Basic Plan for the Advancement of Utilizing Geospatial Information

(Provisional English Translation[*])

Cabinet Decision

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Contents

Preamble

An opportunity has come for Japan to make a big leap for the utilization of geospatial information.

Aiming for the utilization of geospatial information, the government formulated the Basic Plan for the Advancement of Utilizing Geospatial Information (hereinafter referred to as the "Basic Plan") for the 1st term in April 2008, and the 2nd term in March 2012, based on the Basic Act on the Advancement of Utilizing Geospatial Information that was enacted in 2007 (Act No. 63 of 2007). By developing the fundamental map information, and conducting development, experimentation and verification of the first quasi-zenith satellite “Michibiki”, the government has been developing Japan's own positioning bases so as to build a foundation for utilizing geospatial information. Further, basic acts that have close relevance to the advancement of the utilization of geospatial information, including the Aerospace Basic Act (Act No. 43 of 2008), the Basic Act on Ocean Policy (Act No. 33 of 2007) and so on, has been developed.

Currently, with the progress of information technology, the wave of the Fourth Industrial Revolution is about to come wherein Internet of Things (IoT) enables various types of information to be gathered and accumulated instantaneously as big data, then processed and utilized at a high level by artificial intelligence (AI). Under these circumstances, Japan's four-satellite constellation of the quasi-zenith satellite system will begin operation on a full-scale in 2018, enabling centimeter-level positioning and two-way communication in real-time. In addition, G-Spatial Information Center which began operation in 2016 will become the central hub of the circulation and utilization of geospatial information, enabling sharing and integration of enormous amount of information. Along with the dramatic progress of technologies that make use of such geospatial information, geospatial information should become the key to realizing the Fourth Industrial Revolution. Further, the Olympic and Paralympic Games Tokyo 2020 scheduled to be held in 2020 is a great chance for Japan to promote the advanced utilization of geospatial information to the outside world, to expand new business opportunities and to make international contributions.

The third Basic Plan, with the next five years as the implementation period, aims to realize a new society where each person can perceive "growth" and "happiness", with geospatial information utilization technology being placed as the front runner of the Fourth Industrial Revolution. Its goal is to realize the world’s highest level of “Advanced Geospatial Information Utilization Society" (G-Spatial Society) with a focus on the advanced utilization of geospatial information in a wide range of fields such as disaster prevention, transportation/logistics, living environment, regional revitalization, and exports of technologies. In order to implement advanced utilization of geospatial information in society, the government will work on the establishment of a common base in collaboration with industry, academia, government and citizens, and the development of an environment in which anyone can participate in

and make use of geospatial information, so as to realize new growth through free competition.

Part 1 Basic policy on the measures to advance utilization of geospatial information

1. Recognition of the policy related to the advancement of utilizing geospatial information

(1) "When, Where, What and How" - Geospatial information is a source of innovation

The IoT where various types of information is connected with things via the Internet has dramatically spread, and the wave of the "Fourth Industrial Revolution" in which new industries and services emerge one after another by utilizing big data and AI is surging. In the world, efforts are being made by maximizing the use of information and communication technology (ICT) in the field of manufacturing, for example, Germany's "Industry 4.0", while in Japan, realization of "Super Smart Society" that combines cyberspace and the real world has been actively promoted under the name of "Society 5.0", at the same time, efforts have been made to disseminate the "Fourth Industrial Revolution" throughout Japan.

One of the keys and the sources of innovation to realize this new society, is geospatial information which consists of the location, time, and related information, in specific, when, where, what, and in what state. With the rapid popularization of smartphones and the like, and the significant advances of navigation and search services using maps, geospatial information will make our lives dramatically convenient, which include the mobility of the elderly and disabled persons.

Geospatial information such as three-dimensional map information and highly precise Satellite Positioning, Navigation and Timing (hereinafter referred to as “Satellite PNT”) information is indispensable for automated driving of automobiles which private business operators of various countries are competing for the development, and the governments of the respective countries are also working on the development of an environment toward the realization of automated driving system.

New knowledge will be created by overlaying and analyzing the enormous amount of geospatial information all over the country on the human flows, logistics, conditions of the infrastructure and the like that was gathered by IoT, and in turn, new products or services may be created through the integration of different events which had never been assumed at all in the past. Creation of new industries and new services will also lead to the expansion of employment, improvement of the level of income, and the creation of new ways of working, thereby contributing to the realization of the Society of Dynamic Engagement of All Citizens which allows everyone to play an active role.

(2) Dramatic improvement of circulation and utilization of geospatial information - Establishment of a four-satellite constellation of the quasi-zenith satellite

system and a full-scale operation of G-Spatial Information Center

Moving forward, utilization of geospatial information will be dramatically improved by the following two factors:

One is a dramatic improvement of Satellite PNT services. With regard to Satellite PNT, US satellite Global Positioning System (GPS) has been complemented and augmented by our first quasi-zenith satellite that was launched in 2010, and the provision of more precise positioning services to the public has been demonstrated. Meanwhile, the operation of highly precise positioning service of centimeter-class is set to begin in real time 24 hours nationwide through the establishment of the four-satellite constellation of the quasi-zenith satellite system to be scheduled for 2018. In addition, the establishment of a seven quasi-zenith satellite constellation, which is aimed to be attained by 2023, will make it possible for sustainable positioning to be achieved without depending on GPS. In this way, the infrastructure of society where geospatial information is highly utilized is expected to be solidified.

The other element is a full-scale operation of G-Spatial Information Center. G-Spatial Information Center, which began its operation in 2016, assumes the core of the G-Spatial Society as infrastructure of collaboration among industry, academia, government and citizens. Its objective is to build a mechanism that allows anyone to search and obtain information easily and smoothly at any time by gathering geospatial information developed by each entity and then processing and converting such geospatial information to that with higher utility value. With the establishment of the four-satellite constellation of quasi-zenith satellite in 2018, various services utilizing highly accurate and real-time geospatial information will be developed. G-Spatial Information Center will provide information to support such services. At the same time, by receiving feedback of the data generated out of various services, more diverse geospatial information with higher quality, higher accuracy and higher freshness will be accumulated in G-Spatial Information Center, which will be utilized by a wide variety of entities.

In this way, the circulation and utilization of Japan's geospatial information will be dramatically improved by the two elements as mentioned above.

(3) New industries and new services created one after another from geospatial information

In a society where the circulation and utilization of geospatial information have dramatically improved, new industries and new services are created one after another by overlaying geospatial information and linking various types of information with the locations and the times.

With the development of the quasi-zenith satellite system, signals to augment GPS are constantly transmitted, which will enable highly precise centimeter-level positioning throughout the country by using dedicated receiving equipment. As a result, for example, it will become possible to

commoditize automated driving assisting devices of high accuracy and low price for farm equipment or automated driving systems for farm equipment within the farm field ahead of the rest of the world; thereby the competitiveness of Japan's agriculture will be enhanced. Furthermore, even at the gaps between buildings in urban areas and mountainous areas, complemented/augmented signals will always be received from any of the quasi-zenith satellites above in the sky, which is expected to contribute to the stable realization of automated driving of automobiles in the central areas of cities or in the hilly and mountainous areas.

Mobile terminals, including wearable terminals are expected to become increasingly sophisticated, smaller and widely popularized. Geospatial information on not only outdoors but also inside various facilities will be provided, thereby everyone, including the elderly and disabled persons can move both indoors and outdoors easily and seamlessly as well as throughout the country. Geospatial information will become fundamental and indispensable infrastructure that makes our lives more convenient.

Furthermore, an advanced utilization of geospatial information is expected in the hilly and mountainous areas, etc. where declining population and regional vitality have become a concern. Innovative technology, including a service where goods are delivered to residents automatically by small unmanned aerial vehicle, smart agriculture that enables super energy-saving and high-quality production, smart forestry that enables stable production by making use of highly accurate forest information, is expected to be introduced. In this way, such technology will contribute to the regional revitalization by preserving and utilizing the abundant natural environment, improving the convenience of lives and the vitality of the region while making up for the labor shortage at low cost.

(4) Geospatial information that saves each person's life from a disaster

In addition to such utilization of geospatial information in ordinary time, geospatial information will be of great use in the event of a disaster.

The Great East Japan Earthquake in March 2011 was an unprecedented catastrophe that caused damages in extensive areas, but immediately after the disaster stuck, various types of geospatial information, including that on the tsunami inundation situation, were used in the activities of initial response and emergency measures. In the recovery and reconstruction phases, too, support has been provided for the rebuilding and community development efforts through the provision of fundamental map information, promotion of cadastral surveying in coordination with the reconstruction projects, designation of inundation risk areas, and so on. While in the Tokyo metropolitan area, many people faced difficulty returning home and heavy traffic occurred, but information on the state of confusion in the wake of the disaster was collected and accumulated as big data via location information from mobile phones as well as driving data from car navigation systems, which was then utilized for analysis and visualization of disaster information by various

entities.

Furthermore, in the 2016 Kumamoto Earthquake in April 2016, the earthquake disaster situation was modeled as three-dimensional forms using the geospatial information recorded by small unmanned aerial vehicle operated by Geospatial Information Authority of Japan and other organizations. Also, there were attempts to bring geospatial information on the disaster situations gathered and processed by various entities consisting mainly of citizens and corporate volunteers, together on one portal site, and those to provide it to the public.

It is expected that geospatial information will make post-disaster measures more efficient through the visualization of various aspects caused by disasters in extensive areas. In respect of various types of information owned by local governments and other organizations that contain personal information and the utilization of which as geospatial information is assumed, it is desirable to consider mapping and digitization of such information, so that it can be utilized smoothly in disaster or emergency situations. Furthermore, there are expectations that geospatial information can be utilized increasingly in disaster prevention fields because geospatial information can contribute to the disaster prevention and mitigation measures prepared beforehand, including identification of disaster risks through various simulations.

Information on where the people are evacuating in need of emergency response such as rescue and lifesaving; whether food and medicines are sufficiently available; whether the transportation infrastructure such as the roads leading to the evacuation center is damaged; who is conducting first aid activities and where; strongly needs to be integrated on a common map and shared by stakeholders involved in initial responses and emergency measures, including not only the government but also the private sector. If initial responses and emergency measures are conducted more quickly and effectively through the utilization of geospatial information, more lives can be saved, and it can be connected to early recovery and reconstruction activities.

In addition, by using the new message function of the quasi-zenith satellite, for example, in the event of a disaster, it becomes possible to transmit disaster information to the receiver installed on a guide board and the like via the satellite, or to transmit individuals' safety information to the disaster prevention organization via the satellite from the evacuation center by a communication terminal, thereby initial responses and emergency measures are expected to be further improved.

Geospatial information will strengthen national resilience in intangible aspects and save each citizen from disaster, thus becomes the vital information infrastructure.

(5) Making use of the Olympic and Paralympic Games Tokyo 2020 to showcase the G-Spatial Society

In 2020, the Olympic and Paralympic Games Tokyo 2020 will be held and a number of overseas visitors will come to Japan. The host city, Tokyo and eventually the entire Japan will be

gaining more attention worldwide. This can be a great opportunity for Japan to showcase our society where geospatial information is highly utilized, at the same time to disseminate the potential of geospatial information to the world. By taking advantage of this opportunity, Japan will further attract world's attention to its culture and charms and export its technologies and industries related to geospatial information to overseas countries as well as promoting international contributions through such exports.

Foreigners who are visiting Japan for the Olympic and Paralympic Games Tokyo 2020 will be provided with indoor/outdoor seamless, multilingual navigation services using their mobile terminals in an environment where highly precise positioning service is always available. This makes it possible for them to move around safely and securely from the airport to the railway stations, hotels, stadiums, and surrounding tourist spots. Meanwhile, in the vicinity of the stadiums, cutting-edge unmanned and labor-saving services such as automated buses utilizing automated driving technology will be provided. Furthermore, by integrating various types of location information, real-time monitoring and prediction of the flow of people and automobiles can be realized, thereby transportation and facilities can be operated more effectively. In respect of disaster risks, such as a potential inland earthquake directly under the capital or an approaching typhoon, Earthquake Early Warning or information necessary for evacuation will be provided in multiple languages, thereby providing further safety and security to the people.

Furthermore, by seamlessly assisting overseas visitors with traveling to sightseeing spots not only in and around Tokyo, but also throughout the country, such visitors will be provided with opportunities to expose themselves to various natures and cultures of Japan. This will also be expected to promote inbound tourism, and contribute to the realization of a tourism-oriented country.

In this way, Tokyo will embody the world-class G-Spatial Society and showcase its achievement to the world in 2020.

(6) Aiming for the creation of a virtuous circle of the economy through the realization of G-Spatial Society

By making further advanced use of geospatial information which has become indispensable in our lives, new industries and new services are expected to be created. It is also expected that geospatial information helps to solve social issues which arise in conjunction with the declining population and the aging society.

For this reason, aiming to implement various initiatives in every region that have been tested and demonstrated, the wisdom and efforts of industry, academia, government and citizens will be collected, and an environment that allows an advanced utilization of geospatial information will be developed nationwide as Japan's core infrastructure.

In addition, since the signals of the quasi-zenith satellite system of Japan can be received in the Southeast Asia and Oceania region, development of GNSS Continuously Operating Reference Station (CORS) that is necessary to utilize such signals, provision of the expertise thereof, assistance in the human resources development and other services will be exported as a service package in accordance with the needs of the partner country. Further, products and services that utilize satellite images and the like, and their utilization technology and operational expertise are jointly developed with the partner countries. Through these efforts, Japan will contribute to these regions in the sophistication of technologies and industries related to geospatial information as well as in solving social issues.

With the prospect of the establishment of a seven-satellite constellation of the quasi-zenith satellite system targeting for 2023 as well as the development of related industries, human resources will be fostered who are capable of developing geospatial information not only for Japan, rather, from a global perspective and also capable of utilizing such information in advanced ways.

Aiming for the further advances of inventive ingenuity and innovation carried out by private business operators, the government will improve the environment where geospatial information can be utilized in advanced ways, contribute to the improvement of international interoperability related to the utilization of geospatial information, including the development of standards originated from Japan in collaboration with industry, academia, government and citizens, and also assist Japan's industries in their advancement into the global market, thereby forming a virtuous circle of the economy where industrial competitiveness will be strengthened and sustainable growth will be achieved.

2. Current status and issues with geospatial information

(1) Summary of achievement in previous Basic Plans

Based on the Basic Act on the Advancement of Utilizing Geospatial Information enacted in 2007, the government formulated the first Basic Plan in 2008 and the second Basic Plan in 2012, and worked on the development of an environment for the utilization of geospatial information, including development of a framework for relevant organizations to work for the promotion, development and provision of geospatial information as public infrastructure, establishment of an advanced high-tech base for the Satellite PNT, and others. With regard to each policy based on the Basic Plans, under its "Committee for the Advancement of Utilizing Geospatial Information” (hereafter, “Advancement Committee”), concrete goals and achievement deadlines were summarized in the "Action Plan for the Advancing the Utilization of Geospatial Information" (G-Spatial Action Plan), and relevant ministries and agencies have been working on the policies and measures comprehensively and systematically in a joint effort.

Measures implemented so far under the Basic Plans pertaining to the geographic information system (GIS), policies and measures concerning Satellite PNT, and initiatives for the utilization of geospatial information in the fields of disaster prevention and reconstruction that had strengthened after the Great East Japan Earthquake in 2011 are summarized as below:

(i) Development, provision and update of geospatial information, including fundamental geospatial data

In order to overlay geospatial information with GIS and utilize it in various fields, the government has developed and updated comprehensively the Digital Japan Basic Map, which is composed of Fundamental Geospatial Data that serve as the positional references represented on a digitalized map and items representing the state of the national land, and started provision thereof on the Internet as "GSI Maps." These pieces of information serve as the base when the central government or/and local governments implement public services such as national land management, crisis management, environmental measures, and other measures, and also as an indispensable platform when each entity newly adds information according to the purpose and transmits its own public information. In addition, the Fundamental Geospatial Data has also been used as information to serve as the fundamental information in web map services provided by private business operators. In order to meet specific and detailed user needs, services have been provided after information was added and processed. In this way, Fundamental Geospatial Data has been widely spread as a common infrastructure in Japan with or without the knowledge of the general public.

On the other hand, with regard to Satellite PNT, owing to the improvement of the quality of the positioning signals and the processing performance of the software, positioning with more than a certain level of accuracy was enabled in real time, and the mounting of satellite positioning, functions on mobile terminals has become common, which has led the wide spread of services that utilize positioning information acquired by the quasi-zenith satellite system and the like.

Based on these circumstances, the government is required to develop and provide more accurate and high added-value geospatial information in respond with the technological innovations such as IoT, big data, AI, at the same time continuing updating, maintaining and providing the existing geospatial information and GIS steadily. Furthermore, in an effort to meet the diversified individual user needs and to contribute to the creation of new industries and new services, efforts are being sought after in the promotion of circulation, collaboration and utilization, for example, establishment of standard rules so that various geospatial information can be utilized efficiently and in a unified manner as information that can be made compatible with the unified positional reference.

(ii) Promotion of circulation and utilization of geospatial information

G-Spatial Information Center began providing one-stop services in November 2016 with a view to developing a framework, under the collaboration with industry, academia, government and citizens, to properly gather, analyze, process, convert and provide wide-ranging geospatial information owned by each entity according to the characteristics of data, as well as allowing users to search and browse geospatial information and obtain and use such information according to the purpose.

Also, in an effort to promote the release of public data owned by the central government, local governments, public utilities, and other institutions, to the general public (open data), the government has systematically implemented relevant policies and measures, including demonstrations of a model using open data toward expansion of open data and promotion of secondary use taken into consideration of the private sector’s needs, based on the "Electronic Administrative Open Data Strategy" adopted in July 2012 (Advanced Information and Telecommunications Network Society Headquarters Decision, of July 4, 2012), the "Declaration to be the World's Most Advanced IT Nation" revised in May 2016 (Cabinet Decision of May 20, 2016) and so forth. In addition, the Basic Act on the Advancement of Utilizing Public and Private Sector Data (Act No. 103 of 2016) was also enacted in December 2016.

Moving forward, advancement of utilizing geospatial information in a wide range of fields is called for by registering useful geospatial information to meet the social needs and by building a framework that allows anyone to obtain and utilize geospatial information at any time.

(iii) Maintenance and strengthening of a high-tech base for Satellite PNT

Taking into consideration that other countries have been working on the development of a positioning satellite system, the government has specified the target deadline for the development of the four-satellite constellation in the second Basic Plan, and worked on the transfer of jurisdiction of the first quasi-zenith satellite to the Cabinet Office and also worked on the development of the second to the fourth satellites, while steadily working on the development of a ground base that is necessary for the operation of the four-satellite constellation. In addition, the government has been promoting utilization of highly precise Satellite PNT services through a joint effort of the Quasi-Zenith Satellite System Business Innovation Council (QBIC), which was established in July 2013 and the Space-New Economy Creation Network (S-NET), which was established in March 2016. Furthermore, it was decided to develop the seven-satellite constellation targeting for 2023 in the "Basic Plan on Space Policy" (Strategic Headquarters for Space Development Decision of January 9, 2015).

Moving forward, in order to achieve a higher level of utilization of highly accurate geospatial information in the four-satellite constellation that is scheduled to be established in 2018, efforts are called for, including the development and popularization of receivers, higher accuracy and practical

use of positioning service, safety confirmation service, etc., further promotion of creation of new industries and new services in various fields, including disaster prevention, agriculture, transportation utilizing the QBIC, the S-NET and so on. In addition, advancement of technological development and human resource development are also called for in view of the seven-satellite constellation targeting for 2023.

(iv) Reconstruction after the earthquakes, and formation of disaster-resilient and sustainable national land

The Great East Japan Earthquake in March 2011 caused an unprecedented catastrophe with extensive damage mainly on the Pacific coast of the Tohoku region. Immediately after the disaster occurrence, the government assisted in the initial responses and emergency measures, such as gaining an understanding of the tsunami inundation situation, by providing geospatial information, including fundamental map information, aerial photographs, crustal movement information that can be shared among various entities. At the time of recovery and reconstruction, the government also assisted in the restoration of cadastral information in the areas where the land boundaries became uncertain due to the crustal movements or tsunamis, as well as in the designation of inundation risk areas and the formulation of hazard maps taking into consideration of large-scale tsunami risks.

In order to prepare for an assumed massive Nankai Trough earthquake and inland earthquake directly under the capital, based on the lessons learned from the Great East Japan Earthquake and other past disasters, the government has promoted initiatives to develop, circulate and utilize geospatial information which serves as a base to materialize the disaster-resilient and sustainable national land, including development of technology that enables immediate assessments of crustal movements using GNSS-based control stations throughout the country and that contributes to post-earthquake tsunami prediction and land subsidence monitoring on coastal areas; as well as demonstration projects for information conveyance in underground malls at the time of urban disasters.

Urgent issues to prepare for potential disasters are further development of the environment, research and development, and concrete implementation in the society that allow various entities to effectively use geospatial information in various aspects that include not only initial disaster responses and emergency measures, and recovery and reconstruction supports, but also pre-disaster prevention and mitigation activities.

(2) Changes in the social situation surrounding geospatial information and potential of geospatial information

The situation of society in terms of the utilization of geospatial information keeps changing from moment to moment.

Smartphones and the like are rapidly spreading, and pedestrian navigation and search services are being used everywhere. Moving forward, mobile terminals including wearable terminals are expected to increasingly become smaller, sophisticated and popularized. In addition, with the advance of IoT technology, various things will be connected to the Internet, information of things will be collected in large quantities, data on human behavior will be also generated in large quantities through SNS and mobile terminals, and the data generated by the market will increase with acceleration. Much of such data have properties as geospatial information connected to the location or time, and the big data in which geospatial information is accumulated will be utilized in an advanced manner through advanced analysis methods represented by AI, while various new values will be created as a result of various entities utilizing and processing the released data, and releasing it again.

Meanwhile, Japan has faced various social challenges, including further declining of birthrate and aging populations at an unprecedented speed, and the resulting declining of production population, expansion of disaster risk, aging of infrastructure, aggravation of environmental problems, intensified international competition along with the globalization. Workings on these problems have been called for by utilizing geospatial information in an advanced manner, so as to improve the productivity and create new industries and new services.

By effectively analyzing, processing and providing big data concerning highly precise positioning information and locations according to user's needs, a safer and more comfortable society is expected to be realized, in term of seamless indoors and outdoors mobility, development and operation of a pinpointed and speedy logistics system, supports for appropriate evacuation in the event of a disaster, and also innovative industries are expected to be created in a wide range of fields, including automated driving and small unmanned aerial vehicles.

In addition, in order to advance smooth circulation and high-level utilization of geospatial information, development of the environment is called for, including, developing standards and rules for the development, circulation and utilization of geospatial information that take into account of national security and personal information, ensuring accuracy and reliability in data circulation, ensuring security measures against impersonation and data tampering.

3. Visions and basic policies on measures for the achievement of such visions

Based on the summary of the policies and measures implemented under the previous Basic Plans, and the changes and potential changes in social situation, the government, with the next five years as the implementation period of this Basic Plan, will work on the development of an environment that allows highly accurate and useful geospatial information to be used in real time in a joint effort of industry, academia, government and citizens, with an aim at solving social issues of Japan as well as creating new industries and new services through the advanced utilization of

geospatial information and an environment thereof. Also with an aim at realizing a new society where each citizen can perceive "growth" and "happiness" through the realization of the world's highest level G-Spatial Society that makes use of advanced technologies such as IoT, big data, AI and the like, the government will set five goals as Japan's "Visions" and will promote policies and measures to realize such goals.

(1) Contribution to the formation of disaster-resilient and sustainable national land

Even after the Great East Japan Earthquake in March 2011, natural disasters frequently occurred, including the Kumamoto Earthquake in April 2016, and it is concerned that there are increasing risks of large-scale natural disasters such as an inland earthquake directly under the capital and megathrust Nankai Trough earthquake. In order to save the life of every single person, the government will comprehensively strengthen the prediction capability, prevention capability and response capability to disasters such as heavy rains, earthquakes or tsunamis by making best use of geospatial information, and work on building cities and national land that are resilient and resistant to natural disasters. The government will also work on the strengthening and sophistication of disaster response capabilities in respect of collecting, sharing and providing disaster information and damage information by utilizing geospatial information, as well as the prompt and smooth dispatch and management of rescue workers and other personnel, and guiding evacuating disaster victims.

Regarding public infrastructure such as roads, rivers, bridges, water supply, sewerage systems, port facilities and other facilities, the government will improve the efficiency and sophistication of maintenance and management of such public infrastructure by utilizing geospatial information, thereby contributing to the early detection and early repair of damage and malfunctions. Furthermore, the government will work on the conservation of national land and oceans through continuous monitoring of land use, animals and plants etc., as well as the generation of related geospatial information.

Through these efforts, the government will achieve sustained maintenance and management of Japan’s national land base; maximize the stock effects and proper understanding of national land and ecology. In this way, the government will manage the national land efficiently and systematically.

(2) Creation of new transportation and logistics services

As the new era’s transportation and logistics system created on the basis of highly accurate geospatial information, the government will work on research and development projects aiming for the realization of automated driving systems for automobiles and automated parcel delivery utilizing small unmanned aerial vehicles, thereby achieving the sophistication of such industries and the

creation of new industries and services.

In addition, in the regions like the hilly and mountainous areas where population decline and depopulation has progressed and the decline of regional vitality has become a matter of concern, the government will introduce innovative new services, such as automated package delivery to residents and flexible and efficient mobility improvement services.

(3) Contribution to the formation of a safe, secure and high-quality living in the depopulated and aging society.

Our lives will become safer, more secure, richer and more diverse when an environment where "anyone can get information on the position and location anytime and anywhere" is realized. We have quasi-zenith satellites in the sky and mobile terminals in our hands. By using geospatial information, we will be able to travel indoors/outdoors and between cities seamlessly and comfortably to places where we want to go.

As population aging is progressing nationwide, the government needs to realize mobility improvement services utilizing automated driving technology of automobiles as well as the sophistication of watching services in its efforts to provide more attentive supports to the elderly and disabled persons and others in their day-to-day living. In this way, the government will deliver more convenience into the day-to-day living of people to realize high-quality living. Considering that the popularization of mobile terminals and digitalization of things, people and services will accelerate, the government will advance the utilization of geospatial information in service fields that are closely associated with local residents, such as shopping, medical/health services, and various administrative services.

(4) Revitalization of regional industries and creation of new industries and new services

It is necessary to establish a framework which allows various types of geospatial information to be gathered and processed, then efficiently obtained and utilized according to the purposes of users, with G-Spatial Information Center as the core. Also, the four-satellite constellation of the quasi-zenith satellite system is scheduled to be launched in 2018 which will make highly precise positioning services to be available in real time on a 24-hour basis in the entire country. This will further improve geospatial information in terms of accuracy and accelerate its utilization. In this way, highly accurate geospatial information will be obtained and utilized efficiently according to the purposes of users, which will lead to the creation of new industries and new services.

In particular, in the field of industry where securing producers and people who assume a leading role has become more difficult as a result of the acceleration of birthrate decline and aging population, regional revitalization needs to be accelerated by making industries more labor-saving

and productive with the use of automated technologies of AI, robots, and the like, in addition to the utilization of geospatial information, for example, through the realization of automated driving systems for farm equipment, promotion of i-Construction at construction sites, and so on.

Further, developing surrounding environments, including human resources development to foster technologies and ideas related to such geospatial information, sharing of expertise, consultations, start-up businesses and research and development, will be sought so as to create new domestic employment of human resources who can lead the utilization of geospatial information.

(5) Promotion of export of technology and mechanisms utilizing geospatial information, and international contribution

Japan's quasi-zenith satellite system is scheduled to be enhanced to the four-satellite constellation, which enables highly precise positioning services to be provided not only in Japan but also in Southeast Asia and Oceania for 24 hours, real time. There are expectations that Japan's technology and expertise will be utilized in these regions. In this regard, by providing the Asia-Pacific region and other countries with a package that varies depending on the characteristics of the region, containing Japan’s cutting edge technologies for the creation, updating and utilization of advanced GIS data using positioning information obtained from the quasi-zenith satellite system or satellite images and also providing assistance to related businesses and human resource development and the like. G-Spatial Society will be expanded into the world. In fields where Japan is taking a leading role in the world, such as disaster prevention and environment, in particular, international contributions by utilizing wide-ranging and useful geospatial information and highly precise positioning services utilizing satellite imagery and the like will be engaged in.

Offering cutting edge "hospitality" services utilizing geospatial information to overseas visitors in conjunction with the Olympic and Paralympic Games Tokyo 2020 to be held in the year 2020 will be a great opportunity to showcase Japan's advanced technology. In this regard, Japan will seek to provide "hospitality" that utilizes geospatial information for overseas visitors to Japan, so as to disseminate our "hospitality" widely to the world, in specific, provision of seamless mobility from arrival to departure, the realization of an environment where various services can be provided according to personal attributes and so on.

In addition, in collaboration with industry, academia, government and citizens, contributions will be made for the improvement of international interoperability related to the utilization of geospatial information, which includes the development of standards originating from Japan so as to support the growth of Japan's industries in the global market. In this way, the government will aim at strengthening Japan's industrial competitiveness and forming a virtuous circle of the economy that realizes sustainable growth.

In order to achieve these "Visions" as described from (1) to (5), the foundation and an

environment will be developed which allow highly accurate and useful geospatial information to be utilized in real time in an advanced manner.

Specifically, greater freshness, accuracy, reliability, etc. of geospatial information, greater sophistication of provision means and greater functionality are aimed to be achieved in collaboration with industry, academia, government and citizens in response to the expansion of the scope of geospatial information applications along with the advances in advanced technologies such as IoT, big data, AI, and the like, and the diversification of individual user needs. Further, a new framework for the utilization of geospatial information needs to be widely established as public infrastructure in collaboration with industry, academia, government and citizens with G-Spatial Information Center playing a central role. At the same time, in order to catch up with the changes in social environment and to promote a greater level of smoothness in the circulation and sophistication in the utilization of geospatial information, standards and rules for the development, circulation and utilization of geospatial information will be developed with consideration of national security and personal information, accuracy and reliability will be ensured in data circulation, and security measures will be taken against impersonation or data forgery. Other than that, in light of the recent government initiatives to promote Open Government, which is a concept to open up the government administration to the public by making use of the Internet, as well as the growing interest in open data, disclosure of highly public geospatial information will be promoted in a secondary usable form, so as to improve the transparency, reliability and efficiency of the administrative services and to vitalize the economy.

In addition, an environment will be developed to develop highly precise and highly reliable indoor and outdoor positioning services in various fields, while improving the sophistication of the quasi-zenith satellite system and GNSS Earth Observation Network System (GEONET). In respect of high accuracy three-dimensional geospatial information, the demand of which is expected to expand following the popularization of small unmanned aerial vehicles and the like, a standardized mechanism will be developed so that such information can be handled smoothly and in an integrated manner. In respect of the provision of advanced geospatial information services, it is indispensable to conduct earth observations by satellites highly frequently, but it is difficult to do so in the current situation of Japan where the number of nationally-owned satellites is limited. Therefore, the development of earth observation satellites will be promoted steadily, at the same time, the development and use of satellites by private enterprises will be promoted, and measures concerning the maintenance and management of such satellites for the continuous utilization of satellite data by these public and private sectors will be studied. Further, the Research and Development (R&D) infrastructure related to the Satellite PNT technology and geospatial information technology, which contributes to the improvement of the functions, performance and operability of quasi-zenith

satellites and remote sensing satellites, and the expansion of the use of positioning information and remote sensing data, will be maintained and strengthened. Furthermore, in order to develop an environment where seamless indoor/outdoor positioning can be realized, an environment for the utilization of indoor positioning technology will be developed as well.

In addition, in order to further advance the utilization of geospatial information, literacy education related to geospatial information and human resource development are the important common foundations. For this reason, a framework for human resource development will be established with an aim at building a society which allows such human resources to play active roles.

4. Effective Promotion of Basic Plan

Upon advancing this Basic Plan, a full consideration will be paid to maintaining compatibility and manifesting of cooperation effects with others policies, including the Japan Revitalization Strategy 2016 (Cabinet Decision of June 2, 2016), the Basic Plan on Space Policy (Cabinet Decision of April 1, 2016), the Fundamental Plan for National Resilience (Cabinet Decision of June 3, 2014), the Basic Plan on Ocean Policy (Cabinet Decision of April 26, 2013), Science and Technology Basic Plan (Cabinet Decision of January 22, 2016) among others. Then, the government will examine more concrete targets and the planned period for each measure and follow up the progress each year. While promoting this Basic Plan, the government will also organize the issues in terms of institution and make institutional revisions of the Basic Plan and amendments of related laws and regulations as necessary.

In advancing the policies and measures of this Basic Plan, provision of world-class services that utilize geospatial information at the Olympic and Paralympic Games Tokyo 2020 is set as one of the goals. By making use of this initiative as a momentum, the government will further expand the utilization of geospatial information in the entire society. Also, in order to strategically advance the utilization of geospatial information, important measures will be prioritized and selected as "Symbolic Project" so that the implementation thereof can be powerfully put forward.

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

1. Development of infrastructure and an environment for utilizing geospatial information in an advanced manner

(1) Building a framework for utilizing geospatial information that autonomously creates new values

By collecting, classifying, and analyzing various geospatial information that has been developed by each entity by superimposing information of different fields, new information and new values will be created. Forming one platform consisting of such an accumulation of geospatial information allows users to easily access such information, then, retrieve it for analysis and widely share the results. This will invite even more people to use that information, which will result in the creation of new values. Amid the situation where various kinds of geospatial information are being generated and collected in large quantities through SNS and IoT, the mechanism of utilization of geospatial information that develops autonomously with participation of many users, as well as social rules to support such mechanism, is aimed to be established with consideration of machine readability.

(i) Promotion of circulation and utilization of geospatial information with G-Spatial Information Center playing a central role

With an aim at advancing the utilization of geospatial information, G-Spatial Information Center began its operation in November 2016 where geospatial information, including map information, image information, disaster prevention information and other data can be easily searched, obtained and used, with a function as foundation of collaboration among a wide variety of interests that make use of public-private sector data. Following the advancement of information and communication technology and the spread of smartphones, dynamic geospatial information, such as information on the social media usage situation, probe information of automobiles and the like, is being generated in addition to the conventional static geospatial information. For this reason, registration with G-Spatial Information Center of geospatial information with high utility value that meets the social needs must be advanced, at the same time; G-Spatial Information Center will be utilized as a hub for the circulation and utilization of geospatial information.

Specifically, highly accurate three-dimensional geospatial information and the like that is collected, utilized and updated to be used in automated driving for automobiles and others will be registered and then provided to users as open data so that such information can be used for other purposes. Furthermore, with an aim for the diversification of geospatial information, geospatial information that underpins the realization of G-Spatial Society, including three-dimensional data created by i-Construction, probe information held by private businesses, transaction price

information on real estate, urban planning basic survey data, nationwide vacant house and vacant land bank information, static information that contributes to the formulation of disaster prevention plans and urban planning and also to the creation of new industries and services, information on the results of geological and resource exploration, information on farmland, land classification and land use, will be collected and maintained in G-Spatial Information Center. Geospatial information provided as open data by the central government or local governments also needs to be gathered in G-Spatial Information Center, in principle. Then, in order to respond to the diversification of geospatial information, gathering systems for various types of geospatial information that are formed according to the purpose and information centers needs to be mutually coordinated, with G-Spatial Information Center being the hub. With an aim at forming a circulation system of geospatial information that generates new data with values, more information needs to be gathered, shared, then analyzed and processed in an integrated way. Using such various data, G-Spatial Information Center will showcase the data utilization, share data with high added value, and promote smooth utilization of geospatial information by various users. This will contribute to solving social issues in various aspects, including town development and disaster prevention measures, as well as to creating new industries and new services.

The geospatial information to be registered with G-Spatial Information Center should reflects the needs of society, and be determined by seeking wider opinions, at the same time, every piece thereof needs to be distributed as open data, in principle. However, upon operation, public benefits need to be ensured, for example, restricting of certain purposes of use as appropriate. For this reason, industry, academia, government and citizens will work together and collect, process and update geospatial information on a sustainable basis, and also consider ways of circulation so as to establish an appropriate mechanism, with G-Spatial Information Center playing the core role.

Also, in order to advance these initiatives, industry, academia, government and citizens will work together and study necessary matters with an aim at realizing a stable and autonomous operation of G-Spatial Information Center.

(ii) Development of standards and rules for the development, circulation and utilization of geospatial information

In respect of geospatial information to be developed in various fields, to advance the utilization of public and private sector data, it is necessary to further advance its circulation and utilization by a wide variety of interests working together in ensuring the quality, thorough digitalization of delivered products, promotion of open data and other activities. For this reason, the development of standards and rules needs to be further accelerated for the orderly circulation and utilization of geospatial information owned by industry, academia, government and citizens.

With an aim at realizing various new industries and new services created out of advanced

technologies such as automated driving of automobiles or indoor/outdoor seamless positioning, standardized mechanisms and methods will be developed to utilize smoothly and in an integrated manner a combination of information consisting of highly accurate three-dimensional geospatial information and Satellite PNT information in align with international standards. In addition, in order to advance the circulation, interconnection and utilization of geospatial information, a mechanism to connect geospatial information with relative positional accuracy to geospatial information with absolute positional accuracy will be established.

Furthermore, for regions of active crustal movements, development of a mechanism will be advanced to achieve highly precise mutual compatibility of positions between Satellite PNT information of various methods and the highly accurate three-dimensional geospatial information. In addition, in order to facilitate the circulation and utilization of highly accurate three-dimensional geospatial information in various fields, standardization of matters to be commonly developed needs to be promoted.

To ensure national security and protect personal information, intellectual property rights and the like, rules etc., will be developed according to the level of sophistication of geospatial information, diversification of user needs, and so on. Upon implementation of the Act on Securing Proper Handling of Satellite Remote Sensing Records (Act No.77 of 2016), consideration needs to be given to maintaining a balance between the promotion and the regulation in both fields of civilian use and national security. Also, in order to ensure the quality of geospatial information, including its accuracy, unified standards and work manuals will be developed and updated, and a framework for ensuring the quality of such standards or manuals will be established continuously based on the latest technology trends. The government will also timely revise the Japan Profile for Geographic Information Standards (JPGIS) that has been systematized according to the latest international standards and conduct dissemination and awareness-raising activities to promote the use thereof by local governments and private business operators. Furthermore, in order to ensure the accuracy and the quality of public surveys conducted by the central government and local governments, in the event where new technologies and methods relating to surveying are developed and put to practical use, technical standards, specifications and the like will be formulated following such trends.

(2) Advancement of development of the quasi-zenith satellite system and utilization thereof and others

(i) Research, development and operation of the quasi-zenith satellite system

The research, development and operation of the quasi-zenith satellite system can contribute not only to the improvement of efficiency and sophistication of industries in the fields of positioning, navigation and time reference, living as well as administration, but also to providing significance in terms of the creation of markets for advanced equipment and services, broad utilization thereof,

enhancement of competitiveness in industries, promotion of exports of new industries and new services, improvement of disaster response capability, and so on. Necessary measures will be taken in order to embody the above-mentioned significance and deliver further benefits to the people. For example, relevant operating specifications were revised so that the position signals of the quasi-zenith satellites could be used in surveying projects such as control point surveys and mapping based on the Survey Act (No. 188 of 1949), and cadastral promotion projects. As a result, quasi-zenith satellites are now being widely used and have contributed to the improvement of work efficiency of such projects.

Specifically, first of all, in view of the fact that foreign countries have been working steadily on the development of a positioning satellite system, Japan is to establish the four-satellite constellation of the quasi-zenith satellite system in 2018, with which positioning services, sub-meter augmentation services, etc. will begin. In promoting the quasi-zenith satellite system, since collaborative efforts from relevant government ministries as well as industry, academia, government and citizens are required in all the phases from the research, development and operation to utilization and exports, such collaborative relationships will be deepened.

Next, in order to maintain the four-satellite constellation, the government will work on the development and maintenance of a successor of the first satellite. In order to improve the performance of the entire system necessary for maintaining and strengthening the world's highest level Satellite PNT, the necessary performance improvement will be incorporated into the specifications based on the results of previous demonstrations and studies using the first satellite and continue working on the development of the necessary technologies while building a framework for continuous research and review.

Furthermore, aiming for the development of the seven-satellite constellation system capable of sustainable positioning which is targeted to be completed in 2023, required functions and performance improvement will be studied continuously so as not to fall behind the positioning satellite system of other countries, and the development of Satellite PNT technology needs to be advanced. At the same time, the R&D infrastructure will be maintained and enhanced.

(ii) Advancement of utilization of the quasi-zenith satellite system

It is desirable that the quasi-zenith satellite system exerts its intended functions to the maximum in its utilization, maximizes its availability and is utilized in many fields. To that end, it is important that Industry and Academia work together in each field where the use of the system is assumed and carry out verification tests, which will be connected and incorporated into various systems that are practically used while working on the enhancement of related new industries and new services.

Specifically, first of all, in order to increase the sophistication of the location information

bases that enable high precision positioning, the government will increase the sophistication of GEONET, and conduct appropriate maintenance and management of GEONET, achieve highly accurate, highly reliable, real-time positioning services by multi-GNSS with the quasi-zenith satellite system as the core, and promote the development and practical use of an indoor positioning environment. Also, international competitiveness of centimeter-level positioning technology such as Multi-GNSS Advanced Demonstration Tool for Orbit and Clock Analysis (MADOCA) and Centimeter Level Augmentation Service (CLAS) will be maintained and strengthened. Furthermore, in order to improve the reliability and ensure the safety in use, the government needs to establish precision satellite orbit and clock estimation technology, and promote security measures such as anti-jamming and anti-spoofing measures so as to contribute to the establishment of an environment where people can use geospatial information safely.

As for disaster prevention and mitigation, which is one of the main fields that utilize the system, aiming for a full-scale implementation of the disaster/crisis management reporting service and the safety confirmation service, disaster prevention and disaster response organizations, local governments, industry, academia and citizens will work together to launch the services that reflect the on-site needs. Also, in the field of air navigation, the government will make necessary preparations aiming for the launch of a Satellite Based Augmentation System (SBAS) which is scheduled for 2020 using the quasi-zenith satellite system. In the field of maritime traffic, the government will continue providing GPS's differential information to ensure the safety of maritime traffic. Furthermore, in promising fields such as road traffic, railway, civil engineering construction, agriculture, Location-Based Service (LBS), map, and so on, the government will advance further utilization in coordination with the activities of S-NET and other organizations.

Furthermore, in order to materialize an environment that enables seamless indoor and outdoor positioning, the government will advance the development of an environment for the utilization of indoor positioning technology such as Wi-Fi, beacon, IMES, and the like, along with the progress of multi-GNSS. In doing so, the fundamental research and development of positioning technology will be continued and advanced.

(3) Advancement of development of geospatial information and GIS, which become public infrastructure

In respect of existing geospatial information, the government will continue working on the maintenance, renovation, maintenance and management of existing geospatial information in steady manners to prevent the freshness from being lost over time and the utility value will not decrease. In order to represent Japan's territory and territorial waters accurately, in particular, survey of geospatial information in the sea area, and installation, maintenance and management of the control points on remote islands will be done, while the Digital Japan Basic Map which represent the state of the

Japan's land with the same basis and the Fundamental Geospatial Data will be consistently updated, then published through the "GSI Maps" without delay. Also, in order to properly understand the actual condition of our national land, the government will revise the map information following the changes in the forest situation using aerial photographs, promote cadastral development, and so on.

In addition, in order to maintain and manage the positional reference of the national land at a high level of accuracy, the results of Very Long Baseline Interferometry (VLBI), geodetic leveling, gravity measurement, and so on, need be connected to the GNSS-based control stations. In addition, the government will systematically develop geospatial information with high temporal resolution based on the absolute positional reference through the stable operation, continuous maintenance and management and further sophistication of GEONET in coordination with the quasi-zenith satellite system.

Furthermore, in order to preserve the natural environment and biodiversity, the government will continuously collect and share information on biodiversity such as the Natural Environment Conservation Basic Survey Data and Monitoring Site 1000 Data owned by the government, then provide it effectively through information systems such as Japan Integrated Biodiversity Information System (J-IBIS).

2. High-level utilization of highly accurate geospatial information – Showcasing the Olympic and Paralympic Games Tokyo 2020

(1) Creation of new industries and new services through a high-level utilization of highly accurate geospatial information

The function of G-Spatial Information Center as a hub of geospatial information will be further established and the quasi-zenith satellite system will be expanded to the four-satellite constellation, which will allow highly accurate geospatial information to be developed. In addition, in the fields surrounding geospatial information, innovation of science and technology such as robot, AI technology and the like, will be accelerated, and new technology related to big data or IoT will be developed in various industries along with the advances in ICT and other technologies, and also the opportunities to utilize these technologies will increase dramatically.

Amid such situations, the government will work on the creation of new industries and new services that utilize highly accurate geospatial information in an advanced manner so that the society of Japan can look attractive globally and the most advanced technology can be exported to the rest of the world.

(i) Creation of new transportation and logistics services

In order to realize an advanced automated driving system for automobiles, the government will conduct research and development on technical issues, develop data circulation environments,

and conduct large-scale verification tests on public roads, and so on. Moreover, in order to realize safe logistics to remote islands and other areas through the operation of highly accurate unmanned aerial vehicles by utilizing the quasi-zenith satellite system, the government will conduct investigative research on issues related to system, technology, safety measures and so on, and also conduct flight demonstrations to collect various data. Furthermore, the government will advance efforts to provide highly accurate, real-time operation information, etc. to facilitate the transfer of public transports, and so on.

(ii) Activation of regional industries

In order to realize improvement of labor-saving and productivity in agriculture, forestry and fisheries and construction industry against the background where the country's production population is declining, the government will work on the research and development for the realization of an automated driving system of farm equipment and promote rule-making of safety assurance measures aiming for the field implementation, achieve the growth of forestry industry using the latest forest measurement technology, cloud technology and the like, develop methods to predict fishing ground formation, fishing and oceanographic condition, occurrence of red tide, etc., using remote sensing satellites. Moreover, the government will implement policies and measures such as i-Construction to improve the productivity by utilizing three-dimensional data or ICT in every construction and production process from research, survey, designing, construction, inspection, maintenance to update.

Furthermore, the government will provide assistance to small and medium-sized enterprises and microbusinesses in their efforts to launch businesses such as the development of innovative services by utilizing information from the quasi-zenith satellite system and remote sensing satellites.

(2) Show the world the achievement of Japan at the Olympic and Paralympic Games Tokyo 2020

Japan will present the world our achievement of utilization of geospatial information in an advanced manner at the Olympic and Paralympic Games Tokyo 2020 to be held in 2020, and use it as a stepping stone to make a further leap toward the realization of G-Spatial Society.

Specifically, the government will develop data for supporting overseas visitors, the elderly and disabled persons, etc., with in their seamless indoors/outdoors mobility, and also data related to pedestrian mobility support, provide information through G-Spatial Information Center and other facilities, provide advanced guidance services utilizing geospatial information at the traffic nodes, and create new services, including automated driving of automobiles.

For example, in transportation facilities near the Tokyo Station and major facilities related to the Olympic and Paralympic Games Tokyo 2020, the government will develop an indoor and outdoor

positioning environment, taking advantage of highly precise positioning technology and the like, in cooperation with stakeholders, including railway operators and facility managements. In particular, for indoor and underground spaces where satellite positioning is unavailable, the government will advance the registration and installation of “public tags” such as Wi-Fi and beacons. In this way, by promoting the development of an indoor/outdoor seamless positioning environment, various location information services, including navigation for foreigners visiting Japan will be materialized. Moreover, Japan is aiming to materialize a society which allows anyone, including foreigners visiting Japan to move and act smoothly without being stressed out by advancing our efforts to provide information while making use of a highly precise positioning environment, taking advantage of the quasi-zenith satellite system, for example, route information from the current position to the destination, and information on the auditorium location like a venue floor plan.

In addition, the world's highest level of accessibility will be achieved by utilizing automated driving technology and ICT. Aiming for the coming Olympic and Paralympic Games Tokyo 2020, the government will realize a mobility service by the next generation urban transportation system (ART: Advanced Rapid Transit) utilizing automotive automated driving control and advanced driving assistance, and the like, in cooperation with the Tokyo metropolitan government, which is the host city.

3. Utilization of geospatial information that can be perceived in day-to-day living

(1) Sustainable land-use that is tough and resistant to natural disasters

(i) Pre-disaster initiatives aiming to strengthen disaster response capabilities utilizing geospatial information

In order to create disaster-resilient and sustainable national land, the government will develop a system to evaluate risk information on various disasters including earthquake disasters by combining geospatial information with estimated damage and the like so that individuals and regional communities can formulate their own disaster prevention measures at ordinary times and implement such measures when a disaster occurs, and the government will also develop and utilize a framework that allows anyone to efficiently and effectively obtain and utilize such information. Such systems or frameworks will become important tools not only for the central and local governments, but also for the affected parties such as individuals, private enterprises, schools, neighborhood associations, and the like from the viewpoints of disaster prevention and mitigation, prompt recovery and reconstruction and other matters. Regarding underground shopping malls, which form an important pedestrian network in urban areas, for users including overseas visitors to Japan and people vulnerable to disasters, the government will provide assistance in the development of underground shopping mall navigation systems used at the ordinary times, and equipment that helps evacuation guidance at the time of disaster, as well as in awareness-raising activities, and others.

In addition, the government will work on the advancement of active utilization of automation technology, sensor technology and the like to build our national resilience and to increase the efficiency of maintenance and management of aged infrastructure as part of pre-disaster prevention measures.

Moreover, as part of post-disaster measures, the government will develop software and work manuals for the development of correction parameters that are required for the prompt and efficient restoration of public surveys results and the like during the time when recovery projects and the like are being implemented properly, so that the people could continue using accurate location information. The government will also advance cadastral development to clarify land boundary, and so on.

(ii) During and post-disaster initiatives to strengthen disaster response capabilities utilizing geospatial information

It is important to enhance the information collection framework promptly after a disaster occurs to achieve quick gathering of information on the damage and understanding of the overall picture of the damage so that the central and local governments can establish a quick and accurate initial response framework and implement emergency measures based on the decision-making.

For this reason, the government will firstly develop a framework to gather and utilize geospatial information owned by related organizations. Regarding the "Integrated disaster prevention information system" that allows sharing of disaster prevention information as geospatial information, which facilitates the government's prompt and accurate decision-making at the time of disaster, the government will introduce a next-generation system incorporating the latest IT and strengthen coordination with the information systems owned by relevant organizations, at the same time enhancing the functions of the systems that enable an estimation of initial damage of not only earthquakes but also tsunamis by ensuring the operation framework of such systems. Furthermore, the government will also expand the functions of various systems for an estimation of initial damage of other disasters. It is also important for the government to provide assistance to various entities such as citizens and corporate volunteers in their collection, organizing, processing and circulation of disaster information. In this regard, G-Spatial Information Center will be utilized as a hub. It is also important to share information individually owned by the central government, local governments, private business operators and other entities in the event of a disaster. For this reason, the government will promote the structure-building related to the "Disaster Information Hub" among related parties by establishing rules related to the handling, sharing and utilization of such information in advance.

Secondly, the government will improve the efficiency of the mechanism to gain an understanding of the damage situation as soon as possible. The government will strengthen the

information gathering and information sharing framework at the time of the initial response and improve the disaster response capability by integrating and displaying on the maps damage information, such as road, railway, landslide disasters collected from the disaster sites at the time of disaster, and the location of important facilities as well as other disaster-related information such as emergency transportation routes using the "DiMAPS (Integrated Disaster Information Mapping System)". Moreover, the government will provide information on damage obtained by emergency photography by operating a survey aircraft with a high level of mobility or small unmanned aerial vehicles that provide an understanding of detailed conditions of disaster sites, at the same time operating the systems utilizing Satellite PNT information and the like to gain an understanding of helicopter locations and deployment of emergency fire response teams, and developing and strengthening the framework for the management thereof. Furthermore, in order to monitor changes and deformation on the surface of the national land in an area level, the government will continuously carry out satellite SAR observation, the method of which is suitable to gain an understanding of changes to our land made up of many mountains, at the same time, advance the utilization of such data so as to detect crustal deformation caused by earthquakes, volcanic changes, ground subsidence, and the like. In addition, the government will utilize an advanced radar satellite that enables wider-area and highly-frequent detection of crustal deformation caused by earthquakes and volcanic eruptions, conduct research and development of airborne SAR which provides a quick understanding of situations of disasters such as earthquakes and volcanic eruptions, develop the advanced data analysis methods of GEONET, study methods to understand the scope of inundated areas at night and so on. In addition, the government will utilize GIS and Satellite PNT for efficient unit operation including the Self-Defense Forces' disaster relief operations. Each organization in the Ministry of Defense/the Self-Defense Force, which has been collecting and analyzing national security related geospatial information independently, will implement the integrated management and operation of geospatial information owned by each organization as well as promoting coordination with other ministries and agencies in order to utilize such information more effectively in situations such as disaster relief.

Thirdly, the government will expand and enhance the evacuee support system. In respect of the quasi-zenith satellite system, relevant organizations will make use of the system that allows information on support and disaster information on earthquakes and tsunamis to be smoothly provided to evacuation centers once a disaster occurs, at the same time, information on the installation of evacuation centers and information on the safety of evacuated residents to be collected based on the information transmitted from evacuation centers, and information necessary for rescue activities to be browsed. Also, based on the lessons learned from the Kumamoto Earthquake, the government will construct a system to manage logistics information from supply sources to

evacuation centers in an integrated manner. In addition, the government will integrate the traffic information provided by the police with the probe information held by private companies to provide such integrated information to the general public, and make effective traffic controls to ensure evacuation routes.

The fourth initiative is to strengthen the framework to support the affected local governments. The government will advance coordination of various systems of related organizations, develop a unified framework of information sharing utilizing SNS, digital signage and the like, and promptly and efficiently convey disaster information by utilizing the L-Alert. In addition, the government will provide support to local governments in the development of a disaster prevention information system with functions such as information sharing with related organizations, understanding of damage situation, material management, victim support and the like. Moreover, the government will promptly provide geospatial information that contributes to the implementation of initial response, emergency measures, recovery and reconstruction, and the like on the request of the afflicted administrative and other organizations, and provide relevant organizations with assistance so that they can utilize such information smoothly and effectively.

(2) Realization of a safe, secure and high quality of living

In view of the potential acceleration of popularization of mobile terminals and digitalization of things, people and services, the government will improve the level of convenience in service fields that are closely associated with the residents to make our livings safe, secure and of high quality.

In specific, the government will materialize services, including mobility improvement services for the elderly and disabled persons by utilizing automated driving technology, mobility support for the elderly by improving the indoor and outdoor positioning environment, advanced watching services taking advantage of location information, shopping service through the operation of community buses, services to urge exercising by clarifying the relationship between the amount of exercise and the health.

In addition, in order to prevent crimes beforehand and the damage from spreading through the utilization of GIS, the government will promote the development of methods such as analysis methods of spatiotemporal accumulation and changes of crime occurrence, evaluation methods of crime deterrence measures, methods of crime prevention activity assistance. In this way, the government will encourage the sophistication of case handling methods and crime prevention activities.

(3) Advancement of efficiency and sophistication of administrative services

In order to achieve economic revitalization through the enhancement of efficiency and sophistication of administrative services and the provision of new services, etc., related

organizations, including the central and local governments will accelerate the open data movement of statistical and other information. Further, the government will provide technical support to local governments and raise their awareness to advance the open data movement for geospatial information generated and owned by such local governments.

The central government and local governments need to minimize the life cycle costs of public infrastructure amid the current severe financial situation that they have faced and resolve problems of the shortages of human resources and technical skills required for the maintenance and management of infrastructure. For this purpose, the government will realize infrastructure management utilizing ICT and robot technology, such as utilization of Location information codes for identifying management facilities and monitoring of aging infrastructure using unmanned aerial vehicles and the like.

In addition, through a collaborative effort from the industry, academia and government, the government will enhance "Statistical GIS" that provides regional statistical data and the like owned by each ministry and agency, and advance the public use of statistical data in the formulation work of disaster prevention plans or urban planning by local government. By providing assistance in the utilization of geospatial information through G-Spatial Information Center and the Regional Economy and Society Analyzing System (RESAS), as well as advancing dissemination of consulting services, the government will develop a supporting framework where geospatial information can be utilized even by users who are in the fields of little relevance to geospatial information by their nature and inexperienced in its handling and utilization.

Furthermore, in order to further improve the efficiency of public survey conducted by local governments and the like utilizing new surveying techniques such as unmanned aerial vehicles, the government will implement technical assistance, disseminate technical manuals and the like and incorporate such manuals into Rules for Operating Specifications which serves as the norm of general surveying work. Moreover, in order to coordinate efficient tasks in basic survey and public survey, the government will provide support in human resource development of administrative agencies involved in the survey related work by making continued efforts including timely providing information, awareness-raising and providing training and lectures to the survey planning organizations and the like.

The government will also promote the development of an integrated type of GIS that allows local governments to share geospatial information and GIS with multiple departments within the agency such as the tax department, the urban planning department, the disaster prevention department and other functions, so as to prevent redundancy of data generation work, increase the efficiency of the work of the agency as well as increase the sophistication of administrative services of the agency.

4. Overseas expansion and international contribution through the utilization of

geospatial information

Expectations are rising that sustainable growth and a virtuous circle of the economy will be formed through the effective utilization of highly precise positioning service utilizing Japan's quasi-zenith satellite system and GEONET, which are at the world-leading level, and the advancement of related businesses such as overseas infrastructure development projects. For this reason, the government will support the development and maintenance of the geodetic reference frames through global-scale international joint observations, including International VLBI Service for Geodesy and Astrometry (IVS) projects, international GNSS Service (IGS) and other projects in line with the initiatives of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). The government will also play a central role in the Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP), which was established with an aim at promoting the development of a geospatial information base in the Asia-Pacific region and exchanging information on related policies. The government will also provide assistance in accurate survey of latitude and longitude, which will become important for the living and economic activities of countries where no positional reference have been established, in collaboration with the United Nations, the International Association of Geodesy (IAG), the International Federation of Surveyors (FIG), as one of the advanced countries in this field with an aim at achieving Global Geodetic Reference Frame (GGRF), which serves as a reference for measuring accurate latitude and longitude. In addition, the government will provide assistance in the Global Geodetic Observing System (GGOS) and the strengthening of the infrastructure of the geodetic reference frame of the Asia-Pacific region to promote the development, circulation and utilization of GNSS data in respective countries.

Moreover, from the perspective of strengthening the basis of the geodetic reference frame for the Asia-Pacific region, the government will lead the regional VLBI joint observations, at the same time providing cooperation and advice on the development of GNSS CORS network, for example, accepting training participants from and dispatching experts to such partner countries in close collaboration with the Japan International Cooperation Agency (JICA) and other relevant organizations, taking advantage of Japan's long experience in the operation while taking consideration of the local situation. Further, the government will realize advanced positioning services in various foreign countries and on the seas where GNSS CORS network is not well developed while developing infrastructure technology related to Satellite PNT continuously, thereby promoting the dissemination of the automated operation of agricultural and construction machinery as well as maritime safety information provision services, and the like. In addition, based on the demonstration of automated operation of farm equipment utilizing the highly accurate positioning, navigation and timing functions of the quasi-zenith satellite system in Australia, the government will accelerate the widespread use of agricultural machinery automated operation technology and the like,

in the Asia-Pacific region. Besides in respect of i-Construction, the government will study the development of a support package incorporating technical standards, institutions, human resource development and others by combining i-Construction with the highly precise positioning functions of the quasi-zenith satellite system or GNSS CORS network. Further, the government will promote the development and widespread use of receivers that are necessary to utilize augmentation services for highly accurate satellite positioning, and also support initiatives to promote the use of Satellite PNT services in the Southeast Asia region such as holding intergovernmental meetings, for example, a Quasi-Zenith Satellite Roundtable, and the like. In this way, the government will develop industry, academia, government and citizens' joint projects in respective countries in various fields such as agriculture, forestry, fisheries or construction industries while working with the Task Force on Space System Overseas Development, S-NET and others so as to promote exports and international contribution in an active manner. Upon promoting the policies and measures, the government will advance the development of a package of intangible and tangible supports including Japan's cutting edge GIS technology and technology related to Satellite PNT such as the quasi-zenith satellite system and human resources development, based on the needs of partner countries, through a joint effort from industry, academia, government and citizens.

The government will also advance the "Sentinel Asia Project" in the Asia-Pacific region that is led by Japan with an aim at strengthening disaster monitoring through the provision of observation data and the like, obtained from earth observing satellites, including "DAICHI-2" (ALOS-2), so as to contribute to the disaster response through all stages, including disaster prevention and mitigation, recovery and reconstruction assistance, at the same time promoting the development of the Global Earth Observation System of Systems (GEOSS) which aims at solving global-scale issues by earth observation through the utilization of the Data Integration and Analysis System (DIAS), while steadily advancing the development of earth observation satellites such as an advanced optical satellite and an advanced radar satellite. The government will also promote coordination with earth observation satellite projects conducted by private sector originated from Japan.

Further, from the perspective of improving Japan's presence in the international community, strengthening competitiveness, strengthening human resource bases in space development and utilization, etc., the government will develop human resources who are capable of conceiving and planning the utilization of geospatial information on an international scale, and participate in and contribute to the discussions at international conferences in active manners, including the UN-GGIM, the Plenary meeting of the International Organization for Standardization (ISO) Geographic Information/Geomatics Technical Committee (TC 211) or other conventions. Meanwhile, the government will coordinate with relevant government ministries to work on the preparations for "The 12th United Nations International Committee on Global Navigation Satellite Systems (ICG)" to be

held in Japan, at the same time advancing international cooperation with Europe and the United States while making use of the said Committee in order to standardize positioning services and increase the sophistication of utilization thereof. Furthermore, the government will continue studying the utilization of the quasi-zenith satellite system in fields such as crisis management and security among relevant government ministries, also from the view of strengthening the Japan-U.S. alliance through space cooperation.

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

(1) Strengthening of promotion framework and collaboration between related entities

(i) Promotion of policies and measures in a joint effort of the entire government and collaboration between the central government and local governments

The government will continue working on solving various issues concerning the advancement of utilization of geospatial information through the Advancement Committee or/and the Working Groups or the Promotion Team installed thereunder, and promote policies and measures in a joint effort of the entire government, while strengthening the framework to powerfully lead the overall operation of such teams.

In addition, the government will build a collaboration and cooperation framework based on the actual circumstances of each region to efficiently utilize and share geospatial information developed and owned by the central or local governments so that such geospatial information can be used for the maintenance and updating of geospatial information, including the Fundamental Geospatial Data and the Digital Japan Basic Map.

(ii) Further deepening of collaboration with industry, academia, government and citizens

In order to realize a G-Spatial Society, it is important to implement policies and measures that capture the needs of various segments of society and sustainably promote technological development and creation of diverse services. It is also important to further develop the cooperation ties among industry, academia, government and citizens where human resources with diversified expertise are assembled. For this reason, with respect to the "Industry-Academia-Government Collaboration Conference for Geospatial Information" consisting of officials and experts from industry, academia and government ("Industry-Academia-Government Collaboration Conference"), its focus needs to be shifted to the social implementation of projects from the pilot demonstration, with a view of the Olympic and Paralympic Games Tokyo 2020 to be held in 2020. Meanwhile, the central government and local governments will further strengthen the joint initiatives with officials

and experts from industry, academia, government and citizens, including private enterprises, universities and research institutes. Also, in order for the central government and local governments to efficiently develop, update and provide geospatial information, it is important to actively make use of the technological capabilities of private business operators and work for the advanced utilization of geospatial information by working together with such private business operators. For this reason, the government will develop a framework to further promote mutual circulation and utilization of various kinds of geospatial information and facilities/infrastructure developed by private business operators.

(2) Promotion of dissemination of knowledge and human resources development, etc.

To allow geospatial information to be highly utilized in more extensive fields, it is necessary to clarify close associations of geospatial information with the day-to-day living of people, and also to disseminate information among the general public on the benefit derived from the utilization of spatial information, the state of progress of national policies and measures, the latest technical trends and the like. Therefore, the government will hold seminars on the benefit derived from the utilization of geospatial information and the latest technology trends, lectures and symposiums that contribute to the creation of new industries and new services, exhibitions of new products and new services, and the like through the "Geospatial EXPO" in collaboration with industry, academia and government in order to invite proposals and stimulate ingenuity of private business operators and the like, concerning the creation of new industries or new services or further sophistication of existing services, at the same time disseminating and raising awareness about geospatial information among the people. In addition, the government will actively publicize the content of the policies and measures utilizing geospatial information and the progress thereof, geospatial information provided by the government as well as information on the services available from the Internet.

As represented by the consideration of Comprehensive Geography to be adopted as a mandatory subject in high schools by the Central Council for Education under the Ministry of Education, Culture, Sports, Science and Technology, in light of the increasing awareness of the importance of geospatial information, implementation of measures to promote the improvement of the level of geospatial literacy of citizens is sought after, such as continuous support in the enhancement of geography education. For this reason, the relevant governmental ministries will work together to render assistance to schools, such as holding seminars for teachers, providing advice on methods of utilizing data including hazard maps, and providing educational materials and tools that have been processed so that they can be used easily. Further, in order to develop human resources involved in the utilization of geospatial information, such as system designers and service designers, transcending the existing boundaries of academic disciplines in universities and other educational

institutions from the long-term and global perspective, the government will advance networking of various research institutions. Meanwhile, the creation of new industries and new services that utilize geospatial information is expected through the combination of surveying technology with other scientific technologies such as ICT. Therefore, the government will also carry out policies and measures to develop collaboration between engineers in other fields and survey engineers or measures to have engineers in other fields to learn surveying techniques. The government will also strengthen a comprehensive promotion framework to improve the liquidity of human resources and intellectual property through collaboration between industry, academia, government and citizens, such as the development of an environment for the creation of innovation and the creation of opportunities for co-creation.

(3) Strategic promotion of research and development

The government will study necessary matters for the strategic promotion of research and development at the Promotion Team established under the Advancement Committee and conduct necessary survey and research by working jointly with Industry, Academia and Government by utilizing the framework of the Industry-Academia-Government Collaboration Conference. With regard to survey and research on the operation and utilization of positioning satellites and remote sensing satellites, in particular, the government will work with relevant organizations, including, primarily, the National Space Policy Secretariat. Also, based on the Science and Technology Basic Plan, the government will collaborate with the Council for Science Technology Policy and implement technology development systematically that is necessary to utilize and promote geospatial information, as part of the national science and technology strategy. Furthermore, with respect to the results of various researches that are carried out in each area, the government will conduct sustained verifications through follow-up of this Basic Plan and other efforts, and also develop a framework to smoothly bring new technology to the social implementation so that the government can steadily deliver such new technology to the day-to-day living of people.

(4) Measures to be prioritized

In order to strategically promote initiatives aimed at realizing the world-class level of G-Spatial Society, the government will pick out policies and measures to be prioritized as "Symbolic Project", represent such projects/businesses in a more tangible way and accelerate such projects in collaboration with industry, academia, government and citizens. Furthermore, in order to steadily deliver to the general public the outcome obtained through research and demonstration, the government will formulate a process chart including key performance indicators (KPI) so as to promote such projects systematically. Regarding the said process chart, after the progress status of the policies and measures is verified every year by the Promotion Team installed under the

Advancement committee or other groups, it will be revised by the Advancement Committee, where necessary.

(i) Strengthening of the disaster prevention functions of evacuation centers utilizing the quasi-zenith satellite system

In order to provide support for prompt and smooth rescue and relief activities at the disaster sites at the initial stage of the disaster, the government will develop a system so that individuals' safety information and disaster-related information collected at evacuation centers or other facilities could be used by disaster prevention organizations such as Emergency Operations Centers by developing a safety confirmation service with disaster-related information conveyance functions making use of the quasi-zenith satellite system. In doing so, the government needs to ensure the coordination of the said service with disaster prevention and mitigation services that utilize IoT, the development and proposals of which has advanced by private business operators.

For this reason, the government will advance verification tests of such system during evacuation drills under the cooperation of local governments, introduce the safety confirmation service in model areas around five prefectures in 2018 on a trial basis, begin the operation of the said service in 2019, and expand the said service to roughly 20 prefectures in 2021.

(ii) Operation of a tsunami inundation damage estimation system

In order to facilitate the government and other organizations to understand the situation of the disaster as soon as possible and make prompt and accurate decision-making in the event of a disaster, the government will develop data such as geospatial information, and establish an advanced system environment utilizing supercomputers and the like, and construct a system to estimate inundation damage caused by tsunamis at the time of an earthquake. The government also aims for the information exchanges with disaster prevention related organizations.

Therefore, the government targets that the tsunami inundation damage estimation system will begin its operation in 2018.

(iii) Promotion of dissemination of the G-Spatial Disaster Prevention Systems

In response to wide-area disasters caused by earthquakes and tsunamis or large scale disasters that require urgency, the government will work on the development of the awareness of the "G-space Disaster Prevention System", an advanced disaster prevention system utilizing the quasi-zenith satellite system and other systems, through disaster prevention drills and promote introduction of the said system to local governments and other organizations as well as strengthening wide area cooperation, so that the system can contribute to the accurate simulation utilizing geospatial information and determination of appropriate evacuation recommendations, and so on.

For this purpose, the government will conduct verification tests and formulate standard specifications relating to multiplexing and diversification of conveyance means of L-alert utilizing geospatial information by 2019, advance dissemination activities of the outcome targeting nationwide development, and implement it in roughly 15 prefectures in 2020. In addition, in order to promote the autonomous implementation of the G-space disaster prevention system by local governments, the government will advance personnel support, dissemination and enhancement of awareness of the said system in cooperation with related government ministries aiming at the introduction of the said system at roughly 100 municipalities in 2020.

(iv) Promotion of development and dissemination of advanced automated driving systems

The government will continue conducting R & D on each technological challenge necessary for advanced automated driving systems such as the "Dynamic Map" that is composed of highly accurate three-dimensional road map data for automated driving system and other data, and conduct large-scale verification tests on public roads and other areas from 2017 for field verification. In this way, the government will establish required technology aiming for the realization of an advanced semi-automated driving system which will become a stepping stone for the development of a fully automated driving system in the future. Through such initiatives, the government will promote practical application of such system in automobile manufacturers and other business operators.

Therefore, the government will conduct a verification of the Dynamic Map, confirm the validity thereof in a large-scale demonstration test scheduled from the latter half of 2017 to 2018 and formulate technical specifications thereof that are necessary for advanced automated driving systems by the end of 2018.

(v) Promotion of unmanned aerial vehicle logistic projects utilizing the quasi-zenith satellite system

Maintaining a circulation network in remote islands and depopulated areas in the future is a matter of concern. Amid such a situation, flight demonstrations will be conducted to collect various data aiming at the realization of a safe and low-cost logistics project to remote islands by unmanned aerial vehicles utilizing the quasi-zenith satellite system, at the same time the surrounding environment will be improved for the promotion of the unmanned aerial vehicle logistics industry.

Therefore, the government will advance verification tests for the realization of a safe logistic to remote islands and other areas by unmanned aerial vehicles utilizing the quasi-zenith satellite system in cooperation with local governments by 2019, and commercialize the logistics project by unmanned aerial vehicles utilizing the quasi-zenith satellite system, and also promote dissemination activities toward nationwide deployment.

(vi) Promotion of development of an environment for highly precise positioning in indoor space

In order to realize a society in which everyone can smoothly move around and act without feeling stressed by developing an indoor and outdoor positioning environment with high accuracy, high reliability and in real time and also utilizing location information services, the government will conduct a study to develop a framework for the efficient and effective development and continuous maintenance and management of indoor maps while utilizing G-Spatial Information Center and other facilities, and promote the development of an environment which facilitates private enterprises to create diversified location information services.

Therefore, the government will promote the development of an environment for the creation of private sector services by demonstrating the development and utilization of spatial information infrastructure at airports, major stations, sports competition venues, and the like, in cooperation with relevant organizations. In respect of the Olympic and Paralympic Games Tokyo 2020, the government targets that an indoor map and positioning environment is provided at the venues, mainly in the related facilities, and various location information services are provided by about five businesses at 25 locations. After that, the government will promote and expand such effort to the whole country.

(vii) Mobility assistance to visitors to large-scale events, etc. by making use of G-Spatial Information Center

The government will provide support for the smooth mobility of operators and visitors of the Olympic and Paralympic Games Tokyo 2020 to be held in 2020 by overlaying the information obtained by observing and analyzing human flows at transport hubs such as stations and facilities that attract customers such as stadiums and the information present in G-Spatial Information Center, then, accumulating such analysis results during normal times and crowded times at G-Spatial Information Center for utilization.

To achieve this, the government will accumulate and utilize information on human flows at stations, stadiums or other event venues during normal times as well as crowded times when various games and events are held, by utilizing G-Spatial Information Center by 2019. By utilizing such data, the government will provide game operators and visitors with assistance for a safe and smooth mobility between the stations and the stadiums during the Olympic and Paralympic Games Tokyo 2020, by analyzing the flow of people around the facilities that attract customers. Further, based on this knowledge, the government will promote the creation of various services with an aim that new services are provided by private sectors in the three areas of crime prevention, guidance and marketing in 2021 by developing cutting edge geospatial information utilization models for domestic and overseas private enterprises.

(viii) Promotion of development and dissemination of automated driving technology and other technology for agricultural machinery

In order to put an automated driving system that can break through the limitation of the size of the land-extensive agriculture into practical use, with the multiple and night driving technology for agricultural machinery, the government will work on the research and development aiming at realizing fully unmanned, and multiple simultaneous automated driving . In addition, the government will work on the preparation of rules on safety measures for on-site implementation as well as the verification of safety-ensuring technologies.

For this reason, the government will advance the development of a low-cost system compatible with the quasi-zenith satellites by 2018 when the four-satellite constellation of the quasi-zenith satellite system is scheduled to be established. In addition, the government will advance the preparation of rules including that for safety measures as well as the verification to establish safety assurance technology, then commercialize the unmanned system to be used within the field under manned monitoring by 2018. Furthermore, the government will further advance the research and development of the safety assurance technology to materialize an unmanned automated driving system by remote monitoring, including traveling between fields, by 2020.

(ix) Promotion of growing industrialization of forestry utilizing geospatial information and ICT

The government will promote the intensification of forest management and improve work efficiency and productivity by utilizing geospatial information and ICT, obtain highly accurate forest resource information for realization of a stable supply system of domestic timber by taking advantage of the remote sensing technology such as airborne laser survey and satellite images, and then share such information using ICT such as clouds among stakeholders including prefectures, municipalities and forestry business entities. Moreover, the government will demonstrate advanced initiatives in the selected regions aiming to improve the efficiency of timber production and circulation and balance the demand and the supply, and so on, through the understanding and sharing information on the demand and supply by utilizing ICT among stakeholders.

Therefore, the government will promote the intensification of efficient forest management by developing and demonstrating the forest cloud in 2017 and engaging in the initiative to enrich forest information utilizing ICT, such as remote sensing and cloud and share information, and also promote demonstrations utilizing ICT at the advanced model regions for growing industrialized forestry. In this way, the government will disseminate and develop a successful model so that the forestry cloud can be introduced by roughly five prefectures by 2021.

(x) Advancement of utilization of three-dimensional data by promoting i-Construction

The government will promote i-Construction that utilizes ICT and the like in all construction and production processes from research, survey, design, construction, inspection, maintenance to renewal with an aim at improving the productivity of construction sites by 20% by 2025.

Upon promoting policies and measures, the government will develop a platform to utilize three-dimensional data of public works that are accumulated through the full use of ICT, create open data, gather information at G-Spatial Information Center and do other initiatives, thereby expanding the circulation and utilization of three-dimensional data.

To achieve this, the government will promote the development of standards and the like, aiming for the expansion of the utilization of ICT, three-dimensional data and the like to all processes, including maintenance and management and also to construction sites including bridge, tunnel, dam construction sites and the like, by 2019.

(xi) Promotion of R & D and service model development engaged by small and medium-sized enterprises and microbusinesses

The government will strengthen the competitiveness of small and medium-sized enterprises and microbusinesses that support the regional economy by providing necessary support to small and medium-sized enterprises and microbusinesses in their research and development as well as their development of new service models utilizing positioning satellites such as the quasi-zenith satellite system and remote sensing satellites.

For this reason, the Regional Bureaus of Economy, Trade and Industry and the Organization of Small & Medium Enterprises and Regional Innovation (SME Support) will unearth potential projects for commercialization among research and development projects conducted jointly by industry, academia and government and new service models developed, and the SME Support will provide comprehensive and consistent support to about five projects selected by 2020. In this way, the government will work on the commercialization and dissemination of products by boosting such symbolic projects.

(xii) Exports of high-precision positioning services utilizing GNSS CORS network and the quasi-zenith satellite system

In view of the growing interest in GNSS CORS network and the quasi-zenith satellite system in the ASEAN region and Australia, a highly precise positioning service that fully utilizes the mechanisms thereof will be developed. Specifically, the government will promote highly precise positioning services while taking consideration of the requests and needs of the partner country so that GNSS CORS network can be operated in an integrated manner and the correction information

for high-accuracy positioning can be made available in the private sector, at the same time developing an environment for the use of the world geodetic system and the quasi-zenith satellite system common to our country. In this way, the government will contribute to the building of a convenient and secure society.

Therefore, based on the resolution of the UN General Assembly on the development and maintenance of GGRF, the government will continue supporting the efforts in introducing the world geodetic system to various countries and assist in the integrated operation of GNSS CORS network, with an aim that roughly 260 control points to be installed or operated by 2021 in the ASEAN regions through the Japan's assistance and support. Furthermore, the government will ensure that quasi-zenith satellites are launched (No. 2 to No. 4 in 2017, the successor to the first unit in 2020, followed by No. 5 to No. 7 in 2023, as a target), and promote the wide-spread use of satellite positioning services and augmentation services without delay so that those services can be available in about two countries in 2021. Through such support and dissemination initiatives, the government will expand high-precision positioning services utilizing the GNSS CORS network and the quasi-zenith satellite system into the ASEAN region and Australia.

(xiii) Formation of a circulation system of geospatial information

To deal with the diversification of geospatial information, the government will mutually link various kinds of gathering systems of geospatial information and information centers which are formed according to the purpose, with G-Spatial Information Center as a hub. With an aim at forming a circulation system of geospatial information that generates new data with values, more information needs to be gathered, shared, then analyzed and processed in an integrated way.

Therefore, the government will promote sharing of more information, and then analyze and process such information by 2019 by utilizing G-Spatial Information Center as a hub for the circulation and utilization of geospatial information. In this way, the government will further advance the utilization of geospatial information with a target that it produces 10 sectors of new valuable data and provides it to users, with more than 50 organizations expected to participate in the circulation system in 2020.