Basic Plan for the Advancement of Utilizing Geospatial Information

(Provisional English Translation*)

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*This document is an unofficial translation.

Contents

Preamble

In 2017, the third Basic Plan for the Advancement of Utilizing Geospatial Information (hereinafter referred to as the "Basic Plan") was formulated based on the Basic Act on the Advancement of Utilizing Geospatial Information (Act No. 63 of 2007). Since then, Japan has been working to realize the diverse components of the happiness of individual citizens and to overcome global crises, such as addressing climate change, while facing new changes due to a further decline in population, an aging population, fewer children, increasingly severe and frequent natural disasters, and the outbreaks and spread of COVID-19. In order to solve these social issues and realize a sustainable society, the fourth Basic Plan requires a new development in advancing the utilization of geospatial information.

Geographic Information Systems (GIS) and satellite positioning, navigation and timing comprise the fundamental infrastructure for the utilization of geospatial information.

In terms of GIS, it has been in use since the 1970s, and its usefulness was reaffirmed following the Great Hanshin-Awaji Earthquake in 1995, and the public and private sectors have worked together to promote the development and utilization of fundamental information and systems. In recent years, GIS has played a major role as a tool for visualizing "human flows" amidst the spread of COVID-19.

As for the satellite positioning, navigation and timing, the United States began launching Global Positioning System (GPS) satellites in 1978, and the European Union (EU), Russia, China, and other countries have also been using their own systems for satellite positioning, navigation and timing. Japan also has already established the four-satellite constellation of the quasi-zenith satellite system, providing high-precision positioning services.

In addition, the open data of various types of geospatial information have produced significant effects. In July 2021, a mudslide disaster occurred in Izusan, Atami City. Various types of geospatial information were available for the disaster, including 3D point cloud data published by the G-Spatial Information Center, images taken by unmanned aerial vehicles, and images on SNS. Analysis of these data by the government and the private sector to identify of the extent of the disaster, allowed for a rapid initial response and the prevention of secondary disasters during rescue and relief operations.

The utilization of geospatial information also contributes to improving productivity, which is a key issue in many fields. In the field of smart agriculture, the use of robot tractors and drones is realizing/achieving significant reductions in work hours. Furthermore, as geospatial information is combined with various information and communication technologies (ICT), technologies such as automated parcel delivery robots and Advanced Air Mobility (AAM), which used to be the stuff of fantasy, are becoming a reality.

Thus, the advanced utilization of geospatial information is effective in addressing

increasingly severe and frequent natural disasters and global-scale environmental issues, improving productivity through digital transformation (DX), and creating a variety of services to enrich people's lives. It is necessary to promote the utilization of this information more than ever.

The fourth Basic Plan, the planning period of which will continue over next five years, calls for industry, academia, government, and the private sector to further work together to maximize the potential of geospatial information and realize a society in which everyone can enjoy their own way of life anytime and anywhere.

Part 1 Basic guidelines for the policies for the advancement of the utilization of geospatial information

1. Achievements of the Basic Plan so far and remaining issues

With an aim toward the utilization of geospatial information, based on the Basic Act on the Advancement of Utilizing Geospatial Information that was enacted in 2007, the government has formulated the first Basic Plan in April of the following year, the second Basic Plan in March 2012, and the third Basic Plan in March 2017. These Basic Plans now consistently aim to realize an "Advanced Geospatial Information Utilization Society (G-Spatial Society)" where anyone can use geospatial information whenever and wherever they need it, and obtain accurate information based on advanced analysis.

A G-Spatial Society is a society in which location information, including time-related information, and geospatial information, which is information on various phenomena connected to location information, are highly utilized to contribute to solving various social problems, such as addressing natural disasters and environmental issues, revitalizing industry and the economy, and realizing comfortable lives. More specifically, a G-Spatial Society is an advanced data-utilizing society that promises to: strengthen disaster prediction capabilities, including heavy rains, earthquakes, and tsunamis, and disaster response capabilities by collecting, sharing, and providing information on disasters and damage; establish automated driving systems and automated package delivery by drones, both of which are based on high-precision geospatial information; realize a smart city that improves the quality of life of citizens and the efficiency of urban activities; and, improve productivity in the agriculture, forestry, fisheries, and construction industries by developing automated driving of agricultural machinery and infrastructure utilizing 3D data and ICT, etc.

So far, the first Basic Plan was established to create a framework for the development, provision, and distribution of basic geospatial information such as Fundamental Geospatial Data, the second Basic Plan was designed to establish a foundation for the utilization of geospatial information, including the launch of the quasi-zenith satellite, and promotion of the penetration and settlement of geospatial information in society, and the third Basic Plan was designed to solve social issues and create new industries and services through the utilization of geospatial information, thus, steadily producing successful results with the following as the main pillars of their efforts. Through these Basic Plans, efforts to utilize geospatial information have progressively deepened from the development of basic infrastructure (first), to the promotion of utilization (second), to the implementation in the society (third).

As for GIS, while the Fundamental Geospatial Data, GNSS Continuously Operating Reference Stations (GNSS CORSs) and continuous GNSS observation network by them (GEONET) have been steadily developed, open data initiatives in the public and private

sectors have progressed during the 3rd Basic Plan, following the full-scale operation of the G-Spatial Information Center in 2016, which creates an environment in which anyone can freely use a wide variety of data from data platforms established for different fields, such as disaster prevention, agriculture, and national land transportation, and the use of GIS by local governments is also progressing.

For satellite positioning, navigation and timing, the four-satellite constellation of the quasi-zenith satellite system was established in FY2018. It has started operations to high-precision positioning services at the centimeter level using the correction information provided by GNSS CORSs in real-time, 24 hours a day, nationwide. Private-sector is expanding its efforts to develop products that utilize this service.

As mentioned above, to a certain extent the development of basic infrastructure for both GIS and satellite positioning, navigation and timing during the past years of the Basic Plans, the utilization of geospatial information has progressed in both the public and private sectors with the 3rd Basic Plan. This progression has been in the areas of implementation of visualization of disaster information by local governments through mapping, etc., full-scale operation of the tsunami inundation damage estimation system, development of technical specs for the Dynamic Map and commercial launch of Level3 automated driving vehicles, and development of unmanned automated driving systems with remote monitoring of agricultural machinery, etc.

On the other hand, while it continues to be challenging to further develop and update geospatial information that serves as the basic infrastructure, including the construction of the seven-satellite constellation of the quasi-zenith satellite system that enables sustainable positioning and the development of high-precision elevation data, it is necessary to accelerate the implementation in the society of new-age transportation and logistics systems, such as the practical use of drones in logistics, and the improvement of the quality of people's lives through the advanced utilization of geospatial information. Moreover, as the potential for utilizing geospatial information in new industries and services expands, there is a need to develop human resources that can utilize geospatial information, which is important for its implementation in the society.

2. Changes in the social situations surrounding geospatial information

During the period of the third Basic Plan, major changes occurred in social situations and issues; increasingly severe and frequent natural disasters, proactive efforts to address environmental issues, changes in lifestyles due to the spread of COVID-19, and the progress of forming a digital society, etc. In response to this, both the public and private sector are making progress in the utilization of geospatial information, and the technologies that support it are also advancing.

(1) Taking proactive efforts to cope with increasingly severe and frequent natural disasters and environmental issues

Japan has traditionally suffered from numerous natural disasters due to its geographical, topographical, and climatic characteristics. During the period of the third Basic Plan, there were severe earthquakes, such as the 2018 Hokkaido Eastern Iburi Earthquake, and wind and flood damage were frequent, including the Heavy Rain Event of July 2018, Typhoon Hagibis in 2019, and Heavy Rain Event of July 2020. In the future, there are also concerns about increasingly severe and frequent water and sediment disasters caused by climate change, as well as the imminent risk of major earthquakes such as the Nankai Trough Major Earthquake and an inland earthquake directly under the capital.

Under these circumstances, the national and local governments are increasingly using geospatial information such as satellite imagery, aerial photographs, and images recorded by unmanned aerial vehicles immediately after earthquake, wind and flood damages, for the implementation of initial response emergency responses. In addition, private business operators are also making use of such information. Cadastral information is being utilized to support recovery efforts. In addition, efforts have also been made to use positional information from mobile phones as well as driving data from car navigation systems to support evacuation guidance, to understand and analyze evacuation conditions, and to formulate disaster prevention plans. In addition to pre-disaster prevention measures, geospatial information should be further utilized at each stage of disaster management, including early assessment of disaster situations after they occur, early rescue of disaster victims, and prompt and accurate emergency and recovery measures by disaster management agencies.

As global warming progresses due to human activities and the effects of climate change become increasingly apparent, addressing environmental issues such as climate change control has also become an urgent issue. In Japan, too, it is required to take proactive measures against global warming and to create a virtuous cycle between the economy and the environment in order to realize a carbon-neutral, decarbonized society by the year 2050. It is expected that geospatial information will be further utilized in various fields, such as understanding the status of greenhouse gas emissions and various simulations for expanding the introduction of renewable energy.

(2) Acceleration of digitalization triggered by COVID-19

Since the first case of infection was confirmed in Japan in January 2020, the spread of COVID-19 has had a tremendous impact on economic and social activities and has drastically changed people's lifestyles and attitudes. With a view to preventing the spread of infection,

the use of digital technology in all areas, such as telework, online education, and online medical care rapidly progressed and prevailed. In addition, the growing need for real-time information on congestion to avoid "crowded" areas, and information on confirmed contact with infected persons have promoted the utilization of positional information. On the other hand, there are international moves to strengthen personal information protection, such as the enforcement of the General Data Protection Regulation (GDPR) in the EU with regard to the use of positional information big data, which is rapidly expanding in the private sector in Japan.

As digitalization and smartification on society are accelerated, the implementation of measures utilizing geospatial information such as automation and unmanned operation of logistics and transportation, smart agriculture, and i-Construction whose needs have been increasing in the context of acceleration of population shrinkage, declining birthrate and aging population is in greater demand, and some efforts are being further promoted, including related measures such as DX in the infrastructure sector are addressed.

Furthermore, in the response to COVID-19, the delay in digitalization in all socioeconomic activities, including government administration, became a major challenge. In order to strongly encourage the formation of a digital society, the Basic Act on the Formation of an Advanced Information and Telecommunications Network Society (Basic IT Act) (Act No. 144 of 2000) was comprehensively revised, and the Digital Agency was established as a new government command post to promote measures related to the formation of a digital society, among other things. The Basic Policy for Reforms toward the Realization of a Digital Society (Cabinet Decision on December 25, 2020) outlines a vision of a "Society in which each citizen can choose services that satisfy his/her demands and achieve happiness in various areas through digital technology," stating that the goal of such a society is to promote a "people-friendly digitalized society, in which no one will be left behind." In order to contribute to the formation of such a digital society, it is necessary for geospatial information to be handled in coordination with the government-wide efforts to improve the data environment (e.g., enhancement of digital data including development of base registries, development of data coordination infrastructure, etc.).

(3) Drastic advancement of geospatial information technology

Geospatial information technology is undergoing a dramatic advancement, and further expansion of its use is expected. Specifically, due to improvements in the accuracy of cameras and sensors that capture information on the position and time of people and objects, it has become possible to acquire large amounts of dynamic geospatial information in real-time. Furthermore, with the development of data platforms that connect and publish such

information, an environment is being created in which anyone can access and use geospatial information.

Regarding satellite data, the four-satellite constellation of the quasi-zenith satellite system has begun providing high-precision positioning services. Also, observation and survey data are acquired and accumulated by utilizing the Advanced Land Observing Satellite-2 "DAICHI-2" (ALOS-2), etc. Currently, efforts are being made to establish the seven-satellite constellation of the quasi-zenith satellite system, which will enable Japan to achieve sustainable positioning on its own. In addition, it is expected that the acquisition and accumulation of high-frequency and wide-area observation data by the Small Satellite Constellation (SSC) will be developed in the future.

On the data processing capability side, innovations in algorithms such as machine learning and deep learning, as well as improvements in CPU performance, are making it possible to handle geospatial information on a 3-D and 4-D digital infrastructure and predict the future through simulations. On the other hand, along with such technological advances in geospatial information (improved accuracy and convenience, real-time performance, etc.), there is an increasing need for more consideration and concrete measures for national safety, etc.

3. Visions to be attained through the utilization of geospatial information

Toward the realization of a society in which everyone can enjoy their own way of life anytime and anywhere, this Basic Plan aims to create a variety of services that maximize and utilize the potential of geospatial information in various fields such as disaster prevention, economics, and daily life, and to realize autonomous, stable, and appropriate provisions of such services through public-private partnerships.

The background to this is as described in Section 2: There is a growing social demand to quickly and accurately grasp geospatial information and reflect it in policy making and the creation of new services and businesses that lead to solutions to social issues; In response to this request, technological advances are enabling more dynamic utilization of geospatial information; and therefore, geospatial information is expected to contribute to solving social issues more than ever.

The third Basic Plan identifies geospatial information as one of the keys sources of innovation for realizing Society 5.0, "A human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space." The Sixth Science, Technology, and Innovation Basic Plan (Cabinet Decision of March 26, 2021) continues to set the realization of Society 5.0 as a goal. Further efforts will be made to create and provide various services that maximize and utilize the potential of geospatial information.

4. Overall guidelines for the fourth Basic Plan

Based on the changes in social situations surrounding geospatial information, the evolution of technology, and the ideal society to be achieved through the utilization of geospatial information, the government will promote each measure under this Basic Plan for the five-year period beginning in FY2022, with the following three points as overall guidelines for efforts.

(1) New development in utilization of geospatial information

As described in section 2. (3), technologies related to geospatial information (GIS) have evolved significantly. Accordingly, the data handled in GIS is increasingly dynamic and real-time in addition to static data acquired in the past. Furthermore, the data are being connected to each other through data platforms developed in each field, leading to the openness of data and the creation of new value. Also, the owners and users of geospatial information have shifted from the government and other public organizations to the private sector. Furthermore, the purpose of its use is not limited to understanding the past situation and analysis based on this information, but it can also be used to predict the future (simulation) by combining past data with real-time data.

For example, the project "PLATEAU" promoted by the Ministry of Land, Infrastructure, Transport and Tourism ("MLIT") has developed a 3D city model that reproduces real-world cities in cyberspace and released it as open data. The model is being used for visualization and disaster prevention planning by overlaying disaster hazard information for integrated indoor and outdoor evacuation simulations by combining with interior building models, and also for local 5G propagation simulations by private companies. In automated driving systems, a system for generating and distributing lane-level road traffic information, etc. using private vehicle probe information held by automobile manufacturers is in the demonstration stage. Also, a hazard prediction system using real-time heavy rainfall information from XRAIN (eXtended RAdar Information Network) has been established, and a service that displays heavy rainfall areas on car navigation systems has begun.

Thus, the potential of geospatial information as a basic tool for solving social issues has been remarkably enhanced due to changes in the nature of geospatial information data and its usages, etc. All entities involved in the development and utilization of geospatial information are to renew their recognition that evolved geospatial information is the next-generation social infrastructure that will contribute to solve various social issues. In order to maximize the potential of evolved geospatial information, all entities will proactively disseminate information and make efforts toward new development in utilization of

geospatial information.

In order to create data platforms and services developed on them, the government will ensure that data with guaranteed accuracy and reliability is utilized, and work to expand the fields of use, including fields where geospatial information has not been fully utilized, even where there has been potential demand. Through collaboration with the government's promotion measures for digitalization, such as the development of a base registry and promotion of inter-disciplinary data platform collaboration, geospatial information will be further connected across fields to promote the creation of new cross-disciplinary businesses and services.

(2) Building a sustainable development spiral of businesses utilizing geospatial information

Until now, various entities in the industry, academia, government, and the private sector have been working together to promote the utilization of geospatial information. As described in (1) above, in order to maximize the potential of geospatial information, the government aims to further develop cooperation based on changes in social situations surrounding geospatial information. In this context, it is important that each of industry, academia, government, and the private sector actively play their respective roles according to the characteristics of each field and initiative in the development and utilization of geospatial information.

Since the first Basic Plan, the national and local governments have often been the main entity in the development of basic geospatial information and infrastructure for utilization of geospatial information. On the other hand, especially after the 3rd Basic Plan, the creation of new industries and services utilizing geospatial information has been a major issue, increasing the number of public-private partnerships aiming to advance geospatial information-related businesses led by private business operators to a stage where they can survive as businesses.

The government, in cooperation with industry, academia, government and the private sector, will continue to play an active role in efforts necessary to promote the utilization of geospatial information, such as the advancement of geospatial information provided by administrative agencies, the promotion of common rules (national coordinates) to make positional information consistent, and the promotion of openness in data. In areas such as disaster response and infrastructure management, administrative agencies will continue to take the initiative and promote further utilization of geospatial information, including private business operators.

In order to develop a business from the demonstration stage to a sustainable business for the

creation of new industries and services, it is important for the government, etc. to encourage collaboration among various players in the industry, academia, government, and the private sector from the initial stages, as well as to establish competitive and cooperative areas to clarify the division of roles between the public and private sectors, and to promote the development of technologies related to geospatial information, thereby creating an appropriate environment for the utilization of geospatial information. To this end, in order to promote national projects for the creation of new industries and services that utilize geospatial information, the government will provide appropriate support and lead the transition from the creation of use cases to the implementation stage, where the private sector can take the lead in self-starting the project, and aim to build a sustainable development spiral of businesses that create diverse values. In establishing the project, the following points are to be considered and established in cooperation among industry, academia, government, and the private sector including the government, while taking into account the characteristics of each project: mechanisms that businesses would like to be involved in (creation of demand, establishment of areas with high growth potential, etc.); mechanisms to facilitate business involvement (standardization and clarification of data specifications, etc.); and mechanisms to promote involvement of businesses (systems to facilitate cooperation among private companies and to involve diverse entities).

Furthermore, in terms of standardization of data specifications, etc., the government will pay close attention to the growing importance of being actively involved in discussions on international standardization, with a view to responding to the global market in the future.

(3) Support for the development and exchange of human resources for geospatial information

In order to maximize and utilize the potential of geospatial information to solve social issues and create new services, it is necessary to have the human resources for this purpose. In the implementation in the society of advanced utilization of geospatial information, human resources who generate novel ideas, so to speak, "discover value," are needed in the stage of commercialization of the technology. In the stage of growing the business that has been created, human resources who "realize the discovered value," so to speak, are needed to expand the business by involving diverse stakeholders and transcending the boundaries of industry.

Efforts have been made to discover human resources that can discover value through ideathons, hackathons, etc. However, it is necessary to enhance efforts to develop and demonstrate the abilities of human resources that can realize value. As the population continues to decline and technological progress accelerates, more efforts than ever will be

required to secure human resources.

In the future, in order to develop human resources that can realize value in each project that utilizes geospatial information, the government will create opportunities for exchange and encourage human resources in the geospatial information field to jump into other fields and industries, and also attract human resources from other fields into the geospatial information field, and encourage the formation of a community in which diverse human resources work together to promote commercialization. It is expected that such efforts will promote business growth, thereby attracting new funds and human resources and building a sustainable development spiral of businesses that will generate further innovation in technology and business development, etc., by utilizing open data and open source.

In light of the subject of geography which will become a compulsory subject in FY2022 where "Students shall acquire the skills to appropriately and effectively research and summarize various information on geography from surveys and various materials using maps and Geographic Information Systems," provided by High School Courses of Study (notified in 2018), as part of its efforts to disseminate knowledge on geospatial information and GIS, the government will continue to support those who are responsible for the utilization of geospatial information in geography-related education and disaster prevention, such as by enhancing educational support contents.

5. Effective promotion of the Basic Plan

(1) Coordination with various plans

In implementing this Basic Plan, full consideration will be paid to maintaining compatibility with the following related plans, as well as to achieving a coordinated effect: Priority Policy Program for Realizing Digital Society (Cabinet Decision on December 24, 2021); Action Plan of the Growth Strategy (Cabinet decision on June 18, 2021); Science, Technology, and Innovation Basic Plan (Cabinet decision on March 26, 2021); Basic Plan on Space Policy (Cabinet decision on June 30, 2020); The Fundamental Plan for National Resilience (Cabinet Decision of December 14, 2018); The Basic Plan on Ocean Policy (Cabinet Decision of May 15, 2018), etc. It is also necessary to coordinate with the efforts to realize the Vision for a Digital Garden City Nation and the efforts to promote DX in society as a whole, which are led by the Digital Agency.

(2) Realization of orderly distribution and utilization of geospatial information

From the perspective of promoting appropriate and effective utilization of public and private sector data, it is necessary for various entities to work together to ensure the quality of geospatial information maintained in various fields and entities, and to promote the

appropriate openness of data, in order to realize the orderly distribution and utilization of geospatial information held by industry, academia, government, and the private sector. Specifically, the government will ensure the accuracy and reliability of data distribution, including the protection of personal information and maintaining compatibility of positional information, and will work to improve the environment, including security measures to prevent spoofing and data tampering, while working to reduce the risk of malicious use of data from the perspective of ensuring national security, etc.

(3) Follow-up of the Plan

In order to implement each measure based on the Basic Plan in a well-planned manner, the government will formulate a process chart of specific goals, including key performance indicators (KPIs), and the timeframe for achieving them, and will follow up on the progress each fiscal year. In doing so, the government will focus on measures positioned as "symbolic projects" as priority measures to be taken to realize the world's highest level G-Spatial Society, summarize the concrete progress of initiatives and the return of their results to society in an easy-to-understand manner, and widely disseminate them as new development in utilization of geospatial information.

In the process of implementing the Basic Plan, the government will also identify institutional issues, study the Basic Plan as necessary, study institutional aspects, including revision of related laws and regulations, and consider necessary actions in response to technological progress and changing social needs.

Part 2 Specific policies and measures for the advancement of utilization of geospatial information

1. Response to natural disasters and environmental issues

(1) Promoting the construction of an integrated G-spatial disaster prevention and mitigation system

[Basic Concept]

In order to mitigate damage from disasters that have become increasingly severe and frequent in recent years, the government will promote the implementation in the society of "G-spatial disaster prevention technology," a technology that contributes to disaster prevention and mitigation through the advanced use of geospatial information, in cooperation with national resilience efforts at each stage of the disaster management.

As part of pre-disaster prevention measures, the government will steadily develop and provide fundamental digital map information and disaster risk information such as hazard maps from normal times. In the event of a disaster, the government will take prompt, appropriate emergency and recovery measures, and support early evacuation of disaster victims by making use of real-time observation of the disaster situation using sensors, etc., and real-time estimation of the disaster situation using images taken by satellites, aircraft, unmanned aerial vehicles, and images posted on social networking services (SNS). In addition, the government will strengthen information sharing and communication functions at the time of a disaster, and promptly and accurately provide each citizen with the information necessary for evacuation in the event of a disaster.

[Main Measures]

① Measures to strengthen disaster response capabilities utilizing geospatial information before a disaster occurs

a) Enhancement and promotion of the use of regional disaster risk information such as hazard maps

・ The government will enhance the information provided via the Hazard Map Portal site, which allows users to view disaster risk and other information on a single map. The government will provide approximately 17,000[1] inundation risk areas by FY2026, including data of inundation risk areas for small and medium-sized rivers that has been newly required to designate based on the revision of the Flood Control Act (Act No. 193 of 1949) in 2021. 【MLIT】

・ The government aims to achieve an 84%[2] active fault map coverage by FY2025 by

[1] As of January 2022: 1,548
[2] As of January 2022: 72%

expanding the scope of geographic information for disaster prevention, such as nationwide active fault zone information, which provides risk information on earthquake disasters, and topographic classification data, which provides risk information on floods, etc. 【MLIT】

- Given the increasingly severe and frequent natural disasters, the government will continue to develop and publish geological information related to the occurrence of geological disasters caused by earthquakes, volcanic eruptions, heavy rains, etc., and promote the digitization of this information. 【METI】
- In order to facilitate various types of analysis using disaster risk information, the government will promote the provision of GIS data, and develop and provide geospatial information, such as land modification status and past disaster history. 【MLIT】
- For efficient and effective operation of the Self-Defense Forces during disaster relief, the government will promote the collection and development of geospatial information and further cooperation with other ministries and agencies. 【MOD】
- The government will promote the development of land cadastral systems to clarify land boundaries, etc., in order to contribute to the quick recovery from disasters. 【MLIT】
- The government will promote the use of geospatial information in order to provide accurate evacuation information and evacuation guidance in the event of a major earthquake in underground malls. 【MLIT】
- The government will provide Hazards Risk Information related to various natural disasters and promote the application of a system that supports the planning and implementation of disaster prevention measures based on hazard risk assessment in model regions, aiming to implement the hazard and risk assessment and utilization system in the society. 【MEXT】

b) Routine monitoring of national land

- The government will promote the operation of the Advanced Land Observing Satellite-2 "DAICHI-2" (ALOS-2) , which has radar observation capability to take images during nighttime and inclement weather, etc., and promote research and development for the advancement of image processing technology. With the aim of launching the Advanced Land Observing Satellite-4 (ALOS-4) in FY2022, which will further develop wide-area and high-resolution sensor technology, the government will promote steady development of the satellite. 【MEXT】
- In order to detect crustal deformations caused by earthquakes and volcanic activities, and land subsidence etc., the government will continuously and comprehensively monitor changes in the national landmass by conducting InSAR time series analysis using data of ALOS-2 and that of ALOS-4 scheduled to be launched in 2022. By FY2023, it will establish a system for detection of more detailed crustal and ground deformation using ALOS-4

observation data, and will seek ways to utilize them to improve the maintenance and management of the Geodetic Reference Frame. 【MLIT】

② Measures to strengthen disaster response capabilities using geospatial information in the event of a disaster

a) Early recognition of disaster information

・ In order to provide rapid rescue and emergency measures in the event of a disaster, the government will promptly collect, analyze, and identify damage on land and underwater using satellites, aircraft, unmanned aerial vehicles, etc., and promptly disseminate information on the scale of damage, etc. that it has identified.

【NPA, MAFF, MLIT, MOD】

・ In order to strengthen the information collection system during initial disaster operations and to enable more efficient and effective rescue operations, the government will deploy high-spec drones that can create map images from aerial photographs to the Emergency Fire Response Teams in all prefectures by FY2022. 【MIC】

・ In the event of a large scale flooding event affecting multiple locations at the same time, the government will promptly provide a Provisional Inundation Depth Map that estimates the extent and depth of inundation using aerial photographs and images posted on SNS, and displays them on a map. 【MLIT】

・ In order to support the government's prompt and accurate decision-making immediately after the earthquake, the government will upgrade the hardware of the tsunami inundation damage estimation system, which is used for immediate estimation of tsunami inundation damage, and continue its stable operation. 【CAO】

・ The government will promote research and development to improve the estimation accuracy of Seismic Ground Disaster Assessment System (SGDAS), which estimates the area and scale of ground disasters (slope disasters and liquefaction) immediately after an earthquake and automatically distributes them to relevant ministries and agencies, and Real-time GEONET Analysis System for Rapid Deformation Monitoring (REGARD), which immediately estimates crustal movements, fault locations, etc. and automatically distributes them to relevant ministries and agencies. 【MLIT】

・ In order to contribute to faster and more reliable disaster response, the government will develop a system for rapid observation and analysis of wide-area damage using multiple satellite data by FY2022. 【CAO】

・ In order to establish a small SAR Satellite Constellation that is expected to be used for disaster response and other applications by 2025, the relevant ministries and agencies will conduct a multi-year utilization demonstration to expand the use of the satellite data and

accelerate the development and deployment of satellites through private investment.

【CAO】

- The government will establish observation technology to achieve the world's highest resolution (15 cm)[3] in the Next-generation airborne synthetic aperture radar, which can observe the earth surface regardless of weather conditions, day or night. 【MIC】
- The government will promote the use of the Disaster Prevention Support System for Irrigation Ponds, which supports the rapid identification and information sharing of damage to reservoirs in the event of a disaster. 【MAFF】
- The government will continue to operate the Radiation Monitoring Information Sharing System (RAMIS), which consolidates and disseminates radiation monitoring information in the event of a nuclear disaster, by making appropriate modifications and other measures. 【MOE】

b) Acceleration and accurate restoration of emergency measures by disaster prevention agencies and early evacuation support for disaster victims

- The government will reorganize the role and nature of the Integrated Disaster Prevention Information System that shares various types of disaster prevention information collected by ministries and agencies, etc., and establish a new system that enables information to be consolidated, processed into map information, and provided to disaster response organizations. Until the new system is operational, the current Integrated Disaster Prevention Information System (ICDIS) will be in continuous operation. 【CAO】
- The government will dispatch an Information Support Team (ISUT) to the disaster area to assist local governments in their disaster response in the event of a large-scale disaster, and provide disaster information in an organized and mapped form. In addition, it will promote the establishment of a mechanism for a Disaster Information Hub among entities concerned, including the establishment of rules for information sharing and utilization in advance, in order to improve the function of the ISUT. 【CAO】
- The government will integrate information about damage to roads and railroads, status of surveys by The Disaster Survey Helicopters and activities of The TEC-FORCE on the maps centrally and efficiently, and will share this information with related organizations by using the Internet, and so on. 【MLIT】
- The government will develop an Integrated System for Municipal Government Disaster Response by FY2022 that will assist in determining the target areas for evacuation and the timing of evacuation orders, etc. In addition, while working to expand the link between the Shared Information Platform for Disaster Management (SIP4D) and various systems of

[3] Resolution of the surface as of January 2022: 30 cm

relevant ministries and agencies, local governments, etc., the government will develop chatbots, etc. for disaster prevention to provide each citizen with the disaster information necessary for evacuation, thereby strengthening disaster prevention and mitigation functions. 【CAO】

- The government will work on the development of a disaster/crisis management reporting service using the quasi-zenith satellite system to provide not only disaster-related information but also urgent information such as evacuation orders. Regarding the QZSS Safety Confirmation Service (Q-ANPI), which can transmit safety information even in areas where general communication lines have been disrupted, the government will also provide this function to No. 7 satellite, which is currently under development, in addition to No. 3 satellite, which is currently in operation, in order to strengthen the stability of the service, while working with various disaster management agencies to develop technologies for the effective use of the service. 【CAO】
- The government will promote linkage between L-alert, which distributes evacuation orders and other disaster-related information simultaneously to the press, etc., in order to share disaster situations linked to geospatial information. 【MIC】
- In order to contribute to residents' appropriate evacuation decisions and disaster prevention activities, etc., the government will provide information on river conditions, including water levels, in a centralized manner on maps, consolidate real-time information on disaster prevention held by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), such as radar rainfall and weather warnings, and provide this information via the Internet. 【MLIT】
- By utilizing satellite positioning, the government aims to improve the efficiency of disaster relief activities of firefighting teams-such as the Emergency Fire Response Teams-and the Self-Defense Forces. 【MIC, MOD】
- In order to strengthen crisis management capabilities in the event of flooding, the government will promote remote monitoring and remote operation of floodgates and drainage pump stations, etc., and achieve a remote monitoring and remote operation rate of 41%[4] by FY2026. 【MLIT】
- In areas where major earthquakes such as the Nankai Trough Major Earthquake, an inland earthquake directly under the capital, and Trench-type Earthquakes in the Vicinity of the Japan and Chishima Trenches are expected, the government will promote the safe closure of sluices and land locks (including automation and remote control) to protect the backlands from tsunamis and storm surges, etc., and achieve 85%[5] of the safe closure rate by FY2025.

[4] As of the end of FY2020: 33%
[5] As of March FY2020: 77%

【MAFF, MLIT】

・ In order to accurately grasp and provide traffic information even in times of disaster, etc., and to effectively regulate traffic, etc., wide-area traffic control systems that utilize probe information held by private business operators, in addition to traffic information collection by vehicle detectors, etc., will be properly managed and operated. 【NPA】

(2) Contribution to a green society by utilizing geospatial information

[Basic Concept]

The government will steadily develop and utilize space systems for global environmental observation, and visualize information on renewable energy, biodiversity, etc. as geospatial information, thereby contributing to the construction of a green society at the regional level as well as the resolution of global-scale issues.

[Main Measures]

① Contribution to measures against global environmental issues such as climate change

・ For the purpose of improving climate change prediction and monitoring greenhouse gases, the government will operate earth observation satellites, including the Greenhouse Gases Observing Satellite “IBUKI” (GOSAT), the "IBUKI-2" (GOSAT-2), the Global Change Observation Mission-Climate “SHIKISAI” (GCOM-C), and the Global Change Observation Mission-Water "SHIZUKU" (GCOM-W), the government will provide data to relevant domestic and foreign organizations, and promote their utilization.

【MEXT, MOE】

・ In order to strengthen the system to continuously monitor global greenhouse gas concentrations and the water cycle, the government will develop the Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW), and its onboard sensor (Total Anthropogenic and Natural emissions mapping SpectrOmeter-3 (TANSO-3), and the Advanced Microwave Scanning Radiometer 3 (AMSR3)), and aim to launch it in FY2023.

【MEXT, MOE】

・ With the TANSO-3 sensor on the GOSAT-GW, the government will work to identify the source of anthropogenic greenhouse gas emissions and improve the accuracy of emissions estimates, aiming to confirm the implementation of climate change measures by countries around the world in accordance with the Paris Agreement. 【MOE】

・ Regarding the AMSR3 sensor to be installed on GOSAT-GW, after its launch in FY2023, the government will work on understanding water cycle changes, and address new application needs such as an improvement of typhoon track forecasting and uses in coastal

fisheries.

【MEXT】

・ The government will add and refine information on the Renewable Energy Potential System (REPOS) information provision system, and visualize information on renewable energy introduction potential as geospatial information, thereby supporting the formulation of various plans to maximize the renewable energy potential of local governments, etc. 【MOE】

② Contribution to ensuring biodiversity

・ Through the use of the "Ikimono Log (ikilog)," a system that collects and shares nationwide biological information on the Internet, and the Natural Environment Survey Web-GIS, the government will work to develop biodiversity information and provide it as geospatial information. 【MOE】

2. Revitalization of industry and economy

(1) Improving productivity and operational efficiency through digital transformation

[Basic Concept]

The government will promote utilization of satellite data and 3D data, sharing and interconnection among different entities, utilization of remote sensing technology, etc., automation, labor-saving, and efficiency improvements in various operations by utilizing the technology of satellite positioning, navigation and timing, thereby strongly promoting smart industry and economy while taking necessary institutional measures for its implementation in society. In addition, it will promote the efficiency of agency operations and the advancement of administrative services through the development and release of administrative information linked to geospatial information. Through these DX promotions, it will contribute to the revitalization of industry and the economy through increased productivity, while also helping to reduce the environmental burden.

[Main Measures]

・ Efforts will be made to accelerate the on-site implementation of smart agriculture by utilizing digital technologies such as automated driving systems for agricultural machinery using satellite positioning information and growth diagnostics based on sensing data from drones and satellites. Through the above efforts, the government aims to have almost all[6] business farmers utilizing data in their workflow by FY2025. 【MAFF】

・ The Common Geographic Information System of MAFF (eMAFF Map) integrates

[6] Actual results for FY2020: 36.4%

farmland ledgers, etc. with satellite images, crop information, etc. to enable drastic efficiency, labor savings, and advancement in farmland-related operations. With the development of this system and its start of operation in FY2022, the government will increase the online utilization rate of farmland-related administrative procedures to 60% by FY2025, and reduce the work time of applicants and examiners by 30% (compared to FY2019) by FY2028. 【MAFF】

- The feasibility of utilizing remote sensing technology for statistics on crops, etc. will be investigated and verified, and efficient survey methods will be established. By FY2022, the government will also establish a method to create and utilize maps for automated agricultural machinery and drone operations based on coordinate data obtained from agricultural and rural development. 【MAFF】
- Aiming to improve productivity in construction sites by 20% by FY2025 (compared to FY2015), the government will promote i-Construction as part of its efforts to accelerate DX in the infrastructure sector. Specifically, by utilizing ICT and 3D data in all processes of construction production (research/surveying, design, construction, inspection, maintenance/renewal), the government aims to increase the implementation rate of ICT utilized construction works to 88%[7] in the civil engineering works implemented by the national government by FY2025. Also, the government will consolidate accumulated 3D data and other data into the MLIT Data Platform, and expand data distribution and utilization to realize open innovation. 【MLIT】
- The government will promote labor-saving and automation improvements of various airport operation tasks utilizing satellite positioning, navigation and timing by quasi-zenith satellite systems, etc., including the introduction of automatic operations equivalent to Level4 for airport ground support tasks in restricted areas of airports by 2025. 【MLIT】
- The government will develop 3D river maps for all rivers under its control by FY2026, using 3D point cloud data from aerial laser surveying, and utilize them as tools for analyzing the situation and studying countermeasures. 【MLIT】
- With the aim of starting operation in FY2024, the government will establish Land/Real estate Information Library that will allow smooth access to information on land and real estate, such as real estate transaction-price and information on disaster prevention, and reduce the cost of collecting information. Also, it will promote the connection, accumulation, and utilization of real estate-related information through measures such as the sequential implementation of rules for a "real estate IDs" as a common code for each real estate starting in FY2022. 【MLIT】
- The government will continue to promote the development of integrated type of GIS, in

[7] Actual results for FY2020: 81%

which local governments share geospatial information and GIS among multiple departments within the government, such as taxation, urban planning, and disaster prevention, in order to prevent duplication of data, improve the efficiency of internal operations, and further enhance administrative services. 【MIC】

(2) Creation of new services utilizing advanced geospatial information, etc.

[Basic Concept]

In light of the fact that it is becoming possible to acquire and provide a variety of geospatial information, including satellite data and human flow data, the government will promote the creation of new industries and services by providing useful information that utilizes geospatial information, and by supporting the development of solutions that contribute to improving industrial productivity.

[Main Measures]

・ The national government will procure a variety of satellite data in selected regions and load them onto the satellite data platform "Tellus." Based on the needs of local governments and other users, it will encourage the demonstration of businesses using satellite data to solve social issues in the region. This will enable the government to create successful cases and to expand the project horizontally to other local governments, etc.

【METI】

・ Through the Space New Economy Creation Network (S-NET) activities to create new space businesses, the government will support the creation of new businesses and services utilizing satellite data by involving diverse stakeholders such as companies, universities, and individuals who are interested in entering the space field in addition to existing space industries. 【CAO】

・ The government will promote the creation of new services and solutions using satellite data to help solve regional issues, based on the needs of end-users such as local governments. 【CAO】

・ In addition to providing information that contributes to the evaluation of the world's major crop situation using satellite data, the government will study the utilization of satellite data in the fields of agriculture, forestry, and fisheries. 【MAFF】

・ The government will promote the use of open data, including data on human flow that contribute to policy planning in various fields such as tourism, urban development, and disaster prevention, as well as barrier-free data on pedestrian spaces. 【MLIT】

・ Efforts will be made to effectively utilize data obtained from hyperspectral sensors, which have a much higher spectral resolution than conventional resource exploration satellites. To

this end, the government will work on the development of databases and the promotion of research and development and utilization of analysis methods in a wide range of fields, such as resource exploration, environment, agriculture, forestry, and disaster prevention, that take advantage of the characteristics of sensors. 【METI】

3. Realization of comfortable lifestyles

【Basic Concept】

In order to contribute to the development of smart cities that will realize Society 5.0, and to achieve affluent and safe lifestyles utilizing geospatial information, the government will promote social implementation and utilization of services that contribute to improved convenience by utilizing high-precision positional information and 3D data in fields familiar to citizens, such as transportation, logistics, and urban development, while improving the necessary environment, etc.

(1) Realization of efficient transportation and logistics services

[Main Measures]

- Efforts will be made to develop automated driving technology to realize "free mobility and highly efficient logistics," and to promote its practical application. The government will expand the database for automated driving and build a data distribution system to realize driving assistance on general roads (Level2) and automated driving on highways (Level3) by FY2022, and will examine a mechanism for the coordination and utilization of data collected from vehicles, etc. 【CAO】
- Through the dissemination of the "Guidelines for Delivery of Packages by Drones" the government will promote the practical use of delivery services by drones in society, which will contribute to the maintenance of convenience in daily life, such as shopping assistance. 【MLIT】
- The traffic management technology for drones, eVTOLs (electric Vertical Take-Off and Landing), and manned aircraft to operate more safely and efficiently will be developed by FY2025. 【METI】
- In order to realize advanced operation of various types of mobility, the government will enable users to efficiently use various kinds of 3D information in real space. In concrete terms, the government will study a method to input, output, and update data through a universal standard, "3D Spatial ID (Spatial ID)," aiming to establish guidelines for the operation of Spatial ID by FY2022 and standardize the rule of Spatial ID by FY2024. 【METI】
- In light of the seven-satellite constellation of the quasi-zenith satellite system being

established by FY2023, the government aims to improve the positioning accuracy of the Satellite Based Augmentation System (SBAS) using the three geostationary satellites. The upgraded service will be provided from FY2025, increasing opportunities for aircraft to land in low visibility conditions. 【MLIT】

・ Efforts will be made to accurately manage and operate the traffic control information collection and management system, which provides traffic control information as geospatial information to car navigation systems, etc. 【NPA】

(2) Promotion of affluent and safe urban development, etc.

[Main Measures]

① Promotion of urban digital transformation to solve social issues

・ Project "PLATEAU" will be promoted to develop, utilize, and create open data 3D city models that will serve as digital infrastructure for urban digital transformation, including "Smart Cities." In FY2022, the government aims to realize the development of 3D city models and open data in about 100 cities[8], and to develop about 30[9] advanced use cases. Through these efforts, a mechanism will be established for autonomous maintenance, utilization, and open data creation of 3D city models involving the public and private sectors to realize new value creation. 【MLIT】

・ The government will expand the functions of "i-Urban Revitalization" an information infrastructure that links urban information with various information on urban activities to analyze, study, and solve problems. In addition, the use of the infrastructure will be promoted through training programs, etc. 【CAO】

② Underpinning safe living through the use of geospatial information technology

・ In order to respond promptly and accurately to emergency calls from cell phones, etc., a system utilizing satellite positioning, navigation and timing, GIS, etc., will be operated appropriately . 【MIC, MLIT】

・ The effectiveness of traffic regulations and other measures in preventing traffic accidents will be verified, and a system for integrating and analyzing traffic regulations and traffic accident data with GIS will be established to make use of this information for more effective traffic safety measures. 【NPA】

4. Continuous development and enhancement of geospatial information infrastructure

(1) Development and advancement of fundamental geospatial information and

[8] As of January 2022: 56 cities

[9] As of January 2022: 0 (reference) Actual number of use cases developed in FY2020: 44

promotion of GIS

[Basic Concept]

It is critical to continue to develop basic geospatial information such as Fundamental Geospatial Data, which have been addressed since the first Basic Plan, to implement the measures listed in Sections 1 through 3 above. The government will steadily develop, update, maintain, manage and upgrade geospatial information to ensure that it does not become obsolete with the passage of time and that the value of its use does not decline, while promoting the provision of geospatial information that meets various needs for utilization through web maps, etc., and the development of GIS.

[Main Measures]

① Development, updating, maintenance and management, and upgrading of fundamental geospatial information

- The government will maintain and manage the standards for high-precision national land location based on Very Long Baseline Interferometry (VLBI) observations, and provide stable operation and upgrading of GEONET, thereby steadily developing and providing geospatial information based on national coordinates. 【MLIT】
- The Digital Japan Basic Map is designated as a base registry for various public and private sector mapping services. The government will continuously develop and update map information including Fundamental Geospatial Data (FGD), ortho image, place name information, etc., which is the standard for locations on these electronic maps. Also, efforts will be made to make information more sophisticated, including multilingualization, elaboration, and three-dimensionalization. 【MLIT】
- The government will steadily establish, maintain and manage control points on remote islands and continue to maintain the Digital Japan Basic Map that covers the entire territory of Japan, as well as develop nautical charts that reflect seafloor topography, etc. through continuous hydrographic surveys using survey vessels, etc., for the accurate delineation of Japan's territory, territorial waters, etc., as well as to ensure navigational safety and secure sovereignty and maritime interests. 【MLIT】
- Development of new vertical reference using aerial gravity surveying will be completed by FY2024 to provide high-precision elevation data to the general public. In addition, the government will continue to develop 3D point cloud data that can be used to develop 3D maps by utilizing aerial laser surveying, etc. In particular, approximately 110,000 km^2 of area with high risk of disasters such as the Nankai Trough Major Earthquake will be developed[10] by FY2025. 【MLIT】

[10] Development starting in FY2021

・ In order to construct a land surface deformation model for managing national coordinates, the government will work on the advancement of space geodetic techniques to measure surface deformation caused by earthquakes, etc., conduct research and development to improve the spatial resolution of measurements to several hundred meters[11] and shorten the measurement time to several weeks[12], etc. 【MLIT】

・ The government will work to develop technologies to streamline and automate the development of fundamental geospatial information, including the automatic extraction of geographic features from images using AI with the goal of automatically creating high-precision maps. 【MLIT】

・ In order to contribute to the continuous development and provision of Fundamental Geospatial Data, the government will demonstrate the utilization of earth observation satellite data in cooperation with relevant ministries and agencies. 【MEXT】

・ In order to properly grasp the actual condition of the national land, the following targets are established: the development of satellite imagery of national forests, updating of map information approximately every five years, and achieving a 57%[13] progress rate in cadastral surveys for the entire target area by 2029. Based on these goals, efforts will be made to steadily promote the maintenance of the land registry and registry office designated maps. 【MOJ, MAFF, MLIT】

・ The performance of GNSS continuous observation stations installed by private companies will be evaluated and registered as GNSS CORSs in the private sectors. This will promote the distribution of reliable GNSS observation data that conforms to national coordinates and its appropriate use for specific purposes. 【MLIT】

② Promotion of GIS development

・ The government will provide highly reliable and fresh geospatial information, such as the Digital Japan Basic Map designated as a base registry, on a continuous basis. In addition to the tile format, the next-generation standard format, vector tile format, will also be made available. 【MLIT】

・ For the purpose of the efficient implementation of the ocean policies and the Maritime Domain Awareness in Japan, the government will enrich the contents and enhance the functions of the MDA Situation Indication Linkages(MSIL), which contributes to aggregating, sharing and distributing the various maritime information collected by the government agencies etc. 【MLIT】

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[11] Spatial resolution as of January 2022: 20 km
[12] Measurement time as of January 2022: several months
[13] As of the end of FY2020: 52%

・ In order to improve the efficiency and speed of various administrative operations and increase industrial productivity, the government will use web mapping technology, etc. to understand and provide geospatial information on the land use, forest resources, fishery resources, economic and social information such as statistical information, and geospatial information on the environment such as soil, water quality, and air quality.

【MIC, MOF, MAFF, MLIT, MOE】

・ The government will improve and streamline the services of the Geospatial Information Library, which allows users to comprehensively search, obtain, and use geospatial information such as survey results from national and local governments, while ensuring its sustainable operations. 【MLIT】

(2) Promotion of the development of the quasi-zenith satellite system, etc.

[Basic Concept]

Japan's own system for satellite positioning, navigation and timing, the quasi-zenith satellite system, started its formal service with the four-satellite constellation in 2018, and launched its successor in 2021. As an important social infrastructure that provides positional and time information indispensable for the realization of a G-Spatial Society, the government will continue to aim to establish the seven-satellite constellation that enables sustainable positioning and steadily provide the service. Also, the government will study the ideal system for satellite positioning, navigation and timing in Japan from a medium-to long-term perspective in order to maintain and improve the positioning capability of the quasi-zenith satellite system.

[Main Measures]

・ While steadily providing position and time information services by the quasi-zenith satellite system, the government will develop and maintain No. 5, 6, and 7 satellites and their ground systems in order to establish the seven-satellite constellation[14] of sustainable positioning by FY2023. The government will study, develop, and maintain the successors of the quasi-zenith satellite system (QZSS) to maintain and improve the sustainable positioning capability of the QZSS, while strategically and continuously promoting the advancement of positioning technology, such as improving the accuracy and reliability of the system and enhancing its resilience. 【CAO】

・ Efforts will be made to share issues and promotion measures for the use of positioning data in the public and private sectors. Including automated driving, the government will work on demonstration projects in various fields of people's lives and economic activities, such as

[14] As of January 2022: Four-satellite constellation system

agriculture, transportation and logistics, and construction, to further accelerate the implementation in the society through the creation of advanced utilization models. 【CAO】

(3) Promotion of geospatial information distribution and utilization

[Basic Concept]

Allowing a wide variety of geospatial data to be interconnected and promoting the openness of data will promote the creation of new information and new value. To this end, the government will promote the use of data platforms that allow users to easily access information, and develop mechanisms and rules for the distribution and utilization of geospatial information, taking into consideration the accuracy, reliability, versatility for mutual use, and safety of geospatial information.

[Main Measures]

① Promotion of geospatial information distribution and utilization led by the G-Spatial Information Center

・ The G-Spatial Information Center functions as an infrastructure to facilitate the search, acquisition, and use of geospatial information, such as maps, images, and statistics, and allows various entities that utilize public and private data to collaborate with each other. This facility should be further utilized and promoted. To this end, the government will promote collaboration with 10^{15} data platforms by FY2026 through APIs, etc., with the aim to form a circulating system for geospatial information that creates new valuable data and services through analysis and processing of shared and aggregated data. 【MLIT】

② Development and operation of standards and rules for the development, distribution, and utilization of geospatial information

・ In order to ensure the accuracy and reliability of geospatial information services enabled by utilizing high-precision positioning, the government will establish a system for crustal deformation transformation by FY2024 that will allow easy use of positional information consistent with national coordinates anywhere in Japan, aiming to promote use of crustal deformation transformation services in four or more areas[16] by FY2025. 【MLIT】

・ Technical support for public surveys conducted by local governments will be provided to promote the development and distribution of geospatial information with ensured accuracy. The government will promote the efficient development and use of geospatial information

[15] As of January 2022: 5 cases
[16] As of January 2022: 1 field

by: (i) Working on the development of international standards for geospatial information at the International Organization for Standardization (ISO); (ii) Continuing participation in the study of the development of Japanese Industrial Standards (JIS) in Japan; and (iii) Making timely revisions to the Japan Profile for Geographic Information Standards (JPGIS), which is systematized based on the latest ISO standards and JIS.

【MLIT】

・ Regarding the assurance of national security, protection of personal information, protection of intellectual property rights, etc., the government will develop rules and regulations based on the advancement of geospatial information, progress in the use of positional information, and the needs of the private sector for open data and secondary use. From the viewpoint of ensuring national security, the government will study the necessary rules and measures to prepare for the risk of data misuse, etc., and realize the orderly distribution and utilization of geospatial information based on the technological progress of geospatial information and the increased frequency of satellite imaging.

【CAS, relevant ministries and agencies】

(4) Overseas development and international contributions of geospatial information infrastructure

[Basic Concept]

Through active participation in the international standardization of geospatial information, etc., efforts will be made to contribute to the development of a global geospatial information infrastructure and advancing its utilization. Furthermore, the government will promote the overseas development of high-precision positioning augmentation services, etc. using Japan's unique quasi-zenith satellite system, mainly in the Asia-Pacific region, to promote private-sector investment and enhance Japan's presence in the international community.

[Main Measures]

① Contribution to the development of a global geospatial information infrastructure and advancing the utilization

・ Government will make technical contributions through participation in the ISO's work to develop international standards for geospatial information, through the technology transfer necessary for accurate latitude and longitude measurements towards the realization of the Global Geodetic Reference Frame (GGRF) as resolved by the United Nations General Assembly, and through support for the establishment of GGRF with the services such as the International VLBI Service for Geodesy and Astrometry and the International GNSS Service in response to the efforts of the United Nations Committee of Experts on Global

Geospatial Information Management (UN-GGIM), etc. 【MLIT】

・ The government will actively engage in international activities to establish and develop the Global Earth Observation System of Systems (GEOSS), an information infrastructure that aims to share earth observation data and geospatial information acquired by each country and create information that contributes to policy making, etc., aiming to achieve 1.2 billion data entries[17] in the common infrastructure by FY2025. 【MEXT】

・ The Data Integration and Analysis System (DIAS) is a system that accumulates global-environment Big Data that contributes to solving global-scale issues. By operating this system stably and over the long term, the government aims to contribute to the resolution of global issues such as climate change countermeasures and disaster prevention, as well as to the decision-making of national and local governments and corporations regarding climate change countermeasures, and to achieve the number of 10,000 DIAS users[18] by 2030. 【MEXT】

・ Through human resource development programs for international space development and utilization, human resources that can conceptualize and plan the utilization of geospatial information on an international scale will be developed. 【MEXT】

② Support for the development of a geospatial information infrastructure and advancing the utilization in the Asia-Pacific region

・ While promoting the development, distribution, and use of GNSS data in the Asia Pacific region through participation in the Asia Pacific Regional Reference Frame (APREF), the government will support the development of basic infrastructure for the Geodetic Reference Frame in the Asia-Pacific region. 【MLIT】

・ The government will develop a system for operation of Multi-GNSS Advanced Orbit and Clock Augmentation-Precise Point Positioning (MADOCA-PPP) and disaster/crisis management reporting service in the Asia-Oceania region, and promote overseas development of such services through Multi-GNSS Asia (MGA), etc. Also, the government will conduct demonstration projects utilizing the MADOCA-PPP, etc. in various fields such as agriculture and forestry, and provide support for overseas deployment of applications by the private sector, etc. using the quasi-zenith satellite system. 【CAO, MIC】

・ Regarding a geospatial information infrastructure in the field of surveying, including GNSS CORS networks, while taking into account the requests and needs of partner countries, mainly countries in the Asia-Pacific region, the government will implement technical contributions to support its construction, advanced operation and maintenance,

[17] As of November 2020: 1.17 billion
[18] As of March 2021: 7,960

etc., and thereby contribute to the overseas development of various applications that will help solve problems in the partner country. 【MLIT】

・ In developing countries in Asia, a pilot project is being implemented to develop agricultural foundational data based on farmland parcels using satellite imagery with attribute information such as land numbers, and others. This project will contribute to the private sector related to agriculture for through the introduction of smart agriculture, etc. in developing Asian countries, which are large markets of the agricultural infrastructure development, and the agricultural production and consumption. 【MAFF】

・ The government will support disaster response in Asian countries by promoting the Sentinel Asia Project, which provides earth observation satellite imagery superimposed on map data, etc. via the Internet to share disaster-related information. 【MEXT】

5. Comprehensive measures to promote the development and utilization of geospatial information

[Basic Concept]

In order to create various services that maximize and utilize the potential of geospatial information in various fields such as disaster prevention, economy, and daily life, and to develop the necessary geospatial information infrastructure, the government will work to solve various issues related to the utilization of geospatial information through the Committee for Advancing the Utilization of Geospatial Information and working groups established thereunder, and strengthen coordination and cooperation among national and local governments, as well as industry, academia, government, and the private sector.

Also, in order to develop human resources who will lead the next generation G-Spatial Society and to create use cases in various fields, including those where geospatial information has not been fully utilized, the government will work with industry, academia, and the private sector to organize various events and actively disseminate information, while also involving the communities in surrounding fields.

Aiming for new developments in the use of geospatial information, the government will strategically promote research and development in collaboration with the Council for Science, Technology and Innovation, working on the verification and effective dissemination of research results, and establishing a mechanism to facilitate implementation in the society.

(1) Strengthening the promotion system and collaboration among related entities

[Main Measures]

・ The government will hold meetings with national and local governments in charge of geospatial information in each region nationwide, as well as industry-academia-government

conferences, to promote collaboration that brings together a diverse range of human resources to meet the various needs of local communities, and facilitate the efficient and effective development and utilization of geospatial information, such as Fundamental Geospatial Data, through industry-academia-government collaboration. 【MLIT】

(2) Promoting knowledge dissemination and human resource development, etc.

[Main Measures]

① Dissemination of knowledge by holding exchange events and publicity through the Internet, etc.

・ In cooperation with industry, academia, and the private sector, the government will hold seminars on the effectiveness of the use of geospatial information and the latest technological trends, lectures and symposiums that contribute to the creation of new industries and services, and the Geospatial EXPO, an exhibition of new products and services, thereby promoting the utilization of new technologies that utilize geospatial information and raising public awareness. 【CAS, MLIT】

・ The government will commend the best practices of original ideas, groundbreaking technologies, and new services related to geospatial information, and promote the dissemination of such practices. 【MLIT】

② Nurturing human resources related to geospatial information

・ The government will hold a competition to discover innovative ideas and skills that are not bound by the existing geospatial information domain, and to bring engineers from other fields into the geospatial information field, in order to ensure the discovery of new value in geospatial information and the identification and cultivation of human resources capable of commercializing such information. 【CAS】

・ The government will continuously promote and educate government officials involved in surveying related work on surveying technology, including new technologies such as unmanned aerial vehicles, in order to improve administrative efficiency and ensure the distribution of accurate geospatial information. 【MLIT】

・ In light of the subject of geography, which will become a compulsory subject in FY2022, provided by High School Courses of Study (notified in 2018), and the recent drastic increase in the number of natural disasters, the government will support those involved in geography-related education and the use of geospatial information in the field of disaster prevention by enhancing educational support contents, etc., thereby contributing to the development of human resources that will support the improvement of local disaster prevention capabilities and the next generation G-Spatial Society. 【MLIT】

・ The government will promote the Regional Economy Society Analyzing System (RESAS), etc., through training programs for those in charge of regional development, etc., and develop human resources that can formulate appropriate policy and make management decisions based on geospatial information and other data. 【CAO】

6. Priority measures (Symbolic projects)

In order to strategically promote efforts toward the realization of a G-Spatial Society, the government will focus on the following measures to accelerate implementation in the society and effectively disseminate the results under the collaboration of industry, academia, government, and the private sector.

① Promoting the construction of an integrated G-spatial disaster prevention and mitigation system (1. (1))

The implementation in the society of G-spatial disaster prevention technology that makes advanced use of geospatial information on disaster prevention possessed and collected by the national and local governments will be promoted. This will enable rapid and accurate information sharing of diverse data and appropriate responses to ever-changing conditions throughout each stage of the disaster management, thereby protecting the lives of citizens and the livelihoods and economies of local communities from the increasingly severe and frequent disasters in recent years.

To this end, the government will designate and provide data on inundation risk areas for small and medium-sized rivers, and reorganize the roles and modalities of the Integrated Disaster Prevention Information System, which shares disaster prevention information collected by ministries and agencies. New systems will be also constructed to enable information aggregation, processing into map information, and provision to disaster response organizations. Furthermore, the information distribution of the disaster/crisis management reporting service by the quasi-zenith satellite system will be expanded, and the information collection function of the QZSS Safety Confirmation Service (Q-ANPI) will be enhanced. It will also conduct verification observations to establish observation technology with the world's highest resolution through the development of Next-generation airborne synthetic aperture radar, which will contribute to the prompt understanding of disaster situations. Through these efforts, the government will strengthen collaboration among ministries and agencies, as well as among industry, academia and government, for initiatives that make use of G-spatial disaster prevention technology.

[KPI: Enhancement of the data on inundation risk areas provided via the Hazard Map Portal site to approximately 17,000 (FY2026) (number of data as of January 2022: 1,548)]

[KPI: Expansion of information distributed by the disaster/crisis management reporting service using the quasi-zenith satellite system (for FY2023) (status as of January 2022: under development and maintenance)]
[KPI: Launch of operation of the No. 7 quasi-zenith satellite with (QZSS Safety Confirmation Service (Q-ANPI)) functions (by FY2023) (status as of January 2022: under development and maintenance)]
[KPI: Establishment of surface observation technology with a resolution of 15 cm using Next-generation airborne synthetic aperture radar (FY2025) (resolution of the surface as of January 2022: 30 cm)]

【CAS, CAO, MIC, MLIT, relevant ministries and agencies】

② Contributing to the solution of global-scale issues such as climate change etc. using earth observation satellites (1. (2)(i))

The government will develop and utilize space systems for environmental and earth observation based on utilization needs, and improve disaster prevention and post-disaster response capabilities. In cooperation with the international community, it will contribute to solving global-scale issues and achieving the SDGs through proactive provision of data.

Specifically, for the purpose of improving climate change prediction and monitoring greenhouse gases to address climate change issues, the following satellites will be operated: Greenhouse Gases Observing Satellite "IBUKI" (GOSAT), IBUKI-2 (GOSAT-2), Global Change Observation Mission-Climate "SHIKISAI" (GCOM-C), and Global Change Observation Mission-Water "SHIZUKU" (GCOM-W). The government will provide the data to relevant domestic and foreign organizations and promote its utilization.

Furthermore, a Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW) will be launched in FY2023, which will be able to observe widely and precisely. By strengthening these efforts, the government aims to enhance Japan's presence in the field of climate change.

[KPI: Number of GCOM-C observation data provided: 16 million scenes or more (FY2022) (average number of scenes provided from FY2018 to FY2020: approx. 12.3 million), number of GCOM-W observation data provided: 12 million scenes or more (FY2022) (average number of scenes provided from FY2018 to FY2020: approx.10.8 million)]
[KPI: The total number of cases in developing countries, etc., that refer to GOSAT-GW and other earth observation satellite data from Japan for preparing inventory reports and calculating various greenhouse gas emissions assessments: approx. 6 cases (FY2026) (total number of cases in countries that refer to the GOSAT series to prepare inventory reports and calculate greenhouse gas emissions assessments until January 2022: 1)]

【MEXT, MOE】

③ Promoting utilization of digital technology, including acceleration of smart agriculture (2. (1))

Amid the aging of farmers and labor shortages, digital technology will accelerate the onsite implementation of smart agriculture, which will realize highly efficient farming production and promote the transformation of agriculture into a growth industry and regional revitalization.

To this end, the government will accelerate the implementation of smart agriculture in the field, utilizing digital technologies such as automated driving systems for agricultural machinery and growth diagnostics based on sensing data from drones and satellites. Also, the development of the Common Geographic Information System of MAFF (eMAFF Map), which integrates information such as farmland ledgers, satellite imagery, and crop information, will be promoted and put into operation in FY2022 to drastically improve the efficiency, labor savings, and sophistication of farmland-related operations.

[KPI: Almost all farmers utilizing data in their workflow. (FY2025) (actual result in 2020: 36.4%)]

[KPI: Increasing the online usage rate of farmland-related administrative procedures to 60% through the use of eMAFF Map. (FY2025) (eMAFF Map is under development, aiming to start operation by the end of FY2022)] 【MAFF】

④ Promoting the utilization of 3D data through the promotion of i-Construction (2. (1))

Aiming to improve productivity in construction sites by 20% by FY2025 (compared to FY2015), the government will promote i-Construction as part of its efforts to accelerate DX in the infrastructure sector. Specifically, ICT, etc. shall be utilized in all processes of construction production (research/survey, design, construction, inspection, and maintenance /renewal). The government will gradually expand the application of Building/ Construction Information Modeling, Management (BIM/CIM) in principle to all public works except small-scale projects from FY2023. Aiming to utilize 3D data for public works that is accumulated through the full utilization of ICT, the government will expand the distribution and utilization of 3D data through the development of the MLIT Data Platform, the creation of open data, and the consolidation of information in the G-Spatial Information Center.

[KPI: Implementation rate of ICT utilized construction works implemented by the national government: 88% (FY2025) (actual performance in FY2020: 81%)] 【MLIT】

⑤ Project to promote satellite data utilization (2. (2))

With the aim of commercializing three satellite data solutions by FY2026, the national government will procure selected satellite data in multiple regions and load them onto the satellite data platform "Tellus." In the region, based on the needs of local governments and other users (marine monitoring, infrastructure management, disaster prevention and mitigation, etc.), it will encourage the demonstration of businesses that use satellite data to solve social issues. The successful cases created by this project will be horizontally disseminated to other local regions, etc.

[KPI: Commercialization of three satellite data-based solutions (FY2026) (number of solutions developed using satellite data on Tellus by January 2022: 3 cases)] 【METI】

⑥ Promoting the development and diffusion of automated driving systems (3. (1))

In order to solve social issues such as the lack of means of transportation in depopulated areas with aging populations and the shortage of drivers in the logistics industry, the government aims to realize a society where driving assistance and automated driving using data distribution are realized and widespread through implementation in society from FY2023 onward.

To this end, the government will expand the database for automated driving and build a data distribution system to realize driving support on general roads (Level2) and automated driving on highways (Level3), while studying a mechanism for the coordination and utilization of data collected from vehicles and other sources.

[KPI: Expansion of the data base for automated driving and construction of a data distribution system to realize driving assistance on general roads (Level2) and automated driving on highways (Level3) (FY2022) (as of January 2022: Demonstration experiments on the effectiveness of data distribution and issues for implementation in the society have been conducted)] 【CAO】

⑦ Developing 3D spatial information infrastructure including "Spatial ID" (3. (1))

Aiming to achieve 5 million operations of various types of mobility per a year using 3D spatial information infrastructure, the government will digitalize real-time information such as various kinds of 3D geospatial information, weather condition and traffic condition and develop digital infrastructure as a foundation for efficiently distributing various types of real time information in machine-readable forms for enabling autonomous vehicles, drones, and autonomous delivery robots, etc. to monitor the operating environment, decide routes in real time and achieve other advanced operations, and developing maps and infrastructure as the basis of those mobility efficiently.

In concrete terms, the government will make various data in real space more shared and utilized by organizing necessary data standards, including “3D Spatial ID (Spatial ID),” which uniquely identifies positional information in real space on universal basis and studying the development of digital infrastructure to control real-world movements of mobility through data input, output, and update, considering the trends of domestic and international standards for geospatial information.

[KPI: Establishment of guidelines for the operation of "Spatial ID" (FY2022) (project began in FY2021)]

[KPI: Standardization of “Spatial ID” (FY2024) (project began in FY2021)]

【METI】

⑧ Project for development, utilization, and open data creation of 3D city models "PLATEAU" (3. (2)(i))

3D city models that reproduce the urban space itself in cyberspace will be developed as a new digital infrastructure. Then, use cases will be developed in various fields such as smart city planning, disaster prevention, mobility, etc., utilizing these models. Through these efforts, a mechanism will be established for autonomous maintenance, utilization, and open data creation of 3D urban models in cooperation between the public and private sectors to realize new value creation.

[KPI: Realization of 3D city models and creation of the open data in about 100 cities (FY2022) (number of cities as of January 2022: 56 cities)]

[KPI: Development of about 30 advanced use cases of 3D city models (FY2022) (number of advanced use cases developed as of January 2022: 0 case. Reference: Number of use cases developed in FY2020: 44 cases)] 【MLIT】

⑨ Promotion of "national coordinates," a common infrastructure of positional information indispensable in the era of high-precision positioning (4. (1)(i), 4. (3)(ii))

Efforts are rapidly advancing in the field of DX, such as i-Construction, smart agriculture, automated driving, and smart cities, that utilize highly accurate and real-time satellite positioning, navigation, and timing. In order to achieve mutual consistency of positional information used in all DX initiatives, including the above, and to facilitate data linkages between systems and services, and ultimately lead to the development of industry, the government will create an environment in which anyone can easily develop and use three- and four-dimensional geospatial information that conforms to "national coordinates," a set of common rules for ensuring the consistency of the positional information.

To this end, the government will promote the appropriate operation of GEONET, promotion

of the registration system for GNSS CORSs in the private sectors, improvement of the accuracy of the crustal deformation transformation system and its stable operation, establishment of new vertical reference etc., and distribution of highly reliable positional information. In addition, the development of standards and 3D point cloud data, which are indispensable for the realization of the digital twin, will be promoted as the basis for the creation of 3D maps.

[KPI: Performance evaluation of approximately 3,000 GNSS continuous observation stations installed by private companies, etc. (FY2026) (number of evaluations as of January 2022: 75)]

[KPI: Development of approximately 110,000 km^2 of 3D point cloud data that can be used for the development of 3D maps (FY2025) (development started in FY2021)]

【MLIT】

⑩ Promotion and development of the Quasi-Zenith Satellite System (QZSS) and improvement of its positioning capability (4. (2), 4. (4)(ii))

Regarding the quasi-zenith satellite system, which is an important social infrastructure to provide positional information and time information indispensable for the realization of the G-Spatial Society, the government aims to establish the seven-satellite constellation of sustainable positioning.

To this end, the government will steadily proceed with the development and maintenance of No. 5, 6, and 7 satellites as well as ground facilities that support improved functionality and performance. In addition, it will start practical services for the overseas Multi-GNSS Advanced Orbit and Clock Augmentation-Precise Point Positioning (MADOCA-PPP), expand the information distribution by the disaster/crisis management reporting service, develop the system for official operation in the Asia-Oceania region, and improve the signal authentication function to prevent spoofing of the positioning signals.

In order to maintain and improve the sustainable positioning capability, the system configuration including functions, performance, and number of satellites after the successors of No. 2, 3, and 4 satellites will be studied.

[KPI: Establishment of the seven-satellite constellation of the quasi-zenith satellite system (by FY2023) (current system as of January 2022: four-satellite constellation)]

[KPI: Launch of MADOCA-PPP services for practical purposes (by FY2024) (status as of January 2022: under development and maintenance)]

[KPI: Launch of official operation of the disaster/crisis management reporting service in the Asia-Oceania region (by FY2025) (current status as of January 2022: under development and maintenance)]

[KPI: Launch of official operation of the signal authentication function (by FY2024) (status as of January 2022: under development and maintenance)] 【CAO】