 QUALITY EDUCATION, 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE, 17 PARTNERSHIPS FOR THE GOALS
Participation in the Working Group on Geospatial Information (WGGI)	Contribute to discussions on the use of Earth observation data in the WGGI, which was established under the Inter-Agency Expert Group on SDG Indicators of the United Nations Statistical Commission.	SUSTAINABLE DEVELOPMENT GOALS
Contribution through the intergovernmental Group on Earth Observation (GEO)	Work as a co-lead of the Earth Observation for SDGs (EO4SDG), which is an initiative of the intergovernmental GEO to conduct national projects, capacity building, data information products and outreach in each member nation.	EARTH OBSERVATIONS FOR THE SUSTAINABLE DEVELOPMENT GOALS

Recently, social momentum toward the achievement of SDGs is growing. The environment surrounding SDGs and aerospace field has also changed significantly. The Basic Plan for Space Policy revised in June 2020 clearly states achievement of SDGs as one of the goals of space policy, and also specifies the fields of contribution. In response to these changes in the situation, we established a team in 2020 to study organizational approaches to promote contribution to SDGs more efficiently and effectively and are promoting activities to enhance understanding and awareness of the SDGs among executives and employees through briefing sessions and training by experts.

### Specific examples of increased effectiveness due to SDG initiatives

#### "SPACE FOODSPHERE", a project to resolve food-related issues on Earth and in space



Business Development and Industrial Relations Department (J-SPARC)

[Examples of business co-creation where SDGs are used as a common language]  
Established a co-creation framework for social implementation of solutions to common issues of food on Earth and in space. The achievement of the SDGs is set as an intermediate milestone in the super long-term scenario, which has encouraged about 60 member companies to enter the field and invest resources.

#### Development of SOLWIN (SOdar-based Low-level Wind Information system)



Aviation Technology Directorate x Business Development and Industrial Relations Department (Joint Laboratory)

[Examples of business co-creation and opportunities to obtain external funding]  
The SOLWIN has been developed for domestic regional airports in a joint laboratory collaborating with private companies and features low installation costs. Introduction of the SOLWIN to the Philippines was adopted in the FY2018 "JICA SDGs Business Support Project for Small and Medium Enterprises - Introduction, Demonstration, and Commercialization," contributing to international cooperation.

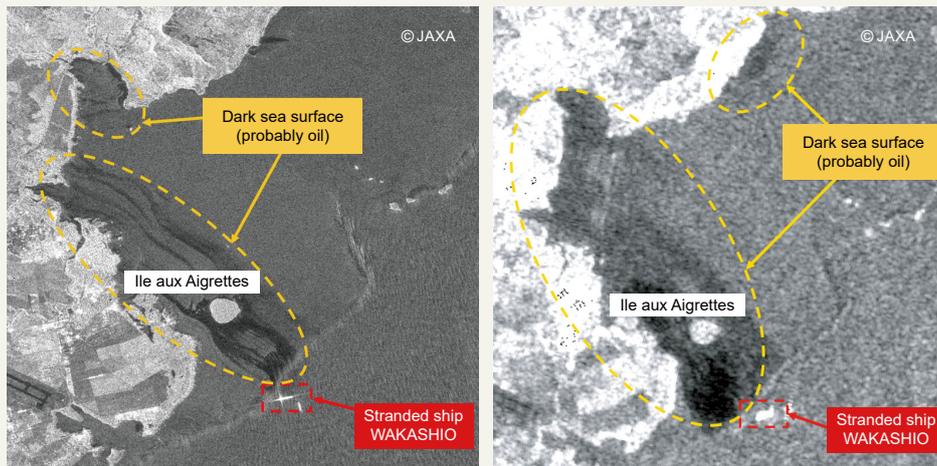
## Daichi-2's contribution in an oil spill incident from a stranded ship

[Details](#)

### Observation of an oil spill incident off the coast of Mauritius

In August 2020, an oil spill occurred from a stranded ship off the coast of the Republic of Mauritius. We conducted emergency observation using the ALOS-2 (Daichi-2) and provided data and technical support to the Japan Coast Guard (JCG), which participated in the international expert/rescue team. The extent of the oil spill was identified by the wide-area observation with the satellite, which was used to formulate the control plan.

The usefulness of the satellite data was highly evaluated, and guidelines for observation and analysis using the Daichi-2 were established to prepare for similar accidents in the future. We will continue to contribute to countermeasures against environmental pollution caused by oil spills and other accidents by providing prompt satellite observation and data.



State at 00:37 on August 14, 2020 (local time) (left) and at 11:42 on August 15, 2020 (local time) (right). Due to the reflection characteristics of radio waves caused by the oil slick floating on the sea surface, the synthetic aperture radar onboard Daichi-2 shows the areas where oil is present as dark areas. By observing a large area of the ocean at once, we contributed to determining the extent of the oil spill and formulating the control plan.

## Observation of atmospheric components by satellites and passenger airplanes

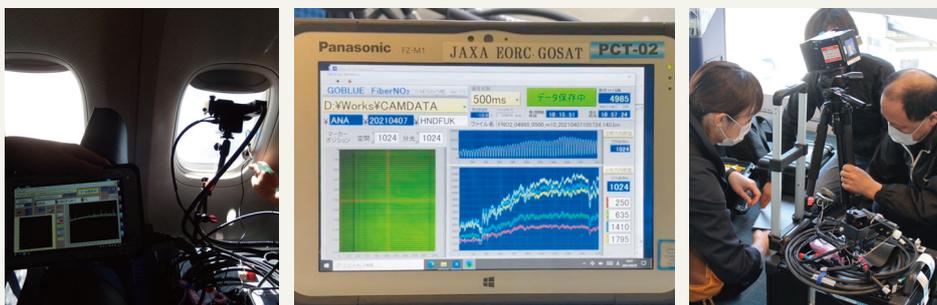
[Details](#)

[GOBLEU](#)

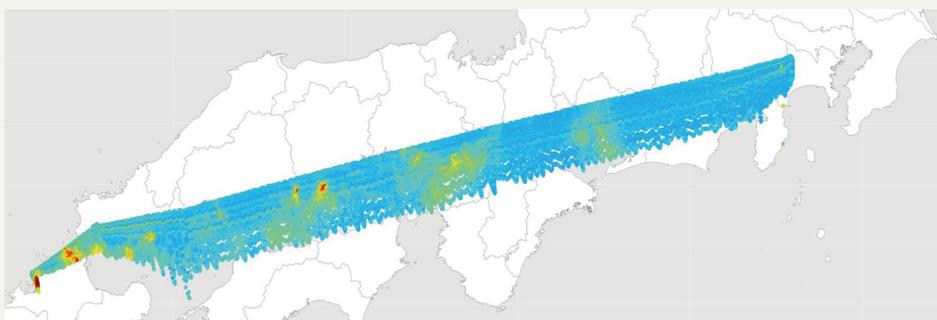
### GOBLEU - Contributing to the fight against global warming from space and sky

We, in cooperation with ANA Holdings, started a project to observe atmospheric components (carbon dioxide and nitrogen dioxide) from passenger airplanes (GOBLEU). By conducting observation from passenger airplanes flying at an altitude of about 10,000 meters, we aim to conduct detailed assessment of greenhouse gases in large cities by source, which is difficult to achieve with satellites alone.

We apply technologies of the Greenhouse gases Observing SATellite "IBUKI" (GOSAT) to this observation. Greenhouse gas emissions in urban areas are considered to account for 70 to 80% of anthropogenic carbon dioxide emissions. By assessing greenhouse gas emissions in urban areas in detail, we aim to contribute to the fight against global warming and the Paris Agreement.



Observation equipment brought on board a passenger airplane



Nitrogen dioxide distribution observed during a flight from Haneda to Fukuoka on October 26, 2020. Emissions from industrial areas and power plants in the Tokai region to the Seto Inland Sea were captured in detail.



# Global Environmental Protection - Social Implementation of Space Utilization and Disaster Prevention -

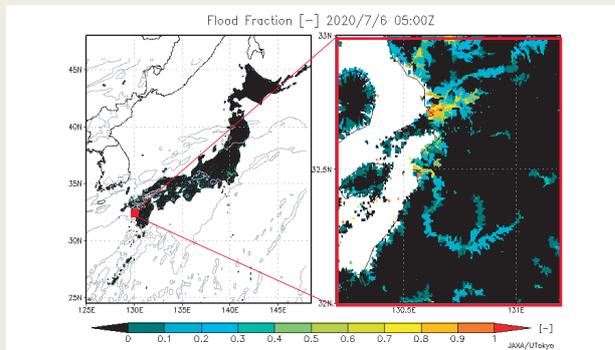
## Efforts to use satellite data for flood forecast

### Monitoring rivers around the world (including Japan) with Today's Earth

In recent years, floods and inundations caused by extremely heavy rainfall become more frequent around the world (including Japan). On the other hand, extremely low rainfall can cause disasters such as water shortages and droughts. Reducing the damage caused by floods and droughts is an extremely important and urgent issue both in Japan and overseas. To solve this problem, it is necessary to immediately and accurately monitor and predict the water cycle on land, including when, where and how much rainwater collects, and when and on what scale disasters such as river flooding occur.

Today's Earth, which was jointly developed by JAXA and the University of Tokyo, is a system to estimate and predict physical quantities of water cycle on land, such as river flow and soil moisture, with high accuracy by integrating satellite observation and numerical simulation technologies. By understanding water on Earth from a space perspective, we will contribute to solving various water-related social issues.

[Details](#) [Today's Earth](#)



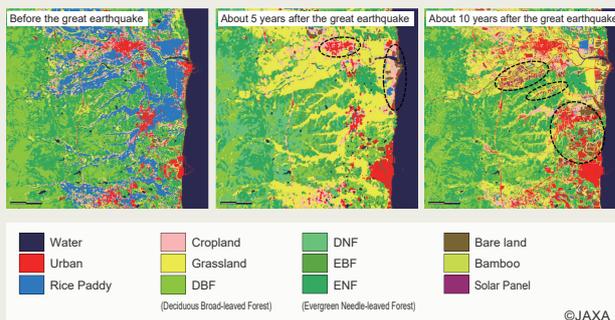
Data on the percentage of flood area estimated by Today's Earth during Heavy Rain Disaster in July 2020 that hit Kyushu region in July 2020. The figure on the right shows the area around the Kuma River basin in Kumamoto Prefecture. This data was also used to automatically calculate inundation areas due to floods based on observation data from Daichi-2, and the data on estimated inundation areas was provided to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and other organizations working for disaster prevention.

[Details](#)

## Ten Years since the Great East Japan Earthquake

### Recovery in 10 Years as Seen from Space

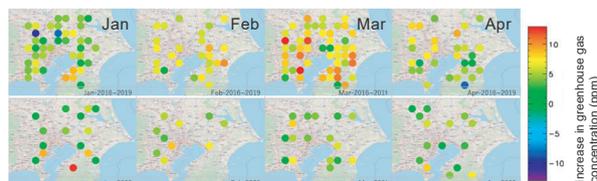
On March 11, 2021, it has been 10 years since the Great East Japan Earthquake. We would like to express our deepest sympathy to those affected by the Great East Japan Earthquake. We have watched the changes before and after the earthquake and recovery in 10 years from space using earth observation satellites. The data captured from space showed the progress of recovery; rice paddies before the earthquake were transformed into grasslands due to the evacuation, and then, transformed into large-scale solar power plants as reconstruction progressed, and disaster-resistant cities have been developed on higher ground. We plan to launch the Advanced Optical Satellite "Daichi-3" and the Advanced Radar Satellite "Daichi-4". We will continue to watch over disaster prevention and recovery from space.



The area around Namie and Futaba towns in Fukushima Prefecture before the earthquake, about five years after the earthquake, and about 10 years after the earthquake. This image was taken from space, showing how rice paddies were transformed into grasslands after the disaster, and how large-scale solar power plants were built as reconstruction progressed.

### Actions related to COVID-19

#### Economic activities and their impact on the global environment as seen from space



Comparison of the increase in carbon dioxide concentration in Tokyo from January to April 2020 (bottom) with the values in average years (2016 to 2019) (top). The increase in carbon dioxide concentration varies with the seasons. However, in March to April 2020, when the Prime Minister of Japan called for the closure of schools and declared a state of emergency in Tokyo, the increase in carbon dioxide was lower than in previous years, as seen from space. A similar trend was observed in New York, Beijing, and Shanghai.

[Details](#) [JAXA for Earth](#) [Earth Observing Dashboard](#)

To understand the impact of COVID-19 from space since 2020, we have analyzed the data from earth observation satellites to observe changes in socioeconomic activities and global environment in cooperation with NASA and ESA. As an example of the analysis results, GOSAT observation data showed that the increase in greenhouse gas concentration over Tokyo and other major cities from January to April 2020 decreased compared to average years (2016 to 2019). The analysis results are available on JAXA's website "JAXA for Earth on COVID-19" and on a joint website of the three organizations "Earth Observing Dashboard". We will continue our efforts to utilize data from earth observation satellites as an objective viewpoint and information for understanding the impact and events caused by COVID-19.



### Development of Water Cycle Simulation System and its Application to Disaster Prevention <Commendation by the Minister of MEXT>

[Details](#)

We, in collaboration with the University of Tokyo, developed and are operating a system (Today's Earth) to estimate and predict physical quantities related to the water cycle on land in the world and Japan in real time. By integrating satellite observation and numerical simulation technologies, we aim to contribute to the mitigation of flood/inundation damage (see page 9 for details). In recognition of our activities up to FY2020, we received the Commendation for Science and Technology by the Minister of MEXT 2021 for our "contribution to development of a terrestrial water cycle simulation system integrating satellite data and its application to disaster prevention".



Our team receiving the award for "Development of Water Cycle Simulation System and its Application to Disaster Prevention"



### Development of Aerosol Monitoring Technology <Commendation by the Minister of MEXT>

[Details](#)

We, in collaboration with the Meteorological Research Institute of the Japan Meteorological Agency, Kyushu University, and the National Institute for Environmental Studies, are developing technologies to predict the arrival of airborne particulates such as yellow sand and air pollutants using data obtained from earth observation satellites. In recognition of our activities up to FY2020, we received the Commendation for Science and Technology by the Minister of MEXT 2021 for "promotion of technologies to monitor the current status of airborne particulates using satellite observation".



Our team receiving the award for "Development of Aerosol Monitoring Technology"



### Global Satellite Mapping of Precipitation (GSMaP) <Dr. Roman L. Kintanar Award\*>

[Details](#)

The Global Satellite Mapping of Precipitation (GSMaP), developed and operated by JAXA, can be used to monitor precipitation around the world. As GSMaP data has widely contributed to flood forecasting around the world, a joint team of the International Center for Water Hazard and Risk Management (ICHARM), the Infrastructure Development Institute (IDI), and JAXA was awarded the Dr. Roman L. Kintanar Award by the Typhoon Committee, an intergovernmental organization on typhoon disaster prevention.



ICHARM Director KOIKE, Toshio delivers his acceptance speech at the 53rd General Meeting of the Typhoon Committee (online) hosted by Japan

\* Dr. Roman L. Kintanar Award: Annual award given to organizations that made significant contributions to the activities of the Typhoon Committee, an intergovernmental organization established under the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and the World Meteorological Organization (WMO) to reduce damage caused by typhoons.



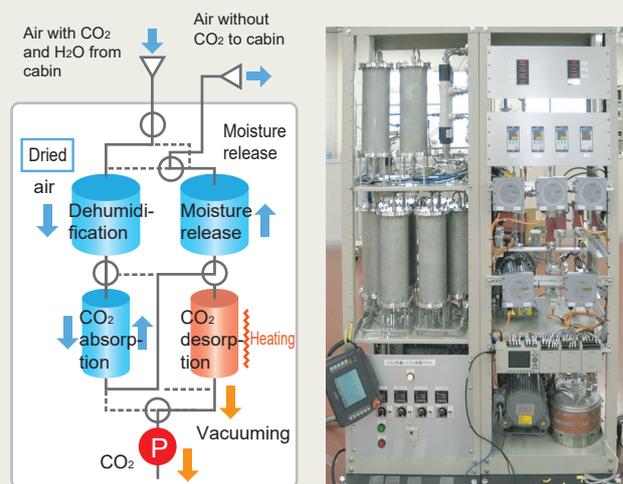
## Global Environmental Protection - Research Contributing to Realization of a Sustainable Society -

### Research on CO<sub>2</sub> separation and recovery

In closed environments such as spacecrafts where astronauts work, "air revitalization technology" is required to maintain the necessary oxygen level while actively removing various gases emitted from human bodies. The most important matter is separation and recovery of carbon dioxide (CO<sub>2</sub>). Compared to the removal of CO<sub>2</sub> from exhaust gas (CO<sub>2</sub> concentration: about 10%), which is researched and developed on the ground, the concentration of CO<sub>2</sub> in the air surrounding manned space activities is low (CO<sub>2</sub> concentration: about 0.4% in spacecrafts, less than 1% in space suits). In addition, there are many issues unique to closed environments, such as power, installation space, and reuse of recovered CO<sub>2</sub>. Therefore, we have focused on underlying research from the fundamental to application level (photo).

A major issue in the separation and recovery of dilute CO<sub>2</sub> is the co-existence of water vapor (moisture) in the air. Conventional technologies, such as dehumidifiers and CO<sub>2</sub> absorbers, have the problem that they absorb both CO<sub>2</sub> and water vapor at the same time. Therefore, we are searching for a new dehumidifier that does not absorb CO<sub>2</sub>, or conversely, a compound that absorbs only CO<sub>2</sub> in the presence of water vapor. On the ground as well, to achieve the SDGs, R&D on Direct Air Capture (DAC) to capture CO<sub>2</sub> directly from the atmosphere (CO<sub>2</sub> concentration: about 0.04%) is accelerating.

While effectively adopting the results, we would like to steadily proceed with underlying research for application to space in the future.



Experimental component to separate and recover CO<sub>2</sub> emitted by one astronaut (right) and a schematic diagram of the system (left)

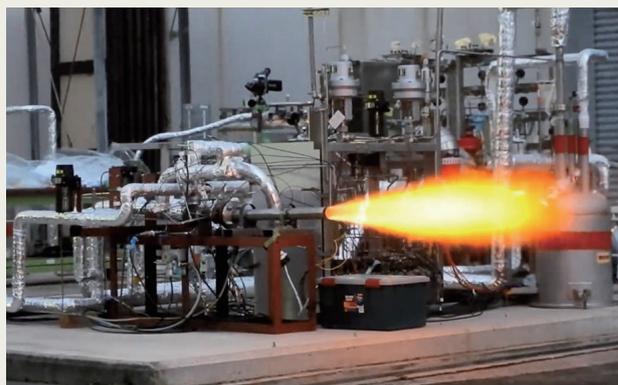
### R&D on hydrogen energy technologies that contribute to the realization of carbon neutrality

We conduct research on hydrogen energy technologies through collaboration and cooperation with the New Energy and Industrial Technology Development Organization (NEDO) to solve the global-scale energy and environmental issues facing Japan and the international community. At the Noshiro Rocket Testing Center in Akita Prefecture, we implement various initiatives to realize the goals set forth in the Basic Hydrogen Strategy by utilizing the liquid hydrogen supply infrastructure of the rocket combustion test facility. In December 2020, we installed a new facility to test large-scale equipment for liquid hydrogen in collaboration with private companies leading the NEDO project "Development of Technologies for Utilizing Hydrogen in the Society / Development of Technologies to Utilize Large-Scale Hydrogen Energy". The facility is the only experimental site in Japan capable of conducting tests using large amounts of liquid hydrogen, which enables testing of large valves/fittings for liquid hydrogen and emergency release mechanisms as well as operational tests of power-driven machinery such as liquid hydrogen pumps and cryogenic hydrogen compressors. Using the facility, joint experiments with various companies are planned from FY2021.

We will continue to conduct R&D to enhance utilization of hydrogen in the society for the public good by using the Ultra-High Pressure Liquid Hydrogen Supply Facility, which was installed for experiments related to the optimization of regulations on hydrogen station. In November 2020, we conducted a low-temperature durability test of a 99MPa-class liquid hydrogen valve. In addition, a NEDO project was started to optimize domestic regulations for hydrogen stations using further ultra-high pressure. In this project, we conduct studies with the Japan Petroleum Energy Technology Center to enhance ultra-high-pressure liquid hydrogen supply facilities.

In October 2020, we were entrusted with the NEDO project, "R&D on Advanced Hydrogen Utilization / Common Infrastructure for Ultra-High Efficiency Power Generation Superior to Conventional Technologies / Common Infrastructure for Hydrogen-Oxygen Combustion Turbine Power Generation" and started R&D on hydrogen-oxygen combustion turbine, which is expected to be a next-generation hydrogen power generation system. In this project, we plan to develop technologies to supply high-temperature, high-pressure (≥2 MPa) steam based on the technologies for hydrogen-oxygen rocket engines.

Thus, we utilize the technologies and experimental facilities for liquid rocket engines to promote R&D on hydrogen energy technologies in collaboration with other organizations, which will contribute to achievement of the government's goal of carbon neutrality by 2050.



Functional test of the test facility for hydrogen-oxygen combustion turbines (December 2020)



## Secure Operation under COVID-19 Pandemic

### Efforts to Prevent the Spread of Infection

#### Activities of the task force

In February 2020, we established "COVID-19 Task Force" with the President as the head and all executives as members. The task force handled important matters such as establishment of the Business Continuity Plan (BCP) and infection prevention measures, as well as specific matters such as information provision to our staff and partners, preparation of telework environment, cancellation of events, closing of tour facilities, and decision on the return of overseas resident employees and their families. In addition, we monitored the situation around private companies involved in our business and overseas trends, including the impact on supply chains, and took countermeasures.

In particular, when a state of emergency was declared, we declared enforcement of the Business Continuity Plan and decided to adopt a work style of "telework in principle, except for critical projects" at the applicable offices, in accordance with the basic policy of carrying out critical projects while giving first priority on the safety of our executives and employees, as well as those involved.

### System Improvements for New Ways of Working

#### Improvement of workplace environment in telework environment

In FY2020, to promote teleworking, we enhanced the system for secure connection to our system from home, expanded the scope of distribution of cell phones for business use, and reviewed internal rules to eliminate the need for seals and signatures on various documents. In addition, we set recommended days for taking leave during the year-end and New Year holidays and consecutive holidays to create an environment where employees can easily take vacations.

In addition to these measures, we allowed employees and our partners who have chronic disease that increases the risk of severe conditions, who are pregnant, and who commute long distances to stay at home and use the teleworking system. In preparation for worsening situations, we continued to expand the scope of applying telework and flexible work arrangements. As a result, we were able to achieve a telework ratio of 60 to 70%.

For health management under COVID-19 pandemic, we promoted health by conducting online radio exercises and health campaigns. Furthermore, to prevent mental health problems in telework environment, we made efforts to maintain mental and physical health by providing information such as "COVID-19 and Mental Health" and preparing a manual outlining measures to prevent infection.

### Secure operation of JAXA projects under COVID-19 pandemic

#### Rocket launches and Hayabusa2 sample recovery

Under the COVID-19 pandemic, we need to steadily carry out our projects while placing the highest priority on the safety of our employees and related parties. To achieve this, we positioned projects that require keeping the schedule as "critical projects", such as projects that are necessary to ensure the safety of astronauts staying in orbit or to maintain the functions of the ISS and satellites in operation, and launches, and worked under strict control to balance these projects with measures against COVID-19 under strict control.

To recover the samples, the personnel involved in the work needed to travel from Japan to Australia. The number of personnel limited to the minimum necessary, and PCR tests before travel, specified quarantine, and thorough measures to prevent infection during the travel were carried out. Through these efforts, we were able to carry out the rocket launch and Hayabusa2 sample recovery safely and securely.

In FY2020, we launched KOUNOTORI No. 9 (H-IIB Launch Vehicle No. 9), the UAE Mars Climate Orbiter (H-IIA Launch Vehicle No. 42), and the Optical Data Relay Satellite (H-IIA Launch Vehicle No. 43). For these launches, JAXA, Mitsubishi Heavy Industries, Ltd. and other related companies took thorough measures to prevent the introduction and spread of the virus into the island: limiting the number of people going to Tanegashima (the launch site) to the minimum necessary; conducting body temperature checks for 14 days prior to travel and 14 days after arrival on the island; refraining from going outside; ensuring that masks are worn at all times; practicing hand washing, gargling, and cough etiquette; ensuring physical distance; and disinfecting the building.

In December 2020, the asteroid explorer "Hayabusa2" capsule returned to Earth, and we recovered samples of the asteroid Ryugu in the Woomera Desert, Australia, with the cooperation of the Australian government and other related parties.



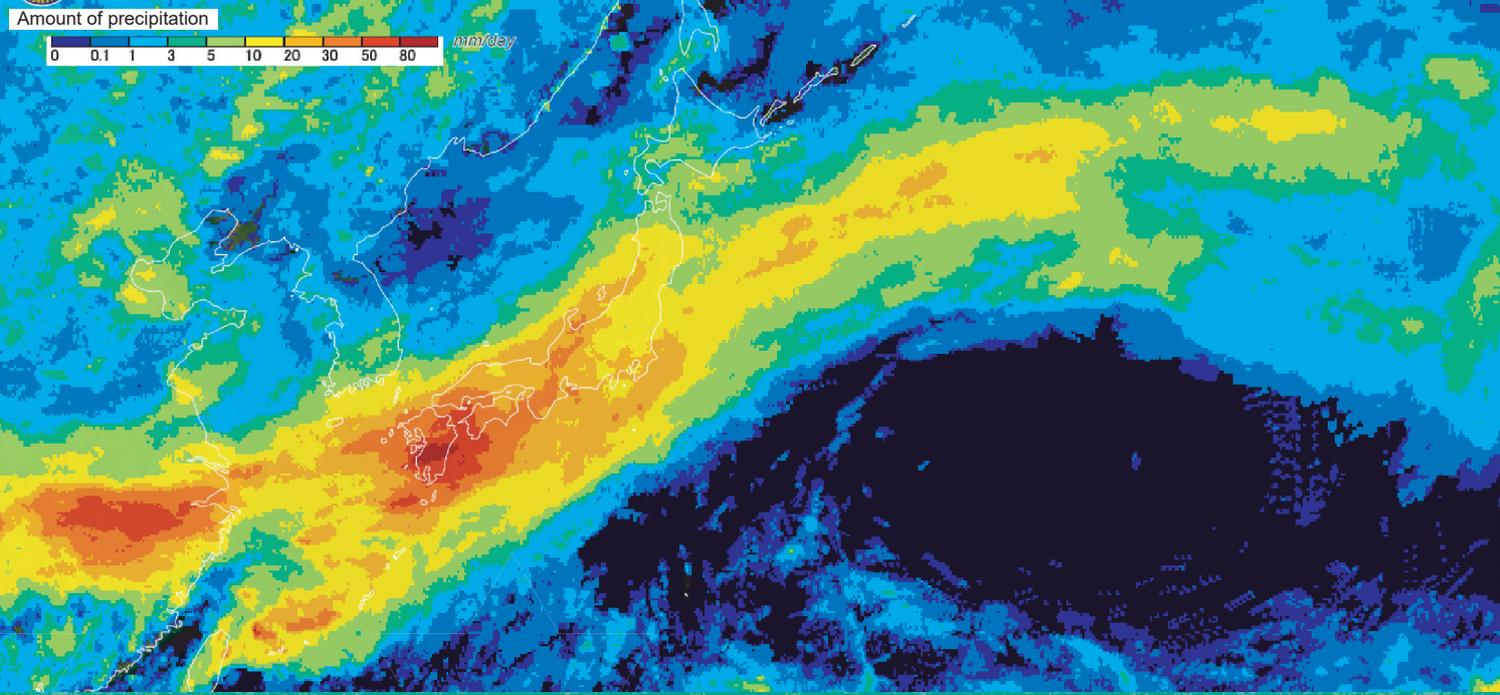
Sample recovery work

# Actions for ISO26000

The international standard ISO 26000 was published as an international guideline for the social responsibility of organizations, and it lists seven core subjects. This section reviews and summarizes our efforts in line with these core subjects.

Photo: The Milky Way and aurora taken by astronaut Soichi Noguchi from the ISS

Seven Core Subjects		JAXA's Efforts			
 The Environment	<b>Actions for Environment</b>	<p>We contribute to the resolution of global environmental issues and promote steady and daily environmentally friendly operation</p>	<ul style="list-style-type: none"> <li>Basic policy for green management</li> <li>Green management system, etc.</li> <li>Efforts to save energy</li> <li>Efforts to create a recycling-oriented society</li> <li>Enhancement of environmental education</li> <li>Coexistence with local nature</li> <li>Material balance of our business</li> </ul>	<b>P.15-24</b>	
		<b>Actions for Society</b>	<p>We aim to be an organization trusted by society through efforts such as internal control and legal compliance</p>	<ul style="list-style-type: none"> <li>Internal control</li> <li>Audit system</li> <li>Promotion of risk management</li> <li>Preparation for large-scale disasters</li> <li>Ensuring information security</li> </ul>	<b>P.26-27</b>
			<p>For safe and stable business operations, we establish quality control and personal information management systems</p>	<ul style="list-style-type: none"> <li>Disclosure and provision of information</li> <li>Protection of personal information</li> <li>Safety, reliability, and quality assurance</li> </ul>	<b>P.27</b>
			<p>We conduct our business properly in accordance with laws and regulations to meet the trust and expectations of society</p>	<ul style="list-style-type: none"> <li>Promotion of compliance</li> <li>System to manage conflict of interest</li> <li>Export control</li> <li>Fair execution of research and appropriate use of research funds</li> <li>Appropriate contracts</li> <li>Management of intellectual property</li> </ul>	<b>P.28</b>
			<p>We aim to create a workplace where all employees can work with vitality</p>	<ul style="list-style-type: none"> <li>Efforts to utilize human resources</li> <li>Aiming for a better work-life balance</li> <li>Work style reform</li> </ul>	<b>P.29-32</b>
			<p>We create a comfortable environment where everyone involved with JAXA can feel at ease.</p>	<ul style="list-style-type: none"> <li>Efforts to prevent harassment</li> <li>Elimination of discrimination against the disabled</li> </ul>	<b>P.32</b>
			<p>We contribute to the development of society through various communication.</p>	<ul style="list-style-type: none"> <li>Public relations and events</li> <li>Support for space education for the next generation</li> <li>Social contribution/awards related to the environment</li> </ul>	<b>P.33-35</b>
 Organizational Governance					
 Consumer Issues					
 Fair Operating Practices					
 Labour Practices					
 Human Rights					
 Community Involvement and Development					



Top Management  
Commitment

Overview of Phase 4  
Medium/Long-Term Plan  
Based on Medium/Long-Term  
Goals

Highlights of 2020

Contribution to Environment  
and Society in FY2020

Actions for ISO26000  
(Environment)

Actions for ISO26000  
(Society)

Third-Party Opinions/  
Review Results

Data Sheets

# Actions for Environment

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Coexistence with Local Nature](#)
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Photo: Average precipitation from July 1 to 7, 2020 (GMT), as measured by Global Satellite Mapping of Precipitation (GSMaP). It shows that heavy rain was brought in July 2020 to the Kyushu region centered on Kumamoto Prefecture and other areas of Japan.

## Promotion of Green Management

We contribute to the resolution of global environmental issues and promote steady and daily environmentally friendly operation

### JAXA Basic Environmental Policy

JAXA will conduct activities to maintain the environment in Earth and space to enable sustainable development of society.

To achieve this, we will

- ▶ work to solve global environmental issues and reduce environmental impact through research, development, and utilization.
- ▶ promote environmentally friendly operation and make continuous improvements.
- ▶ disclose information on our efforts to solve environmental issues and value communication with all stakeholders.

Chairman of Green Management Committee  
(Senior vice president)

**SANO, Hisashi**



We, JAXA, will contribute to the resolution of environmental issues by promoting R&D of technologies for monitoring the global environment using satellites and environmentally friendly aircraft, and by introducing the results of such R&D into various activities in society. In addition, we will give maximum consideration to the environment in our business activities, steadily promote energy conservation and green procurement, and continue to achieve zero environmental accidents.

## Targets and Results for Promoting Green Management

Based on JAXA Basic Environmental Policy, we set targets for promoting green management in FY2020. The details of the targets and results are shown below.

Item	Targets and KPI set in FY2020*1	Results in FY2020	Reference
Efforts to save energy	Target specified in the Energy Conservation Act: Reduce by at least 1% on average over five fiscal years Our target: Reduce by at least 1% compared to the previous fiscal year	KPI Target specified in the Energy Conservation Act: Reduced by 2% on average over five fiscal years Our target: Reduced by 4.5% compared to the previous fiscal year	P.17
	Reduce CO <sub>2</sub> emission intensity by at least 1.0% compared to the previous fiscal year through compliance with the Energy Conservation Act.	KPI Reduced by 4.0% compared to the previous fiscal year.	P.17
	Compliance with the Tokyo Metropolitan Ordinance on Environmental Preservation Reduce CO <sub>2</sub> emissions at Chofu Aerospace Center (headquarters) by 25% compared to base emissions.	KPI Reduced by 39% compared to the base emissions. (Preliminary figure before notification to the Tokyo Metropolitan Government*2)	P.17
Efforts to create a recycling-oriented society	Continue to have zero violations of laws and regulations regarding waste disposal.	KPI There were no violations of laws and regulations.	P.21
	Give consideration to the reduction of environmental impact in goods procurement.	In accordance with the JAXA Green Procurement Policy and Green Contract Policy 2020, we conducted procurement with consideration to the reduction of environmental impact.	P.22
Actions for environmental risk	Continue to have zero environmental incidents.	KPI There were no environmental incidents.	P.16
Creation of new value: Contributing to solution of social issues through business	Research, development, and utilization contributing to solution of global environmental issues	To solve global environmental issues, in collaboration with other organizations, we developed and utilized satellites and other instruments that contribute to elucidation of climate change and monitoring of disasters and conducted R&D in the aeronautic field that contributes to aircraft noise reduction and environmental compatibility.	P.7-11
Communication with society	Communication with stakeholders on environmental issues (Public relations and collection of opinions)	We actively disseminated information on our efforts to solve global environmental issues through lectures, symposiums, and booths at various events. For example, the Aviation Technology Directorate introduced R&D of aircraft engines that contribute to solving global environmental issues through the media, as well as through open day, our website, and PR magazines.	P.34-35

\*1 KPI (Key Performance Indicators): Indicators that can be used to evaluate actions and achievements for targets.

\*2 The figure (39%) will be confirmed after verification by a registered organization under the Tokyo Metropolitan Ordinance on Environmental Preservation.

## Green Management System, etc.

### Environmentally Friendly Operation

We implement environmentally friendly operation to contribute to global environment preservation and sustainable development. We established the Green Management Committee chaired by the Senior Vice President to set our goals and implementation plans for environment such as reducing energy consumption and proper waste disposal. Based on them, plans for each site are prepared and implemented.

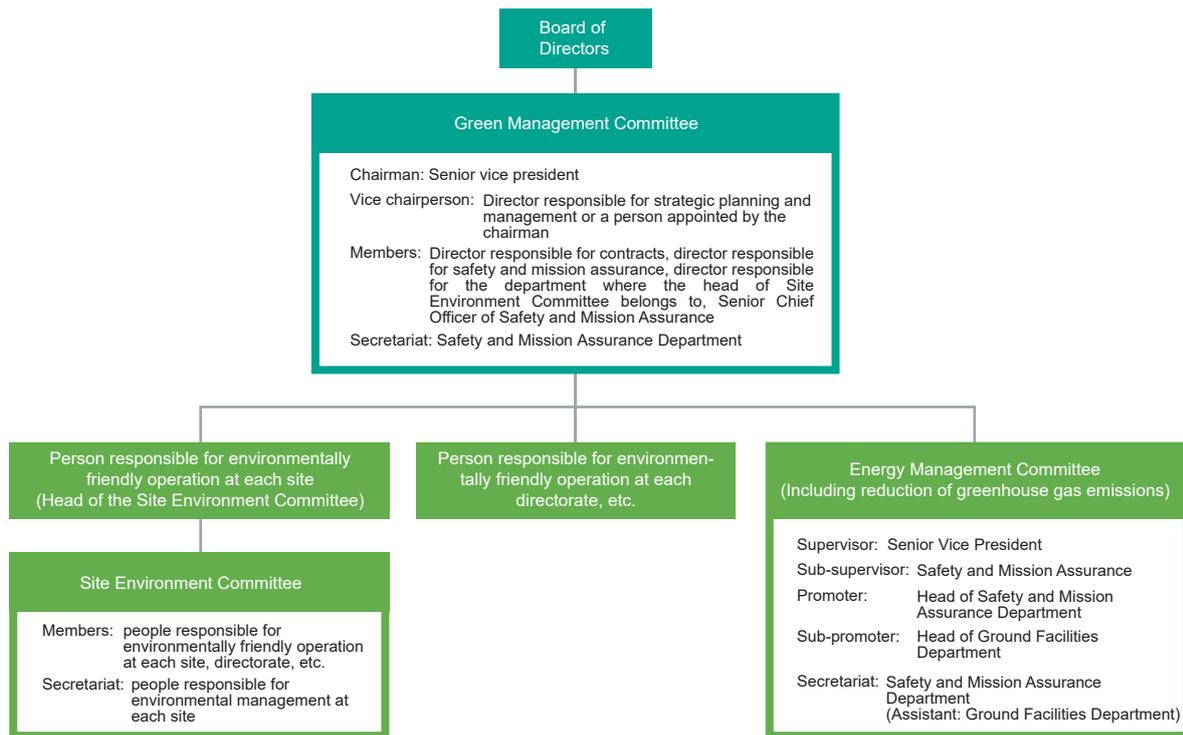
The results of activities are properly evaluated and reflected in the next year's plan.

We appoint a responsible person at each site and organization and clarify the roles and responsibilities to implement environmentally friendly operation.

[Environmental Policy at Each Site](#)

### Green Management System

To improve the efficiency of operation, we integrated our two committees for rationalizing energy use and reducing greenhouse gas emissions into one committee for energy management.



### Prevention of Environmental Incidents and Legal Violations

To prevent environmental pollution, we prepared environmental risk maps, which identify and visualize the risks that could lead to environmental incidents, and action lists for environmental incidents. They are distributed to each building at each office so that they can be used whenever necessary. We utilize them to set evacuation routes in disaster drills and to check actions in case of incidents and update them if revised. As a result of these efforts, no environmental incidents occurred in FY2020.

We ensure that risks are not overlooked by checking compliance with relevant laws and regulations using check sheets, and by including mutual audit by staff of other sites in internal audits of the site.

## Efforts to Save Energy

### Actions for the Act on the Rational Use of Energy (Energy Conservation Act)

Since being designated as a specified business operator\*1 on October 1, 2010, we have made efforts to reduce the energy intensity by at least 1% on average for five years in accordance with the Energy Conservation Act.

In FY2020, the five-year average of energy intensity was reduced by 2%, achieving the goal specified in the Energy Conservation Act.

The reasons for the decrease in energy consumption are as follows.

- (1) The operating rate of experimental facilities, etc. decreased because some sites were closed for a certain period of time following the Business Continuity Plan (BCP) under COVID-19 pandemic.
- (2) Operation of some facilities, equipment, and buildings at the Tsukuba Space Center was transferred to a private company based on a public-private partnership (PPP). Therefore, their energy consumption was excluded from the total energy consumption by JAXA.

(It is noted that the public company reduced their energy consumption by improving efficiency).

In addition, we achieved our own targets for green management as follows.

- (1) Reduced energy intensity by 4.5% compared to the previous fiscal year (target: 1%)
- (2) Reduced CO<sub>2</sub> emission intensity by 4.0% compared to the previous fiscal year through compliance with the Energy Conservation Act (target: 1.0%).

### Actions for Tokyo Metropolitan Ordinance on Environmental Preservation (To Reduce CO<sub>2</sub> Emissions)

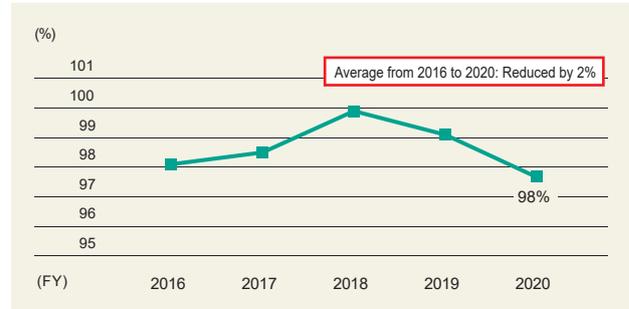
The Chofu Aerospace Center, as an important center for promoting research in aviation technology, is equipped with some of the largest facilities in Japan, such as wind tunnel test facilities, aero engine test facilities, and super computers.

Since these facilities consume a lot of energy (electricity, etc.) for operation, the Tokyo Metropolitan Ordinance on Environmental Preservation is applied and requires reducing CO<sub>2</sub> emissions compared to the baseline level.

CO<sub>2</sub> emissions in FY2020 were 10,997t-CO<sub>2</sub>, which was reduced by 39% (target: 25%). The main reason was a decrease in the operating rate of major facilities due to site closure following the BCP under the spread of COVID-19.

In FY2020, we donated excess credits (8,469t-CO<sub>2</sub>) in the Phase 1 period (2010 to 2014) to "Zero Emission Tokyo" to cooperate with the Tokyo Metropolitan Government's efforts to reduce CO<sub>2</sub> emissions and received a letter of appreciation.

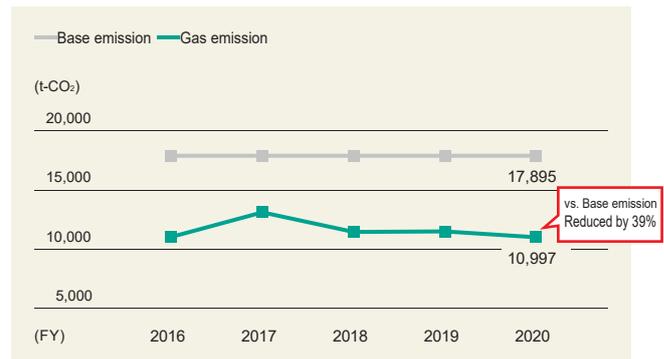
#### Changes in the average energy intensity\*2 over five fiscal years



\*1 Businesses with annual energy consumption of 1,500 kL or more in crude oil equivalent.

\*2 Energy intensity is an index for reducing the amount of energy used in business activities. Our energy intensity is adjusted to offset the increase/decrease in energy consumption due to the number of launches and operation status of test facilities.

#### CO<sub>2</sub> emissions at Chofu Aerospace Center



## Efforts to Save Energy

### Trends in Electricity Consumption

JAXA uses electric power as a basic power source for aerospace R&D and the operation of a wide variety of related facilities.

In FY2020, our total electricity consumption was 111,877 MWh, which was reduced by 17% compared to the previous fiscal year.

The reasons for the decrease in electricity consumption are as follows.

- (1) The operating rate of experimental facilities, etc. decreased because some sites were closed following the BCP under the spread of COVID-19.
- (2) Operation of some facilities, equipment, and buildings at the Tsukuba Space Center was transferred to a private company based on a PPP. Therefore, their electricity consumption was excluded from the total electricity consumption by JAXA.

#### Electricity Consumption



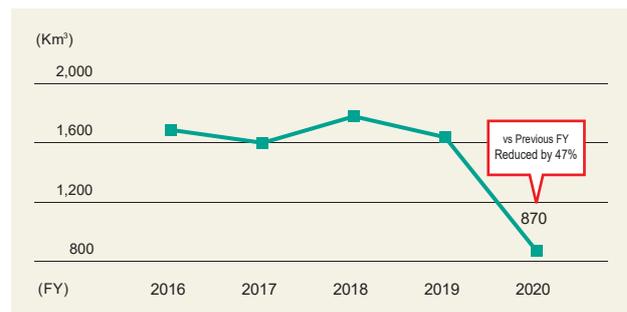
### Trends in City Gas Consumption

We use city gas mainly as fuel for power generators and air conditioners. In FY2020, our total city gas consumption was 870K m<sup>3</sup>, which was reduced by 47% compared to the previous fiscal year.

The reasons for the decrease in city gas consumption are as follows.

- (1) The operating rate of experimental facilities, etc. decreased because some sites were closed following the BCP under the spread of COVID-19.
- (2) Operation of some facilities, equipment, and buildings at the Tsukuba Space Center was transferred to a private company based on a PPP. Therefore, their city gas consumption them was excluded from the total city gas consumption by JAXA.

#### City Gas Consumption

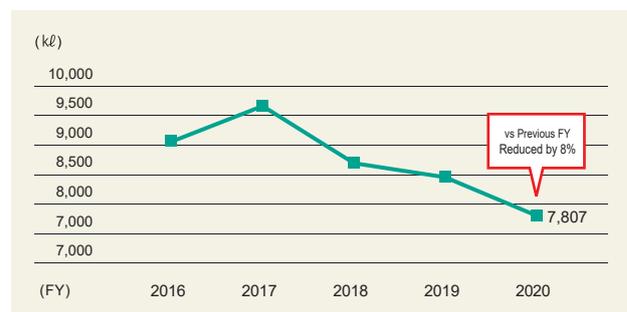


### Trends in Heavy Oil (JIS Grade A) Consumption

We use heavy oil (JIS grade A) mainly as fuel for generators at the Tanegashima Space Center and boilers in the combustion test facility at the Kakuda Space Center.

In FY2020, the amount of heavy oil (JIS Grade A) consumption 7,807 kL, which was decreased by 8% compared to the previous year, due to increased power generation efficiency by prioritizing the use of high-efficiency regular generators among multiple regular generators at the Tanegashima Space Center.

#### Heavy Oil (JIS Grade A) Consumption



## Efforts to Save Energy

### Prepare for Life with Corona! Introduction of the Comprehensive ESCO Project at Sagamihara Campus

The ESCO (energy service company) project at Sagamihara Campus will realize energy conservation through the following actions: renewal of the air conditioning system in the Research and Administration Building and continued tuning (adjustment) and commissioning (verification) for various equipment in multiple facilities according to usage conditions. This is the first time for JAXA to introduce such a comprehensive ESCO project.

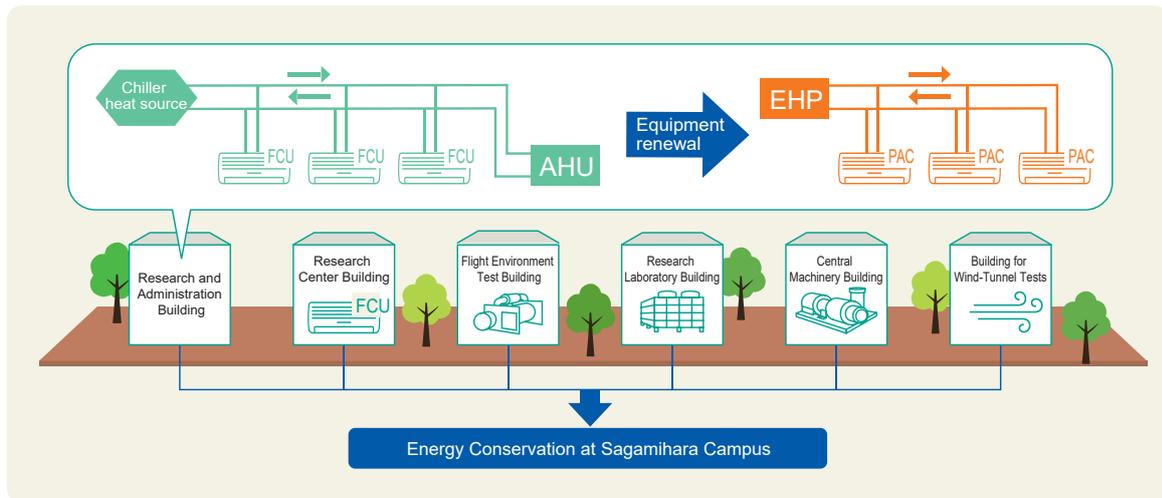
This comprehensive project addresses the entire campus; therefore, the scope is wide. Equipment with large potential of energy-saving was selected based on the energy consumption visualized by the power visualization system, and a feasibility study was conducted based on survey data for two years.

As a result, we expect to reduce the risk of aging equipment failures affecting our business and reduce the consumption of electricity and city gas by 252 kL per year in crude oil equivalent (7.6% reduction compared to FY2020 at the entire Sagamihara Campus). In addition, flexible services are available even if the operation methods change due to COVID-19.

Design, construction, and tuning in trial operation were conducted in FY2021, and actual operation is scheduled to start in FY2022.

#### Overview of the ESCO project

Sagamihara Campus	Tsukuba Space Center
Plan to start actual operation in FY2022	Operated since FY2020
<b>Comprehensive project focused on renewal of individual heat source, including operational improvements</b> <ul style="list-style-type: none"> <li>Renewal of air-conditioning facilities in the Research and Administration Building</li> <li>Tuning (adjustment) and commissioning (verification) for equipment in multiple facilities</li> </ul>	<b>Focus on centrifugal chillers, which are the central heat source installed in the power building</b> <p><small>Related information</small> Sustainability Report 2019: P.16 "Introduction of an ESCO Project to Save Energy at the Tsukuba Space Center"</p>



The air conditioning system in the Research and Administration Building will be changed from a combination of air handling units (AHUs) and fan coil units (FCUs) connected to a chiller heat source to a combination of an electric heat pump (EHP) and packaged air conditioners (PACs).

In addition, the air flow rate of PAUs for the computer room in the Research Center Building, the gas heat pump for outdoor air treatment in the Research Laboratory Building, and the large room air conditioner in the Building for Wind-Tunnel Tests will be adjusted and verified. We will also install, control, and verify inverters on the primary hot/cold water pumps in the Central Machinery Building and the laboratory air conditioners in the Flight Environment Test Building.



Ground Facilities Department Program Management Division  
KAMIJO, Kaede

Chiller heat source: A device that uses refrigerant to regulate the temperature of water and various liquids

AHU: A device that uses hot/cold water or steam to supply temperature- and humidity-controlled air throughout a building

FCU: A device that uses water to control temperature and humidity. It is used in areas where AHUs alone are insufficient for control.

EHP: Equipment that uses an electric motor to drive a compressor.

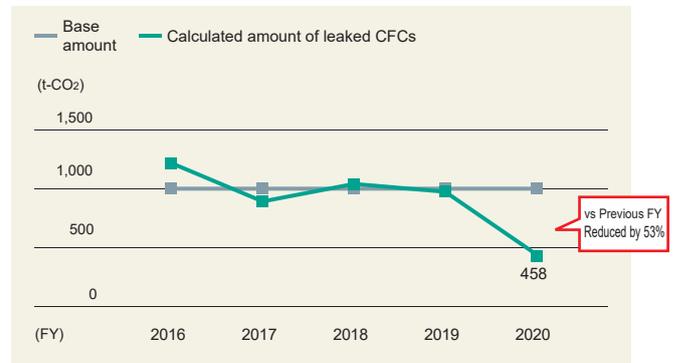
PAC: Business-use air conditioner (with higher capacity than home air conditioners)

## Efforts to Create a Recycling-Oriented Society

### Measures to Prevent CFC Leakage

Since we use CFCs as refrigerants in air conditioners, freezers, and refrigerators, we try to reduce the leakage of CFCs to prevent ozone depletion and global warming. In FY2020, the amount of leaked CFCs was calculated to be 458 t-CO<sub>2</sub>, which was reduced by 53% compared to the previous fiscal year. This was achieved by measures such as reviewing the frequency of inspections of air conditioners and replacing aging pipes as soon as possible.

**Calculated amount of leaked CFCs**



### Appropriate Management of Chemical Substances

We promote the appropriate management of chemical substances by establishing management procedures for chemical substances and periodically checking the compliance. The table on the right shows the amount of chemical substances released and transferred in FY2020 as notified under the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR Law).

Substance name	Amount released (kg)		Amount transferred (kg)	
	Released to atmosphere	Discharged into areas of public waters or soil / landfill disposal	Transferred to sewage system	Transferred to external areas
Dichloropentafluoropropane	2,345	0	0	0
Methylnaphthalene	415	0	0	0

## Efforts to Create a Recycling-Oriented Society



### Appropriate Management of Industrial Waste

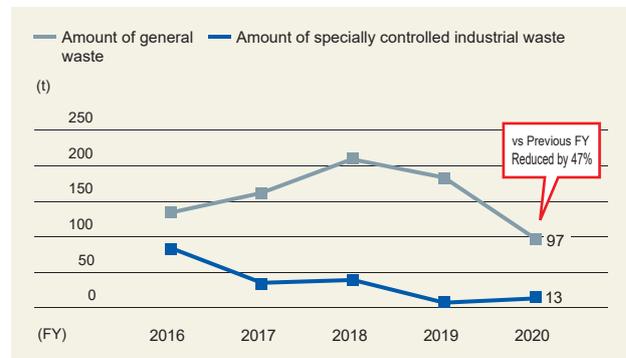


We try to reduce the amount of waste by exploring the opportunities of reuse inside and outside of JAXA when various equipment is no longer needed due to completion of projects.

In FY2020, the amounts of general waste and industrial waste were 97 t and 657 t, which were reduced by 47% and 49% compared to the previous fiscal year, respectively. The amount of specially controlled industrial waste was 13 t, the same low level as the previous fiscal year.

In addition, the waste was properly disposed of in accordance with the Waste Disposal and Public Cleansing Law and JAXA's waste disposal guidelines, and no violations of laws and regulations occurred.

Amount of industrial waste



### Appropriate Disposal of PCB

Since the PCB disposal deadline is set by the Act on Special Measures concerning Promotion of Proper Treatment of PCB Wastes, we need to find all equipment that contains PCBs.

In some cases, the letters on the nameplate of old equipment are so faint that it is difficult to read them, or the equipment is manufactured overseas, making it difficult to investigate whether it contains PCBs. Therefore, we introduce the specialized know-how of outside companies to investigate and dispose of equipment containing PCBs.

In FY2020, we disposed of 496 apparatuses containing high-concentration PCBs and 520 apparatuses containing low-concentration PCBs. The number of apparatuses containing high- and low-concentration PCBs held at the end of the fiscal year was 0 and 410, respectively. The disposal deadlines in Japan for apparatuses containing high- and low-concentration PCBs are set at March 31, 2023, and March 31, 2027, respectively. We are proceeding with the systematic disposal to meet the deadlines.

Disposal of apparatuses containing PCBs (pieces)

	Number at the start of FY	Number newly found	Number of disposals	Number at the end of FY
High-concentration PCBs	496	0	496	0
Low-concentration PCBs	478	452	520	410

## Efforts to Create a Recycling-Oriented Society



### Promotion of Green Procurement and Green Contracts

We procured only designated procured goods for 129 of the 145 items procured in accordance with the JAXA Green Procurement Policy 2020. For the remaining 16 items, supervisors checked that no alternatives are available, and we made efforts to procure environmentally friendly goods as much as possible.

In addition to these items, seven items classified as public works were procured. Contracts that fall under the six contract types covered by the Green Contract Law were nine contracts for supply of electricity (contract amount: 100,184 MWh), two contracts for purchase and lease of automobiles, and seven contracts for disposal of industrial waste.

[JAXA Green Procurement Policy \(Promotion of Procurement of Eco-Friendly Goods\)](#)

#### Results of procurement of goods that do not meet the criteria (items)

	FY2018	FY2019	FY2020
Procurement of goods that do not meet the criteria	38	18	16

#### Results of green contract (cases)

	FY2018	FY2019	FY2020
Contracts for supply of electricity	12	7	9
Contracts for purchase and lease of automobiles	5	2	2
Contracts for energy-saving renovation projects	0	1	0
Contracts for disposal of industrial waste	5	2	7

### Actions in the Value Chain

[Details](#)

For goods other than those specified in JAXA Green Procurement Policy, we select goods that have the least environmental impact possible while ensuring appropriate price, function, and quality. In addition, we encourage contractors (including subcontractors) for delivery of goods, provision of services, and construction to promote green procurement as much as possible.

If multiple bidders quote the same price when selecting a contractor, we give priority to the bidder with the best commitment to environmental activities by evaluating the issuance of environmental reports including ISO 14001 reports, acquisition of ISO 14001 certification, or implementation of equivalent environmental activity evaluation programs.

### Promotion of Paperless Office / Abolition of Seal Usage

In FY2020, we halved the number of printers and multifunction printers used from approx. 450 to approx. 240, thereby reducing the amount of copy paper used.

In addition, we established the rules and regulations necessary to abolish the use of seals and signatures in various internal procedures.

#### Amount of copy paper used (Unit: K)

FY2016	FY2017	FY2018	FY2019	FY2020
22,909	19,294	15,815	12,859	7,092

vs FY2016  
-69%

## Enhancement of Environmental Education



### Enhancement of environmental education



We provide environmental education not only to our employees but also to people belonging to other companies who work within JAXA to educate them on the importance of environmentally friendly operation.

#### ■ Awareness education

We educate our employees, etc. to be aware of the importance of our environmentally friendly operation and the impact of their work on the environment.

#### ■ Procedure education

We provide practical training for green procurement and waste disposal.

Especially for waste disposal, which may lead to legal violations and environmental accidents, reliable practices are required. Therefore, acquisition of a certain level of knowledge through the training is mandatory to conduct waste disposal.

#### ■ Internal auditor training

Education that incorporates practical training enables new trainees to acquire skills that can be used in practice without difficulty. We also provide skill improvement training for experienced internal auditors to improve the auditing skills of our staff.

### Overview of environmental education and number of participants

Name of training	Target and method Number of participants in parentheses	Description
Awareness education	e-learning for all employees who work at our sites (2,302)	In addition to the contents of awareness education described above, legal requirements to be complied with, efforts to rationalize energy use, etc.
Education on green procurement procedures	e-learning for those involved in procurement of goods, etc. (904)	Basic procedures for green procurement and points to judge compliance with the criteria
Education on waste disposal procedures	<New> Classroom training for those newly engaged in industrial waste disposal (173) <Skill maintenance> e-learning for those who already have competence in industrial waste disposal (423)	<ul style="list-style-type: none"> <li>Information on revisions to laws and regulations and review of procedures, etc.</li> <li>A series of procedures from waste generation to waste disposal</li> <li>Points to note when preparing contracts and manifests</li> </ul>
Training for new internal auditors	Group training for candidates for new internal auditors (38)	Requirements specified in the standard, auditing techniques, etc.
Internal auditor skill improvement training	Group training for those who are already competent as internal auditors (8)	Auditing techniques, etc. to determine the effectiveness of processes and link them to improvement plans

## Coexistence with Local Nature

### Participation in Community Cleanup Activities

Continuing from FY2019, the Spaceship Tanegashima (NPO) and Taneyaku Corporation Association organized a cleanup of sightseeing areas on June 20, 2020, at Takesaki Beach in the rain. Companies and people related to the Tanegashima Space Center also participated in this volunteer activity to keep Tanegashima beautiful.



Cleanup activity

Employees at the Kakuda Space Center, in cooperation with contractors working in JAXA, pick up trash around the site every spring and fall.

In FY2020, we conducted this activity in June and October, avoiding three Cs (closed, crowded, close-contact), as a countermeasure against COVID-19. We will continue this activity in the future.



## Material Balance

We determine the environmental impact generated by our business activities and practice business activities that contribute to creation of a recycling-oriented society.

### INPUT

Resources and energy	Unit	FY2019	FY2020
Electricity purchased	MWh	134,036	111,877
Water resources	K m <sup>3</sup>	412	403
(details)	Water supply	K m <sup>3</sup>	152
	Groundwater	K m <sup>3</sup>	31
	Rainwater	K m <sup>3</sup>	3
	Other*	K m <sup>3</sup>	226
Gasoline (including for vehicles)	kℓ	25	20
Kerosene	kℓ	49	38
Light oil (including for vehicles)	kℓ	44	43
Heavy oil (JIS grade A)	kℓ	8,456	7,807
City gas	K m <sup>3</sup>	1,639	870
Propane gas	t	28	22
Petroleum hydrocarbons	K m <sup>3</sup>	0	0
Liquefied natural gas	t	0	15
Other combustible natural gases	K m <sup>3</sup>	1	0
Jet fuel	kℓ	215	173
Aviation gasoline	kℓ	0	0
Liquid nitrogen	t	2,695	2,791
Papers	t	51	39

### OUTPUT

Environmentally hazardous substances	Unit	FY2019	FY2020
CO <sub>2</sub> emissions	Energy related	t-CO <sub>2</sub>	77,955
	Non-energy related <sup>*1</sup>	t-CO <sub>2</sub>	645
Calculated amount of leaked CFCs	t-CO <sub>2</sub>	974	458
NOx emissions <sup>*2</sup>	t	307	273
SOx emissions <sup>*2</sup>	t	59	57
Soot emissions <sup>*2</sup>	t	0	0
Wastewater <sup>*3</sup>	K m <sup>3</sup>	412	403
Biochemical Oxygen Demand (BOD) <sup>*4</sup>	mg/ℓ	26	20
Chemical Oxygen Demand (COD) <sup>*4</sup>	mg/ℓ	3	3
General waste	t	184	97
Industrial waste	t	1,297	657
Specially controlled industrial waste	t	7	13
Class I designated chemical substances	t	4	3

- The data on substances covered by the PRTR Law is shown in page 20.
  - The data is based on resources and energy purchased by JAXA. The data does not include fuel and other resources purchased by service providers due to the transfer of launch services to the private sector.
- \*Intake weirs and rivers

- \*1 Non-energy related CO<sub>2</sub> emissions include emissions of CH<sub>4</sub>, N<sub>2</sub>O, and SF<sub>6</sub>.
- \*2 NOx, SOx, and soot emissions are measured from units generating soot or smoke regulated by the Air Pollution Control Act.
- \*3 In cases where the amount of wastewater is not measured, it is calculated based on the assumption that the amount of used water is the amount of wastewater.
- \*4 BOD and COD are calculated based on the measured values at sites with specified facilities under the Water Pollution Prevention Act and the total amount of wastewater discharged at the sites (per year).

## Energy required for JAXA's business activities and the resulting environmental impact

Rocket launch and satellite testing	Other tests	Power Building management	Construction	Airplane test flight
<ul style="list-style-type: none"> <li>● Use of fuel</li> <li>● Use of liquid nitrogen, etc.</li> <li>● Use of chemicals</li> <li>● Generation of treated wastewater</li> <li>● Noise and vibration</li> <li>● Use of electricity</li> </ul>	<ul style="list-style-type: none"> <li>● Use of electricity</li> <li>● Use of liquid nitrogen, etc.</li> <li>● Use of chemicals</li> </ul>	<ul style="list-style-type: none"> <li>● Use of fuel for power generation (heavy oil, etc.)</li> <li>● Use of boiler fuel</li> <li>● Control of air pollutants (NOx, etc.)</li> <li>● Use of chemicals</li> <li>● Noise and vibration</li> </ul>	<ul style="list-style-type: none"> <li>● Use of water resources</li> <li>● Use of energy</li> <li>● Generation of industrial waste</li> <li>● Noise and vibration</li> </ul>	<ul style="list-style-type: none"> <li>● Use of fuel</li> <li>● Use of chemicals</li> <li>● Use of electricity</li> <li>● Noise and vibration</li> </ul>



# Actions for Society

Photo: Hayabusa2 capsule arrived at JAXA Sagamihara Campus on December 8, 2020

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# Organizational Governance



## Internal Control

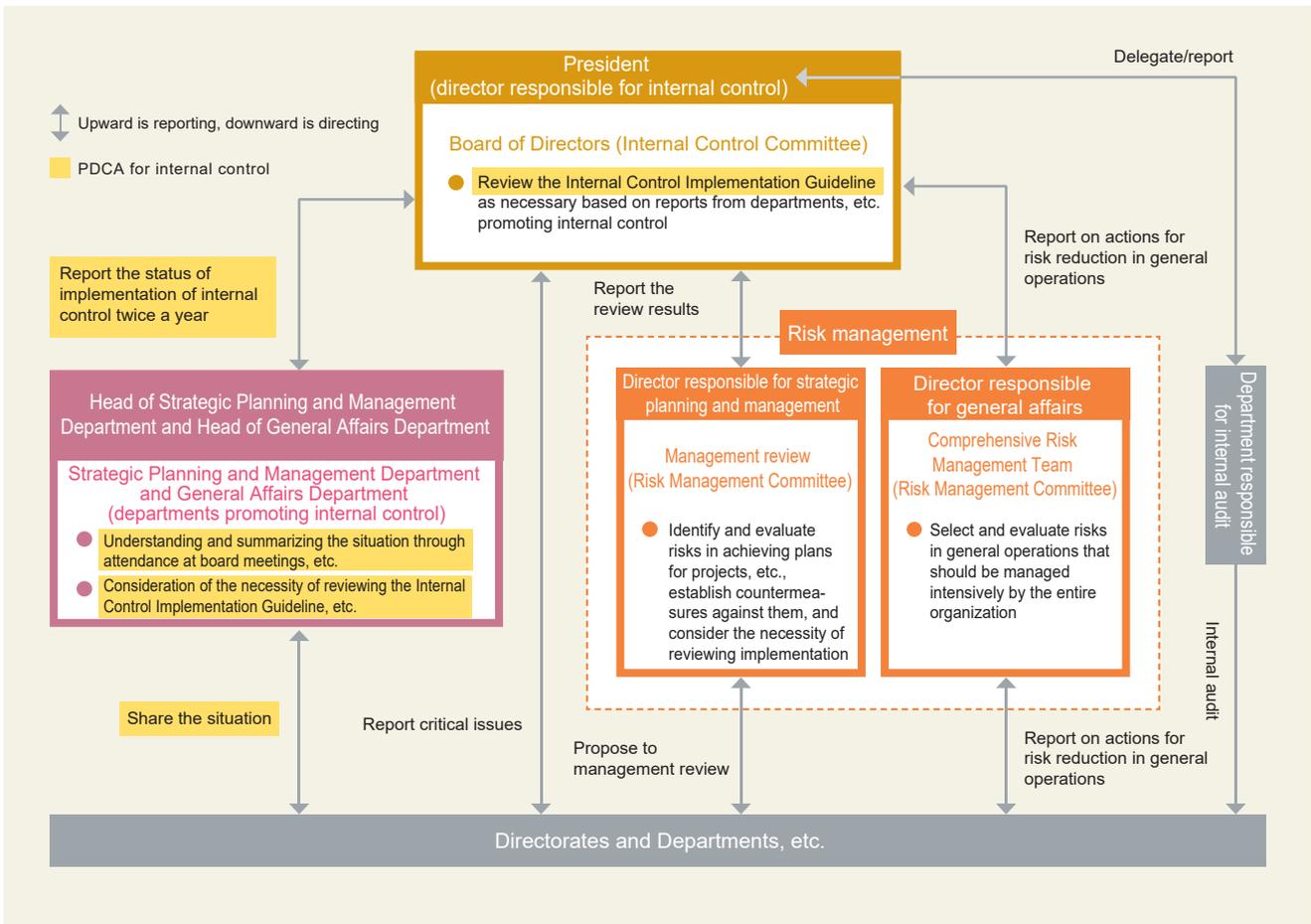
Since becoming a national research and development agency in April 2015, we have been working to strengthen internal control. Specifically, in response to the revised Act on General Rules for Incorporated Administrative Agencies, we specified the internal control system in our business procedures and established the "Internal Control Implementation Guideline" to strengthen internal governance. We will continue to fulfill our missions as a national research and development agency in an effective and efficient manner while complying with laws and regulations and implementing internal control.

### Main items included in the Internal Control Implementation Guideline

- |                                |                                  |
|--------------------------------|----------------------------------|
| 1. Control environment         | 4. Information and communication |
| 2. Risk assessment and actions | 5. Monitoring                    |
| 3. Control activities          | 6. ICT introduction              |

[JAXA Internal Control Implementation Guideline](#)

### Overview of internal control system



## Audit System

We established a system to check that internal control is functioning well by combining the audits conducted by the auditors and accounting auditors based on the Act on General Rules for Incorporated Administrative Agencies and the internal audits conducted by the Evaluation and Audit Department independent of the business execution departments. Audits are conducted for the purpose of ensuring appropriate and efficient business execution and contributing to the improvement of business operations, and audit results are reported to the President as needed and shared at board meetings, etc.

In addition, information regarding the audits is published on our website in accordance with the Article 22 of the Act on Access to Information Held by Incorporated Administrative Agencies, etc.

[Audits in JAXA](#)



## Organizational Governance



### Promotion of Risk Management

In our projects, we identify risks in each project and implement risk reduction activities.

We also established a comprehensive risk management team to promote comprehensive risk management in general operations other than projects. Specifically, we select priority risks to be managed, such as ICT and security risks related to information systems and risks related to disasters and external threats. Directorates and departments set targets to reduce these priority risks in their respective business plans for reducing risks as part of their daily operations.

### Preparing for Large-Scale Disasters, etc.

Related page: P.12

We established the Business Continuity Plan at each site to prepare for disasters. The Business Continuity Plan defines the operations that we should prioritize to ensure the safety of executives and our employees as well as the continuation and

prompt recovery of operations, daily preparation for disasters, and initial response in the event of a disaster. Based on the plan, we are striving to improve our business continuity capability by establishing communication systems including a safety confirmation system, stockpiling spare equipment and supplies necessary for initial response, maintenance, and recovery, and conducting large-scale earthquake drills.

### Ensuring information security



In light of the recent social situations such as sophistication of cyber-attacks, we implement various information security measures: strengthening the information security management system, reducing information system vulnerabilities, and enhancing staff education. We also contribute to the national effort to reduce the number of security incidents beyond the borders of single organizations, such as providing computer virus specimens as threat information to specialized security companies and related organizations.

## Consumer Issues

### Disclosure and Provision of Information

JAXA is obliged to disclose corporate documents in accordance with the Act on Access to Information Held by Incorporated Administrative Agencies, etc. We follow the procedures for information disclosure in response to requests for disclosure in accordance with this law.

[Request for Information Disclosure and Various Public Information](#)

### Protection of Personal Information



To protect the rights and interests of individuals while ensuring the appropriate and smooth operation of our business, we specified matters concerning the protection of personal information in our Personal Information Protection Regulations to protect personal information.

[Regulations to Protect Personal Information and Request for Information Disclosure](#)

### Safety, Reliability, and Quality Assurance



We promote various activities to ensure safety, reliability, and quality so that we can safely launch rockets and conduct astronaut activities, and reliably conduct observation by satellites, various experiments, and R&D of aeronautical technologies to obtain results that contribute to society.

In FY2020, we reduced the annual number of defects that occurred during the development/operation of satellites by half compared to the average during the Phase 3 of the mid-term plan. We also improved reliability and quality in applications of new technologies such as metal additive manufacturing to space. In addition, we promoted the exchange of information with related companies on knowledge about safety, reliability, and quality assurance and jointly implemented risk reduction activities with new companies entering the space field, which contributed to the success of missions. As internal activities, we conducted online programs to maintain and improve the capabilities of JAXA as a whole under the COVID-19 pandemic, such as lectures on safety and reliability, and the "Failure School" to pass on the failure experiences of our staff to young employees in their own words and for young employees to efficiently acquire knowledge through simulated experiences of analyzing factors and planning countermeasures.



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## Fair Operating Practices

### Promotion of Compliance



To ensure the proper execution of our business in accordance with laws and regulations, we established a whistleblowing hotline to receive reports of violations of laws and regulations.

In addition, we established a compliance hotline for the cases that do not fall under the above-mentioned whistleblowing to provide a wide range of consultations on JAXA's compliance from inside and outside of JAXA. Furthermore, we educate and train our directors and employees on a regular basis to raise awareness.

### System to Manage Conflict of Interest

We introduced a system to manage conflict of interest in FY2014 to promote collaborative activities with universities and industries. We require self-assessment of our directors and employees and established a Conflict-of-Interest Management Committee and a Conflict-of-Interest Management Advisor (external lawyer) to provide advice and check to ensure that our directors and employees appropriately conduct industrial collaboration activities.

[Actions for Compliance & Conflict of Interest](#)

### Export Control



In response to the global consensus on preventing the proliferation of weapons of mass destruction, Japan established laws and regulations such as the Foreign Exchange Act and Export Trade Control Order that specify regulated export items and export license systems. We established internal regulations based on these laws and regulations and are working to ensure the implementation of export control by examining export cargo, educating staff, and conducting audits.

### Fair Execution of Research and Appropriate Use of Research Funds

To ensure thorough implementation of the rules and raise staff awareness, we set the "Code of Conduct for Researchers" (for fair execution of research) to establish Research Ethics Committee and the "Basic Policy and Code of Conduct" (for appropriate use of research funds) to establish the Office for Prevention of Misconduct in Competitive Funds, thereby preventing misconduct and ensuring proper operation and management.

[Prevention of Misconduct in Research and Appropriate Management of Research Funds](#)

### Appropriate Contracts



We, as an organization that uses the national budget, strive to fairly conduct projects by emphasizing the transparency and fairness in contracts. As an example, discretionary contracts that exceed the criteria for the small-amount discretionary contract are reviewed by the Contract Review Committee to check that competition is promoted and that the contract processes are in accordance with the regulations. The concluded contracts are announced on our website.

In recent years, the scope of procurement management has been expanded to include project operations, and the Procurement Department has been involved from the stage of selecting companies in charge of development to promote dialogue with the companies. Thus, we promote actions to ensure fairness and rational procurement.

[JAXA Procurement Policy](#)

### Management of Intellectual Property

We established the "Intellectual Property Policy" to show the basic concept of our intellectual property activities. Based on this policy, we will conduct intellectual property activities to identify and protect our own technological achievements as intellectual property and appropriately transfer them to Japanese industry, contributing to the creation of businesses that utilize the results of R&D and the promotion of efforts to stimulate open innovation.

[Intellectual Property Policy](#)



## Labour Practices

### Efforts to Utilize Human Resources

We are working to develop human resources throughout the organization by establishing Phase 4 Human Resources Development Policy as the priority in mid- to long-term human resources development, aiming to both realize the career design of each employee and maximize the results of the organization.

JAXA's vision of human resources

Human resources who have the motivation and ability to propose and create new value to society through aerospace based on their specialized skills and continue to take on challenges

Phase 4 Human Resources Development Policy

Actions	Results of actions related to human resources in FY2020
Strengthen the human resource base in aerospace field by enhancing the mobility of human resources	To obtain human resources with diverse backgrounds and experiences who can be immediately effective, we started to hire employees through a full year and introduced web-based interviews to increase the number of experienced personnel hired, and achieved a significant increase from 14, the number of new experienced personnel hired in FY2018. (36 in FY2019, 34 in FY2020)
	In response to the recent rapid changes in social conditions and technological trends, and diversification of needs, we relaxed the requirements for side jobs and accepted applications from employees for side jobs to provide them with a variety of experiences and opportunities to strengthen their technical and proposal skills.
	Considering the improvement of human resource mobility and career diversification, we removed the reduction of retirement allowances for employees with less than 20 years of service.
Exchange of human resources with the private sector and promotion of new aerospace business	Under the cross-appointment system, two staff members were newly seconded to external organizations. We strengthened the human resource base through human resource exchanges with external organizations, such as promoting space utilization/development with JAXA's knowledge and expertise. In FY2020, including the cases that continued since the previous fiscal year, a total of 27 people were accepted from external organizations and 3 people were seconded from JAXA.
Flexible system operation to cope with COVID-19	To cope with COVID-19, we flexibly implemented temporary measures to review the eligibility and frequency of the flexitime and telework systems. Thus, we established a workplace environment that allows work-life balance under emergency conditions and maintained a company-wide attendance rate of less than 50%. In addition, we plan a staff survey on "new work style" with an eye toward the post-pandemic world.

### Retention Rate of New Staff



The retention rate after three years of employment was 100% (36 new graduates hired in FY2018). We provide extensive support, such as guidance through practical work in the assigned department (OJT system) in the first year and follow-up training and career counseling in the second year.

#### Number of new employees by gender in FY2020

	New graduates hired	Experienced employees hired
Male	17	33
Female	12	1

### Reemployment after Retirement

In accordance with the revised Act on Stabilization of Employment of Elderly Persons, we established a system to rehire those who wish to work after retirement until the end of the fiscal year when they reach 65 years of age. Currently, about 100 rehired employees are working in various workplaces, making use of their rich experience and specialized skills.

### Labor-Management Relations

In accordance with the Labor Standards Act, we respect labor-management autonomy and make decisions on matters related to working conditions (wages, working hours, benefits, etc.) through consultations with the labor union.

### Safety Management



In FY2020, we continued to foster safety awareness through e-learning on safety that reflects past accidents and other incidents, identified dangerous areas and implemented counter-measures through safety patrols, conducted near-miss reporting, and share information that contributes to preventive safety. In addition, we continue to achieve "zero" accidents involving students, which is a target of our accident prevention efforts within JAXA sites. In the future, based on the results of analysis of past accidents, we will conduct safety management tailored to the circumstances at each site, and implement measures to achieve "zero" work-related accidents resulting in injury leave.

### Health Promotion

Interviews on overwork by industrial physicians and public health nurses are conducted as needed. The results of stress checks are systematically used to improve the workplace environment. In addition, in conjunction with the reform of work styles, we held a team-based health promotion walking campaign (JAXARUKU fit motto) to raise health awareness among individuals and organizations.

#### Response rate for the stress check

FY2018	FY2019	FY2020
85.9%	87.4%	86.3%

#### Results of health promotion walking campaigns

	FY2018	FY2019	FY2020
Number of participants	584	566	434
Number of participating teams	71	66	48





## Labour Practices

### Actions for a Better Work-Life Balance

#### Action Plans for the Act on Advancement of Measures to Support Raising Next-Generation Children and the Act on the Promotion of Female Participation and Career Advancement in the Workplace

(May 1, 2019 - March 31, 2022)



Target 1	Promote the use of at least 60% of the total number of days of annual paid leave and WLB* leave given in the fiscal year.	Action 1
Target 2	Encourage male employees to take 5 or more days of childcare leave (with the target of 10%), and 3 or more days of special leave for childbirth (total of maternity leave for men and childcare leave) (with the target of 80%)	Action 2 Action 3
Target 3	Increase the percentage of female managers to at least 15%.	Action 4 Action 5 Action 6
Target 4	Increase the number of and expand the base of women researchers in the field of space science to increase the percentage of women in educational positions.	Action 6
Target 5	Reduce the average monthly overtime hours to 20 hours or less.	Action 4 Action 5 Action 7

\*Work-Life Balance

Descriptions	Results in FY2020
<b>Action 1</b> Encourage employees to take their annual paid leave for long vacations by notifying the recommended days for taking leave on the intranet.	We encouraged employees to take vacations by notifying the recommended days for taking leave and the status of used annual paid leave by department on the intranet. The use rate of annual paid leave and WLB leave was 59%.
<b>Action 2</b> Improve the system to promote the use of childcare leave and other special leave related to childcare, including a review of the operation for the leaves.	In addition to childcare leave and special leave related to childcare, we developed and promoted the use of a variety of leave systems, including WLB leave, which can be used throughout the year and can be taken on an hourly basis.
<b>Action 3</b> Raise awareness among employees and managers through activities to promote the use of childcare support systems.	We raised awareness by sharing interviews with male employees who have taken childcare leave on the intranet and encourage male employees whose spouses gave birth to children to take childcare leave of five days or more.
<b>Action 4</b> Enhance the work system and workplace environment to reduce the burden of commuting and accommodate diverse work styles, such as enhancement of the telework system.	To cope with COVID-19 pandemic, we encouraged telework throughout the organization, and enabled all employees to telework except for it is unable due to business reasons.
<b>Action 5</b> Promote work-life balance for employees before and after childbirth, during childcare, and during nursing care by streamlining, consolidating, and increasing the efficiency of operations.	Using IT, we promoted a variety of work styles that are not restricted by time or place. The average monthly overtime hour was 18.0 hours per month for permanent employees, excluding those in the discretionary labor system, fixed-term system, or management positions.
<b>Action 6</b> Hold collaborative lectures on JAXA's missions at women's colleges and universities with a relatively high percentage of female students to promote the appeal of space science and space development.	We shared a video message from female technical staff introducing the satisfaction of work and how to balance work and life on our YouTube channel to promote understanding of space development work. As of April 2021, the percentage of female managers is 10%.
<b>Action 7</b> Further improve work-life balance by raising awareness on work-life balance.	We held nursing care seminars on different themes to raise awareness of how to balance work and life.

### Systems that support a better work-life balance

	Actions	Description
Career advice	Career advice for next generation	Talk events, etc.
	Mentoring program	Support for staff development
Support for childcare and nursing care	JAXA Hoshinoko Nursery School / JAXA Soranoko Nursery School	Tsukuba Space Center / Chofu Aerospace Center
	Subsidized childcare (babysitter) programs for sick and post-sick children	
	Work system supporting childcare and nursing care	Maternity leave for men, shorter working hours for childcare, shorter working hours for nursing care, etc.
	Lunch networking event for childcare	A place to exchange information
Work style reform	Nursing care seminar	Information provision, cooperation with local governments
	Flextime/telework	Flexible work system, reduced overtime
	Use of IT tools	Use of information systems and videoconferencing
	Collaborative space/free-address office	Use during business trip, environmental improvement, effective use of office space, improved communication, etc.
	Paperless	Streamlining meetings, etc., and abolishing the use of signatures and seals



## Labour Practices



### Career Advice

#### ● Career advice for next generation

Since the special open day was cancelled due to the COVID-19 pandemic, we were unable to hold a talk event to provide career advice to junior and senior high school students and university students by presenting role models through the introduction of female employees' career choices, details of R&D they are engaged in, and their experiences in balancing work and life. Instead, we have posted message videos by female technical staff on the JAXA YouTube channel.

#### ● Mentoring program

This is a system in which experienced mentors, separate from the direct supervisors in the workplace, interact with the mentees to help them solve their problems in career development and resolve their concerns, and support their personal growth. To make mentoring more effective, we are working on a fundamental review of the mentoring system.

We are also proactively studying ways to build a pipeline for promoting female participation and career advancement in the workplace (consistent development of female managers).

### Support for Childcare and Nursing Care

#### ● Various leave systems

We have seven leave systems: annual paid leave, special leave, sick/injured childcare leave, nursing care leave, childcare leave, and leave for spouse overseas transfers. Special leave includes leave given for volunteer work and for donating bone marrow for bone marrow transplantation.

#### ● Establishment of the hotline

We established the "Voice Your Concern Hotline" available for anyone who works at JAXA. We provide consultation on balancing work and family life such as marriage, childbirth, childcare, and family care, as well as on the workplace environment, with the aim of creating a comfortable work environment.

#### ● On-site nurseries

We operate on-site nurseries at two sites, the Tsukuba Space Center and Chofu Aerospace Center, to provide a comfortable working environment where employees can balance work and childcare.

#### ● Work system supporting childcare and nursing care

We allow employees to limit overtime and late-night work and to work shorter hours for childcare until their children reach the third grade. In addition, subsidized childcare (babysitter) programs for sick and post-sick children are available until their children reach the sixth grade. In September 2019, we were certified by the Minister of Health, Labor and Welfare as a "childcare supporting company" (Kurumin certification) based on the Act on Advancement of Measures to Support Raising Next-Generation Children.

For nursing care, in addition to leave and vacation, employees can limit overtime and late-night work and work shorter hours while caring for a family member in need of constant nursing care.

In addition, we hold nursing care seminars & briefing sessions describing our support systems to provide information to our staff.

#### ● Lunch networking event for childcare

Our offices in Chofu, Tokyo, Tsukuba, and Sagamihara hold monthly lunch networking events for childcare during lunch breaks. In this event, anyone, regardless of gender, can participate in exchanging information, including employees who are raising children, who have subordinates raising children, and who want to gather information for their future child-rearing.



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## Labour Practices

### Work Style Reform

#### ● Diverse work styles

We have introduced a super flextime system that allowed research staff and employees who were raising children or caring for family members to work a minimum of two hours a day. Subsequently, in April 2016, in addition to the existing super-flextime system, we started to allow all employees approved by their department heads to use the flextime system (with core time 10:30-15:30) aiming to improve labor productivity by raising individual awareness of time management.

In addition, to improve the work-life balance of employees, increase labor productivity, and improve business continuity in the event of unexpected natural disasters or commuting disruptions, the telework (work from home) system introduced in April 2016 became available with the approval of the department heads since April 2018.

As a result of the above measures, we were able to quickly switch to telework in response to the recent outbreak of COVID-19. We will continue to promote new ways of working that are not restricted by time or place.

#### ● Free-address office for work innovation

Free-address offices without fixed seating are not only an office innovation but also a work innovation. By digitizing documents and sharing them among employees, they can be viewed anywhere via the network. This has enabled us to create a functional office according to work styles, instead of the traditional compartmentalized seat arrangement.

#### ● Use of IT tools

We have introduced secure IT tools to support various ways of working. Since employees are lent lightweight laptops equipped with webcams as standard, they can participate in online meetings, which is highly effective in telework under COVID-19 pandemic. In addition to the introduction of tools, we are also working to improve the literacy of our employees to use them. Furthermore, we reviewed and abolished the use of seals and signatures in line with the government's Regulatory Reform Implementation Plan.

## Human Rights



### Efforts to Prevent Harassment



Comprehensive compliance training, code of ethics training, and harassment prevention training are provided to raise awareness and prevent harassment. To ensure that employees do not take on their concerns about harassment and the work environment, we established a hotline to improve and solve their problems.

- Hotline for various harassment such as sexual harassment, power harassment, and academic harassment (external consultation service)
- Voice Your Concern Hotline (staff assigned to each office)
- Compliance hotline

In addition, we established the "Harassment Prevention Team" for both labor and management to cooperate in studying harassment prevention based on the "the Act on Comprehensive Promotion of Labor Policies, Stability of Employment of Workers and Enhancement of Occupational Life" (Act No.132 of 1966) and other related laws and regulations as well as the new legal system. We will continue to actively prevent harassment, including research and analysis of anti-harassment system and proposal of feasible anti-harassment measures (such as counseling systems and educational methods).

### Elimination of Discrimination against the Disabled

In response to the enactment of the Act for Eliminating Discrimination against Persons with Disabilities on April 1, 2016, we established internal regulations on how directors and employees should respond to the Act and provide training to deepen knowledge and understanding within the company. In addition, the Compliance Hotline provides consultation on discrimination against persons with disabilities as a part of its wide range of services.



## Community Involvement and Development

As specified in our management philosophy, we believe that our mission is to pursue the enormous potential of space and aviation to contribute to solving global environmental problems. To fulfill our mission, it is important to interact with all stakeholders. A safe and prosperous society utilizing space and the sky can only be realized through cooperation and dialogue not only with government agencies, companies, and R&D institutions, but also with Japanese citizens and educational institutions.

For sustainable development of aerospace R&D together with the public, we always keep our social responsibility in mind as we proceed with our business.

Main stakeholders	JAXA's social responsibility to stakeholders	Means of communication (Main items)	Reference
Japanese citizens	<ul style="list-style-type: none"> <li>● Providing factual and accurate information (improve transparency of business)</li> <li>● Providing timely and easy-to-understand information (to gain the confidence in JAXA)</li> <li>● Promoting aerospace R&amp;D through various projects</li> <li>● Ensuring two-way communication opportunities</li> </ul>	<ul style="list-style-type: none"> <li>● Press conferences and press releases</li> <li>● Accepting inquiries and opinions</li> <li>● Web site, SNS, live streaming</li> <li>● Exhibition facilities and open day to the public</li> <li>● Bulletins and printings</li> </ul>	P.34
Administrative agencies	<ul style="list-style-type: none"> <li>● Formulating business plans based on goals specified in the national policy</li> <li>● Promoting projects autonomously in accordance with the JAXA Law.</li> <li>● Proper execution of the budget</li> </ul>	<ul style="list-style-type: none"> <li>● Report on evaluation, financial statements, audits</li> <li>● Business report</li> </ul>	P.4 P.40
R&D institutions	<ul style="list-style-type: none"> <li>● Developing and improving the level of academic research in the aerospace field</li> <li>● Building mutual and cooperative relationships through international cooperation</li> <li>● Giving benefits from aerospace technology back to society</li> <li>● Proper management of intellectual property</li> <li>● Proper management of confidential information</li> <li>● Export control</li> </ul>	<ul style="list-style-type: none"> <li>● Provide research opportunities</li> <li>● Joint research agreement</li> <li>● Personnel exchange</li> <li>● Paper presentation</li> <li>● Conference presentation</li> </ul>	P.7-12 P.27-28
Companies	<ul style="list-style-type: none"> <li>● Conducting transactions with high transparency and fairness</li> <li>● Prevention of collusion</li> <li>● Proper management of confidential information</li> <li>● Giving benefits from aerospace technology back to society</li> </ul>	<ul style="list-style-type: none"> <li>● Contracts</li> <li>● Procurement information</li> </ul>	P.28
Employees and their families	<ul style="list-style-type: none"> <li>● Ensuring appropriate working conditions and work environment</li> <li>● Physical and mental health management for employees</li> <li>● Capacity building for employees</li> </ul>	<ul style="list-style-type: none"> <li>● Hotlines</li> <li>● Various training programs</li> <li>● Interviews</li> <li>● Whistleblowing system</li> </ul>	P.29-32
Educational institutions	<ul style="list-style-type: none"> <li>● Expanding the base of human resources in the aerospace field</li> <li>● Providing research and education opportunities for researchers and graduate students</li> <li>● Providing support for educational programs and educational opportunities for elementary, junior high, and high schools</li> </ul>	<ul style="list-style-type: none"> <li>● Educational events</li> <li>● Support for human resource development</li> </ul>	P.35





## Community Involvement and Development

### Public Relations and Events

Due to the COVID-19 pandemic, FY2020 was a year of adversity for us in which we were unable to conduct conventional public relations activities based on the premise of gathering people. Under these circumstances, to fulfill our accountability to the public and deepen their understanding of the significance and value of our projects, we took the following measures: (1) swiftly shifted to public relations activities with thorough measures to prevent the spread of COVID-19 (mainly online events); and (2) conducted interactive virtual symposiums that incorporate new ideas and technologies, as well as external collaborations.

#### Results in FY2020

	FY2019	FY2020
Number of visitors to the exhibition hall	595K	103K*
Press release	188 times	171 times
Press conferences and briefings	67 times	60 times
Number of staff dispatched for lectures / Number of audiences	559 / 119,244	207 / 68,378

\* To prevent the spread of COVID-19, it was closed based on the government's declaration of a state of emergency and the actions of local governments. Even after it is reopened, the number of visitors was limited by appointment to prevent the spread of the infection.



JAXA Symposium 2020 (virtual event)

#### ● Press conferences and press releases

To provide information on the significance and achievements of JAXA projects in a timely manner, we provide a wide range of opportunities for thorough explanation and dialogue to the press and media, such as press releases, press conferences and press briefings.

In FY2020, from the perspective of preventing the spread of COVID-19, press conferences and press briefings were held online in principle. We provided information in as timely a manner as the previous year.

#### ● Accepting inquiries and opinions

We welcome your inquiries and comments at the following website. You can also check our Frequently Asked Questions.  
<https://fanfun.jaxa.jp/navigator/>

#### ● Web site, SNS, live streaming



In FY2020, we opened the website "STAY HOME with JAXA" to introduce contents that can be enjoyed by both parents and children.

In addition, the top page of our website was completely renewed to improve convenience, accessibility, and guidance. On the JAXA's YouTube channel, 147 new videos (about 1.4 times compared to the previous year) were released.

With the increase in online events, a new subchannel dedicated to live event streaming was established. The return of the Hayabusa2 re-entry capsule to Earth, the launch of the spacecraft with Astronaut Soichi Noguchi on board, symposiums, and other events were live-streamed.

#### ● Exhibition facilities and open day to the public

We operate 12 exhibition facilities across Japan and have many visitors to them every year, but in FY2020, it was difficult to have visitors to prevent the spread of COVID-19. To make it possible to visit the exhibition facilities even under COVID-19 pandemic, we developed a 360-degree virtual tour of the exhibition hall at Tsukuba Space Center and the Kibo Operation and Control Room and conducted special open days of our sites online.



Facility Tour

#### ● Bulletin JAXA's

The Bulletin JAXA's was significantly renewed in FY2019. It is available in two media: an easy-to-read tabloid (paper) version and a web version. The tabloid version has QR codes embedded throughout for easy access to detailed information. The web version includes all the contents that were not included in the tabloid version due to limited space. In addition, since FY2020, we have started to distribute it to public libraries across Japan to get more readers.

About JAXA's





# Community Involvement and Development



## Support to Space Education for the Next Generation

Using space as material, we will raise children with curiosity, sprits of adventure, and craftsmanship, based on the preciousness of life.

In 2005, under the philosophy of "Space ignites sprits within children," the Space Education Center started with the aim of "fostering young people with fertile minds and broad insights" making use of knowledge and technologies gained through space exploration and development. In collaboration with educators who are directly responsible for the development of children, we have been developed projects that utilize our various achievements in the aerospace field. We will continue to contribute to the development of human resources who will pave the way for the future.

### Activities by Space Education Center - Program Map

<b>Support for school education</b>	Teacher training	Class collaboration	SEEC dispatch program	Space Education Symposium
<b>Support for social education</b>	Cosmic College	Space School®	Space Education Leaders Seminar	
<b>Provide experience-based learning opportunities</b>	Aerospace School	Making Your Own Space Mission (Kimission)	APRSAF Space Education Subcommittee	
	One-Day Space Reporter	ISEB Student dispatch program		

Details



## Major Educational Support Activities in FY2020

In FY2020, we had to cancel, postpone, or scale back programs due to the impact of COVID-19 pandemic. However, we took measures focusing on digitalization and took advantage of the online tools. As a result, we were able to promote the digital transformation of space education activities, which increased the number of participants from remote areas who are difficult to participate in usual ways of events and promoted interaction.

### Digitalizing teacher training

We started to provide on-demand teacher training courses online. By this digitalization, anyone, including those who were difficult to participate in due to their schedule and location, can now attend the teacher training at any time.



### Adoption of "Kaiketsu Zorori" for the space education magazine "Portal to Space" and publication of the book "Space School" edited and supervised by JAXA

We adopted the character popular with children "Kaiketsu Zorori" for "Portal to Space" and were able to attract new readers. We also published a book for children "Space School," edited and supervised by JAXA, and sold it in bookstores.



### Digitalizing Space Education Leaders Seminar and Cosmic College

We digitalized the Space Education Leaders Seminar and held monthly seminars at a level comparable to that of the face-to-face programs. In addition, we produced video contents for space education that can be used online and promoted digitalization of Cosmic College.





MIZOGUCHI, Masaru

[Short Biography]

Doctor of agriculture, Professor, Department of Global Agricultural Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo. Graduated from the Department of Agricultural Engineering at the University of Tokyo, which was founded by Hachiko's owner. Specialized in soil physics, agricultural engineering, and international agro informatics. Conducting research on decontamination of agricultural land and revitalization of agriculture in Iitate Village, Fukushima Prefecture since the Great East Japan Earthquake.

Japan is currently rocked by conflicts over the hosting of the Tokyo Olympics and Paralympics, the rapid spread of COVID-19, crisis of collapse of medical system, and torrential rains caused by a stationary front sitting on the Japanese archipelago. The situation is reminiscent of the time when Kamo no Chomei wrote Hojoki. How do the events occurring on the ground in the Japanese archipelago look from space? With this question in mind, I read through the Sustainability Report 2020.

In the "Top Management Commitment" section, the President described about the important missions that JAXA accomplished, such as sample recovery from the asteroid Ryugu by the asteroid explorer "Hayabusa2" and resupply mission to the ISS by "KOUNOTORI." He also expressed his enthusiasm as the President in response to the first revision of the Basic Plan for Space Policy in five years.

In the "Highlights of 2020" section, in addition to the achievements by Hayabusa2 and KOUNOTORI, I was interested in the report that "5-day whether forecast" was realized using the Global Satellite Mapping of Precipitation "GSMaP" directly in numerical weather forecast and real-time precipitation forecast has been released as a contribution to disaster countermeasures and national resilience. I once again realized the value of this achievement after listening to the current news of rainfall predictions and disaster warnings due to a stationary front.

In the "Contribution to Environment and Society in FY2020" section, my attention was drawn to the caption of the figure in the "Ten Years since the Great East Japan Earthquake" section, as I have frequently visited the affected area since immediately after the earthquake. Indeed, over the past ten years, weeds and shrubs such as willow invaded the rice paddies in the areas where evacuation orders were issued, and solar power plants were constructed in the rice paddies that could not be used. The results of showing this by satellites are wonderful. However, it is questionable whether the phrase "the progress of recovery" is appropriate. I hope that JAXA researchers see the areas firsthand and understand that it was a heartbreaking decision for them.

It is also of interest to note that economic restraints can be observed from space based on the decline in CO2 concentration in March to April 2020, when the Prime Minister of Japan called for the closure of schools and declared a state of emergency, as shown in the figure in the "Actions related to COVID-19" section.

In the "Actions for Environment" section, the graph shows that energy conservation and paperless office work were significantly promoted in FY2020 due to a decrease in office work under COVID-19 pandemic. The "Failure School" (Consumer Issues section) to pass on skills to younger employees and the JAXA YouTube channel by female technical staff (Labor Practices section) are good programs. Such environment may be one of the reasons why the retention rate of new employees is 100%.

Last year, I asked JAXA to promote R&D that would give people dreams. Perhaps they took it seriously and promoted the digital transformation of space education support programs (p.35). I greatly appreciate it. I hope that such activities will continue in the next year and beyond.



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## OCHIAI, Yoichi

### [Short Biography]

Media artist. Born in 1987. Graduated from Graduate School of Interdisciplinary Information Studies, the University of Tokyo (academic acceleration for the first time in the Graduate School of Interdisciplinary Information Studies). Doctor of Interdisciplinary Information Studies.

Associate Professor in University of Tsukuba, Director of Digital Nature Development Research Center, and Principal Investigator of JSTCRESTxDiversity Project. IPA certified super creator/talented programmer.

From 2017 to 2019, served as an assistant to the president of the University of Tsukuba. Since 2018, a member of the Specialized Research Committee for the Vision of Intellectual Property Strategy organized by the Cabinet Office; a member of the Visionary Council for the Moonshot R&D System organized by the Cabinet Office; a member of the Working Group on Laws for Digitalization; a cultural ambassador appointed by the Agency for Cultural Affairs; and a producer of theme projects for the Osaka-Kansai Expo. Received many awards including Prix Ars Electronica, SXSW Arrow Awards, and MIT Innovators Under 35 Japan. As a photographer and essayist, freely cross the boundaries between research and arts to continue exploration and expression.

FY2020 was a year when humanity experienced a variety of problems, including the lockdown caused by COVID-19 pandemic, stagnation of economic activities, and division caused by discrimination and conflicts. In this context, looking up at the universe seems to be gaining more importance as a symbol of new unity to overcome division, and gives people hope.

This is the 16th issue of the Sustainability Report, and this year is the third year of the Phase 4 Medium/Long-Term Plan. In FY2020, JAXA was blessed with many achievements, such as the successful recovery of the re-entry capsule detached from the asteroid explorer Hayabusa2 and the successful launch of KOUNOTORI no.9. For disasters hitting the Japanese archipelago such as torrential rains, JAXA made contributions to society demonstrating the significance of its existence, such as analysis using the water cycle simulation system and five-day whether forecasts using GSMaP, as part of its efforts to utilize remote sensing satellites in society.

As of August 2021, when I am writing the third-party opinion, COVID-19 pandemic still continues in Japan, and the public health crisis as well as sustainability and environmental impact, including SDGs, became a big concern in the past year. In FY2020, the five-year average of energy intensity was 98%, achieving the goal specified in the Energy Conservation Act. In addition, regarding energy use, carbon dioxide emissions at the Chofu Aerospace Center were reduced by 39%, exceeding the target of 25%. Electricity consumption, city gas consumption, and heavy oil (JIS grade A) consumption were reduced by 17%, 47%, and 8%, respectively, compared to the previous year, achieving the biggest energy conservation in years. Although the change in operating rate for remote work and BCP due to the COVID-19 pandemic may be one of the reasons, this may be the beginning of the path to energy conservation through promotion of digitalization. Regarding the COVID-19 pandemic, JAXA cooperated with NASA ESA to understand the situation of the global environment and economic activities before and after the pandemic and disclosed the analysis results.

Even in FY2020 under the COVID-19 pandemic, many videos related to civilian space development were spread on social networking services as hopeful news. On the other hand, the race for development by capitalists has been criticized in some respects as a symbol of new disparity and division. In this context, the contribution to space development and infrastructure development by public organizations such as JAXA is becoming more valuable and may send a message that they aim for space development where no one is left behind. I hope that space development as a symbol of unity will move forward along with the social environment in the future.



### To Enhance the Reliability of This Report

**To enhance the reliability of Sustainability Report 2021 (hereinafter this report), we used a checklist and an internal audit system to evaluate the activity reports from all divisions in accordance with Environmental Reporting Guidelines issued by the Ministry of the Environment.**

Using the Self-assessment Guide for Enhancing the Credibility of Environmental Reports as a reference, we used a checklist to check that the information (numerical data, etc.) and descriptions about environmental impact contained in this report comply with the Environmental Reporting Guidelines.

September 2021  
Head of Safety and  
Mission Assurance Department

上森規光

To ensure the reliability of the information (numerical data, excluding those on papers) about environmental impact contained in this report, we selected the following sites from all of our sites, conducted audits in July 2021 to verify the consistency of the source documents and forms with the numerical data in this report, and checked that there were no problems.

- Tsukuba Space Center
- Kakuda Space Center
- Uchinoura Space Center

September 2021  
Head of Evaluation and  
Audit Department

佐藤雅彦

[Details: Self-assessment Checklist](#)

#### [Editor's Note]

Thank you for reading JAXA Sustainability Report 2021.

This report introduces our activities to address "various issues in the environment and society" from the perspective of the space and aviation field, actions for SDGs, and countermeasures against COVID-19. Please visit our website for more information on each of these activities. We would also like to ask for your cooperation in completing the questionnaire so that we can continue to make this report a better communication tool for you. The Japanese version shall prevail in case of any discrepancy or inconsistency between the Japanese version and its English translation.

#### [Scope of the Report, etc.]

- Scope ..... All sites except overseas sites
- Period ..... April 1, 2020, to March 31, 2021 (including some data after this period)
- Guidelines used for reference ..... Environmental Reporting Guidelines 2018 (issued by Ministry of the Environment), ISO 26000:2010 Guidelines for Social Responsibility (Japanese Standards Association)
- To enhance reliability ..... Internal evaluation was conducted to enhance the reliability of this report.
- Rounding figures ..... Rounded off to the indicated place

#### [Copyright]

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#### [Publication]

- September 2021 (Vol. 16)
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- Issue of the next report ..... Department September 2022

#### [Contact]

**Green Management/Operation Division, Safety and Mission Assurance Department**  
Tsukuba Space Center, 2-1-1 Sengen, Tsukuba, Ibaraki, 305-8505, Japan  
E-Mail : JAXA-SR@ml.jaxa.jp

### Environmental INPUT Data (Resources and Energy)

Resources and energy		Unit	FY2016	FY2017	FY2018	FY2019	FY2020
Electricity purchased		MWh	143,631	143,162	137,728	134,036	111,877
Water resources		K m <sup>3</sup>	437	453	440	412	403
(details)	Water supply	K m <sup>3</sup>	174	182	184	152	155
	Groundwater	K m <sup>3</sup>	35	42	33	31	12
	Rainwater	K m <sup>3</sup>	2	2	2	3	3
	Other*	K m <sup>3</sup>	225	228	221	226	234
Gasoline (including for vehicles)		kℓ	34	32	28	25	20
Kerosene		kℓ	43	57	45	49	38
Light oil (including for vehicles)		kℓ	49	47	49	44	43
Heavy oil (JIS grade A)		kℓ	9,058	9,661	8,694	8,456	7,807
City gas		K m <sup>3</sup>	1,688	1,601	1,780	1,639	870
Propane gas		t	36	36	18	28	22
Petroleum hydrocarbons		K m <sup>3</sup>	0	0	0	0	0
Liquefied natural gas		t	0	0	0	0	15
Other combustible natural gases		K m <sup>3</sup>	1	1	1	1	0
Jet fuel		kℓ	173	186	180	215	178
Aviation gasoline		kℓ	0	0	0	0	0
Liquid nitrogen		t	4,732	3,547	3,016	2,695	2,645
Papers		t	100	77	63	51	39

● The data is based on resources and energy purchased by JAXA. The data does not include fuel and other resources purchased by service providers due to the transfer of launch services to the private sector.

\*Intake weirs and rivers

### Environmental OUTPUT Data (Environmentally Hazardous Substances)

Environmentally hazardous substances		Unit	FY2016	FY2017	FY2018	FY2019	FY2020
CO <sub>2</sub> emissions	Energy related	t-CO <sub>2</sub>	83,212	84,954	81,809	77,955	62,134
	Non-energy related <sup>*1</sup>	t-CO <sub>2</sub>	243	278	314	645	502
Calculated amount of leaked CFCs		t-CO <sub>2</sub>	1,216	892	1,040	974	458
NO <sub>x</sub> emissions <sup>*2</sup>		t	361	309	306	307	273
SO <sub>x</sub> emissions <sup>*2</sup>		t	109	107	95	59	57
Soot emissions <sup>*2</sup>		t	0	0	0	0	0
Wastewater <sup>*3</sup>		K m <sup>3</sup>	385	453	440	412	403
Biochemical oxygen demand (BOD) <sup>*4</sup>		mg/ℓ	35	32	41	26	20
Chemical Oxygen Demand (COD) <sup>*4</sup>		mg/ℓ	6	8	6	3	3
General waste		t	134	162	209	184	97
Industrial waste		t	935	562	1,073	1,297	657
Specially-controlled industrial waste		t	86	35	39	7	13
Class I designated chemical substances		t	7	7	5	4	3

\*1 Non-energy related CO<sub>2</sub> emissions include emissions of CH<sub>4</sub>, N<sub>2</sub>O, and SF<sub>6</sub>.

\*2 NO<sub>x</sub>, SO<sub>x</sub>, and soot emissions are measured from units generating soot or smoke regulated by the Air Pollution Control Act.

\*3 In cases where the amount of wastewater is not measured, it is calculated based on the assumption that the amount of used water is the amount of wastewater.

\*4 BOD and COD are calculated based on the measured values at sites with specified facilities under the Water Pollution Prevention Act and the total amount of wastewater discharged at the sites (per year).

### Personnel-related data

	Unit	FY2016	FY2017	FY2018	FY2019	FY2020	
Number of employees	people	1,526	1,512	1,517	1,554	1,652	
Average number of days of paid leave taken	days	11.13	11.8	12.7	13.5	11.13	
Number of employees taking childcare leave	people	29	31	48	56	59	
Number of employees taking sick/injured childcare leave	people	154	162	168	190	135	
Percentage of female managers	%	7.8	9.0	10.4	10.2	10.5	
Percentage of disabled employees	%	2.37	2.42	2.49	2.65	2.66	
Number of compliance hotline calls	cases	54	42	54	45	25	
Use of the whistleblowing system	cases	0	0	0	1	0	
Work-related accidents*	Accidents during work	cases	8	11	14	12	7
	Accidents during commuting	cases	7	10	8	2	3

\*The number of work-related accidents occurred to employees of subcontractors is also included.



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