Responses of Geographical Survey Institute to Basic Plan for the Advancement of Utilizing Geospatial Information

Geospatial Information Planning Office, Planning Department

Abstract

With respect to policies concerning Advancement of Utilizing Geospatial Information (AUGI), the Basic Act on the Advancement of Utilizing Geospatial Information (hereafter, "Basic Act"), which defines basic elements for AUGI policies, came into effect in August 2007 while establishing basic principles and clarifying the responsibilities of both the national and local governments. In addition, the Basic Act provides that a basic plan concerning AUGI is to be formulated. This led to the discussion by the Committee on Geographic Information System and Positioning, subsequently followed by the April 2008 cabinet decision, of the Basic Plan for the Advancement of Utilizing Geospatial Information (hereafter, "Basic Plan").

The Basic Plan sets the period of this plan to be until FY2011. Through the use of Geographic Information System (GIS) and Space-based Positioning, Navigation and Timing (Space-based PNT), it also aims to create an advanced geospatial information utilization society where people are able to utilize the geospatial information anytime, anywhere and to obtain accurate information derived from highly sophisticated analyses for their activities.

Policies of the Geographical Survey Institute (GSI) on the Basic Plan being encompassed are: surveys and research for formulating rules related to the general development, updating, provision and distribution of geospatial information; promotion of the standardization of geospatial information; and development and updating of Fundamental Geospatial Data (FGD).

Regarding all the governmental policies including the said policies, the Committee on Geographic Information System and Positioning (Chair: Assistant Chief Cabinet Secretary) established the Action Plan for the Advancement of Utilizing Geospatial Information (G-Spatial Action Plan) in August 2008 and is conducting a follow-up on the state of policy progress each year.

1. Introduction

Through full use of the digital technology and rapid advance of its services, map data can now be used in a wide variety of ways. However, this may bring about varying standards created due to independent approaches or the provision of positionally unaligned map data, possibly confusing users and resulting in inefficiency. To effectively use the map data, it is, therefore, necessary to promote the distribution of a new, highly-accurate common base map that allows users to overlay a various types of geospatial information.

Meanwhile, Space-based PNT, such as the United States' Global Positioning System (GPS), using satellites has been infiltrated into people's lives and national economy and has become the nation's essential infrastructure.

Due to the 2002-revision of the Survey Act and other relevant actions, the geodetic system has changed from the Japan Geodetic System to the world geodetic system, and the possibility of linkage between GIS policies and Space-based PNT policies has extended. With comprehensive advancement of these two policies, synergistic effects are expected.

In response to given circumstances, a draft of the Basic Act, which defines the basic principles, clarifies the responsibilities, etc. of both national and local governments and provides basic elements concerning AUGI policies, was proposed during the ordinary session of the Diet in 2006. In May following year (2007), the Basic Act, proposed by the Chairman of the Committee

on Cabinet in the House of Representatives, in response to a motion called by the members of the Liberal Democratic Party, New Komeito and Democratic Party, was resubmitted as a lawmaker-initiated bill. Then, it was passed on May 23, promulgated on May 30 (Act No.63 of 2007) and implemented on August 29 in 2007. (Reference: http://www.gsi.go.jp/kokusaikoryu/kokusaikoryu-e30004.html)

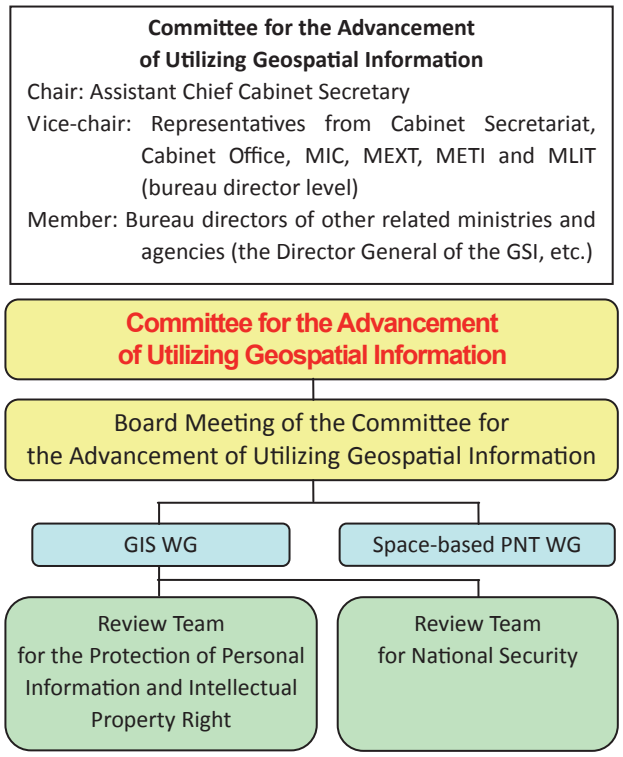
On August 29, the same day when the Basic Act came into effect, the ordinance of the ministry and public notice also promulgated and implemented were as follows: the ordinance of the ministry concerning the items of FGD provided by the Basic Act and standards required for FGD positional information ("Ordinance on the Information Items of and the Requirements for Fundamental Geospatial Data that is referred to in Article 2, Paragraph 3 of the Basic Act on the Advancement of Utilizing Geospatial Information," the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) No. 78 of 2007, Partial Revision: the Ordinance of MLIT No. 11 of 2008); and public notice concerning the technical standards for the development of FGD ("Public Notice on the Technical Standards for the Development of Fundamental Geospatial Data that are referred to in Article 16, Paragraph 1 of the Basic Act on the Advancement of Utilizing Geospatial Information," the Public Notice of MLIT No. 1144 of 2007, Partial Revision: the Public Notice of MLIT No. 105 of 2009).

Article 9, Paragraph 1 of the Basic Act provides the establishment of the Basic Plan by stating "(i)n order to carry out policies concerning AUGI in a comprehensive and well-planned manner, the Administration of the State Government shall develop a Basic Plan concerning AUGI."

Thus, the Basic Plan was proposed and discussed by the governmental Committee on Geographic Information System and Positioning (Chair: Assistant Chief Cabinet Secretary) and was established on April 15, 2008 by the cabinet decision.

Since 1974, the Japanese government has been employing pioneering individualized approaches to GIS including the development and public release of the digital national land information and development of urban planning GIS; however, following the South Hyogo Prefecture (Hanshin Awaji) Earthquake in 1995, the government has set up the GIS Liaison Committee of Ministries and Agencies and has been making its full efforts in promoting the GIS policies. As a result, the standards regarding geospatial information were established and base map data, such as digital maps 2500 and 25000, were developed while GIS-based information services of government agencies being expanded. In 2005, the GIS Liaison Committee of Ministries and Agencies was expansively reorganized as the Committee on Geographic Information System and Positioning with the purpose of linking GIS with Space-based PNT in a comprehensive manner. In June 2008, the committee was renamed again as the Committee for the Advancement of Utilizing Geospatial Information, the name that corresponds with the Basic Act and Basic Plan.

The GSI has been consistently involved since the setup of the GIS Liaison Committee of Ministries and Agencies until the current Committee for the Advancement of Utilizing Geospatial Information. As a



*MIC: Ministry of Internal Affairs and Communications
MEXT: Ministry of Education, Culture, Sports, Science and Technology
METI: Ministry of Economy, Trade and Industry

Fig. 1 Government structure regarding AUGI

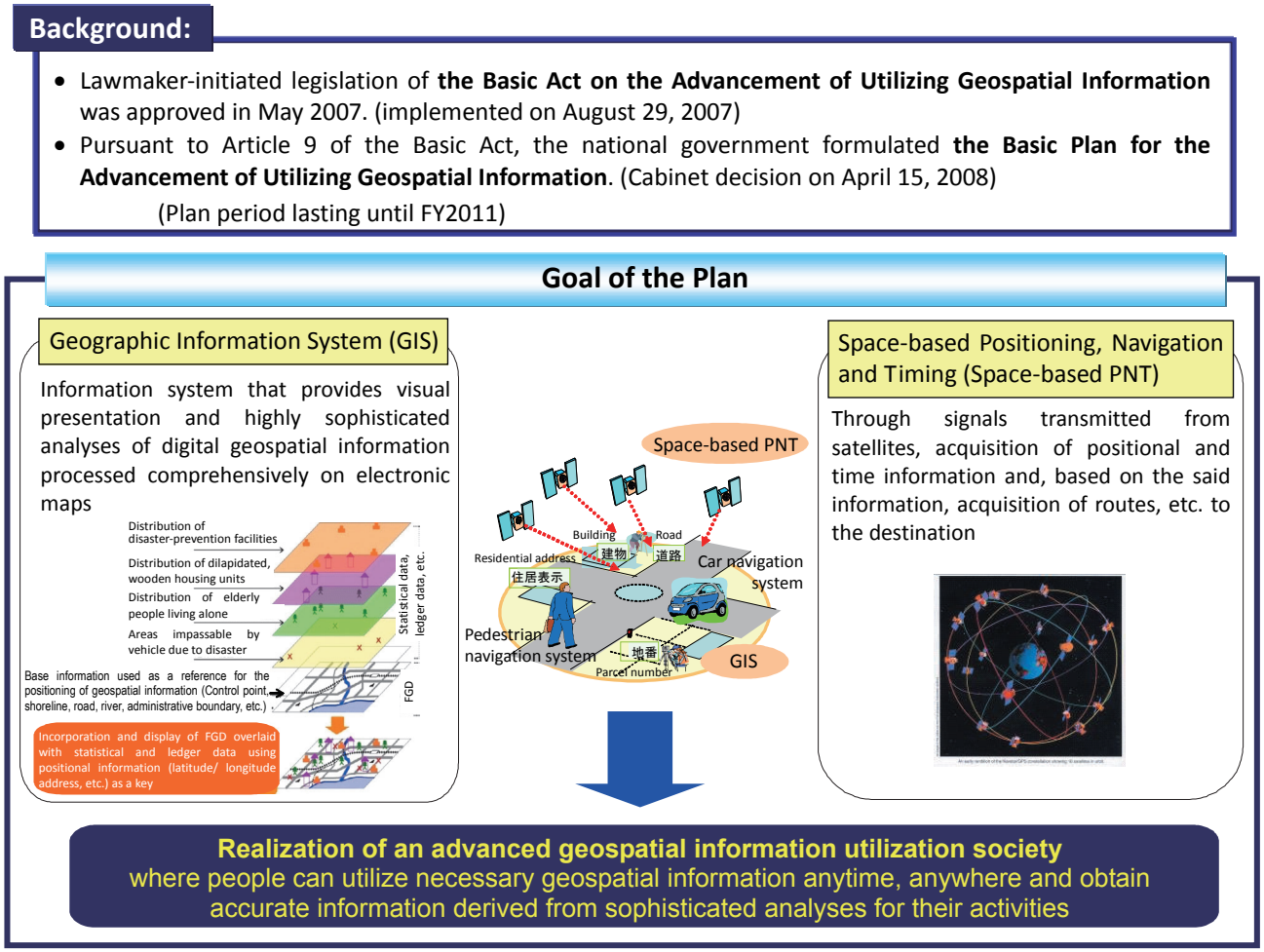


Fig. 2 Overview of Basic Plan for the Advancement of Utilizing Geospatial Information

secretariat member, it also takes part in planning and coordinating the efforts regarding the Basic Plan (Fig. 1). (Reference: http://www.cas.go.jp/jp/seisaku/sokuitiri/org.html)

2. Basic Plan Overview

2.1 Plan Overview

The period of the Basic Plan is set to be until FY2011. Utilizing GIS and Space-based PNT, the plan aims to create an advanced geospatial information utilization society where people are able to utilize the geospatial information anytime, anywhere and to obtain accurate information derived from highly sophisticated analyses for their activities (Fig. 2).

2.2 Goal to be Achieved – Realization of an Advanced Geospatial Information Utilization Society

In terms of fully utilizing geospatial information, an advanced geospatial information utilization society that the Basic Plan aims to create expects to include the following components (Fig. 3).

- Promoting utilization, development and preservation of the national land and other related actions
- Enhancing the efficiency and quality of administration
- Enhancing safety, security and convenience of people's lives
- Development and growth of new industries and services

2.3 Table of Contents of the Basic Plan

The Basic Plan consists of two parts: Section I and Section II. The Section I explains basic policies and Section II describes the implementation approach in detail (Fig. 4).

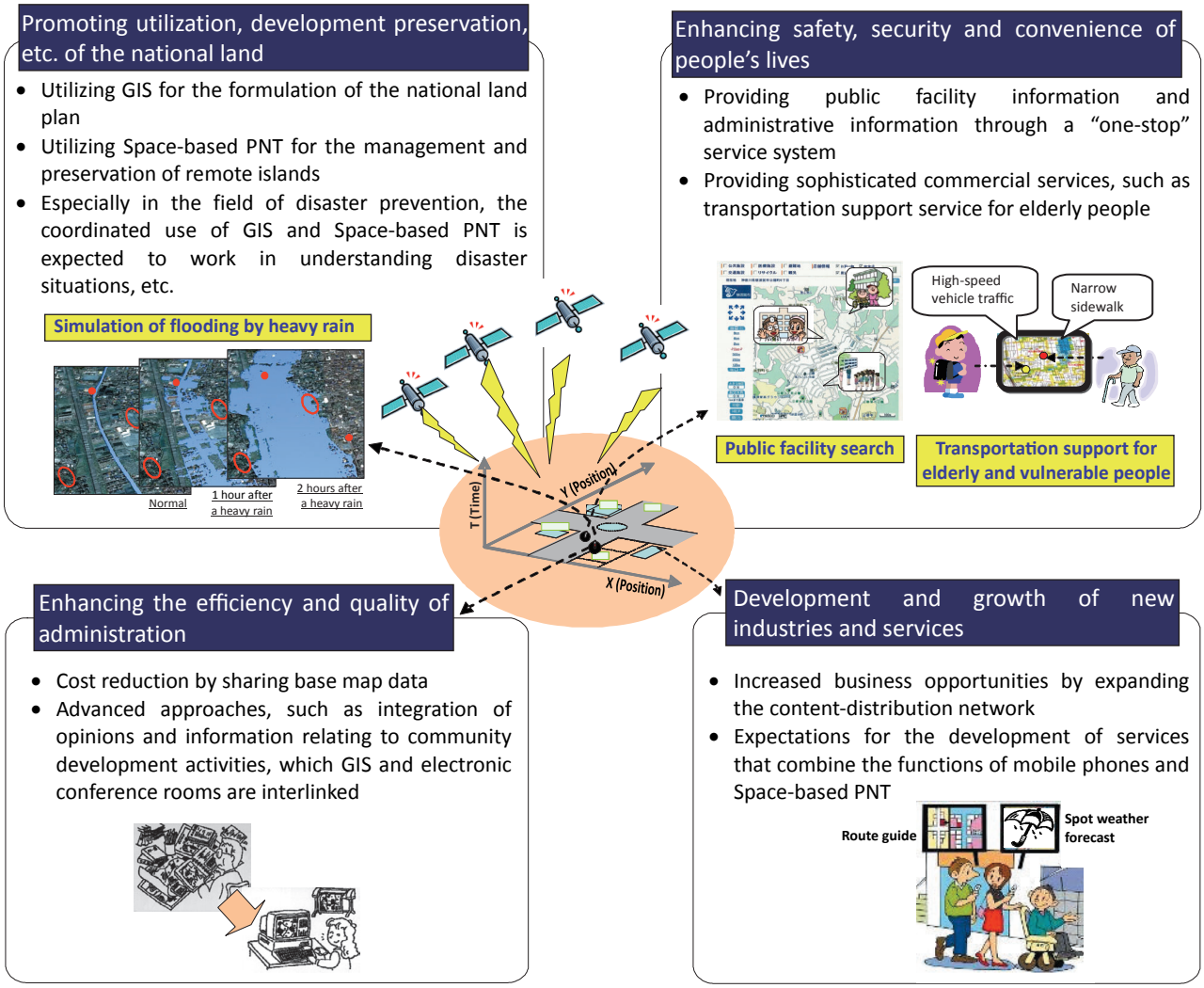


Fig. 3 Basic Plan, goal to be achieved - realization of an Advanced Geospatial Information Utilization Society -

2.4 Important Points for the Implementation

The Basic Plan provides the following four points as important points for the implementation.

- Preparing draft guidelines related to the development, provision and distribution of geospatial information, and promoting the provision and distribution of it.
- Promoting the development and provision of FGD.
- Promoting the establishment and utilization of a high-tech base for Space-based PNT.
- Strengthening ties among business, academia and government with respect to the utilization of geospatial information.

The following is the overview of the important points for the implementation.

2.4.1 Preparing draft guidelines related to the development, provision and distribution of geospatial information and promoting the provision and distribution of it

Geospatial information contains a variety of information including thematic maps, such as land-use maps, geological maps or hazard maps, which depict special interests (nature, potential disasters and socioeconomic activities, etc.) of a particular region. Urban planning maps, topographic maps, place name information, ledger and statistical information, aerial photographs and satellite images are part of geospatial information as well. In order to promote the digitization, effective development and utilization of such geospatial information, the national government is to take the lead in using the geographical information standard when

Section I. Fundamental Policies on Measures for the Advancement of Utilizing Geospatial Information (AUGI)
1. Significance of AUGI
2. Goal to be Achieved – Realization of an Advanced Geospatial Information Utilization Society
3. Current Issues
4. Important Points for the Implementation and Effective Promotion of the Plan

Section II Implementation of Specific Actions on Measures Related to AUGI
Chapter 1 General Measures Related to AUGI
1. Developing Institutional Arrangements of Relevant Organizations and Strengthening Their Alliances
2. Implementation of Surveys, Research, etc.
3. Dissemination of Knowledge and Other Activities
4. Nurturing Human Resources
5. Utilization of Geospatial Information by Administrative Organizations
6. Promotion of International Cooperation
Chapter 2 Measures Related to Geographic Information System (GIS)
1. Establishing and Disseminating Standards, etc., Related to the Development and Provision of Geospatial Information
2. Promoting the Development, Updating and Provision of Geospatial Information
3. Promoting the Utilization of GIS
4. Items That Should Be Considered When Utilizing Geospatial Information, Such As Protecting Personal Information
Chapter 3 Policies Related to Space-Based PNT
1. Contact Coordination Related to Space-Based PNT for Effectively Maintaining an Environment That Can Stably Receive Services by Highly Reliable Space-Based PNT
2. Promoting Research and Development of Space-Based PNT

Fig. 4 Table of contents of the Basic Plan

developing and providing geospatial information. It should also provide technical and other supports for disseminating standards through seminars and the like so that the said standard will be well used by local governments and private sectors. For geospatial information to be shared and utilized by overlaying multiple data one on the other, formulating rules is necessary not only for the development and updating of positionally aligned geospatial information but also for easy combination of map data with image information, ledger information and statistical information and other relevant information as well as use of them. Then, the national government should review these rules by conducting model studies such as substantiative research. Furthermore, to smoothly distribute geospatial information, the national government must formulate guidelines for handling personal information, intellectual property rights and other pertaining issues in relation to the provision and distribution of such information.

2.4.2 Promoting the development and provision of FGD

Because geospatial information is utilized for analyses, etc., by overlaying of different types of data with positional information as the "key," it is important that data developed by different organizations have a common base for the positional information. At the present situation, however, different base maps are used to develop positional information, and different types of data are not necessarily overlaid properly with each other. It is thus necessary for the national government and local governments to work together in the development, updating and provision of FGD which serves as the standard for linking geospatial information to the space position.

The GSI shall virtually complete the development of FGD nationwide by FY2011. From FY2008 via Internet, the GSI started the provision service of completed FGD as soon as it becomes available (Fig. 5).

2.4.3 Promoting the establishment and utilization of a high-tech base for Space-based PNT

Given the circumstances under which Space-based PNT has become part of people's daily life in Japan, it is essential to maintain effectively an environment that enables the people to receive highly reliable Space-based PNT services. For that purpose, efforts will be made to establish liaison and coordination with operators of systems involved with the global Space-based PNT. Moreover, while promoting research and development on the Quasi-Zenith Satellite System (QZSS), which helps provide advanced Space-based PNT services, the government and the private sector shall work together to implement research and development, conduct tests for technical and usage verification related to Space-based PNT and promote the utilization of the system based on its achievements.

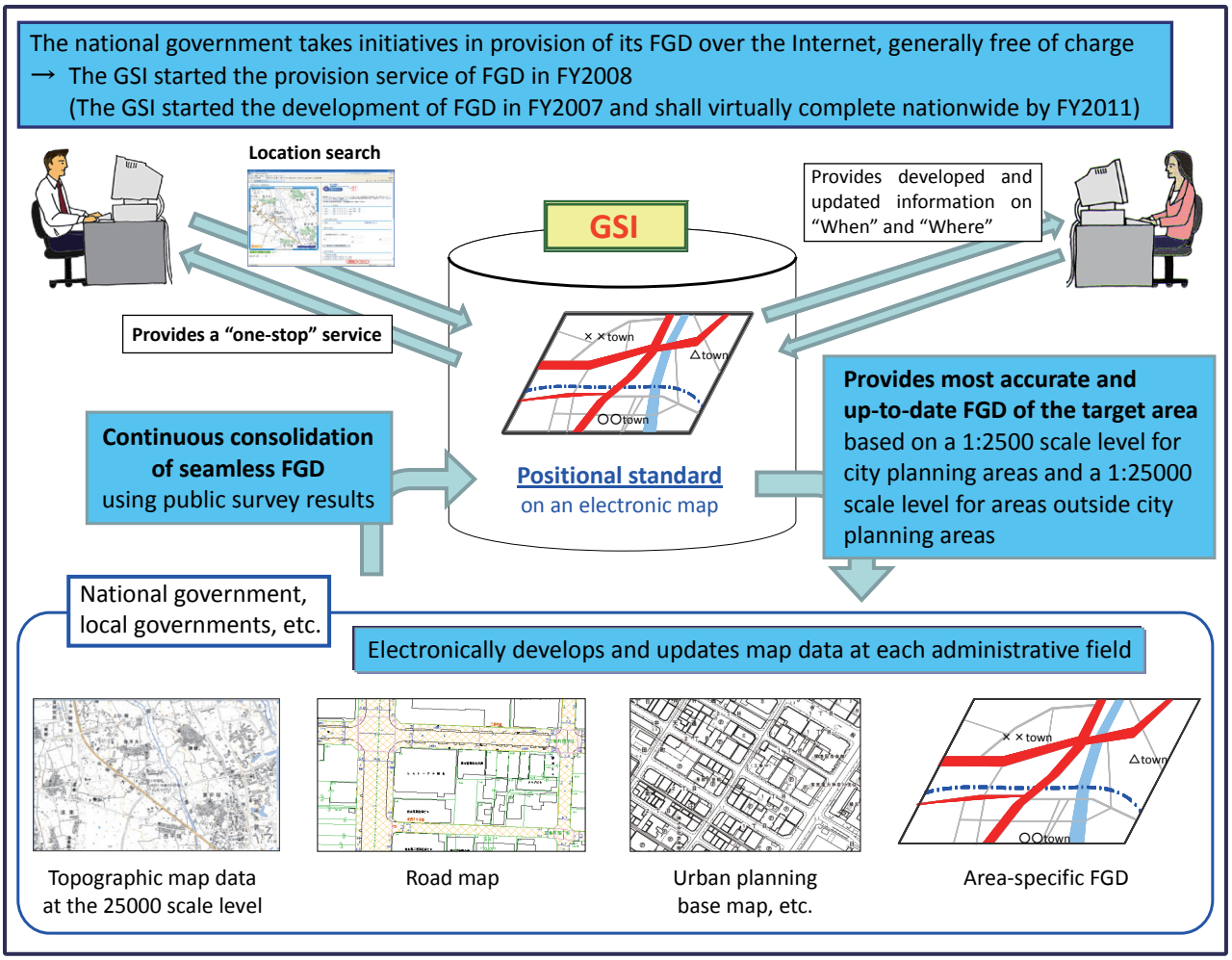


Fig. 5 Image of development and provision of FGD

2.4.4 Strengthening ties among business, academia and government as they relate to the utilization of geospatial information

In order to develop updated, highly accurate geospatial information, and create an environment where such information can be utilized without difficulty, it is extremely important for the national government, local governments, the private sector, and the academic world, among others, to all play a role in addressing this issue as they form close working relationships with one another. For this purpose, the national government will have to further strengthen its ties with local governments, the private sector, and academia.

2.5 Consistency with the Basic Plan on Ocean Policy

The Basic Act on Ocean Policy came into effect in April 2007. Appointing the Headquarters for Ocean Policy established in the Cabinet Secretariat as an administrative bureau, the Basic Plan on Ocean Policy pursuant to the said Act was formulated in March 2008 by the cabinet decision along with the Basic Plan for the Advancement of Utilizing Geospatial Information.

Regarding the preservation of remote islands and other related issues specified in the Basic Plan on Ocean Policy, consistency between the said two Basic Plans was maintained by having both plans describe the development of basic information, such as positional information, and periodic taking of aerial photographs with regard to remote islands in the formulation process of both plans.

2.6 Formulation of G-Spatial Action Plan

Toward the promotion of each measure provided by the Basic Plan in line with the Basic Act, the Committee for the Advancement of Utilizing Geospatial Information has set up specific objectives and a

completion period, etc. for each measure. The Action Plan for the Advancement of Utilizing Geospatial Information with specific objectives and its supplemental/explanatory material, "A Collection of Summary of Measures," which describes an overview of individual measures, was formulated in August 2008. The objectives of each measure, its completion period and other related matters are subject to a yearly follow-up assessment.

The Action Plan for the Advancement of Utilizing Geospatial Information is divided into theme-specific subheads in relation to the descriptions of the Basic Plan and organized according to individual measures. If a measure corresponds to several different sections of the Basic Plan, it will be categorized into the section where it is considered most relevant (or into the first section of the Basic Plan, if its relevance to those sections is considered equivalent).

The Action Plan for the Advancement of Utilizing Geospatial Information was nicknamed "G-Spatial Action Plan" in the hope of making it understandable to people and widely disseminated. The G-Spatial Action Plan will hereafter be used as a unified term to express AUGI-related matter.

(Reference: See "Completed Decisions, etc." of June 10, 2009 at http://www.cas.go.jp/jp/seisaku/sokuitiri/index.html)

3. Measures of the Geographical Survey Institute on the Basic Plan

3.1 General Measures

3.1.1 Developing institutional arrangements of relevant organizations and strengthening their alliances

Meetings on AUGI with representatives of participating prefectures should be held in the process of strengthening the alliance.

For the development, timely updating and provision of FGD and digital image information, the national government and local governments must cooperate with each other such as for the mutual utilization of the results of basic surveys and public surveys and for arrangements of survey work.

3.1.2 Implementation of surveys and research

(1) Surveys and research on issues concerning the impact of the distribution of geospatial information on the protection of personal information, secondary use of data and national security

Geospatial information often contains personal information and is subject to intellectual property right including copyrights. Disclosure of such information may affect national security. To have geospatial information distributed to and used by people properly and safely, rules that take this issue into account need to be formulated for the provision of information. The national government is to formulate guidelines for handling personal information and intellectual property rights in relation to the provision and distribution of geospatial information. Therefore, with focus on general geospatial-information survey results, such as maps and aerial photographs, the GSI conducts surveys and research on issues concerning the protection of personal information or secondary use of data, as well as on issues concerning national security, in the distribution of geospatial information.

(2) Research and examination of a method for the development and updating of FGD, its quality evaluation, etc.

Section II, Chapter 1, Paragraph 2 of the Basic Plan states that surveys and research on a method to improve the development, updating, management, etc. of FGD are to be conducted.

From FY2008 at the target region in the Chubu region of Japan, the GSI has been reviewing the effects and scheme of collaboration between the governmental agencies and prefectures/municipalities. It also reviews the methods by which FGD and geospatial information are provided, developed and updated.

Applications of FGD that the GSI develops and provides to the utilization of legal documents and Integrated GIS are also reviewed and studied.

(3) Research and development of high-level utilization, etc.

While promoting the development of technologies that allow successively developed geospatial information to be utilized effectively for the protection of environments and national land, technologies that allow easy and seamless positioning in indoor/outdoor using GPS, IC tags, etc. will be developed.

3.1.3 Dissemination of knowledge

Establishing an organization where governments, industries and academia are all work together in each region, the utilization of geospatial information will be promoted by exchanging opinions, sharing information, etc. with regard to geospatial information. Furthermore, the development and updating of FGD are being promoted by establishing a collaborative organization for representatives of each prefecture and providing supports for FGD-related technologies.

3.1.4 Nurturing human resources

As to a qualification system for surveying technicians, restructuring of the qualification system as well as granting of credentials to those who possess comprehensive technical skills in the development and utilization of geospatial information will be discussed.

3.1.5 Promotion of international cooperation

(1) Participation in meetings, conventions, etc.

The GSI should play a very active role in the International Organization for Standardization (ISO) in formulating international rules for standardization related to geospatial information. At the same time, international activities at the United Nations Regional Cartographic Conference for Asia and the Pacific (UNRCC-AP) and the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP), etc. in promoting the utilization of geospatial information are to be supported.

(2) Development and provision of data and other related activities

Through international collaborations with Japan as a central figure, the Global Map Project that aims to develop digital map dataset covering the whole land of the globe is promoted. The GSI will also participate in global geodetic observations and other relevant activities directed under the frameworks of the International GNSS (Global Navigation Satellite System) Service (hereafter, "IGS"), etc.

3.2 Measures Related to Geographic Information System (GIS)

3.2.1 Establishing and disseminating standards, etc., related to the development and provision of geospatial information

(1) Standardization of geographic information

The GSI has been working energetically on standardizing geographic information since 1994 when the ISO launched the 211th technical committee, TC211, titled "Geographic information/Geomatics." Between FY1996 and FY2003, it also conducted government-private sector joint research on an approach to international standardization of geographic information inside Japan. The results of the said research, then, have been utilized in the establishment of the Japanese Industrial Standards (JIS), which follow the TC211 standards. In order to disseminate the geographic information standards, the Japan Profile for Geographic Information Standards (hereafter, "JPGIS"), a framework based on the up-to-date ISO standards and JIS, was created in FY2004. The use of JPGIS is officially provided in the "rules for the operation provided by Article 34 of the Survey Act" revised in March 2008. In April 2008, the version of the JPGIS was updated to 2.0 by incorporating 19136 (the geography markup language), the latest ISO standards.

The following are the 10 converted-JIS from the ISO standards as of December 2009.

X7105 Conformance and testing, August 2001
X7108 Temporal schema, March 2004
X7113 Quality principles, August 2004
X7111 Spatial referencing by coordinates, August 2004
X7115 Metadata, March 2005
X7107 Spatial schema, August 2005
X7112 Spatial referencing by geographic identifiers,

February 2006

X7109 Rules for application schema, January 2009

X7110 Methodology for feature cataloguing, January 2009

X7114 Quality evaluation procedures, May 2009

The GSI plans to further develop necessary measures to disseminate/promote the geographic information standards and JPGIS.

(2) Rules, etc., related to the general development, provision and distribution of geospatial information

Section I, Paragraph 3. (2) of the Basic Plan provides as follows: "efforts should be made to develop, update and provide Fundamental Geospatial Data (FGD) that should be used as the standard spatial reference for geospatial information. In addition, in order to make different geospatial information, developed by various organizations, geospatially aligned by utilizing FGD as the common spatial reference, it will be necessary to establish the necessary rules and disseminate them." As provided so, rules concerning FGD are disseminated by creating and compiling them in manuals or other printed material in order for FGD to be used on a functional basis as positional standards when various types of geospatial information are utilized.

Using FGD as positional standards, the GSI will study and review requirements and related issues in the development and updating of various geospatial information and create a manual for developing and updating geospatial information with FGD regarded as positional standards.

(3) Dissemination of the standards, etc., for developing FGD

To disseminate the rules for the operation which are related to public surveys and revised in March 2008, the GSI should provide technical advice and promote submission of results by understanding the annual plan of public surveys and prompting submission of implementation plans.

3.2.2 Promoting the development and provision of geospatial information

(1) Thematic map

A variety of thematic map data are developed and provided according to the purpose of disaster prevention, environment, land use and topographical classification.

(2) Aerial photograph

Areas mainly composed of flatlands, remote islands, urbanization promotion area and urbanization control areas are photographed while developing digital aerial photographs.

(3) Development, updating and provision of FGD

The GSI has been developing FGD as positional standard data of features since FY2007. The following section explains the development and provision of such FGD.

Article 2, Paragraph 3 of the Basic Act provides as follows: "'Fundamental Geospatial Data (FGD)' refers to positional information, in digital form, that belongs to features, which provide positional reference to geospatial information on a digital/electronic map, including geodetic control points, coastlines, boundaries of public facilities, administrative boundaries and others listed in an ordinance of the Ministry of Land, Infrastructure and Transport (hereinafter, 'MLIT'), and that also meets the criteria defined by an ordinance of MLIT."

Pursuant to the said provision, the ordinance of the MLIT on information items of and the requirements for FGD came into effect on August 29, 2007. The ordinance provides the following 13 information items as the items developed as positional information.

1) Geodetic control point

Permanent monuments provided in Article 10, Paragraph 1 of the Survey Act or everlasting monuments provided in Article 1 of the Ordinance for Enforcement of the Act on Services Related to Waterways

2) Coastline

Boundary between the land area and the sea area when the sea level reaches its highest

3) Boundary of public facilities (Road management boundary)

Boundaries of road areas pursuant to Article 4-2, Paragraph 4(1) of the Ordinance for Enforcement of the Road Act for roads that are provided in Article 2, Paragraph 1 of the Road Act. Boundaries which are equivalent to the aforementioned boundaries for roads not provided in Article 2, Paragraph 1 of the Road Act

4) Boundary of public facilities (River management boundary)

Boundaries of river areas that are provided in Article 6, Paragraph 1 of the River Act or said areas applied mutatis mutandis to rivers designated by the provision of Article 100, Paragraph 1 of the said Act. Boundaries of other rivers that are waterways for public use

5) Administrative boundary (town level; with a point in each polygon)

Boundaries of administrative districts (prefectures and municipalities) with representative points in their districts

6) Road edge

For roads that are provided in Article 2, Paragraph 1 of the Road Act, outermost lines of outermost lines of roads composed of sidewalk, bicycle path, pedestrian/bicycle path, motoring road, median zone, road shoulder, tramway site, traffic island and planting zone pursuant to Article 2 of the Road Construction Ordinance. For roads that are not provided in Article 2, Paragraph 1 of the Road Act, lines equivalent to the said description

7) Riverside edge of levee crown

Riverside edge of crown of levees, which are river management facilities, pursuant to Article 3, Paragraph 2 of the River Act

8) Railroad track centerline

Centerlines of tramways pursuant to Article 1, Paragraph 1 of the Act on Rail Tracks and those equivalent to tramways to which the said Act applies mutatis mutandis. Centerlines of railroad tracks pertaining to Railway Business provided in Article 2, Paragraph 1 of the Railway Business Act

9) Elevation (ground surface point where the elevation is known)

Surveyed or calculated elevation points (except control points)

10) Shoreline

Boundaries between the land and ordinary water level of rivers, lakes and marshes and the waterways, such as public ditches, irrigation channels and other public channels, connecting to them

11) Building outline

The circumference line of roofs of buildings provided in Article 2, Item (i) of the Building Standards Act

12) Community boundary (with a point in each polygon)

Boundaries enclosing districts of “cho” or “aza” within a municipality with representative points in their districts

13) Street block boundary (with a point in each polygon)

For regions with residential addresses determined by the block method pursuant to Article 2, Item (i) of the Act on Indication of Residential Address, block boundaries and their representative points with block codes provided by the said item. For other regions, boundaries and representative points of areas, where districts of “cho” or “aza” within a municipality are zoned by roads, tracks and other permanent facilities of railway or tramway, rivers, waterways, or the like

These are the information items provided by the Ordinance of the MLIT.

In the FGD development plan of the GSI, Japan’s city planning areas (approximately 100,000km^2) will be covered at the scale level of 1:2500 or larger and other areas at the scale level of 1:25000.

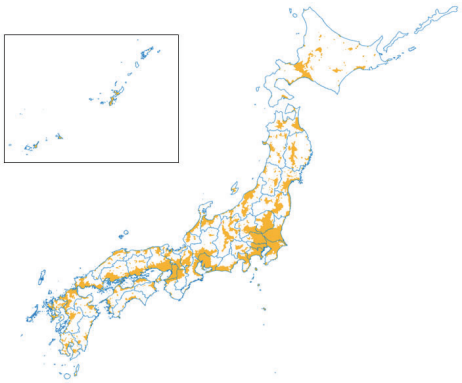


Fig. 6 City planning areas in Japan (approx. 100,000 km^2), in which FGD is to be developed at the scale level of 1:2500 or larger

Regarding the city planning areas (Fig. 6), FGD (the scale level of 1:2500) will be created through necessary processing applied to highly accurate electronic maps held by the national government, local governments, etc. and is to be developed by FY2011. Regarding the areas other than city planning areas, FGD (the scale level of 1:25000) was created for the entire nation through necessary processing applied to digital maps, etc. held by the GSI.

From April 1, 2008, the GSI started free provision of browsing and download of the created FGD via Internet (http://www.gsi.go.jp/kiban/index.html). The FGD available for provision as of December 2009 are as follows.

<Vector format (the scale level of 1:2500)>

Covers 24,000km^2 (224 municipalities).

<Vector format (the scale level of 1:25000)>

Covers the entire nation (the scale level of 1:50000 for four northern islands).

<Spot elevation (DEM)>

Covers areas of 33,000km^2 with 5m-mesh spot-elevation data and the entire nation with 10m-mesh spot-elevation (250m-mesh for four northern islands) data.

For further information on FGD availability, refer to: http://www.gsi.go.jp/kiban/seibi.html.

(4) Construction of a "one-stop" service system

In order to smoothly distribute various types of FGD obtained from public surveys by the national and local governments, the GSI is upgrading a clearinghouse where searching of FGD is available and is also working with other relevant organizations so as to offer "one-stop" services when using survey results.

(5) Maintenance and management, etc., of the control point information

Control point surveys have been conducted systematically so as to maintain the national control point system and provide accurate positional information. In addition, introduction of semi-dynamic correction and construction of "Control Point GIS" that provides control point information via Internet are implemented while high-level maintenance, management and utilization, etc. of the control points are promoted.

For comprehensive management of the national land and maritime areas, the GSI shall also install, maintain and manage control points on the remote islands.

(6) Provision of data through the Web mapping system

As to the Denshikokudo ("Digital Japan") Web System that allows information to be easily released and accessed by citizens through WebGIS, the GSI is to expand and disseminate features of the web system while still providing services.

(7) Supporting, etc. of local governments and other organizations

While promoting initial development of FGD, the GSI lends aerial photographs to local governments to promote collaboration between the national government and local governments. Since March 2008, the GSI has encouraged the borrowing of its aerial photographs, taken for the development of FGD (elevation), by local governments for their use in developing digital topographic maps and other data. Through this system, the GSI lends the aerial photographs taken by the GSI to the local governments and other organizations only when the lent photos are used for the development of digital topographic maps. The procedure consists as follows: the procedures carried out by local governments pertaining to public surveys under the Survey Act; approval of the GSI's use of submitted public survey results for the development of FGD; and approval of the GSI's free provision of FGD developed by the GSI based on the Basic Act. Through this system, the GSI has given approval for the lending of its aerial photographs free of charge to a total of 25 local governments as of December 2009.

In addition to this system, the GSI also opened the "FGD site" on its homepage in February 2008 to promote the provision of information related to the development, provision, etc. of FGD. The site provides interpretations of the Basic Act, the Ordinance, the

Public Notice and the development of FGD, information on areas for which FGD are, or will be, available and related materials. It also serves as a portal (entrance) site where FGD and application software, etc. required to use FGD can be downloaded.

After April 2008 when FGD was released, the number of access to the site has increased, especially to the site pages that allow users to browse and download FGD, the relevant application software, etc.

Furthermore, an inquiry service by e-mail becomes available since June 2007. This is to accommodate inquires related to the Basic Act, the Ordinance and the Public Notice, the development of geospatial information including FGD items by the local governments and other organizations, or linkage/cooperation between the national and local governments.

Most frequent inquiries that were submitted when the service was first started were about interpretations of the Basic Act, the Ordinance and the Public Notice. After the announcement of the lending of aerial photographs, however, inquiries from local governments seeking advice regarding collaboration with the GSI in developing digital topographic maps, etc. have been increased. Similarly, inquiries on the specifications and usage of FGD developed by the GSI are on the increase after the FGD was released.

The GSI makes continuous efforts to update/operate the FGD site, improve its service for FGD-related inquiries and update/provide information in a timely manner in this fiscal year as well.

(8) Digital Japan Basic Map

The GSI shall develop the Digital Japan Basic Map. The components comprising the Digital Japan Basic Map are: map information for the entire nation, aligned spatially with FGD which is the positional standard on electronic maps; ortho images that use digital aerial photographs; and place name information, such as a name of the residence area or natural region, which works as a key in positional search.

3.3 Policies Related to Space-Based PNT

3.3.1 International cooperation regarding Space-based PNT

With respect to GPS satellites operated by the United States, the Japan-U.S. Consultations on the Civil Use of the GPS are convened to review and discuss matters of importance regarding the civil use of GPS satellites pursuant to the "Joint Statement on Cooperation in the Use of the Global Positioning System" issued by the then heads of the two governments in September 1998. As a member of relevant ministries, the GSI participates in the meetings and gathers information on the use of GPS satellites.

As mentioned in (2) of 3.1.5, the GSI participates in the IGS which, under the cooperation among relevant institutions of various countries, provides researchers around the world with information on GPS, GLONASS, Galileo, etc. for the purpose of supporting studies on geodesy, geophysics and others. The GSI also provides observation data required in the development of precise orbit information (precise ephemeris) and performs analyses for the International Terrestrial Reference Frame (ITRF), contributing to the international cooperation.

3.3.2 Promotion of the Quasi-Zenith Satellite System project

The GSI partakes in the QZSS project by which provision of advanced Space-based PNT services becomes possible by means of reducing effects of negative factors such as shadow of mountains or buildings. It also plans to develop highly precise augmentation technologies for surveying that makes highly accurate positioning services possible as well as to conduct and verify a technological experiment by using the first Quasi-Zenith Satellite.

Furthermore, the GSI's involvement in promoting this project also includes incorporation of the specification of highly precise augmentation information for surveying to the Quasi-Zenith Satellite System Navigation Service Interface Specification for QZSS (IS-QZSS) issued by the Japan Aerospace Exploration Agency (JAXA).

3.3.3 Provision of information for utilizing Space-based PNT

The GSI has installed approximately 1,200 GPS-based Control Stations across the nation that receives signals from GPS satellites. At both the GPS center (Tsukuba City, Ibaraki Prefecture) and those GPS-based Control Stations, the GPS Earth Observation Network System (GEONET) that aims to build high-density and high-accuracy survey networks and monitor regional-scale crustal movements is operated.

As for monitoring of crustal movements, it contributes to the clarification of the mechanism of phenomena occurring in the earth's interior by understanding the crustal movements that cause earthquakes and volcano activities using the entire nation's observation data. Plate motions in areas surrounding Japan are measured daily, and, because of this, obscure phenomena such as slow earthquakes, which can hardly be detected by other methods, are successfully perceived. The GEONET plays a role as a fundamental observation network which is vital in monitoring of crustal movements.

Using the GPS-based Control Stations as existing points in surveys, GPS devices need to be set only at a new point for differential positioning, eliminating the need of the survey equipment installed at existing points and streamlining the work process.

Because all of the nation's GPS-based Control Stations and GPS center are interconnected at all times through a dedicated line, observation data from GPS satellites are constantly transmitted and utilized in real-time monitoring of crustal movements so as to facilitate research studies. In addition, real-time data of the GPS-based Control Stations are delivered to private sectors through a distribution service agency, used for the development of service business in the provision of highly accurate positional information, and utilized for various surveys and positional information services.

4. Conclusion

To promote the implementation of the Basic Plan, sufficient consideration should be given to maintaining the consistency between the plan and policies of the Basic Plan on Ocean Policy, the Basic Plan for Space Policy, the New IT Reform Strategy and the Strategic Principles for Economic Growth, etc. and producing advantageous effects achieved by linkage/cooperation while at the same time actively reviewing the contents if relevant acts/ordinances need to be amended. To further promote the Basic Plan, the national government is to review and formulation the G-Spatial Action Plan (the Action Plan for the Advancement of Utilizing Geospatial Information) on specific objectives, the completion period and other related matters for each measure and each year conduct a follow-up on the state of its progress. Also, the Basic Plan is to be reviewed as needed.

Toward realization of an advanced geospatial information utilization society, a goal to which the Basic Plan is committed, the GSI will make all efforts to keep taking actions for that goal by implementing the G-Spatial Action Plan where measures regarding the development, provision, etc. of geospatial information as well as FGD are discussed in detail.

References

Basic Act on the Advancement of Utilizing Geospatial Information (Act No. 63 of 2007)

Ordinance on the Information Items of and the Requirements for Fundamental Geospatial Data that is referred to in Article 2, Paragraph 3 of the Basic Act on the Advancement of Utilizing Geospatial Information (Ordinance of the MLIT No. 78 of 2007, Partial Revision: Ordinance of the MLIT No. 11 of 2008)

Public Notice on the Technical Standards for the Development of Fundamental Geospatial Data that are referred to in Article 16, Paragraph 1 of the Basic Act on the Advancement of Utilizing Geospatial Information (Public Notice of the MLIT No. 1144 of 2007, Partial Revision: Public Notice of the MLIT No. 105 of 2009)

Basic Plan for the Advancement of Utilizing Geospatial Information (Cabinet Decision in April 2008)

Action Plan for the Advancement of Utilizing Geospatial Information (Formulation by the Committee for the Advancement of Utilizing Geospatial Information in June 2009)