

Revision of Specifications for Global Map Version 2

**Noriko KISHIMOTO, Yoshikazu FUKUSHIMA, Tsuneo TANAKA,
Takayuki NAKAMURA, Kosei OTOI, Hidehisa TAKAHASHI, Seiichi OOMIYA,
Shuhei KOJIMA and Masayuki YOSHIKAWA**

Abstract

Global Map Version 1 was released in 2008 and Global Map Version 2 will be released by 2013, developed by respective National Mapping Organizations of the world. In order to promote application and distribution of Global Map data, revision of Global Map Specifications, such as 1) modification of Data Dictionary, 2) adoption of GML as vector data, 3) change in data tiling, and 4) correspondence of metadata with International Standard has been made.

This paper reports the revision process, major points discussed at the “International Workshop on the Revision of Specifications for Global Map Version 2” in September 2009, and future prospects of Global Mapping Project from a viewpoint of the revision of Specifications.

1. Introduction

The Global Mapping Project is an effort in which National Mapping Organizations (NMOs) of the world develop Global Map, digital geographic datasets of the whole globe, through international cooperation. The objectives of the project are to contribute to solving global environmental problems and achieving sustainable development, and the data is intended to update every five years. The data developed in consistent specifications enables us to compare the status of the environment globally and chronologically.

The Global Map Specifications describe Global Map datasets in detail, and all NMOs develop their data in accordance with these Specifications. It is basically described for “data users” to help them understand the data itself. The information for “data producers” such as procedure for developing Global Map data should be described in a data development manual prepared separately.

To date, several minor revisions have been made to the Specifications. (See APPENDIX A: History on the Revision of Global Map Specifications, for details) The revision for Global Map Specifications Version 2 aims at the releasing Global Map data by 2013, and the change has been made thoroughly including the replacement of the Vector data format.

The Geographical Survey Institute of Japan (GSI)

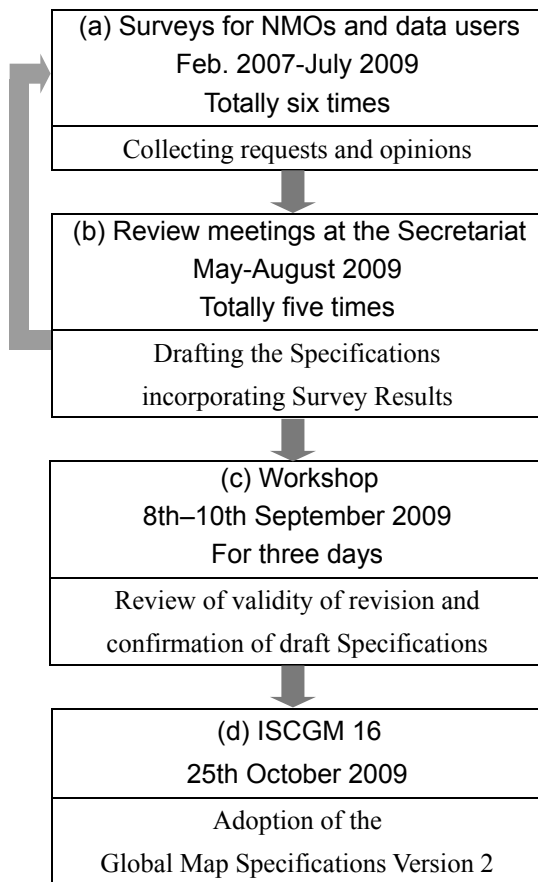
has contributed to the project not only as a participating organization, but also by serving as the Secretariat of International Steering Committee for Global Mapping (ISCGM) since its establishment in 1996. For the revision of the specifications, ISCGM secretariat conducted surveys, summed comments from relevant parties such as NMOs and Liaison Organizations, and drafted the specifications. This paper reports the process of the revision, points discussed and its result.

2. Process of Revision

Discussions on the revision of specifications for Global Map Version 2, which is a basis for the Phase 3 of the Global Mapping project for the 2008-2012 period, were started at ISCGM12 in Cairo, Egypt in April 2005. (See APPENDIX B: Discussion at ISCGM toward the Revision of Specifications for Global Map Version 2, for details) On the basis of these discussions, Secretariat of ISCGM started surveys in 2007.

2.1 Outline of the process

The revision for Specifications has been progressed in four stages shown in the Table 1 below. It has taken more than two and a half years since February 2007.

Table 1 Flow Chart of the Revision Process

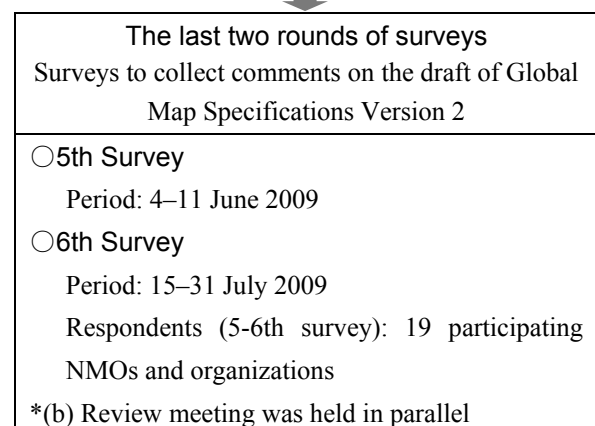
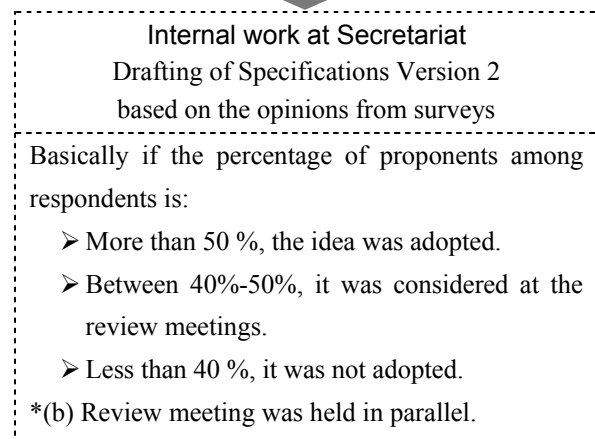
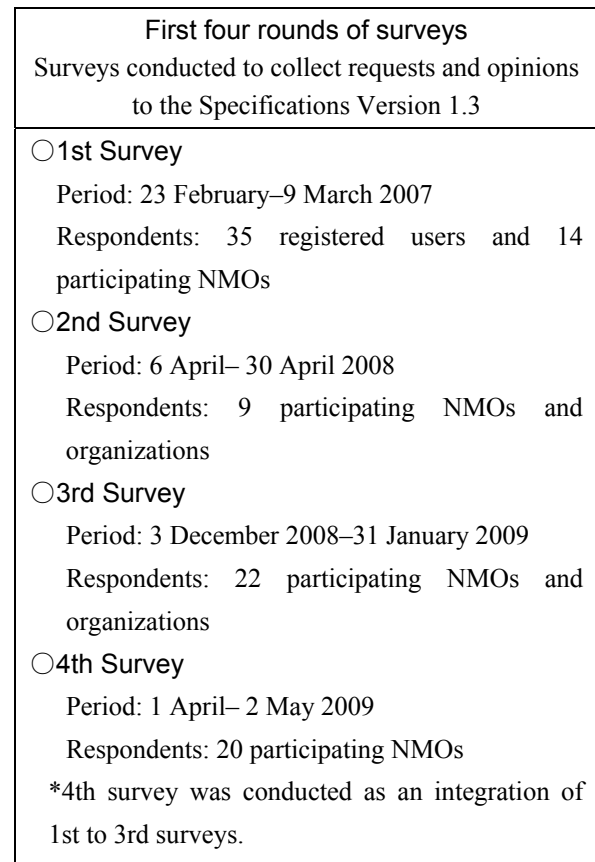
2.2 Details of the process

(a) Surveys

Surveys were conducted six times totally. The first four rounds were made to collect opinions from related parties. On the basis of the collected opinions through these four surveys, Secretariat of ISCGM drafted the Specifications Version 2. The last two rounds of surveys aimed to collect comments for the draft Specifications Version 2 developed by the Secretariat. Summing up of the comments and drafting specifications were held in parallel with review meetings. Following Table 2 shows the flow of the surveys for six times.

(b) Review Meetings

To consider how to reflect the opinions from the surveys into Specifications Version 2 and to draft it, review meetings were held totally five times at the ISCGM Secretariat. The Secretariat's members and two technical officials of GSI: one is in charge of small-scale maps and the other is for geographic information

Table 2 Flow Chart of the Survey

standards, joined the discussions as the members of the review meetings. Finally, review team summed the survey comments into draft Specifications Version 2 and submitted to the Workshop.

(c) International Workshop on the Revision of Specifications

International Workshop on the Revision of Specifications for Global Map Version 2 was held at GSI in Tsukuba, Japan. On 8th September 2009, an open forum took place attended by 72 people including those from NMOs of seven countries and experts of global environment and disaster prevention. (See Photo 1 and APPENDIX C: Agenda of Open Forum in International Workshop on the Revision of Specifications)



Photo 1 Attendees of the open forum of the workshop

From 9th to 10th September, discussions were held on the contents of the Specifications Version 2, attended by the representatives of seven countries, Australia, Brazil, Indonesia, Japan, Kenya, Nigeria, USA and officials of GSI. (See Photo 2)



Photo 2 Scene of discussion at the workshop

A summary for two days was developed at the end of the workshop and the results of the workshop were reflected to the draft specifications to submit them to ISCGM 16. (See APPENDIX D: International Workshop on the Revision of Specifications for Global Map Version 2, 8th-10th September 2009, Summary, for details)

(d) ISCGM16

ISCGM 16 was held in Bangkok, Thailand on 25th October 2009. The Global Map Specifications Version 2 drafted at the International Workshop was adopted.

In addition, it was recommended that a manual be prepared on these specifications, with the cooperation of the ISCGM Working Group 2 (WG2) members.

3. Revision Points

3.1 Basic Policies of Revision

The revision of the Global Map Specifications Version 2 was developed on the basis of the following basic policies.

- Contents and characteristics of Global Map data can be understood quickly and easily.
- Data can sufficiently cover basic information needed for the use of geographic information to cope with global issues.
- Contents should also be in consideration of the capacity of NMOs of developing countries.

3.2 Outline of the revision points

Mainly four points were revised to update Global Map Specifications into Version 2: 1) modification of Data Dictionary which describes the composition of layers, features, attributes and attribute values of Global Map; 2) format change of vector data from VPF to GML; 3) change of file coverage to be provided by countries; and 4) correspondence of metadata with International Standard.

3.3 Data Dictionary

From the viewpoint of the composition of layers and features, added and removed features are as

Table 3 Comparison of layer composition between Version 1.3 with Version 2

	Global Map Specifications Version 1.3	Global Map Specifications Version 2	
Transportation	Airport	Airport	○
	Rail yard	Railroad Station	
	Railroad	Railroad	◎
	Road	Road	◎
	Trails and Tracks line	Trails and Tracks line	
	Structure (Bridge, Ferry route, Tunnel)	Ferry route (*Bridge and Tunnel are moved to Railroad and Road features)	
	Transportation Text	—	
		Port	
Boundaries	Political Boundary (Point)	Political Boundary (Point)	○
	Coast Line	Coast Line	
	Political Boundary (Line)	Political Boundary (Line)	○
	Political Boundary (Area)	Political Boundary (Area)	○
	Ocean/Sea	—	
	Political Entity Text	—	
Drainage	Miscellaneous (Point)	Miscellaneous (Point) (Dam/Weir/Island Spring/Water-Hole)	
	Aqueduct/Canal/Flume/Penstock	Aqueduct/Canal/Flume/Penstock	
	Miscellaneous (Line)	Miscellaneous (Line) (Dam/Weir)	
	Water Course	Water Course	◎
	Inland Water	Inland Water	○
	Water Text	—	
Population Centres	Built-up Area (Point)	Built-up Area (Point)	○
	Built-up Area (Area)	Built-up Area (Area)	○
	Miscellaneous Population	—	
	Population Text	—	

Removed feature
 Added feature

Changes of definition of acquired feature

Changes of attribute

Table 3.

Newly added features are defined as optional items in the Specifications Version 2, to make the shift from Version 1.3 to Version 2 smoothly.

The points revised in the respective items are as follows. The items described in the boxes are the revised points, and the background information or details follow the boxes.

3.3.1 General

To eliminate text feature in all vector layers

Text feature is acquired by digitalizing texts on paper topographic map. It is used to display texts such as river name or political boundary name on the computer screen and printed maps. In version 1, feature names acquired as text features need to be described in name attribute table, too. It is difficult to handle the text features with GIS software, e.g. difficulty in changing the text size. Few countries use text features.

Due to these facts, text features in all vector layers are eliminated.

3.3.2 Transportation

To include “Port” as a feature

Definition of port is that a point where a ferry takes on or discharges its load.

To include “Railway station” as a feature

In place of “Rail yard,” which includes Railroad yard, Marshalling yard and Railway Stations, “Railway station” was adopted.

To replace bridge and tunnel features with location attribute of road and railroad features

In the Specifications Version 1.3, bridge and tunnel are obtained as separate features with road and railroad, and road/railroad network is not a continuous line, but is split. To resolve this discontinuity and show the continuous road/railroad network, bridge and tunnel are moved to road or railroad features. And these features have location attribute table, with “below surface/submerged underground” for tunnel, and “suspended or elevated above ground or water surface” for bridge.

To include “IATA code” for airport feature

In addition to four letter ICAO code, three letter IATA code was added.

3.3.3 Boundaries

To include “population value” and “year of population census” in political boundary features

As shown in Fig. 1, sum of the population value in the attribute table should match the actual population of the country. Duplication should be avoided in data acquisition.

For example, given the population of State A is 10,000,000 and respective values of a, b, c and d are not identified, 10,000,000 is entered into one of a, b, c and d, and the others are kept as -89999999.

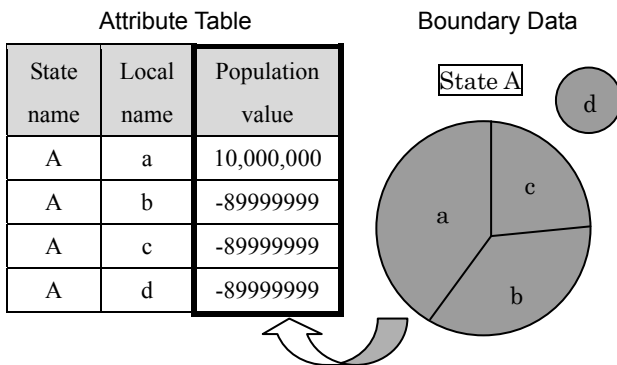


Fig. 1 How to acquire population value

To include “SALB code” and “administrative code” to political boundary features

The Second Administrative Level Boundaries data set project (SALB) is developed by UN Geographic Information Working Group (UNGIWG) and provides codes and digital maps of the 2nd national level boundaries since 2000. By adopting SALB code and administrative code which are defined at respective countries, combined use of Global Map data and statistical data will become promoted.

3.3.4 Drainage

To include “network connector/imaginary line” as a “type” attribute code in water course feature

As shown in Fig. 2, in Specifications Version 1.3, single-line stream is described as line, and double-line stream and lake are described as polygon. The problem of this expression is that water course line is split by

polygons even though water stream is continuous. In this revision, to solve this problem and construct water course networks, imaginary line through the inland water polygon is acquired.

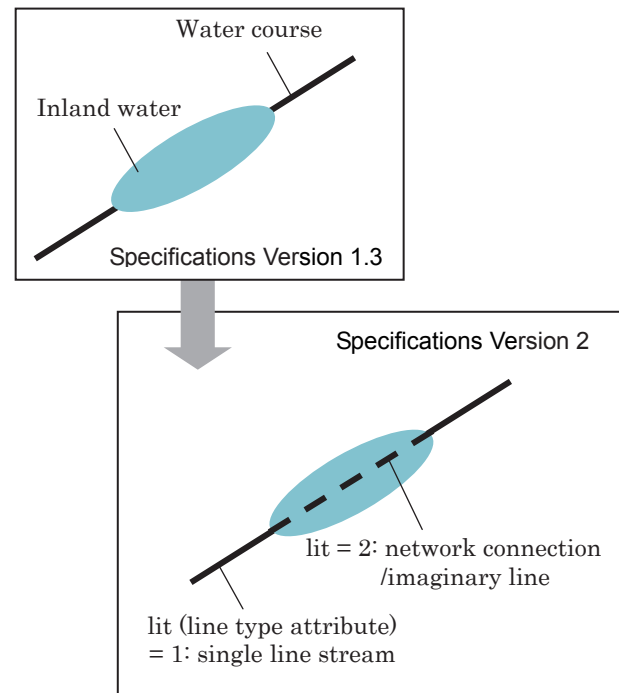


Fig. 2 network connector of river line

To include “river,” “lake,” “lagoon,” “reservoir,” “swamp or marsh” and “glacier” as a “type” attribute code in inland water

“Type” attribute is newly added to identify the types of inland water.

3.3.5 Population Centres

To eliminate “miscellaneous population (settlement)” feature

In Population Centres layer, settlement and built-up area are acquired in Version 1.3., but the detailed definitions to distinguish these two features, such as population or population density do not exist and their difference is not clear. So settlement feature is eliminated and population value and year of population census are added to estimate the size of the area.

To include “population value” and “year of population census” in built up features

Same as political boundary features, “population

value” and “year of population census” are added to attribute of built up features.

3.4 Vector Data Format

3.4.1 Problems of VPF formats

At the time Specifications Version 1.1 was developed, VPF, a format developed by National Imagery and Mapping Agency (NIMA), was an open and practical format. But VPF did not become the major format of vector data on GIS and now has many problems as follows:

- Most GIS software does not support VPF format, and data users have difficulties in handling it.
- Data Conversion into VPF format takes much time and requires a troublesome task.

3.4.2 Outline and merit of GML

Geography Markup Language (GML) is intended to be used for exchanging geographic information documented with Extensible Markup Language (XML) through the Internet.

ISO 19136 Geographic Information–GML was prepared jointly by ISO/TC211 and the Open Geospatial Consortium (OGC) in September 2007. GML 3.2.1 was published as an International Standard.

The following are some good points of adopting the GML 3.2.1 as the vector official format of Global Map:

- Compliance with International Standards
- Vendor-Neutral (Independence from any vendor)
- Open Specifications

Both compliance with International Standards and vendor-neutral are in accordance with the basic policy of Global Map. And open specifications imply a possibility that the data is supported by a wide variety of software.

3.4.3 History and Points of Discussion

The issue of the format transfer from VPF to GML in vector data format was mentioned at ISCGM 12 for the first time. It was said that GML would enable Global Map to be more usable in the current software and technology of the Internet environment. At ISCGM

14 in 2007, experimental conversion of Global Map Vector data into GML 3 format was reported and also adoption of GML 2 was discussed. Although the GML 3.2.1 became an International Standard in 2007, adoption of GML was postponed, considering the needs and its dissemination.

As it has passed two years since the time of the international standardization of GML, adoption of GML is reconsidered. Main discussion points in this revision process are:

- How to correspond with future change of GML specifications
- Whether corresponding software with GML exists or not
- How to deal with huge data size (Generally GML needs a huge data size compared with VPF.)

It had big changes from GML 2 to GML 3 in 2003 and there is a possibility of major redesign in the future. Meanwhile simple feature profile of GML 3.1.1 almost remained in GML 3.2.1. So GML schema for Global Map Version 2 has been designed in accordance with GML 3.2.1 and approximates GML 3.1.1 simple feature profile in order that the data may not to be affected seriously by changes in the GML Specifications.

At present, there is software which can read and convert various GIS formats into GML 3.2.1. Also a free GIS data viewer can read GML 3.2.1. We expect more software programs which can correspond with GML 3.2.1 are developed in the future.

It is generally said that the GML needs huge data size as it is a structured text based on XML. As a result of experimental conversion of Global Map data into GML, the size of GML data is about four times of VPF data. But GML data could be downsized nearly one-tenth by compression, and compressed size of GML and VPF data is almost the same. Additionally the size of GML data is less than half of shapefile format data. This experiment shows that the data size is not a serious matter in considering GML adoption.

3.4.4 GML for Global Map

Adoption of ISO 19136 (GML 3.2.1) as the official format of Global Map Vector data was endorsed

at ISCGM 16 as it is appropriate in view of improvement of Global Map and due to the timing of adoption described in the previous section. See APPENDIX E; GML schema and GML sample data for detail.

3.5 Area of File Coverage (Tiling)

3.5.1 Current file coverage and its problems

The tiling is required to manage the large amount of data. Current Global Map adopts data division in tiling shown on Table 4 (a range of 5 degrees by 5 degrees in low latitude area).

Table 4 Tile size defined in Global Map Specification Version 1.3

Latitude	Tile Size (Degrees Latitude by Degrees Longitude)	Origin (Latitude north and south, Longitude)
0°– 40°	5° x 5°	0°, 0°
40°– 50°	5° x 6°	40°, 0°
50°– 60°	5° x 8°	50°, 0°
60°– 65°	5° x 10°	60°, 0°
65°– 70°	5° x 12°	65°, 0°
70°– 75°	5° x 15°	70°, 0°
75°– 80°	5° x 20°	75°, 0°
80°– 90°	5° x 90°	80°, 0°

Especially in vector layers, it is pointed out that polygon data, such as administrative area and lake/marsh, and line data, such as river and road are cut at the boundary of tiles, which results in a loss of the data utility.

As for Raster data, there are voices indicating that the data be provided in tiles with a bigger size and/or in multiple division levels. In the work field, in a case that raster data covering the whole country is needed, it will be a time-consuming work to merge pieces of raster data that have been split into many tiles in a country.

In the surveys, although the majority answered that data be provided both by countries and in tiles for both raster and vector data. Comparing tiles with countries, the majority expect that the data be provided by countries rather than tiles. In short:

- Providing data by countries is preferable if the data size is acceptable.

3.5.2 Criteria of Dividing Data

In a case that the tile coverage is too big, the operability of personal computer and GIS software goes down. On the other hand, in a case of too small file coverage, time-consuming works such as merging small pieces of file coverage increase. The size of the file coverage needs to be defined appropriately.

Vector data

The above consideration finds that if country-based data is handled without trouble on PC and GIS software, the data can be delivered in one file for each feature class of a country.

As it has problem to handle the data for the nation whose territory spans greater than 3,000,000 square kilometer experimentally, the data is divided into tiles. The number of the countries which have the area greater than 3,000,000 square kilometer are seven; Russia, Canada, China, USA, Brazil, Australia, and India. Data of these countries may need to be divided.

Raster data

As for raster data, the data size is almost proportionate to the country area. The data size of the largest country, Russia, is about 168 MB for elevation and 84 MB for land cover, land use and vegetation. An experimental operation shows that the data can be handled without dividing the file. Therefore the whole national territory is basically defined in one file coverage for raster data.

3.5.3 Revised file of coverage

As a result, definition in Global Map Specifications Version 2 concerning the file coverage is changed into as follows:

National Version

Vector data:

- Nations territory with less than 3,000,000 square km
→One file for each feature class
- Nations territory with greater than 3,000,000 square km
→Divided into tiles

*Respective countries define the tile size by themselves not to make extreme differences in size *Describe tiling

guideline in manual to promote unified tiling

Raster data:

One file coverage

Global Version

Tiles of 30 deg×30 deg (Totally 72 tiles)

3.6 Metadata

3.6.1 Needs for Revising Metadata Specifications

Global Map metadata defined in Global Map Specifications Version 1.3 is composed of 38 items. Those are adopted from the draft version of ISO 19115 (draft version of ISO 15046-15 conformance level 1). International Standard of metadata, composed of 400 items, was defined in 2003 as ISO 19115 by ISO/TC211. It has a quite different structure from the previous one. Thus specifications of the metadata in Version 1.3 are not in accordance with the international standard. Due to these reasons, Global Map Version 1.3 metadata needs to be revised in accordance with the international standard ISO19115.

3.6.2 Compliance with ISO 19115

ISO19115 has the following characteristics:

- A good many of items (about 400)
- Core metadata items are defined in ISO 19115 in place of the draft version of ISO 15046-15 conformance level 1.

On the basis of these backgrounds, criteria for the adoption of metadata profile are defined as follows: (See Fig. 3)

- Metadata items defined in Version 1.3 are all adopted to maintain consistency with metadata.
- ISO19115 core metadata items are all adopted as ISO requires adoption of these items.
- A few optional items including information about updating frequency are added to above two categories.

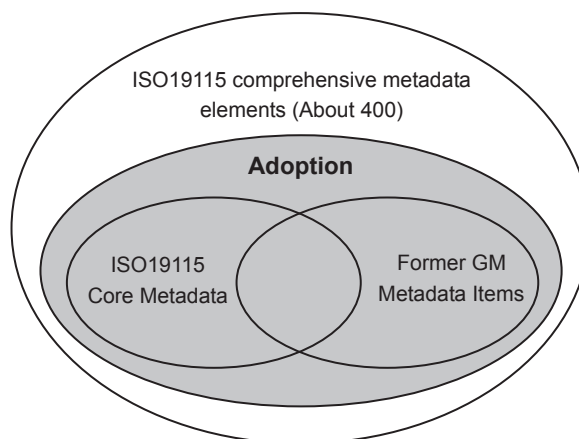


Fig. 3 Metadata items for Global Map Version 2

4. Future Prospects

Global Map Specifications Version 2 has been just completed. New Data Dictionary in Specifications Version 2 enables us to express water and transportation networks and relations between boundary area and population density. Also the change of format to GML cuts down on the workload of NMOs and facilitates data development. From now on, the ISCGM Secretariat should enhance the dissemination of Specifications Version 2 and encourage NMOs to develop Global Map data in Version 2.

We, as the ISCGM secretariat, will prepare the “technical manual” and “rules” for Global Map development based on the Global Map Specifications Version 2 so that developing countries will be able to make their data by themselves, including conversion to GML and preparation of metadata. Also we are considering providing multilingual specifications with assistance of other NMOs.

GSI will develop Global Map Japan Version 2 as soon as possible to show a good example of new version to other NMOs, and give technical advice to other NMOs of developing countries through the JICA (Japan International Cooperation Agency) training course hosted by GSI and other means.

We hope that these activities will contribute to pushing up technical levels of whole NMOs.

Acknowledgement

We would like to express our sincere gratitude to

47 country/region NMOs and organizations as below for their cooperation in this revision process. Also we extend our thanks to Mr. Koshimizu and Mr. Hoshikawa for the cooperation through the review meetings; Mr. Fujimura for his useful comment about GML; and Ms. Kurotori for her precise comments on this paper.

ISCGM Secretariat members in 2008, especially, Mr. Nagayama and Mr. Ubukawa made great efforts for this process of revising the Global Map Specifications.

(Collaborating countries/regions and organizations in the revision of Specifications for Global Map Version 2)

Algeria, Australia, Bahrain, Belize, Brazil, Bulgaria, Chile, China, Colombia, Dominica, El Salvador, ESRI, EuroGeographics (Finland), Georgia, Germany, Hong Kong SAR, China, Indonesia, INTERGRAPH, Jamaica, Japan, Kiribati, Latvia, Lebanon, Libya, Macao SAR, China, Macedonia, Madagascar, Malaysia, Mauritius, Mexico, Mozambique, Nicaragua, Nigeria, PAIGH, Papua New Guinea, Republic of Korea, Romania, Senegal, Sri Lanka, Timor-Leste, Tonga, Tristan da Cunha, Ukraine, United States of America, Uzbekistan, Viet Nam, Zimbabwe (Alphabetical order)

Reference

- Digital Geographic Information Working Group (2000): The Digital Geographic Information Exchange Standard (DIGEST) Part 4, Feature and Attribute Coding Catalogue (FACC), Edition 2.1.
- eurogeographics (2008): EuroGlobalMap Pan-European Database at Small Scale, Specification and Data Catalogue, version 3.2 (final).
- Geographical Survey Institute, Ministry of Land, Infrastructure, Transport and Tourism, Japan (2003): Specification of Japan Metadata Profile 2.0 (JMP 2.0), Technical Report of the Geographical Survey Institute, E·1-No.281.
- Geographical Survey Institute, Ministry of Land, Infrastructure, Transport and Tourism, Japan (2003): Description of Japan Metadata Profile 2.0 (JMP 2.0), Technical Report of the Geographical Survey Institute, E·1-No.282.
- Geographical Survey Institute, Ministry of Land, Infrastructure, Transport and Tourism, Japan (2009): Japan Profile for Geographic Information Standards (JPGIS) Ver. 2.1.
- International Organization for Standardization (1998): ISO/TC211 Geographic information/Geomatics, ISO 15046-15: Geographic information-Part 15: Metadata.
- International Organization for Standardization (2002): ISO/TC211 Geographic information/Geomatics, Revised text of 19115 Geographic information-Metadata, as sent to the ISO Central Secretariat for registration as FDIS.
- International Organization for Standardization (2007): ISO 19136 Geographic information – Geography Markup Language (GML), First edition.
- International Steering Committee for Global Mapping (2007): Global Map Specifications Version 1.3, Revised at 14th ISCGM meeting, Cambridge.
- International Steering Committee for Global Mapping (2009): Global Map Specifications Version 2, Revised at 16th ISCGM meeting, Bangkok.
- Okatani, T., H. Maruyama, H. Sasaki, H. Yaguchi., T. Nagayama, S. Kayaba, M. Abe and N. Kishimoto (2006): Progress of Global Mapping Project since Johannesburg Summit in 2002, Bulletin of the Geographical Survey Institute, 53, 7-16.
- Oota, M. : ISO19136 General Information Manual, 2 Geographic Information - Geography Markup Language (GML) General Information, http://www.dpc.jipdec.or.jp/gxml/contents/shiryuu/2007/19136gaisetsu/02_ota.pdf (accessed 14 Dec. 2009).
- Secretariat of International Steering Committee for Global Mapping (2005): Report of the Twelfth Meeting of International Steering Committee for Global Mapping, Cairo, Egypt.
- Secretariat of International Steering Committee for Global Mapping (2006): Report of the Thirteenth Meeting of International Steering Committee for Global Mapping, Santiago, Chile.
- Secretariat of International Steering Committee for Global Mapping (2007): Report of the Fourteenth Meeting of International Steering Committee for Global Mapping, Cambridge, United Kingdom.
- Secretariat of International Steering Committee for

- Global Mapping (2008): Report of the Fifteenth Meeting of International Steering Committee for Global Mapping, Tokyo, Japan.
- Tanaka, T. (2009): International Workshop on the Revision of Specifications for Global Map Version2, Global Mapping Newsletter, 55, 1-2.
- UN, SALB (Second Administrative Level Boundaries), <http://www.unsalb.org/> (accessed 14 Dec. 2009).

APPENDIX A: History on the Revision of Global Map Specifications

ISCGM holds an annual meeting, where it confirms the progress of the development of the project, reports related activities and discusses revision of specifications. Since Global Map specifications were first adopted in 1998, revisions had been made five times.

Discussions on the specifications of Global Map were started at ISCGM 3 in Gifu, Japan on November 12th-14th, 2007 with subsequent adoption of provisional technical specifications. The discussions were continued at WG2 on Specifications. Global Map Specifications have been revised in contents as follows:

◇Version 1.1:

Adopted at ISCGM 7 in Cape Town, South Africa on March 16th, 2000. Text representation was amended.

◇Version 1.2:

Adopted at ISCGM 12 in Cairo, Egypt on April 17th, 2005. A condition to express names thoroughly in upper case characters was modified so that the Secretariat can more smoothly process the data to upload them on the Web site. Regarding the expression of a river mouth, it was decided to draw a temporary line on the border of river and sea.

◇Version 1.2.1:

Adopted at ISCGM 13 in Santiago, Chile on November 11th, 2006. Small correction on the description of meta data and correction on the expression of data dictionary were made.

◇Version 1.3:

At ISCGM 14 in Cambridge, U. K. on July 14th, 2007, data items to be developed and provision in tiling of the global coverage of “Land Cover data (GLCNMO)” and “Percent Tree Cover data” in Raster layers were added along with description method of the header file, terminology and Data Dictionary.

APPENDIX B: Discussion at ISCGM toward the Revision of Specifications for Global Map Version 2

Discussions on the revision of specifications for Global Map Version 2, which forms a basis for the Phase 3 of the Global Mapping project for 2008-2012, was started at ISCGM 12 in Cairo, Egypt on April 17th, 2005 and the following discussions have been done to date.

◇ISCGM 12:

It was discussed that format transfer from VPF to GML would make Global Map more usable with the current software and technology of the Internet environment.

◇ISCGM 13:

A work plan on formats and specifications was proposed. Revision of Global Map Data Specifications (Version 1.2.1) submitted by WG2 was endorsed.

◇ISCGM 14:

Two core groups, specifications and formats, were established at WG2. Activities including a questionnaire survey to producers and users on the current specifications, and an experimental conversion of Global Map data into GML 3 format were reported. An idea to adopt GML 2 was also discussed. It was considered that it was too early to adopt the GML 3, and therefore we needed to wait for its dissemination although the GML 3 had become an international standard.

◇ISCGM 15:

It was discussed that in response to the up-to-date technological development and to make Global Map data interoperable with existing software and other data, revision of Global Map Specifications was needed. Also it was recognized the importance of activating experiences in respective organizations of the ISCGM Members in revising the specifications.

APPENDIX C: Agenda of Open Forum in International Workshop on the Revision of Specifications for Global Map Version 2

Date : Tuesday, 8 September 2009, 11:00-17:00

Venue : The Science Museum of Map and Survey, GSI, Japan

Program (draft):

11:00 Opening Address

Dr. Kazuo Komaki, Director General, GSI, Japan

11:05 Lecture

○**Mr. Yoshikazu Fukushima**, Secretary General, ISCGM

Outline of Global Mapping and its Specifications

○**Mr. Kazuhiko Akeno**, Head of Planning Div. Topographic Dept., GSI, Japan

Present Status of the Geographic Information Standards in ISO/TC 211

11:55 (Lunch Break)

13:00 Lecture

○**Prof. Ryutaro Tateishi**, Chiba University, Japan (ISCGM WG4 Chair)

Direction of Global Mapping Project and Land Cover

○**Dr. Yoshiki Yamagata**, Center for Global Environmental Research, National Institute for Environmental Studies

New IPCC Geographically Explicit Scenarios (RCP)

○**Mr. Tomonobu Sugiura**, International Center for Water Hazard and Risk Management, Public Works Research Institute

Development of Integrated Flood Analysis System (IFAS)

14:10 (Break)

14:20 Lecture

○**Dr. Noriaki Sakaguchi**, Biodiversity Center of Japan, Ministry of the Environment

Assessment and Monitoring of Biodiversity for Its Conservation Policies

○**Mr. Toru Fukuda**, Earth Observation Research Center, Japan Aerospace Exploration Agency (JAXA)

JAXA's Earth Observation Satellites for Land Mapping

15:00 (Break)

15:20-17:00 NSDI and Specifications in each country

○**Mr. Richard Broers**, GeoScience Australia

The Geoscience Australia National Topographic Mapping Specifications and Validation System

○**Mr. Jay Donnelly**, U. S. Geological Survey

Toward a Global Map for North America

○**Ms. Luciana Mara Temponi de Oliveira**, Instituto Brasileiro de Geografia e Estatística (IBGE)

Contribution of Global Mapping Project to the National Spatial Data Infrastructure in Brazil

○**Dr. Mulyanto Darmawan**, National Agency for Surveying and Mapping (BAKOSURTANAL)

Implementation of the NSDI for disaster management in Indonesia

○**Mr. Muturi Christopher Tatua**, Survey of Kenya

The Geo-spatial Data standardization challenges in Kenya

○**Mr. Fatuga E. Olusegun**, Surveyor General of the Federation

National Spatial data Infrastructure (NSDI)

17:00 Closing

Mr. Hidenori Yoshikane, Deputy Director General, GSI, Japan

APPENDIX D: International Workshop on the Revision of Specifications for Global Map Version 2, 8th - 10th September 2009, Summary

International Workshop on the Revision of Specifications for Global Map Version 2 was held at Geographical Survey Institute in Tsukuba, Ibaraki-ken, Japan from 8th to 10th September 2009.

Global Map of its Version 1 was released in June 2008 and this workshop was held to discuss Global Map Specifications and to draft new specifications.

On the 8th of September, an open forum took place with the participation of representatives of NMOs of respective countries, experts of global environmental and disaster prevention and other fields dealing with opinions, requests and the methodology of the data development as well as the data held by respective countries.

On the following two days, on 9th to 10th of September, discussions were held on the contents of the new specifications, attended by the representatives of seven countries, Australia, Brazil, Indonesia, Japan, Kenya, Nigeria and the USA and officials of Geographical Survey Institute of Japan. The main contents of the discussions and the items of the output are as follows:

◆Revision of Data Dictionary

In a round of questionnaire regarding the revision of the specifications which has been conducted three times to date, a lot of opinions from 39 countries were submitted on the additions of new features and attributes, and the elimination of unnecessary ones. Out of these opinions, matters which were strongly supported by NMOs were discussed at the Working Group and it was agreed that the following items need to be changed.

General

- To eliminate text feature in all vector layers

Transportation

- To include “IATA code” for airport feature
- To include “domestic” and “international” as “use” attribute for airport feature
- To include “train station” as a feature
- To include “port” as a feature
- To replace bridge and tunnel features with location attribute of road and railroad features

Administrative boundary

- To eliminate “ocean/sea” as a feature
- To include “population value” and “year of population census” in political boundary features
- To include “SALB code” in political boundary features
- To include “special” as a “usage” attribute code in political boundary line for describing other cases in the manual

Drainage

- To include “network connector/imaginary line” as a “type” attribute code in water course feature
- To include “lake”, “lagoon”, “reservoir”, “swamp or marsh” and “glacier” as a “type” attribute code in inland water feature

Population centres

- To eliminate “miscellaneous population” feature
- To include “population value” and “year of population census”

Raster data

- Elevation, vegetation and land cover layer remain in the specifications
- Concerning land use data, there were a lot of opinions such as changing its legend to contribute to developing Green House Gasses inventories, input the information of agriculture and so on, and we will continue to discuss this matter in the future

◆ **Adoption of GML as an official format of Global Map Vector data**

- To replace VPF format with GML 3.2.1 which is internationally standardized in ISO 19136 as an official format of Global Map Vector data

◆ **Change in data tiling**

- To discontinue georef tiling scheme
- Vector data to be evenly divided into tiles whose extent of each separate coverage will be less than 3,000,000 square kilometer
- Raster data are to be distributed as one file by country or region
- Raster data of Global version are distributed by 30 x 30 degrees

◆ **Metadata**

- To adopt Global Map metadata profile in accordance with ISO19115
- Metadata will be created at feature class or layer level depending on NMOs requirement

The Global Map Specifications Version 2 will be finalized at the ISCGM 16 Meeting scheduled to be held in Bangkok, Thailand on 25th October. The finalized draft Specifications Version 2 will be submitted to ISCGM 16 together with a summary of this workshop for consideration. Manual for Global Map will be updated along with new specifications.

APPENDIX E: GML Schema and GML sample data**◆GML Schema – Coast Line (edge data)**

```

<schema xmlns="http://www.w3.org/2001/XMLSchema" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gmp="http://www.iscgm.org/spec/2.0/GMP_GMLSchema"
targetNamespace="http://www.iscgm.org/spec/2.0/GMP_GMLSchema" elementFormDefault="qualified">
  <import namespace="http://www.opengis.net/gml/3.2" schemaLocation="http://standards.iso.org/ittf/PublicI
yAvailableStandards/ISO_19136_Schemas/gml.xsd" />
  <element name="coastl" type="gmp:coastlType" substitutionGroup="gml:AbstractFeature" />
  <complexType name="coastlType">
    <complexContent>
      <extension base="gml:AbstractFeatureType">
        <sequence>
          <element name="f_code">
            <simpleType>
              <restriction base="string">
                <length value="5" />
              </restriction>
            </simpleType>
          </element>
          <element name="acc">
            <simpleType>
              <restriction base="integer">
                <enumeration value="0" />
                <enumeration value="1" />
                <enumeration value="2" />
                <enumeration value="3" />
              </restriction>
            </simpleType>
          </element>
          <element name="exs">
            <simpleType>
              <restriction base="integer">
                <enumeration value="0" />
                <enumeration value="1" />
                <enumeration value="3" />
                <enumeration value="44" />
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                <enumeration value="55" />
                <enumeration value="60" />
              </restriction>
            </simpleType>
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        </sequence>
      </extension>
    </complexContent>
  </complexType>
</schema>

```



```

<element name="soc">
  <simpleType>
    <restriction base="string">
      <length value="3" />
    </restriction>
  </simpleType>
</element>
<element ref="gml:curveProperty" />
</sequence>
</extension>
</complexContent>
</complexType>
</schema>

```

◆ Sample Data – Coastline (edge data)

```

<gml:FeatureCollection xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gmp="http://www.iscgm.org/spec/2.0/GMP_GMLSchemas" xsi:schemaLocation="http://www.iscgm.org
/spec/2.0/GMP_GMLSchemas coastl.xsd">
  <gml:boundedBy>
    <gml:Envelope srsName="EPSG:4326" srsDimension="2">
      <gml:lowerCorner>20.4239 122.9308</gml:lowerCorner>
      <gml:upperCorner>45.5573 153.9831</gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy>
  <gml:featureMember>
    <gmp:coastl gml:id="coastl_jpn.1">
      <gmp:f_code>BA010</gmp:f_code>
      <gmp:acc>1</gmp:acc>
      <gmp:exs>1</gmp:exs>
      <gmp:soc>JPN</gmp:soc>
      <gml:curveProperty>
        <gml:LineString srsName="EPSG:4326" srsDimension="2">
          <gml:posList>45.4762 140.9649 45.4770 140.9704 45.4795 140.9705 45.4794 140.9686 45.4793
140.9666 45.4805 140.9645 45.4779 140.9629 45.4762 140.9649</gml:posList>
        </gml:LineString>
      </gml:curveProperty>
    </gmp:coastl>
  </gml:featureMember>
  <gml:featureMember>
    <gmp:coastl gml:id="coastl_jpn.2">
      <gmp:f_code>BA010</gmp:f_code>
      <gmp:acc>1</gmp:acc>

```

```
<gmp:exs>1</gmp:exs>
<gmp:soc>JPN</gmp:soc>
<gml:curveProperty>
  <gml:LineString srsName="EPSG:4326" srsDimension="2">
    <gml:posList>45.4033 142.0509 45.4181 142.0357 45.4199 142.0349 45.4266 142.0333 45.4314
142.0356 45.4373 142.0253 45.4431 142.0243 45.4487 142.0239 45.4554 142.0173 45.4581 142.0080
45.4613 142.0031 45.4613 141.9988 45.4621 141.9968</gml:posList>
  </gml:LineString>
</gml:curveProperty>
</gmp:coastl>
</gml:featureMember>
<gml:featureMember>
<gmp:coastl gml:id="coastl_jpn.3">
  <gmp:f_code>BA010</gmp:f_code>
  <gmp:acc>1</gmp:acc>
  <gmp:exs>1</gmp:exs>
  <gmp:soc>JPN</gmp:soc>
  <gml:curveProperty>
    <gml:LineString srsName="EPSG:4326" srsDimension="2">
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140.9848 45.4513 140.9811 45.4549 140.9799 45.4576 140.9751 45.4633 140.9696 45.4646 140.9679
45.4596 140.9670 45.4536 140.9695 45.4529 140.9745 45.4477 140.9773 45.4424 140.9725 45.4394
140.9671 45.4363 140.9832 45.4275 140.9940 45.4199 140.99400 45.4183 140.9906 45.4170 140.9864
45.4159 140.9836 45.4146 140.9873 45.4115 140.9861 45.4122 140.9905 45.4072 140.9915 45.4067
140.9906 45.4041 140.9886 45.4017 140.9870 45.3991 140.9864 45.3956 140.9873 45.3919 140.9896
45.3867 140.9906 45.3843 140.9835 45.3753 140.9867 45.3653 140.9936 45.3600 140.9968</gml:posList>
    </gml:LineString>
  </gml:curveProperty>
</gmp:coastl>
</gml:featureMember>
</gml:FeatureCollection>
```