

# **Basic Plan for the Advancement of Utilizing Geospatial Information**

(Provisional English Translation\*)

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\* This document is an unofficial translation.

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## **Introduction**

In various natural, social and cultural environments, as well as the socio-economic and daily living activities that are conducted in those environments, diverse matters related to the land and the lives of the people involve much information about position and time, and the states of when, where, what and how, which are treated as geospatial information. Thus, because we are surrounded by a wealth of geospatial information, we must have an accurate understanding of this information and conduct analyses to reveal complex phenomena in order to resolve a wide range of problems from the very local level to social issues that involve the entire nation.

Geographic Information Systems (GIS) and Space-based Positioning, Navigation and Timing (Space-based PNT) enable the intensive utilization of geospatial information. GIS is a system that processes digitized geospatial information in an integrated manner on digital maps to provide visual expressions and high-level analyses. In addition, Space-based PNT uses signals transmitted from positional satellites to acquire temporal and location information in real-time, as well as information on such things as the paths of movements. Massive amounts of geospatial information acquired through the use of GIS and Space-based PNT can be used to “visualize” changes in complex phenomena in the world that occur moment by moment. Furthermore, high-level analyses can enable the accurate sharing of information and help to resolve problems.

In 2007, the Basic Act on the Advancement of Utilizing Geospatial Information (Act No. 63 of 2007) was implemented. Based on this act, in April 2008, the Japanese government promulgated the Basic Plan for the Advancement of Utilizing Geospatial Information, or Basic Plan for the Advancement of Utilizing Geospatial Information (hereinafter referred to as “the previous basic plans”). The previous basic plans were government plans for promoting the comprehensive and systematic use of geospatial information in an effort to achieve “an Advanced Geospatial Information Utilization Society (G-Spatial Society)”.

In the previous basic plans, progress was made in arranging fundamental geospatial information and setting rules for its distribution, and the launch of “Michibiki,” Japan’s first quasi-zenith satellites, helped to provide technical and utilization corroboration. In addition, with the establishment of a framework for cooperation among industry-academia-government, and events such as the “Geospatial Expo,” these three sectors began to act as an integrated body to address various topics and issues.

During this time, social conditions that involve geospatial information have been changing dramatically. Information and communication technology has undergone rapid development, and new and diverse services have been appearing. Highly functional personal technologies for individuals such as smartphones have seen explosive growth as well, and people’s needs are becoming even more diversified. In addition, Japan is facing many social issues, such as a declining and aging population, low birthrate and longevity, environmental problems, energy problems, globalization of the economy, maintenance of public infrastructure, and preserving the safety and security of communities. However, there are expectations that the development of

geospatial information and the use of GIS and Space-based PNT can be used as tools for solving these issues. Furthermore, demands are being made for geospatial information to play an even greater role in rebuilding and restoration efforts in the wake of the 2011 Great East Japan Earthquake and subsequent disaster preparedness.

Against this backdrop, in order to respond to issues that face us, and to promote even greater use of geospatial information in society, a new five-year Basic Plan for the Advancement of Utilizing Geospatial Information has been formulated to continue to address these issues.

## **Part I. Basic Guidelines for Formulating Measures for Advancing the Utilization of Geospatial Information**

### **1. Approaches that should be taken to materialize the G-Spatial Society**

The development of geospatial information and the promotion and high level of its utilization through GIS and Space-based PNT are important for achieving a society that can help the people live rich, safe and secure lives, today and in the future. For that purpose, previous basic plans were designed to achieve “an Advanced Geospatial Information Utilization Society (G-Spatial Society)” that would enable “anyone, anywhere, at any time” to use geospatial information and obtain accurate information based on high-level analyses for their daily activities. The current plan builds upon the results of previous plans, incorporating subsequent advancements in geospatial information technology and new ideas to respond to the various changes in the economy and society to promote further advancement of the G-Spatial Society.

The following is a description of tangible effects that the materialization of the G-Spatial Society is aiming for.

#### **(1) Promoting the utilization, development and preservation of land, and sustainable land-use that is highly resistant to disasters**

Japan is covered by a variety of natural and social environments. The development of geospatial information and the use of GIS and Space-based PNT have enabled analyses to be made for understanding all aspects of Japanese territory, not just land areas but maritime areas as well, which in turn can lead to better management of those areas.

Geospatial information which accurately depicts the position and shape of Japanese territory is the most fundamental type of information of Japan’s land and sea areas. The development of reliable information can help to guarantee Japan’s safety and protect its rights and interests.

It has become possible to use technologies such as remote sensing and Space-based PNT to learn more about changes in the global environment, Japanese territory, and the various phenomena that are occurring there in order to promote greater effectiveness, efficiency and safety in the use and development of the country’s land and resources. Furthermore, high-level analyses are enabling progress to be made in reducing carbon dioxide emissions and environmental pollution, preserving biodiversity, and making efficient use of resources and energy, and well as promoting sustainable use of the nation’s land.

In regard to public infrastructure, such as roads, streams, bridges, water and sewer systems, and port facilities, data on its arrangement, routes, changes over time, etc., is developed as geospatial information which can be analyzed to a high degree using GIS and Space-based PNT. The utilization of such types of information can help to improve greater efficiency and quality in the maintenance and management of public infrastructure and contribute to the early detection and repair of damage and malfunctions.

The utilization of geospatial information can help to improve the monitoring systems and

establish regional response systems based on new predictions of potential damage from various types of natural disasters including earthquakes, tsunamis, volcanic eruptions, typhoons and floods. Furthermore, accurate predictions of damage and rapid understanding of damage conditions when a disaster occurs can enable precision responses to be made and help to quickly provide information for recovery and restoration which in turn can help Japan become more resistant to disasters.

## **(2) Achieving high-quality, safe and secure living**

The utilization of geospatial information to help resolve various issues in daily living can increase the safety, security, and quality of daily life.

In response to the various threats that we face in daily living, such as damage from natural disasters like earthquakes and floods, the outbreak of communicable disease, accidents, fires, and crime, the linking of changing conditions with place information can enable accurate and efficient decisions to be made on a regular basis and provide rapid response when the need arises. This in turn helps to protect the lives and property of the people and make communities safer and more secure.

Against a backdrop of declining and ageing population, the utilization of geospatial information by, for example, alliances among local governments, private companies, NPOs, local residents, etc., can help communities provide a wider variety of support services for children, the elderly and others such as transportation on demand, caregiver services, barrier-free maps, services for assisting pedestrians, and so on.

Furthermore, the combination of geospatial information with new technologies and devices such as smartphones that are quickly coming into widespread use can help to increase the quality and convenience of daily living by, for example, providing easy access to a high level of useful services and information.

## **(3) Creation of new services and industries**

New ideas and advances in geospatial information technologies have led to the creation of unprecedented services and industries, as well as new developments in existing industries, which are expanding business opportunities and vitalizing the economy and local communities.

Location information services, which handle information on the locations of people, things and local conditions, have been popularizing pedestrian navigation systems, location-based games, etc. among the public, and the development of information and communication technologies have made it possible to utilize these even more effectively. For example, the fusion of information about activity history with information about stores, sightseeing, etc., which is now possible for both indoors and outdoors, has led to the creation of new services to meet diverse individual needs.

In addition, in various aspects of industrial activities, the utilization of GIS and Space-based PNT makes it possible to have more accurate movement, automation and labor savings, which



helps to increase productivity and efficiency.

With the expansion of such services and industries, new means for accommodating staff who handle the utilization of geospatial information are being formed, which is creating new employment opportunities in Japan. Furthermore, the high-level geospatial services and technologies that are available in Japan are being combined with other technologies and services and being offered overseas as “total packages,” which helps to enhance Japan’s international contributions and international competitiveness.

#### **(4) Promoting greater efficiency and quality of administrative services, and new public benefits**

The development and utilization of geospatial information by public organizations of the national and local governments are enabling greater efficiency and higher quality of services, and cooperation between residents and local governments through GIS can be used for community development.

Most of the information handled by the national and local governments is closely related to land use and community. Therefore, by developing and sharing this information as easy-to-use geospatial information, it is possible to get an accurate understanding of conditions and make administrative decisions and responses based on analyses, as well as promote greater efficiency and quality of administrative work. Moreover, in individual administrative fields such as town planning, the combination with information from various other fields can help to implement more precise measures and policies.

In addition, “visualizing” information about the community, such as having local governments provide and distribute their geospatial information in a format that can be utilized with GIS, collecting opinions and data on the state of activities of residents and others, etc., as geospatial information, can help local governments and residents work together to solve problems, promote alliances of various groups, and provide greater vitality to local community.

In this way, the development of geospatial information and the utilization of GIS and Space-based PNT can be expected to make a wide array of contributions, from providing support for land management and daily living, to expanding business opportunities and helping local governments become more efficient and provide a higher level of services.

Today, Japan is facing a variety of social issues, such as a declining and aging population, environmental and energy problems, globalization of society and the economy, maintaining and managing public infrastructure, ensuring safety and security in the community, and recovering and rebuilding from disasters, among other things. These issues are overlapping one another and are becoming opaque to the public. However, the utilization of geospatial information can help to resolve such issues. In other words, it is a new means for unraveling the complex social phenomena and considering solutions that can be used in the future to enrich people’s lives and society in general.

## **2. Current conditions and issues with geospatial information**

In order to promote an even higher level of geospatial information use in the present plan, the results and achievements of the previous basic plans were examined. The conclusion was that it is necessary to identify issues that should continue to be addressed, as well as new issues arising from recent changes in social conditions, and encourage efforts toward their resolution.

### **(1) Results and achievements of previous basic plans and associated issues**

Previous basic plans were promoted under the national government's "Committee for Advancing the Utilization of Geospatial Information" (hereafter, "Advancement Committee"), systematically in a joint effort with various government ministries. Specific goals of each policy, period of achievement, etc., were compiled as the "Action Plan for Advancing the Utilization of Geospatial Information (G-Spatial Action Plan)." Follow-up and necessary revisions are made every fiscal year, and the results are released to the public.

The results of approaches made as important items during the period of the previous basic plan, and the issues that should be continued to be addressed in the present plan based on those results, are as follows:

#### **1) Development and provision of geospatial information such as fundamental geospatial data**

In order to overlay the geospatial information developed by various organizations, GSI and others established cooperative relationships with local governments, etc., to develop fundamental geospatial data that would become reference information on positions. As a result, in fiscal 2008, fundamental geospatial data of 1:25,000 in scale for the entire country were publicly released on the Internet; at the end of fiscal 2011, highly precise 1:2,500 fundamental geospatial data covering nearly all of Japan's urban planning zones were released free of charge on the Internet. In addition, work was begun on the Digital Japan Basic Map to replace the conventional topographic maps. These maps are the result of intensive efforts made in close cooperation between the national and local governments. However, greater efforts must be made to continue these cooperative relationships.

In addition, the national government, local governments, private companies, etc., will all have to utilize the previously developed fundamental geospatial data as position standards when developing geospatial information. At the same time, in order to ensure the freshness of fundamental geospatial data, the Digital Japan Basic Map, etc., while proceeding with the day-to-day development of public infrastructure, it is necessary to strengthen the cooperative system for updating information even more quickly, as well as to continuously provide location information database such as GNSS-based Control Stations in order to provide support for location standards.

In previous basic plans, geospatial information other than fundamental geospatial data that was owned by the national government, local governments, etc., was being digitized and

provided through the Internet. However, there was still much information in various fields that could be used more effectively if it were digitized and provided in a format for secondary use. Thus, it is necessary to continuously develop, update, and provide information that can be used with GIS.

## **2) Promoting the provision and distribution of geospatial information**

In September 2010, the Advancement Committee formulated its “Guidelines for Handling Personal Information when Utilizing Geospatial Information” and “Guidelines for Promoting the Secondary Utilization of Geospatial Information” as basic concepts for facilitating the secondary utilization of geospatial information and the protection of personal information. It is also necessary to take appropriate measures in continuous investigations out of concerns for public safety. In order to help expand the provision and distribution of geospatial information, it will be necessary to further develop precise rules for shared use, establish specific frameworks for mediating between data creators and users, and investigate frameworks for publicly releasing not only maps, but also map contents in formats for secondary use.

However, the geospatial information created by various organizations is widely scattered and thus is not always satisfactorily shared and utilized. Therefore, in order to promote the distribution and sharing of such different types of information, a framework for enabling the comprehensive searching, acquisition, and utilization of geospatial information must be established. In addition, because demand for types, contents, accuracy, freshness, etc., of geospatial information is diversifying and intensifying, it will be necessary not only to address the efficient utilization of geospatial information that administrative organizations have already developed, but also to strengthen collaborative relationships among administrative organizations and private companies, etc., to develop environments, frameworks, etc., for utilizing geospatial information created by private companies, community residents, NPOs, and others.

## **3) Establishing a high-tech base for Space-based Positioning, Navigation and Timing**

The utilization of Space-based PNT is rapidly expanding in many fields, both inside and outside Japan.

Ever since the September 2010 launch of “Michibiki”, Japan’s first quasi-zenith satellite, the Japan Aerospace Exploration Agency (JAXA) and related organizations have been conducting technical and utilization verification tests. These tests have already confirmed that functions for supplementing and strengthening the positioning functions of GPS in quasi-zenith satellites, have more or less achieved the original objectives. Regarding the utilization tests, the Satellite Positioning Research and Application Center recruited over 200 corporate and organizational participants to conduct corroborative research on more than 100 themes. The results have demonstrated the possibilities of new projects and new applications and have identified issues to be addressed for materializing them.

Japan is still using “Michibiki” to conduct corroborative research on quasi-zenith satellite

systems. To materialize practical services, it will be necessary to develop practical quasi-zenith satellite systems, and at the same time, the Japanese government will have to increase cooperation and collaboration with industry and academia to advance utilization and overseas projects.

#### **4) Strengthening ties among industry-academia-government**

In order to encourage industry-academia-government to form a partnership and fulfill their respective roles for materializing a G-Spatial Society, the Industry-Academia-Government Collaboration Conference for Geospatial Information was established in October 2008 composed of various organizations, scholars and professionals from these sectors, and 3 working groups (WGs) were set up: Research and Development, Disaster Prevention, and Geospatial Expo. The Geospatial Expo that was held in September 2010 based on these frameworks attracted roughly 40,000 visitors served as a means for creating new services and industries and for enlightening laypersons.

In June 2009, the Research and Development Working Group compiled its “R&D Map for Utilizing Geospatial Information” to provide a roadmap for future research and development. The Disaster Prevention Working Group held ambitious research seminars, etc., to bring in new ideas and opinions from private companies and others. To continue with this, it is necessary to work to strengthen industry-academia-government partnerships that utilize these frameworks. Furthermore, in order to expand the fields where geospatial information is used, the frameworks for industry-academia-government partnerships for geospatial information use must be expanded and developed from the national to the local level.

In addition, previous basic plans dealt with developing programs and textbooks for training people in the fields of administration (local governments, etc.) and education, and holding seminars, creating pamphlets, building portal sites, etc., to enlighten as many average citizens as possible. These results should be used for the public benefit, and further attempts must be made to satisfactorily manifest their effects.

#### **(2) Changes in social conditions surrounding geospatial information**

Since the implementation of the previous basic plan, social conditions surrounding the use of geospatial information have been in state of flux. Various developments have been seen, such as expansion of the usage environment in conjunction with advances in information and communication technology, advances in technologies for acquiring geospatial information, and various countries’ approaches to the field of Space-based PNT. Furthermore, while the Great East Japan Earthquake of March 11, 2011 caused an enormous amount of damage, from the perspectives of recovering from disasters and future preparations, it showed the value of utilizing geospatial information and revealed new issues.

Solutions for such new issues that have arisen in conjunction with the various changes that have surrounded geospatial information will have to be addressed in the present plan.

## **1) New issues and possibilities arising from advances in information and communication technology**

With advancements in information and communication technology such as the popularization of cloud computing, permeation of social media, expansion of services through Mashup, open-sourcing of GIS software, etc., and the development of corresponding environments, compound services that are a fusion of individual systems and services are being developed. Furthermore, the popularization of highly functional portable terminals such as smartphones, improvements in wireless communication environments such as Wi-Fi (Wireless Fidelity), etc., are creating an environment where information can be obtained anywhere at any time. Against this backdrop, the environment for utilizing geospatial information has been improved, and various location information services, such as services for pedestrian navigation, location-based games, position-linked advertising, and services that use activity history have been created. One means that has come to the forefront for expressing geospatial information to give people an intuitive understanding involves overlaying information on real-life images is augmented reality (AR), which visualizes things that do not exist in reality.

By itself, information on the massive numbers of things that fill actual space is not geospatial information. However advancements in and popularization of electronic tags, sensor networks, etc., have made room for new uses as geospatial information that are related to location and time information.

In addition, regarding methods for measuring positions on land (indoors, outdoors) and in maritime areas and the seamless framework that supports them, work has been progressing on technical studies, place identifiers (PI), etc., for international standardization, but actual development will take time. However, given that most human activity probably takes place indoors, demands are arising for the development of new spaces to correspond to new technologies, especially indoor positioning which will lead to new business opportunities and help to provide safety during times of disaster.

With advancements in such information and communication technology, come new issues regarding the confidentiality of communications, personal information, privacy, intellectual property rights, and so on. For example, due to the popularization of smartphones, etc., new location information services that use activity history are expanding, and it is becoming even more important to maintain a balance between protecting privacy and personal information, and ensuring safe use with anonymous technologies. In addition, demands are arising to establish frameworks for preventing deliberate distribution of fake and misleading information, preventing the obstruction to Space-based PNT, implementing measures to prevent the leakage of information that should be confidential, and guaranteeing positional accuracy and the reliability of information, among other things.

## **2) Changes in the environment surrounding surveying and positioning technologies**

The development of technology for high-quality 3D surveying enabled by digital aerial cameras, mobile mapping systems, etc., the technical development for indoor/outdoor seamless positioning and for using quasi-zenith satellites, improvements in acquiring information resulting from advancements in sensor technology, etc., real-time depictions of information, etc., have expanded the amount of space and acquirable information. These technological developments are increasing demand for fresh geospatial information of high quality and accuracy. At the same time, however, even more detailed geospatial information, such as high resolution satellite images and aerial photos, will likely permeate society, leading to demands to take proper measures to protect privacy and ensure national safety.

The numerous devices that acquire information on position and time are becoming dependent on Space-based PNT, making it increasingly important for Japan to possess its own positioning satellite system.

Other countries such as the United States, Russia, the EU, and China are proceeding with the development of a Global Navigation Satellite Systems (GNSS), and India is developing a regional positioning satellite system. In addition, supplemental functions for increasing the reliability and accuracy of positioning are being created on a regional basis around the world. Using positioning functions in conjunction with supplementary functions should lead to the development of wide-area land-based systems that incorporate satellite positioning. In this way, countries are competing with one another to construct a positioning satellite system as part of their socio-economic infrastructure. Against this backdrop, Japan must develop a practical quasi-zenith satellite system as soon as possible.

Amidst such advancements in surveying technology, improvements in surveying equipment, development of positioning satellite systems, etc., such events as the globalization of markets are changing economic conditions in Japan, and even in industries involved with geospatial information, it has become necessary to undertake overseas projects. In order to strengthen its international competitiveness for overseas development, Japan must establish partnerships for various fields, package services, systems, regulations and leading technologies, and examine frameworks and strengthen systems for development, among other things.

## **3) Occurrence of the Great East Japan Earthquake and lessons learned therefrom**

The Great East Japan Earthquake that occurred on March 11, 2011 was an unprecedented catastrophe that caused massive damage over an extensive area. In the midst of this disaster, however, the latest surveying, and information and communication technologies have been able to provide a rapid understanding of all damage and changes that have occurred in affected areas. In addition, partnerships among various organizations, including private companies, have used geospatial information to provide rapid information about disaster conditions and support for victims. Efforts based on geospatial information made significant contributions. However, while there was recognition of this role, the loss of information possessed by administrative

organizations, the lack of coordination among administrative organizations, private companies, NPOs, etc., meant that some information and technologies were not utilized satisfactorily, among other things, and issues with the use of geospatial information during major disasters became apparent.

As a result, it is necessary to investigate what, if any, contributions previously developed and applied GIS and Space-based PNT could make during the Great East Japan Earthquake, and to promote policies designed for sustainable land-use that will accelerate the restoration and recovery of disaster areas and be highly resistant to future disasters. In addition, there is rising demand to take measures to prevent and mitigate future disaster damage based on what was learned from this and other earthquakes, by not only digitizing information, but also developing a framework for sufficiently distributing necessary information during major disasters and formulating business continuity plans (BCPs), among other things.

### **3. Basic goals of the present plan**

Given the above conditions and issues, the present plan contains project goals for the coming 5 years, especially the following 4 foundations of work that should be undertaken to achieve a G-Spatial Society:

#### **(1) Developing continuous geospatial information to meet society's needs and applications to new uses**

Basic geospatial information such as fundamental geospatial data and the Digital Japan Basic Map is being continuously developed, updated, and provided. In the previous basic plan, there was a concerted effort among various organizations such as the national government, local governments and private companies, to develop geospatial information which is bearing fruit to a certain extent as information infrastructure. However, demands are rising for easy-to-use geospatial information that is geared toward the diverse and intensive needs of users. Therefore, efforts are being made to develop and provide higher quality geospatial information from users' perspectives.

In order to expand the methods and scope for utilizing geospatial information, a framework is being developed for linking various types of information about places and things as key location information, and a database for enabling seamless positioning indoors and outdoors is being created. As a result, rapidly advancing information and communication technologies, etc. are being used to develop an environment which can effectively use large amounts of information that have potential for utilization as geospatial information, in a wider range of fields and situations.

#### **(2) Domestic and overseas development and utilization of practical quasi-zenith satellite systems**

Quasi-zenith satellite systems can help to improve Japan's international industrial

competitiveness, increase the efficiency and quality of industrial production, government and daily living, enhance Japan's presence and contributions to the Asia-Pacific Rim, and in a broad sense ensure safety by, for example, strengthening US-Japan cooperative ties and disaster response capabilities.

With other countries developing Space-based PNT systems, Japan has decided that it should develop a quasi-zenith satellite system as soon as possible. Specifically, this involves developing a 4-unit system by the late 2010s. Plans call for the eventual development of a 7-unit system that can provide for sustainable positioning.

In addition, as it promotes partnerships with industry, the government as a whole is making a full-fledged effort to undertake overseas projects, and develop and utilize a practical quasi-zenith satellite system.

### **(3) Further permeation and establishment of the geospatial information in society**

As means for various municipal offices to undertake their duties, solve problems, share information among themselves, and provide better services to residents, the national and local public governments are continuously promoting the development and effective use of geospatial information to achieve the G-Spatial Society. By taking the lead in promoting its use, the national and local governments are also working to expand its use by related fields and by the general public.

In addition, the sharing and mutual use by the general public of geospatial information developed by various organizations have not always been satisfactory, so work is being done to create a new framework. Releasing information in a format that can be used with GIS and developing an environment which facilitates searches, acquisition, and utilization of geospatial information, etc., required by users is designed to form the grass roots for enabling its utilization by the general public.

In addition to such efforts, as a continuation of the previous basic plan, examinations are being made regarding such things as benefits to individuals and the safety of the country in order to provide geospatial information in a proper manner. Also, policies are being implemented to train people to be in charge of the G-Spatial Society, enlighten the general public, and strengthen ties among relevant players. This will lead to greater permeation of geospatial information in society and accelerate the efforts to achieve a G-spatial Society.

### **(4) Recovery from the Great East Japan Earthquake and contribution to sustainable land-use that is highly resistant to disaster**

Necessary geospatial information is being developed and provided in order to contribute to the rapid recovery and restoration from the Great East Japan Earthquake, and to record the major changes that occurred to the land as a result of the disaster, as well as the course of subsequent restoration. As a result, the "Prevention of damage from earthquakes and other natural disasters" and "Safe community development where everyone can live secure lives into



the future” are being promoted based on the fundamental concepts of the Basic Act on Reconstruction in response to the Great East Japan Earthquake (Act No 76 of 2011).

In addition, a system is being established to utilize geospatial information both during times of disaster and during restoration and recovery efforts, and geospatial information is being developed to prevent and mitigate disasters. By undertaking this work based on the numerous issues that arose from the response to the Great East Japan Earthquake, preparations are being made to deal with a hypothetical massive earthquake or other disaster originating in the Nankai Trough.

#### **4. Effective implementation of the plan**

This 5-year plan, which includes all of fiscal years 2012 through 2016, was established giving full consideration to what was addressed in the previous plan and subsequent changes that have occurred in social conditions, etc. Follow-up will be made to monitor the progress of the plan, and revisions will be made as needed in response to changes in social conditions, etc.

The following are measures that must be taken to systematically and effectively carry out this plan.

##### **(1) Construction of a comprehensive and systemic base for geospatial information**

To materialize a society that can utilize a high level of geospatial information, it is not sufficient merely to develop, provide and distribute this information; it is also necessary to develop the technology and train people to utilize it, among other things. To advance the present plan, all of these aspects are treated as public infrastructure and are being developed in a comprehensive and systematic manner.

##### **(2) Legal measures, etc.**

To advance the present plan, thorough investigations are made when it appears that relevant laws and regulations must be revised.

##### **(3) Linkages with various other plans**

When advancing the present plan, sufficient consideration is given to maintaining compatibility and manifesting of cooperation effects with other policies for new information and communication strategies, such as Strategies to Revitalize Japan, Basic Plan for Outer Space, Basic Plan on Ocean Policy, Basic Guidelines for Recovering from the Great East Japan Earthquake, and the 4th Basic Plan for Science and Technology, among others.

##### **(4) Follow-up for the plan**

To advance the present plan, the government will give consideration to more detailed targets of policies and the period for achieving them, and will conduct a follow-up every fiscal year on the state of progress. When necessary, revisions will be made to the plan.

## **Part II. Development of Concrete Measures for Advancing the Utilization of Geospatial Information**

### **1. Measures and policies related to Geographic Information System (GIS)**

#### **(1) Development and updating of geospatial information as public infrastructure**

Whether GIS is used effectively or not depends on having people regularly using the latest geospatial information for a variety of purposes. Therefore, the national and local governments, private companies, etc., must work to digitize their own information and continuously develop and update it.

For such development and updating, the national and local governments, private companies, etc., must utilize previously developed fundamental geospatial data and make have position compatible with other geospatial information. In addition, related organizations must collaborate with one another to make development and updating faster and more efficient while avoiding redundant work. Furthermore, regarding that developed and updated information that must be provided widely to the general public, the national government, after considering the rights and interests of individuals, the nation's safety, and relevant laws, regulations, etc., provides this information, usually through the Internet, for free, or a low price, whenever possible.

Against this backdrop, geospatial information is systematically being developed and updated as follows, and research and development are being advanced to make this development and updating more efficient.

#### **1) Developing base map information, etc. for land and maritime areas**

The most fundamental information about Japanese territory is developed and updated as appropriate by the national government. This is extremely important for national land management, and must continuously be ambitiously addressed. Therefore, the Japanese government is promoting the development of the most basic maps that show current land-use conditions, i.e., Digital Japan Basic Map, that can be used by the general public as a base for utilizing various types of geospatial information based on fundamental geospatial data for all land areas, including some remote islands for which that had been difficult in the past. This is especially the case with regions and topographic features that are important for land management. The national and local governments form cooperative relationships with managers, etc., of public facilities to give priority to developing and updating fresh, high-level information.

In addition, the various types of geospatial information on maritime regions are important as basic scientific materials for determining Japan's maritime boundaries and the extent of the continental shelf, and as materials for the use, development, environmental protection, maritime safety, disaster prevention, etc., of territorial waters and exclusive economic zones. Therefore, the national government is working to develop various types of information about such things as seafloor topography, sediments and geological structure, terrestrial magnetism, and gravity,

which is incorporated into maritime maps and provided via the Internet.

In the previous basic plan, observation data from the Advanced Land Observing Satellite (ALOS) “*Daichi*”, etc., were utilized for various purposes such as cartography, disaster prevention, and land management. It is necessary to continuously develop and provide such image data as important geospatial information. Consequently, for various Earth observation satellites developed in Japan, the Japanese government is continuously promoting the development and provision of observation images, archives, etc., as well as on-going research and development of next-generation Earth observation satellites and sensors.

In addition, the national and local governments are constantly and systematically taking aerial photographs for various official purposes such as updating the Digital Japan Basic Map and managing national forests, and are also developing orthophotos that can be superimposed on maps. Furthermore, research and development is being done on synthetic aperture radar (SAR), which can acquire data even during nighttime and stormy weather, to facilitate the development of image data that is necessary for disaster prevention and other uses.

Information about land and public facility boundaries, such as lot line information, etc., in maps archived in land registries derived from the results, etc., of cadastral surveys, is an important foundation that supports various activities of the public and is also utilized as basic materials for administrative activities. However, land registries conducted by municipalities are lagging, especially for urban sections. Consequently, the national government is promoting, as the first stage of cadastral surveys, basic boundary survey between public and private lands in urban areas such as survey of the perimeters of street blocks. The results of various types of surveys on public and private boundaries have a major effect in promoting proper management of public properties, cadastral surveys, etc., so they are important for conducting sound surveys. In addition, cadastral registers are being developed through the use of surveying results besides cadastral register surveys of city centers. The results are being used to promote the development of maps archived in land registries, especially in congested areas of urban maps.

Various types of geospatial information developed for specific purposes, such as geology, land-use, etc., is important information for efficient land-use, disaster prevention, and environmental preservation, so it is important to promote its continuous development as digital data. Consequently, the national government is promoting further surveys and digitization of information related to geology, resources, active faults, volcanoes, history of tsunamis, land-use, land cover, soils, lakes and wetlands, rivers and streams, groundwater, oceans and seas, flora and fauna. Furthermore, various types of information on land use, legally designated areas, public facilities, etc., that have been converted into GIS numerical data, as well as various types of geospatial information such as numerical map information on national forests, are constantly being developed and updated.

Statistical data provides an important public database to help the people make rational decisions. As with other types of geospatial information, it is important to have this information widely used by the general public, so the national government is continuously promoting the

development and provision of statistical data as geospatial information.

In other areas, geospatial information such as maps, geographical names, ledger data, surveying charts, etc., developed by various sectors of the national and local governments contains information of particularly high value for other governmental departments, private sector companies, the general public, and others, so efforts are being made to develop this information in a format that can be used with GIS.

## **2) Developing and updating fundamental geospatial data, etc., that becomes the standard for digital maps**

As standards for positions on digital maps, fundamental geospatial data, etc., that are used to support various types of geospatial information must be continuously kept fresh and accurate and widely distributed, so it must be developed and updated by relevant national and local government organizations acting as one unit.

Therefore, regarding fundamental geospatial data, GSI is efficiently using city-planning information that is constantly updated by municipal organizations, as well as CAD data of construction plans developed by national government organizations, etc., to update the Digital Japan Basic Map. Items that are particularly important for the management of lands such as roadsides, disaster prevention measures, etc., are given priority for frequent updating. Furthermore, information that is developed national and local government organizations is being utilized to continuously update it and increase the accuracy of elevation data that is widely used by various sectors as highly detailed 3D information that covers the entire land area of the country.

For fundamental geospatial data to be widely used by the general public as position standards on digital maps, the national government constantly provides developed and updated information to users, usually free of charge through the Internet. Additionally, the government is working to properly provide updated information in order for users to utilize fundamental geospatial data continuously. Furthermore, regarding items, development methods, etc., of fundamental geospatial data, revisions are made when necessary based on development up to that point, state of use, changes in the social situation, etc., to promote sustained use.

In Japan, where there are numerous earthquakes and other crustal movements, it is extremely important to precisely determine positioning standards on the globe. Therefore, the national government systematically carries out base point surveying, etc., on information related to land survey standards in Japan to promote continuous systemic development. Furthermore, an environment is being developed that will provide an accurate, real-time understanding of crustal movements in Japan through the precise use of GNSS continuous observation systems using GNSS-based Control Stations distributed throughout the country. This and other developments will help to maintain the accuracy of all geospatial information, and both sustain and increase the accuracy of the location information database that can help to provide an accurate assessment of the land and sea areas of Japan.

## **(2) Development of a new base for high-level utilization**

In order to use an even higher level of geospatial information, conventional GIS is used in conjunction with other geospatial information. Furthermore, a database is being constructed to promote new linkages between various things and events in the real world with various types of geospatial information that are circulating in society, and the following policies are being advanced to expand it to indoor spaces where location information can be utilized.

### **1) Systematic development of place identifiers of geographical names, etc., and advancement of codification**

Geographic identifiers such as codes of geographical names, structure names, and postal codes are used to identify the various things such as mountains, rivers, structures and buildings that exist in the real world and link them to location and positional information in a space. In order to expand the places for utilizing geospatial information and further increase the intensity of use, it is necessary to systematically develop such geographic identifiers and attach a standardized code when needed.

For this purpose, the Japanese government has been continuously developing and updating information on place names and natural geographical names. At the same time, it has also been systematically developing and updating, through linkages with relevant organizations, geographic identifiers related to Residential Block Level Location Reference Information and social infrastructure having a high level of public interest. Furthermore, this is contributing to the proper management of land by helping to quickly determine the names of the numerous islands which are a particularly important component of Japan.

Relevant government organizations and local public organizations are working together to develop these geographic identifiers based on trends in domestic and international standards. At the same time, to promote the smooth circulation of geographic identifiers and expand their use in society, various relevant parties, including private sector companies, are working together to develop, operate and utilize them.

### **2) New frameworks and foundation for expressing places**

Amidst the expansion of fields utilizing geospatial information, in order to share location information consistently among the systems that are tailored to various types of environments such as indoor spaces for using various types of positioning technologies and location information services, it is necessary for relevant organizations to work together to promote the development of a common foundation to express places.

For this purpose, the national government has been formulating guidelines required for developing and utilizing the “place information code,” composed of latitude, longitude, height (hierarchy), as a common database, and has been promoting the creation of new location information services. At the same time, it has been developing new frameworks and foundations

for providing technical support to relevant organizations for developing and introducing “location information points” that incorporate place information codes, and promoting the development of an environment for providing location information about the various places that surround us.

In addition, to unify the various types of information about the same place and widely circulate geospatial information, international standardization of rules and regulations such as place identifiers (PIs) is being promoted.

### **3) Development of a seamless location information database for indoors and outdoors**

While numerous geospatial information services have been developed to utilize location information acquired from Space-based PNT, as the next step, there is growing demand to acquire location information indoors where it is difficult to utilize Space-based PNT. By getting an accurate understanding in real-time of one’s own location information in indoor space and further enabling its seamless use with outdoor positioning, for example, for examining effective evacuation plans for buildings and underground areas, there are growing expectations for expanding the utilization space of geospatial information to an unprecedented level to maintain safety and security, among other things.

For this purpose, the national government, in collaboration with the private sector, is continuously developing technologies, and is formulating guidelines based on the results of corroborative experiments, etc., for using them in real-life in order to develop location information services and seamless positioning bases that can be used both indoors and outdoors. In addition, basic specifications are being proposed and methods are being developed to use them effectively from existing design charts, etc., for indoor 3D geospatial information, etc., in order to utilize the location information acquired from this seamless indoor/outdoor positioning.

## **2. Measures and policies related to Space-based Positioning, Navigation and Timing**

### **(1) Promoting the development of practical quasi-zenith satellite systems**

Regarding the first quasi-zenith satellite system, “Michibiki”, continuous corroborative experiments are being conducted to verify technologies to further increase positioning accuracy.

In this sense, the results from “Michibiki” are being utilized to develop a practical quasi-zenith satellite system, based on the “Basic Concepts for Advancing a Practical Quasi-Zenith Satellite System” (approved by the Cabinet on 30 September 2011) and following the guidelines listed below:

1) Based on advances made in other countries for developing Space-based PNT systems, Japan will work as quickly as possible to develop a practical quasi-zenith satellite system.

Specifically, a 4-unit system was built in the beginning to reach that goal in late 2010. Future plans are aiming for a 7-unit system that can enable continuous positioning.

2) For Japan, it has been determined that the development, improvement and operation of a practical quasi-zenith satellite system in Japan would be done by the national government. In addition, relevant government ministries will consider ways of transferring jurisdiction of “Michibiki” to the national government until the practical quasi-zenith satellite system comes into operation.

3) To advance the practical quasi-zenith satellite system, relevant ministries and agencies shall work with industry to handle everything from development, improvement and operation to utilization and overseas projects.

In addition, continuing efforts will be made to advance research and development of all aspects of Space-based PNT systems, including the practical quasi-zenith satellite system.

## **(2) Promoting the utilization of a practical quasi-zenith satellite system, etc.**

Through alliances with industries in various fields, concerted efforts to develop applications, etc., will be made to utilize the practical quasi-zenith satellite system.

## **(3) Promoting overseas projects and international cooperation for the practical quasi-zenith satellite system**

To promote overseas projects for the practical quasi-zenith satellite system, an environment is being improved for international standardization, etc., in conjunction with industrial sectors. At the same time, international cooperation will be systematically promoted to establish and operate offices for monitoring position signals from quasi-zenith satellite systems, to train personnel, and to develop applications for dealing with problems such as traffic jams, dense populations, and natural disasters such as earthquakes and tsunamis that can be shared in the Asia-Pacific Region.

Regarding GPS operated by the United States, the Joint Announcement on United States-Japan GPS Cooperation made in September 1998 by leaders of Japan and the US is serving as the basis for holding meetings as regularly as possible to investigate and discuss important items related to GPS use. Continuous efforts are also being made to work with the United States to enable stable use of GPS in Japan.

Japan is a steady participant in the International Committee on Global Navigation Satellite Systems (ICG) and in the GNSS System Provider Forum established by the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). Furthermore, Japan is promoting international partnerships with the United States and other countries to develop and utilize GNSS and to enhance the compatibility and mutual operability of GNSS with other countries.

## **3. Development of various approaches for utilizing geospatial information, and measures and policies to help its evolution**

Geospatial information can be used for a variety of purposes, including managing national lands, supporting daily living, expanding business opportunities, and increasing the efficiency

and quality of administrative services. So far, both the private and public sectors have been taking various approaches for utilizing GIS and Space-based PNT as important tools for supporting their own activities. It will be necessary for them to continue these efforts, as well as to expand the range where these tools can be utilized. For this purpose, the national and local governments are striving to utilize GIS and Space-based PNT to implement policies and carry out their duties, as well as to support their further integration and expanded use in society. In addition, development of information and communication technology and surveying technology is leading to an even higher level of applications, the utilization of cloud computing technology, more accurate positioning, new uses connected to various types of geospatial information, and so on.

A wide variety of players, including the national and local governments, private sector companies, universities and research institutes, local NPOs and residents, must use geospatial information in many different fields of activity and connect this with enriching the lives of the people. The following concepts have been used in approaches taken so far, and as a part of what is desired for the future. Each of these players is expected to promote the use of GIS and Space-based PNT and further expand its possibilities.

#### **(1) Promoting the utilization, development and preservation of land, and sustainable land-use that is highly resistant to disasters**

Information that shows the topography, geology, land-use, etc., of Japan, as well as information about its roads and other public infrastructure, is important geospatial information that forms the foundation of land management. Consequently, work is proceeding on developing various types of information, such as the Digital Japan Basic Map. There are expectations for its full-scale use in projects in these administrative fields and for providing information to the people of Japan. At the same time, it is extremely important to strive for sustainable land-use that is made highly resistant to natural disasters through disaster prevention and mitigation policies. The national government is continuously working to make full-scale use of GIS in, for example, managing forests, which occupy more than half of the country's land area, and to provide support to local governments, etc., to develop and utilize this information.

Currently, the various environmental, resource and energy problems that Japan is facing which require spatial global modeling of water and atmospheric cycles are becoming more complex, and the national government is utilizing GIS to formulate various environmental measures by, for example, analyzing information about biodiversity to learn which regions should be given priority for restoration and preservation. In addition, GIS is being utilized to provide information about geological resources, assessments of resource reserves, and resource development and associated environmental management.

To deal with disasters, the national government, based on what was learned from the Great East Japan Earthquake, is using digitized geospatial information, GIS and Space-based PNT to monitor crustal movements and collect information on disaster-related damage and display it as



visual information about local hazards to prepare for future disasters.

In other areas as well, Japan is making full use of geospatial information by, for example, utilizing remote sensing to gain an effective understanding of conditions in various areas in which there are expectations for the efficient use of geospatial information to handle the maintenance and preservation of land and public infrastructure.

## **(2) Achieving high-quality, safe and secure living**

To maintain safety and security, it is important to have an immediate understanding of when, where and how trouble has occurred. Japan is continuously using geospatial information to learn the position of people who call the emergency numbers of 110, 118 and 119. In addition, GIS and Space-based PNT are being used to analyze temporal and spatial changes in local police and criminal activities, to examine crime prevention measures, to dispatch self-defense forces to disaster areas, and to operate equipment and facilities efficiently. Furthermore, an environment is being created that will enable the use of message functions prepared by the practical quasi-zenith satellite system in conjunction with geospatial information when a disaster occurs.

In the transportation field, GIS and Space-based PNT are already being widely used in car navigation systems to determine the route to travel to the destination. In recent years, as a result of the advances in various types of public infrastructure, the use of new innovations, such as traffic system IC cards and mobile telephone terminals, is making it possible to understand such things as the current locations of people and the history of their activities. The use of such location information in conjunction with supplemental information from practical quasi-zenith satellites, probe cars and probe persons may lead to even more intensive utilization.

With advancements in Intelligent Transport Systems (ITS), measures are being formulated to use high-level geospatial information to improve the safety, security, efficiency and convenience of road and public transport.

In addition, as we head toward a universal society, it is important to promote the “soft” aspects of the construction of a barrier-free environment where everyone can be as active as possible. For example, the national government is utilizing geospatial information to help support the movement of pedestrians. It is also using information and communication technology to formulate policies that are required to achieve a high standard of living where everyone can be healthy and live in a safer and more secure environment.

## **(3) Creation of new services and industries**

New technologies and ideas related to geospatial information, when used in conjunction with supplemental and complementary functions derived from practical quasi-zenith satellites and other technologies such as information and communication, can lead to the creation of new services and industries, increased efficiency even in existing fields and new projects, and there are expectations for greater collaboration from a wide variety of interests, communities, and so on.

For example, in the tourism field, it may be possible to increase the attractiveness of sightseeing resources by providing various information about places visited by travelers in a format using GIS and Space-based PNT. In agriculture, research on automating farm equipment using GIS and supplementary functions of quasi-zenith satellite systems may help to reduce the amount of labor needed for production.

Therefore, the national government is utilizing geospatial information to make farming and fishing more efficient, and to advance computerization in construction, among other things. At the same time, efforts are being made to develop technology for utilizing ITS to conserve energy. In addition, the government is taking the necessary steps to create new services and industries based on the development of a seamless indoor/outdoor location information database, services, and other advancements.

#### **(4) Promoting greater efficiency and quality of administrative services, and new public benefits**

Geospatial information has already been used in administrative fields such as urban planning and taxation. However, its use in other fields close to us, such as health and welfare, disaster prevention, environment and education, as well as greater use of information and communication technology in high-function mobile phones, can improve the effectiveness and quality of administrative and resident services by enhancing the efficiency of official work, quicken responses in times of disaster, and provide accurate information to the people, among other things.

Therefore, the national government is continuously providing technical support and financial assistance for an integrated type of GIS which is a combination of GIS and geospatial information that can be shared by various departments in municipal and other offices, and for promoting the use of GIS in cloud computing systems which can be shared by multiple local governments. Furthermore, because the various statistics released by the government contain various types of information which, when analyzed, can help to make work more efficient and effective, there is continuous development of statistical GIS.

Because the government can provide information to the general public in an easy-to-understand format using GIS, it is working to upgrade services utilizing the geospatial information by providing various types of information owned by administrative agencies, such as information about landowners, and land prices and boundaries; national assets and cultural artifacts; and air, water, natural environments and biodiversity.

#### **4. Comprehensive measures to promote the development and utilization of geospatial information**

To promote the circulation and utilization of various types of geospatial information among the general public, it is necessary to develop an environment where it can be acquired and used safely and easily. Organizations of the national government must work with local governments,

private sector companies, etc., to promote policies that will encourage research and development, training of workers, etc., to help the permeation of geospatial information into society. For this purpose, the following measures are being widely implemented.

### **(1) Promotion of sharing and mutual use of geospatial information**

To promote the use of geospatial information, it is necessary to create an environment where the information that is developed by various organizations can be easily searched, acquired and utilized. For this purpose, a framework for sharing geospatial information with the general public must be created that transcends developers' boundaries.

Therefore, regarding the geospatial and locational information developed by a wide array of players, including national and local governments, the developers must work together to appropriately collect, manage, and provide data such as surveying results, images, disaster prevention information, etc., sorted by characteristics and fields.

For example, to help promote and expand the public and private use of data acquired from Earth observation satellites, a "one-stop" platform to promote the use of different types of satellite data having comprehensive search, view, and processing functions will be developed and operated. Moreover, geospatial information such as maps that have already been created has value as historical materials and can also help with disaster response because it contains information about past land conditions. Thus, efforts are being to further digitize, manage and provide such information.

The environments required for such geospatial information that was collected and sorted by characteristics and fields, to be searched, viewed, and acquired by users in a one-stop format are being developed and improved. A framework is also being created which will facilitate the procedures for secondary use of geospatial information.

Such efforts, as well as the use, research and development of information, are collectively being made by research institutes, NPOs, private companies, and so on. By advancing measures as one unit, the national and local governments, private companies, etc., are aiming to build an information center that will share and provide geospatial information about Japan.

Digital Japan Web System, which can be used for superimposing various types of geospatial information over the Digital Japan Basic Map with a web browser, is increasingly being used by local governments and others. Therefore, continuous efforts are being made to improve the user environment by constantly updating background map information and revising and expanding functions.

### **(2) Formulation of rules for proper development, circulation and use**

#### **1) Promotion of standardization**

To promote the effective development and utilization of geospatial information, it is necessary to standardize data exchange methods, service specifications, etc. that will enable mutual use of the data and services developed by different organizations. For this purpose, the

national government is revising the Japan Profile for Geographic Information Standards (JPGIS) as standard rules within Japan, taking the latest international standards and standardization trends of geographic information into consideration.

Efforts are also being made to revise the Japan Metadata Profile (JMP), which regulates the formats for sharing geospatial metadata, and “Regulations for Quality Requirements, Assessment and Reporting” based on international standards.

Finally, timely strategic revisions are made to Japan’s response to international standardization based on trends, etc., in industries involved with geospatial information and associated technical development.

## **2) Protection of personal information and consideration of secondary use of data**

When promoting the use of geospatial information, it is necessary to take proper measures to protect personal data and intellectual properties. In the previous basic plan, the national government was developing guidelines for this purpose. These guidelines will now have to be linked to a social framework with greater practicality and tangibility so that relevant organizations can develop geospatial information and advance its use more securely.

For this purpose, the national government is working to educate secondary users about the guidelines for handling personal data in regard to geospatial information. At the same time, surveys and research are continuously being conducted on issues related to personal data in the circulation of geospatial information, and rules for the provision and circulation of geospatial information to various parties, including private businesses, are constantly being examined and formulated. Also, organizations of the national and local governments are taking appropriate steps based on these guidelines to provide and develop geospatial information.

Furthermore, to promote the smooth secondary use of geospatial information, it is important to know the accuracy of positioning. Therefore, the national government is developing a framework for certifying the quality of geospatial information that is compatible with fundamental geospatial data and the Digital Japan Basic Map and has the same positional accuracy.

## **3) Considerations for national safety**

The safety of Japan is essential for its people to live with peace of mind and for the country to develop and flourish. To promote the use of geospatial information, it is necessary to follow the fundamental concepts of the Basic Act on the Advancement of Utilizing Geospatial Information so that the nation’s safety will not be compromised.

Therefore, when providing geospatial information, the national and local governments, private businesses, etc., are working to strike a balance between safety and advancing the utilization of geospatial information to property fulfill their obligations based on this act. Decisions on guidelines for handling such information that has particular relevance to the nation’s security, particularly the items listed below, are made after considering the opinions of

relevant parties.

It should be noted that considerations for national security are continuously made while examining the state of implementation after the guidelines have been formulated.

- a) Geospatial information that will be used by the public but which must also be considered from the perspective of national security (types, scope, etc.)
- b) Measures that should be considered for national security when providing geospatial information that corresponds to a) above (reduce scale, resolution, etc.)
- c) Rules for providing geospatial information corresponding to a) above but measures described in b) have not been taken when there is a justifiable reason

### **(3) Strengthening advancement systems and alliances of relevant organizations**

#### **1) Promoting policies by government as a whole and associated system for development**

In the previous basic plan, the national government created a system in which relevant government organizations would work closely with the Advancement Committee and which enabled them to act in concert to comprehensively and systematically advance necessary policies. Since then, broader discussions about promoting the utilization of geospatial information by the Advancement Committee and its umbrella working groups and investigation teams have led to the resolution of many issues. Efforts are also being made to further strengthen the system by making strategic reviews of these frameworks when needed.

#### **2) Partnerships and collaboration between the national and local governments**

Local governments develop various kinds of geospatial information such as thematic maps and ledger data that are intricately linked to their communities. Because this includes much information with a high user value, it is necessary to encourage the provision of geospatial information developed and owned by local governments so that it can be used by the national government, local residents, private businesses and others. Furthermore, the planning, formulation and promotion of policies by the national and local governments for developing, updating and utilizing geospatial information require suitable examinations of policies, undertaking of projects, and collaboration, such as efforts to mutually utilize geospatial information.

For this purpose, technical support and instruction is being given by the national government to promote the development, updating and provision of geospatial information by local governments. Furthermore, the national government is building a partnership system with local governments to effectively share and utilize geospatial information that their respective organizations develop and own and which can be further developed and updated, like map databases and digital base maps.

Regarding public surveying conducted by local governments and others, support is being provided to make this even more efficient by utilizing new information and communication technologies. Moreover, information and instruction are provided at appropriate times to

surveying and planning organizations, etc., so that they may consider revising general working standards that become the rules for general surveying work, and make both basic and public surveying work more efficient.

### **3) Alliances among industry-academia-government**

To help materialize the G-Spatial Society, it is important to implement policies that meet the needs of various segments of society and to develop suitable technologies and a wide variety of services. Thus, an alliance among government, industry and academia is needed for further development.

For this purpose, the Industry-Academia-Government Collaborative Conference on the Advancement of Utilizing Geospatial Information was established under the previous basic plan. With its membership comprised of a wide range of experts and other relevant people from industry-academia-government, it is working to establish such things as a system for the mutual utilization of geospatial information at both the national and local levels.

To efficiently develop, update and provide geospatial information at both the national and local government levels, every effort must be made to utilize the technological prowess of private companies, and work together to utilize a higher level of geospatial information. Therefore, much consideration is being given to systems and operations to further promote the use of private sector surveying results.

### **4) Uniform and systematic advancement by strengthening alliances among relevant players**

Efforts are being made to further strengthen national and local governments and industry-academia-government alliances to advance the use of geospatial information, and it is important for relevant players to work in concert toward the strategic resolution of various social issues. For this purpose, relevant persons have assembled from the national and local governments, private companies, universities and other research organizations involved with the fields of the issues being addressed to further strengthen systems for advancing the utilization of Space-based PNT, including GIS and quasi-zenith satellite systems.

The development of new services utilizing Space-based PNT including practical quasi-zenith satellite systems can be expected to expand the fields that utilize geospatial information. In order to promote the effective and efficient development, updating, provision and circulation of geospatial information, and to uniformly and systematically advance projects that provide geospatial information services, various preconditions must be met, such as constructing business models of such projects. Relevant players such as national and local governments, private companies, universities, research institutes, etc., examine these preconditions as one body.

#### **(4) Strategic advancement of research and development**

In order to further proceed with such things as the planning, formulation, and implementation of policies designed to advance the utilization of geospatial information, the utilization of GIS and Space-based PNT in various administrative fields, the development of applications for improving administrative services, and the creation of next-generation Space-based PNT technologies, it is necessary to strategically conduct pertinent surveys and research that take such things as social changes and advancement of information and communication technologies into account.

For this purpose, the national government is working with private sector companies to carry out necessary surveys, research, etc., based on R&D maps and other materials derived by the R&D Working Group established by the Industry-Academia-Government Collaborative Conference on the Advancement of Utilizing Geospatial Information. The government is also encouraging partnerships with its Council for Science and Technology based on the 4th Basic Plan for Science and Technology. As part of the government's science and technology strategy, research and development are being systematically undertaken to advance the use of geospatial information. There is also continuous corroboration of the results of studies conducted in various fields through follow-ups of this plan, and a framework is being built for facilitating practical use so that these results can be utilized in the daily lives of the people.

#### **(5) Advancement of disseminating knowledge and training personnel**

To facilitate the use of geospatial information by the national and local governments, private businesses, NPOs, etc., it is necessary to inform the public about its close connection with geospatial information, promote the effective use of this information, and to educate the public about technical information, etc. such as geographical information standards and government policies.

For this purpose, a consortium of industry-academia-government is continuously holding seminars about the effectiveness and technical aspects of geospatial information, lectures and symposia that contribute to the creation of new industries, and exhibitions of new products and services at the "Geospatial Expo." It is also seeking out creative proposals, resources, etc. from private companies and others to improve and develop new and existing services and industries, and is helping to educate the public about geospatial information. For its part, the national government is improving its GIS portal site, and providing information about national policies and the progress of related geospatial information provided by national government, its services and geospatial information that can be utilized through the Internet.

Furthermore, expanding applications, services, etc., for using geospatial information can provide an environment where users can safely use GIS, and will help to expand various uses of geospatial information, such as with the Digital Japan Basic Map. Consequently, the national government is developing a framework for promoting the development and dissemination of high-quality applications and services to encourage even greater use of geospatial information.

Training personnel is an important part of advancing the utilization of geospatial information. In addition to people who have the skills to develop, update, and intensively utilize this information, it is necessary to train a wide spectrum of personnel to handle a variety of related tasks. For this purpose, the national government accredits highly talented and experienced technicians. To ensure a high quality of results, it is constantly reviewing the qualification system for surveying engineers. It also holds seminars for workers of local governments, proposes curricula for universities, etc., to encourage the training of personnel who can supervise the utilization of geospatial information.

#### **(6) Partnerships with overseas projects and international efforts**

In various fields such as “smart communities,” energy, and automobiles and transportation, it is expected that new industries will be created through IT fusion, based on the global development of Japan’s industries. Among the most important and effective tools for these efforts are geospatial information and high value-added services based on quasi-zenith satellite systems. However, before these services can be used, it is necessary to develop land bases for quasi-zenith satellite systems, environments for disseminating receiving equipment, and so on.

It is also important to promote the fusion and packaging of Space-based PNT technologies such as practical quasi-zenith satellite systems and Japan’s cutting-edge GIS technologies with other types of information and communication technologies, to disseminate these around the world, especially the Asia-Pacific region, and to develop new industries and geospatial information solutions. For this purpose, the national government is working hard to support these efforts, and developing an environment for industry alliances to foster further development of related industries and their overseas projects.

To utilize geospatial information, Japan is promoting policies that are in concert with international trends. Furthermore, as a country that uses advanced geospatial information, Japan must take an international role by promoting standardization and providing support to lesser-developed countries in the Asia-Pacific region and elsewhere. Japan must also vigorously promote partnerships with international organizations, initiatives, projects, etc., to further its own industries, make global contributions, and encourage international cooperation.

To develop universal frameworks and tools for advancing the utilization of geospatial information and resolve global-scale issues, Japan is participating fully in the United Nations Initiative on Global Geospatial Information Management (GGIM) recently established by the United Nations Economic and Social Council. It is also providing leadership in the development, circulation, and use of international data such as the Global Earth Observation System of Systems (GEOSS) and the Global Map Project. Japan is also participating in establishing international rules such as geospatial information standards for the International Organization for Standardization (ISO), is involved with creating geological and other maps of various countries, and is a major participant in geodetic observation projects to help determine standards for international positioning, among other projects.



Japan is also promoting the Sentinel Asia Project for enhancing disaster monitoring through the sharing of satellite image data in the Asia-Pacific region, and is contributing to the construction of disaster-prevention systems for other countries through overseas projects with its Earth observation satellite system. Through these and other means, Japan is making international contributions to disaster prevention.

## **5. Formulating measures and policies for recovering from earthquake disasters and for sustainable, highly disaster-resistant land-use**

### **(1) Development of infrastructure for recovering from the Great East Japan Earthquake, and utilization of geospatial information**

The Great East Japan Earthquake that occurred on March 11, 2011 inflicted major damage on a wide area, especially Tohoku region. Starting immediately after the disaster, much geospatial information was utilized by the national and local governments in their emergency responses and efforts toward recovery and restoration. To assist in the rapid recovery and restoration of disaster areas, and to leave a record of these efforts for future generations, it is necessary to further develop geospatial information of disaster areas and to get an up-to-the-minute understanding of conditions in Japan by using various geospatial information technologies.

For this purpose, the national government rapidly developed and updated satellite images, aerial photographs (orthophoto images), fundamental geospatial data and Digital Japan Basic Map as fundamental geospatial information for recovery efforts. To contribute to future efforts for recovery and restoration and to understand land conditions, the government is intensively developing statistical data and information on land-use condition. In disaster areas where earthquake-induced crustal upheaval, tsunamis, etc., have blurred land boundaries, the government is promoting basic boundary surveying between public and private lands, and developing cadastral maps by supporting revision of survey results and cadastral resurveying, among other things.

The geospatial information developed in this way is widely shared with the national and local governments, private companies, etc., and an environment is being developed that can help accelerate recovery and restoration efforts.

### **(2) Development, circulation and utilization of geospatial information to prevent and mitigate future disasters**

#### **1) Development of information for sustainable land-use that is highly-resistant to disaster**

To prepare for future disasters, it is of the utmost importance to utilize the knowledge that was gained from the 2011 disasters to upgrade land-monitoring technologies for understanding crustal movements, etc., and to develop, circulate, and utilize geospatial information to provide a base for sustainable land-use that is highly resistant to disaster.

Therefore, the national government is promoting research and development for making

real-time observations of crustal movements from GNSS-based Control Stations data obtained from the GNSS continuous monitoring system, improving technologies for monitoring undersea crustal movements through a fusion of GPS and sonar positioning, undertaking comprehensive active fault surveys, conducting priority research on areas of concentrated strain, and developing databases of volcanoes and active faults, to develop, circulate and utilize geospatial information as fundamental data for preventing and mitigating seismic and volcanic disasters. Regarding landform classification data, those for volcanic disaster prevention, national wide date of active fault zones, etc., which form the basis for developing, circulating and utilizing hazard maps, geospatial information is being developed for major plains and surrounding areas, and active volcanoes throughout the country. To improve its reliability, research is being conducted to improve methods for assessing vulnerability using aerial laser data and Earth observation satellite images.

To understand more about areas that are vulnerable to earthquakes, tsunamis, volcanic eruptions, typhoons, etc., for local disaster prevention and crisis management policies, greater efforts are being made to compile hazard maps and to inform and educate as much of the public as possible. Regarding the various types of information on local disaster risks, research and development are continuously being conducted to operate and utilize data sharing infrastructure, and to encourage alliances among relevant organizations to standardize data developed by various organizations for secondary uses. These efforts are designed to create an environment where anyone can easily obtain disaster hazard information.

Furthermore, to prepare for future disasters, efforts are being made to develop technologies, etc., for various types of geospatial information in addition to tsunami warnings and evacuation information that will provide pertinent and timely information to avoid danger. Because it is important to clearly understand land boundaries to accelerate recovery and restoration after a disaster, in regions where land cadastral surveys have not been taken, the national government is conducting basic boundary surveying between public and private lands in urban areas. Moreover, statistical GIS is being developed to utilize various types of statistical data in disaster policies.

## **2) Development of an accurate and effective utilization system for times of disaster**

In order for geospatial information to make an even greater contribution to first response when a disaster occurs, it must be acquired and provided quickly and accurately during the disaster. There are also cases where personal and other information must be handled differently than in normal times.

Therefore, the Comprehensive Disaster Prevention Information System that plays an important role in first response during a major disaster must be expanded to comprise improved information about disaster risk, lifeline damage conditions, etc., and associated strengthened functions that can be shared with local governments during times of disaster.

In addition, efforts are being made to gain a rapid understanding of conditions during a major disaster by, for example, improving GPS wave meters using practical quasi-zenith

satellite system to enable highly accurate and consistent monitoring of heavy waves and tsunamis, as well as developing systems and technologies for acquiring image information during disasters using remote sensing aircraft and Earth observation satellites, and for understanding conditions using Synthetic Aperture Radar, and using Space-based PNT to know the locations of regional emergency response teams and the positions of video images taken from helicopters and other aircraft. At the same time, efforts are being made to create an environment for continuously providing geospatial information that is highly resistant to disaster by, for example, creating a precision operating system for the GNSS continuous monitoring system that can provide instantaneous information about crustal movements during disasters, and implementing measures to prepare for possible loss of geospatial information when disaster strikes.

Regarding evacuations during a major disaster, it is anticipated that the widespread use of car navigation systems, mobile phone terminals, etc., will provide efficient support for utilizing message functions of quasi-zenith satellite systems via GIS and Space-based PNT that can, for example, convey area-specific information to users in special designated locations. Technology is also being developed to provide evacuation guidance and understand the movements of evacuees during a disaster.

During the Great East Japan Earthquake, various types of geospatial information were developed and provided by many organizations. Most of this information was developed on a secondary basis from existing geospatial information. Providing this information through the Internet and other media enables it to be utilized by even more organizations and individuals. However, the concepts regarding the provision of geospatial information during a major disaster and its secondary use are not always well-organized, and there were times during the great disaster when it was not fully utilized. Efforts are therefore being made to develop and release various types of disaster information in a format that can be easily used on a secondary basis, and concrete rules for the provision, use, sharing, etc., of information should be formulated to further enable the rapid and smooth use of geospatial information by a wide variety of organizations and individuals during a major disaster.