

Publication of The Digital Maps (Basic Geospatial Information)

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Abstract

The Digital Maps (Basic Geospatial Information) published since the end of July 2012 are integrated geospatial information summarizing Japan's basic land information including map information such as political and administrative districts, roads, railroads, buildings, residential area names, altitude, etc. This information is updated on a nonscheduled basis and the revised version is published.

Moreover, with the use of a Geographic Information System (GIS), the user can choose to display only the necessary information, or layer the map data over other information. This paper describes the data items of Digital Maps and the basic concept of data integration.

1. Advisory Committee on Digital Japan Basic Maps

1.1 Background

The Digital Japan Basic Map is a new fundamental map in digital format that has been developed according to the 7th long-term plan of the Basic Survey established in 2009. In particular, it has been developed as a format providing three types of information: map information, ortho photo images and geographical dictionary (gazetteer). The main usages of this map information can be for information on which the topographical map is built of, or as a base map for GIS or for background illustrations.

The Geospatial Information Authority of Japan (GSI) established the Advisory Committee on Digital Japan Basic Maps” (hereinafter referred to as ‘Committee’) in February 2012, consisting of external experts, in order to

obtain recommendations as a result of reviewing ways to further improve Digital Japan Basic Maps to offer valuable and improved user-friendliness (Fig. 1).

The Committee has been held 3 times so far; in February, March and June of 2012. Its interim recommendations were compiled in July 2012 and include considerations towards the public opinions surveyed by the GSI regarding the publication of Digital Japan Basic Maps.

1.2 Feedback on The Digital Japan Basic Maps from Users

The Digital Japan Basic Maps have been partially modified from the traditional topographical map in terms of data acquisition and representation standards. For example, power transmission lines, monuments, areas of vegetation and short-range elevated parts are no longer collected, mainly due to the challenges of maintenance. Yet users have raised complaints and requested their restoration. In addition, opinions have been received claiming that the vector data of The Digital Japan Basic Maps should be provided so that users can utilize it according to their needs with high utilization value.

1.3 Directions in Digital Japan Basic Map Improvement

In order for The Digital Japan Basic Maps to hold value and be easy to use, the Committee recommends the following focuses in the fields of data acquisition,

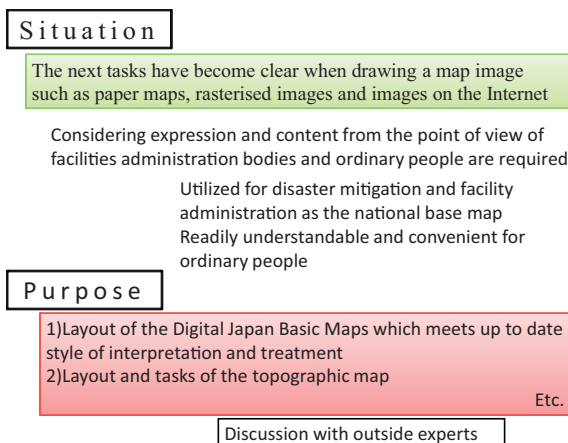


Fig. 1 Background and Objectives of the Advisory Committee on Digital Japan Basic Maps

representation, delivery and utilization for future measures.

With regard to the information included in traditional maps but has been omitted in Digital Japan Basic Maps, such as power transmission lines, due to the challenges involved with keeping the information up-to-date, this type of information should be regarded as useful content when used in juxtaposition with basic information and should be made available as accompanying documentation.

There is a need to provide methods where users can select the data they want from a single data set and choose the geospatial information they want to use easily. For this reason, the committee recommends that GSI should publish vector data in a single package containing a variety of information currently provided by GSI, including elevation grid information and any other documentation that can accompany the basic information. Moreover, the committee recommends that a mechanism should exist to preserve a snap shot of the latest data set, at a certain point, as a digital archive, for example once every year.

2. Basic Concept of the Digital Maps (Basic Geospatial Information) Data Items and Integration

The Digital Map should be developed, maintained

and updated as basic current land status information, of the entire country, in an integrated way. Therefore, the arrangement is implemented using the coordinates of each planimetric feature to indicate its true position. In addition, not only basic attribute data such as names but also other data useful for representation enabling simple comprehension should also be arranged according to the scale.

Furthermore, in order to meet the needs of users, data should be organized separately as accompanying documentation that can be used to overlap in GIS, etc. In addition to map information, a variety of information must be included as packages in vector format in order to provide users a way to select geospatial information easily according to their needs. Moreover, data should be available not only in GML format that conforms to JPGIS but also in generic format in order to offer users a form that is easy-to use for processing and analysis in GIS, etc.

2.1 Data Items

GSI has so far published the Fundamental Geospatial Data, a Digital Map series (Digital Map 2500/25000 (Spatial Data Framework), Digital Map 25000 (administrative boundary and coastlines), Digital Map 25000 (Geographical names and public facilities))

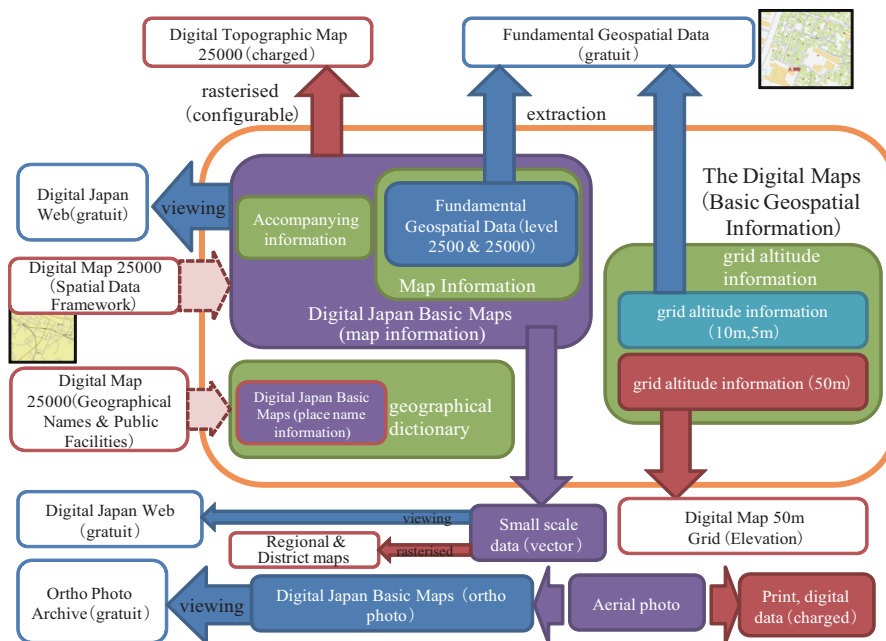


Fig. 2 Relationship Between Digital Map (Basic Geospatial Information) and Products Available Until Now

and digital elevation data (5, 10 and 50m grid) separately. Digital Maps (Basic Geospatial Information) integrates the above information and adds various data items necessary for map representation so as to offer a variety of attribute information (Fig. 2).

Digital Maps offer 4 types of information: map information, place name information (geographical dictionary), grid altitude information and accompanying information (only map information and accompanying information are provided for the Northern Territories).

Some of the above items of information are explained below.

2.1.1 Map Information

Map information is digital information arranged as a main component of Digital Japan Basic Maps (Map Information) that covers the whole country. This includes the Fundamental Geospatial Data and true position/high-precision geospatial information position of which matches with the position of the former. Positional accuracy of map information is equal to or more than 1:2500 for Fundamental Geospatial Data items in urban areas and 1:25000 or more for other areas, so it is possible to create a detailed map using Digital Maps for urban areas.

The planimetric features of map information come with data maintenance registration date, data maintenance deletion date and a record ID. Since the value of the record ID is defined as a unique string throughout the entire future of the Digital Japan Basic Maps (Map Information), each item can be easily identified. It is therefore easy to update map data sectionally.

Furthermore, Digital Maps (Map Information) have different scales according to areas and planimetric features (1:2500 – 1:25000 scales) because they function as a foundation in vector format covering the entire nation including scales more accurately than 1:25000. For this reason, each planimetric feature has attributes displaying the accuracy of its representation.

The map information consists of nine subpackages including annotations, boundaries, traffic facilities, buildings, structures, water areas, land use, topography

and accompanying information (Fig. 3).

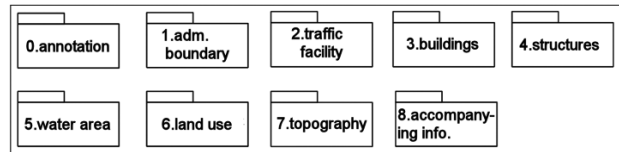


Fig. 3 Subpackages of Digital Japan Basic Maps (Map Information)

The boundaries subpackage includes not only political areas but also administrative boundaries. Political areas are planimetric features representing the range of administrative districts as a polygon at a map information scale of 1:25000. Administrative district boundaries are boundaries that separate the administrative districts, and include planimetric features, which were maintained until now, at map scale of 1:25000 arranged as part of a Digital Japan Basic Map (Map Information), and planimetric features at map scale of 1:2500 arranged as part of Fundamental Geospatial Data (1:2500). Therefore, it must be noted that there are cases where an identical boundary is displayed by multiple administrative district boundaries.

The traffic facilities subpackage includes road edges as well as a road center line class. The road center line class has an attribute according to type and road width, so it is possible to display only national roads or wider roads when, for example, the data is displayed at small to medium scale (Fig. 4, Fig. 5).

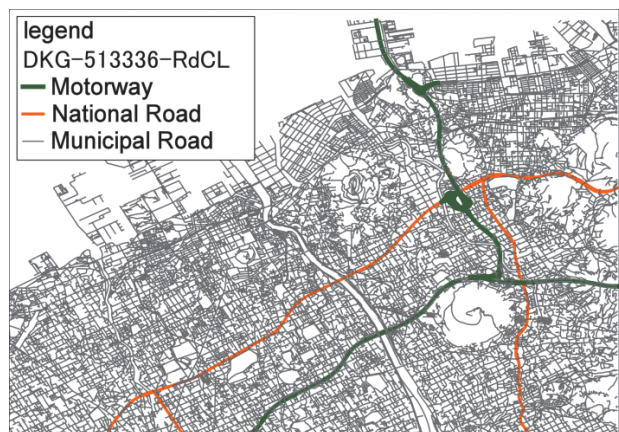


Fig. 4 Example showing National Highways (green), National Roads (brown) and other roads (grey) according to road type

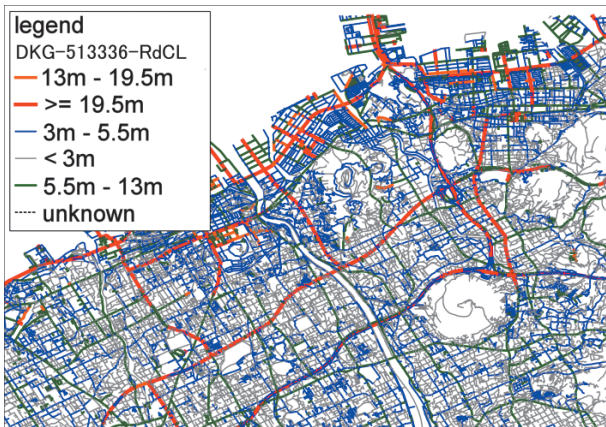


Fig. 5 Example of display change according to road width based on width classification

The buildings subpackage includes not only buildings and peripheral lines of buildings but also the symbol class of buildings. This building symbol class maintains the locations and type of symbols of public buildings such as government agencies, town halls, schools and post offices displayed as attributes in Digital Japan Basic Maps. It is therefore possible to display particular types of symbol only.

2.1.2 Grid Elevation Information

Grid Elevation information includes 50m grid elevation data, in addition to the 5m and 10m grid elevation, offered as Fundamental Geospatial Data. The Digital Map's 50m grid data is the Digital Elevation Model (DEM) measured and calculated from the contours of 1:25000 topographical maps and is the same data as that of the Digital Map 50m grid (elevation) sold in CD-ROM format (however, the data format is different from the one that used to be for sale). The 10m grid elevation is the same data as that offered as Fundamental Geospatial Data. The 5m grid elevation is the same data as that offered as both Fundamental Geospatial Data (5m grid elevation; digital topography), which is known as DEM5B, and Fundamental Geospatial Data (5m grid elevation; Laser altimetry), which is known as DEM5A, but it does not include the public survey results (DEM5K).

2.1.3 Place Name Information

Place name information is maintained as

information on The Digital Japan Basic Maps which shows names of areas and places, and is a basic piece of information which will provide the key to searching for locations when using geospatial information.

This geographical name information consists of a package including place name information, etc., which consists of 4 classes: residential place names, natural place names, public facilities and signaled intersections (Fig. 6).

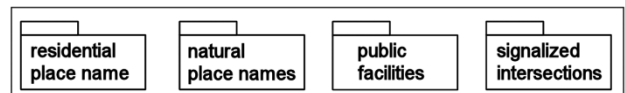


Fig. 6 Place Name Information Package

The residential place name class includes names of residential areas and their representative points. Each planimetric feature includes a type of residential area name (larger section, town, street, section or common name), its administrative code, prefectural and municipal names and their pronunciations, enclave flag, and so on as attributes.

The natural place name class includes natural place names and their representative points. Here, each planimetric feature has a type of natural place name (river, lake, waterfall, mountain, rock, cave, headland, cape, coastline, shore, beach, island, bay, strait and waterway), administrative code, prefectural and municipal names, their pronunciation as well as Romanized spelling as attributes (Fig. 7).

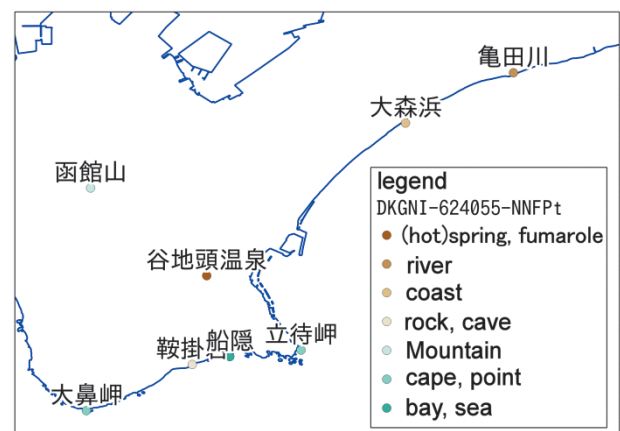


Fig. 7 Example of display with color-coded symbols according to the type of natural place names (the coastline is shown in blue)

The public facility class includes names and representative points of public facilities. Each planimetric feature includes the following attributes: type (national agencies, regional agencies, health centers, police, fire stations, schools, hospitals, post offices, designated public institutions or museums), administrative code, name of facility, address, etc.

The signalized intersection class contains representative points of the intersection where traffic signals are installed. Each planimetric feature includes attributes such as the signalized intersection code, in order to differentiate each signalized intersection, and location names for identification.

2.1.4 Accompanying information

Accompanying information is a part of the map information, and is usable in layers according to the objectives of users. Please note that there is some data that has not been verified or updated, and their positional / attribute accuracy is relatively low because it was created based on the old 1:25,000 topographical maps.

Accompanying information is defined as one of the subpackages of The Digital Japan Basic Maps (Map Information). The subpackage comprising of accompanying information etc. includes power plants, radio towers, monuments, vegetation boundaries (points), railroad center lines, power transmission lines, vegetation boundaries (lines), and residential areas surrounded by

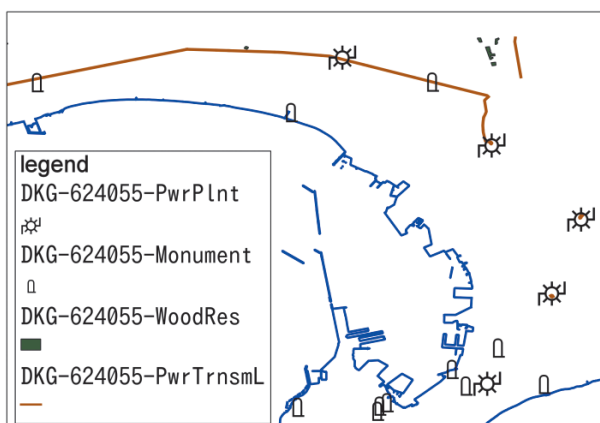


Fig. 8 Example displaying power transmission lines, power plants and monuments (displayed as 1:25,000 topographical map symbols). Power transmission lines (brown) and residential areas surrounded by trees are displayed as examples (the coastline is shown in blue).

trees (Fig. 8). The first four of these are defined as point data, the next three are defined as line data, and the last one is defined as surface data.

Among these, railroad center lines are acquired as the line representing the linear shape of railroads near the center of the railroad, and it is used for drawing railways on the 1/25,000 scale map images. Similarly, the traffic facilities subpackage includes the track center lines class. It is especially complex to display this data for acquired railroad center lines at a medium to small scale when all tracks are displayed in the sections with multiple tracks. In this case, it is possible to represent railroad shapes using the data from the railroad center line class.

2.2 Publication Unit, etc.

The Digital Map (Basic Geospatial Information) data is arranged with a unit of secondary grid (grid size is 5' in latitude and 7'30" in longitude) similar to the standard borders of 1:25,000 topographical maps (Table 1).

The publication data format can be selected as JPGIS-compatible Encoded GML format or Shapefile format. Shapefile format can be easily manipulated using geographical information systems such as ArcGIS or QGIS. Shapefile's character code is Shift_JIS. Map information and accompanying information in GML format can be viewed by Digital Japan Basic Map (Map Information) viewers provided by GSI. Map symbols generally conform to Digital Topographical Map 25000, but due to their nature of being vector data viewers, the maps are in a simplified representation (Fig. 9). Grid elevation information is identical to the information provided in The Fundamental Geospatial Data so users can view it with Fundamental Geospatial Data Viewing/Converting Software provided by GSI or export it to other file formats.

The coordinates of the published data are based on the Japan Geodetic Datum 2011 (JGD2011) and data is compressed in zip format by secondary grid units. However, a secondary grid including a smaller amount of data for areas mainly covered by the sea, for example, may be merged with an adjacent secondary grid. In addition, file names include data format, secondary grid name and publication date so that the necessary zip file

can be easily identified.

Table 1 Digital Map (Basic Geospatial Information) Delivery Method and Specification

| | |
|-------------------------|---|
| Delivery Method | Download sale/order performed by the Japan Map Center |
| Delivery Unit and Price | <ul style="list-style-type: none"> ● Online sales: JPY 170 per unit ● DVD format (prefectural unit, with 2 agencies for Hokkaido): JPY 7500 |
| Data Format | Encoded (GML) format compatible with JPGIS (character code is UTF-8) or Shapefile format (Shift_JIS) |
| Border Unit | Secondary grid |
| Coordinates | Longitude and latitude based on JGD2011 |

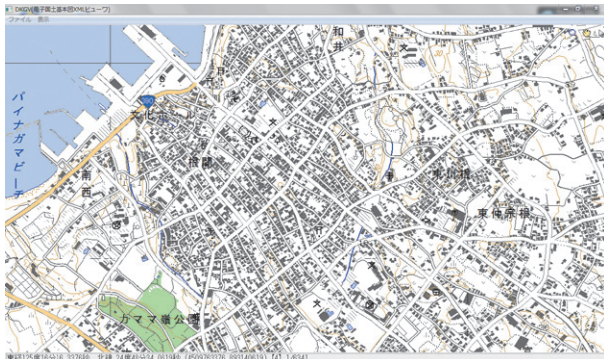


Fig. 9 Display example of Digital Map (Basic Geospatial Information) on Digital Japan Basic Map (Map Information) Viewer

When a zip file is opened, the data is stored in the following structure: Digital Japan Basic Map (Map Information) directly under the secondary grid name folder; Digital Japan Basic Map (place name information) data under the DKGNI subfolder; grid elevation (50m, 10m, 5m) data under the DEM subfolder (Fig. 10).

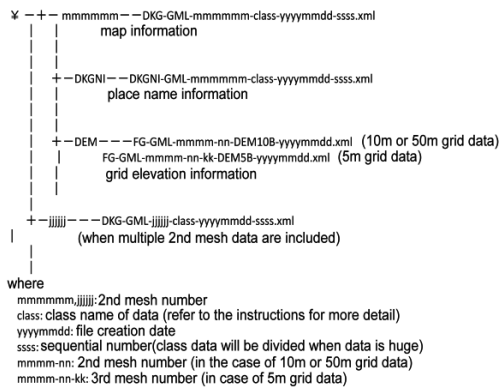


Fig. 10 Folder Configuration for Digital Map (Basic Geospatial Information)

Digital Maps can be purchased from the GSI Japan Digital Map webpage (http://net.jmc.or.jp/digital_data_gsiol.html) in the portal site managed by the Japan Map Center (JMC). Users can purchase them online (purchased map to be downloaded) or in DVD format. Online editions can be purchased as one or more zip files (secondary grid x 1 sheet. However, the adjacent grid might be included. The same condition also applies to those subsequent). One zip file costs JPY 170. The DVD format is intended for customers who would like to purchase data for a wider area in a bundle, and is offered by prefectural unit (data for Hokkaido is provided in two units). One DVD costs JPY 7500 (Table 1).

3. Summary

As a basic source of information covering the entire country, we hope that the Digital Map is utilized effectively in many fields, since it provides integrated geospatial information including map information such as administrative districts, roads, railroads, buildings, as well as geographical information including place names, altitudes functioning as reference data in order to specify a background map or location on each GIS, and as a base map from which a variety of maps can be created.

Reference

Advisory Committee on Digital Japan Basic Maps: Recommendations for Valuable and User-Friendly Digital Japan Basic Maps (Interim Recommendations) <http://www.gsi.go.jp/common/000075390.pdf> (accessed December 17, 2012).