Global Mapping Project-Activities and Way Forward

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SUMMARY

Global Mapping Project is an initiative that aims at contributing to sustainable development through the development of globally consistent and reliable geospatial information. The Project is reaching 20 years since it started in 1996 and has been developing Global Map, fundamental geospatial information for sustainable development, in cooperation with National Geospatial Information Authorities (NGIAs) of 183 countries and regions around the world. Global Map data developed by 119 countries and regions as well as Global Elevation, Global Land Cover and Global Vegetation are currently available and downloadable from the website. Geospatial Information Authority of Japan (GSI), the Project's secretariat, took the central role in the data development of the latter three data sets. Further, in response to the growing awareness of the importance of using geospatial information in disaster risk reduction, the secretariat has developed web portals for Global Thematic Maps and Urban Hazard Maps as new services. This paper introduces these activities of the Project.

Key words: Global Map, Global Mapping Project, Sustainable Development, Fundamental Geospatial Information, Elevation, Land Cover, Vegetation, Disaster Risk Reduction

1. OUTLINE OF THE GLOBAL MAPPING PROJECT

Global Mapping Project was initiated by the Ministry of Construction of Japan (current Ministry of Land, Infrastructure, Transport and Tourism of Japan), to which Geospatial Information Authority of Japan (GSI) belongs, in response to the recommendation about the requirement of geospatial information for decision making in "Agenda 21", the outcome document of the Earth Summit in Rio de Janeiro in 1992. Based on the discussion on the

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scope of the Project in the International Workshop on Global Mapping in Izumo, Japan, in 1994, International Steering Committee for Global Mapping (ISCGM), a central body for the Project's implementation, was established in 1996. GSI has been continuously serving as the secretariat of ISCGM since then.

The mission of Global Mapping Project is to contribute to global sustainable development (including solving environmental problems and mitigating large-scale disasters) through the development of globally consistent and reliable geospatial information. In order to achieve this mission, the Project has been developing fundamental geospatial information which is called Global Map. The Global Map data have the following three characteristics:

a. Developed and authorized by National Geospatial Information Authorities (NGIAs) to ensure high reliability.
b. Developed under the consistent specifications for the entire globe.
c. Distributed free of charge for non-commercial uses.

As shown in Figure 1, Global Map data consist of eight layers: Boundary (e.g., administrative boundary), Drainage (e.g., river and marsh), Transportation (e.g., road and railroad), Population Centers, Elevation, Land Use, Land Cover, and Vegetation (Percent Tree Cover). Global Map is equivalent to 1:1 million scale in principle, but can be developed at a larger scale.

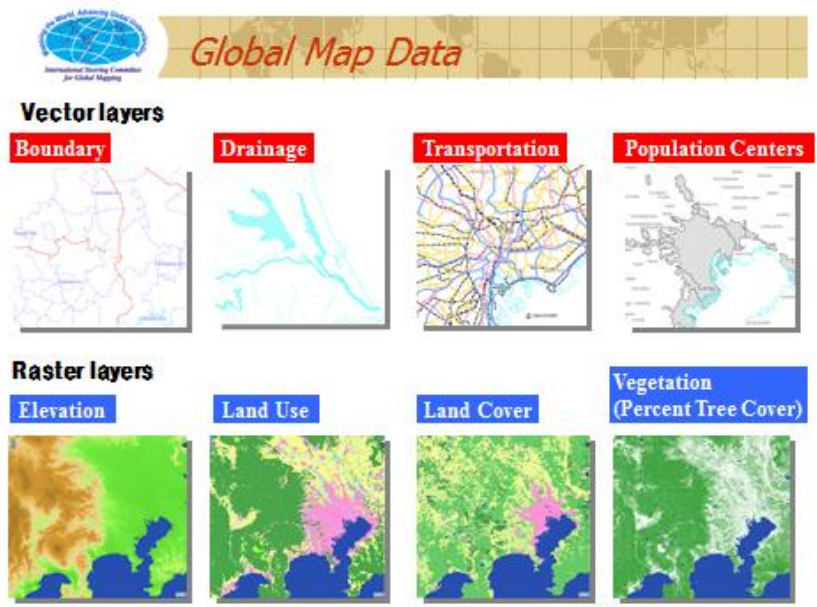


Figure 1: Eight layers of Global Map

In addition to these data, global version of three layers, namely Elevation, Vegetation and Land Cover, have been developed and released. GSI, serving as the secretariat of ISCGM, has been playing a central role in this activity. Details of Global Map data and their applications are described in Chapter 2.

After the establishment of the ISCGM, need of fundamental geospatial information for sustainable development, "Global Mapping," has been addressed in UN documents and other important meeting documents, including "Programme for further implementation of AGENDA 21" of the UN General Assembly in 1997; "Plan of Implementation of the World Summit on Sustainable Development (WSSD)" of WSSD in Johannesburg in 2002; and "The Future We Want" of the UN Conference on Sustainable development (Rio+20) in 2012. These references facilitated the cooperation of NGIAs in different countries for the Global Map development.

Dr. Paul Cheung, professor of National University of Singapore, is the current Chair of ISCGM that has the membership from 183 participating countries and regions, out of which 119 countries and regions have released their Global Map data. (See Figure 2)

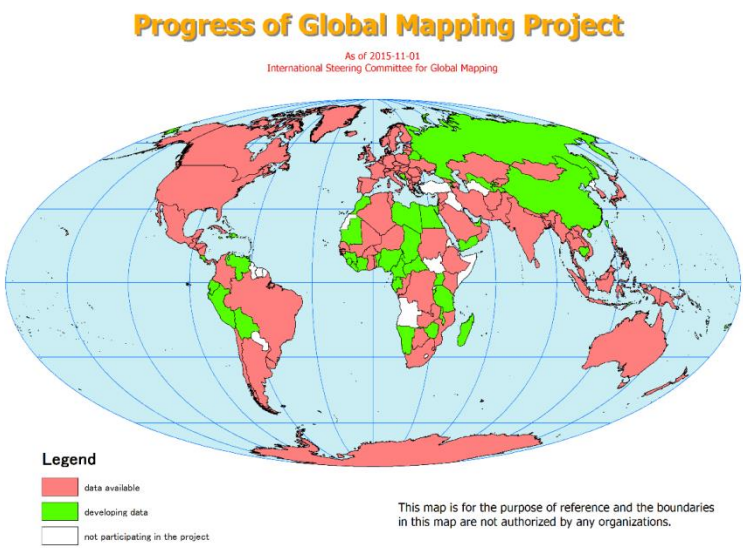


Figure 2: Status of development and release of Global Map data (as of Nov. 1, 2015)

To date, the ISCGM Secretariat has been implementing capacity building of NGIAs for Global Map development. Specifically, the ISCGM Secretariat has conducted a technical training at GSI for the development of Global Map in collaboration with Japan International Cooperation Agency (JICA) and has accepted a total of 112 training participants from 67 countries. Further, the ISCGM Secretariat has prepared tools and manuals for Global Map data development and its quality assessment. These efforts have significantly contributed to the strengthening of capacity of technical experts in NGIAs.

In addition, in order to meet the increasing need of finding global thematic maps and improving preparedness of urban areas against various hazards, the ISCGM Secretariat started developing web portals for Global Thematic Maps and Urban Hazard Maps in 2014.

The current activities of the Global Mapping Project, including these new efforts, are summarized as follows:

a. Development of fundamental geospatial information (Global Map) for sustainable development
b. Development of a web portal for easy access to different Global Thematic Maps, namely, Catalogue Service of Global Thematic Maps
c. Development of Urban Hazard Maps Web Portal to understand the disaster risk in urban areas in the world
d. Improvement of the ISCGM Website to use as a platform to disseminate these information
http://www.iscgm.org/index.html

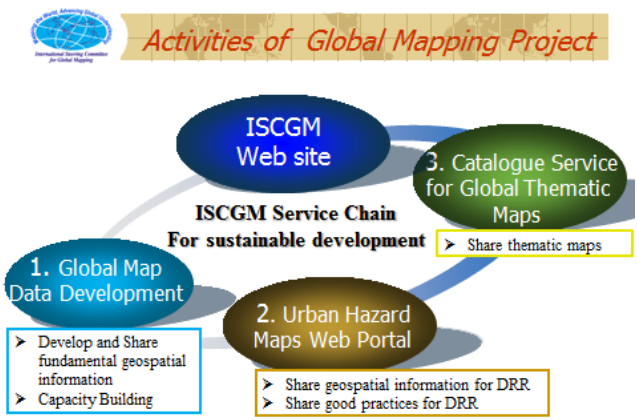


Figure 3: Activities of the Global Mapping Project

2. GLOBAL MAP DATA AND APPLICATION EXAMPLES

As stated in Chapter 1, Global Map data (Global Map's National/Regional Version) with eight layers developed by NGIAs are the main product of the Global Mapping Project. As a part of promoting applications of geospatial information, the ISCGM Secretariat uses Global Map to prepare status maps when major disasters take place to enable the international community to understand the disaster-affected areas at a glance. These status maps are posted on Relief Web (http://reliefweb.int/) maintained by the UN Office for Coordination of Humanitarian Affairs (UNOCHA).

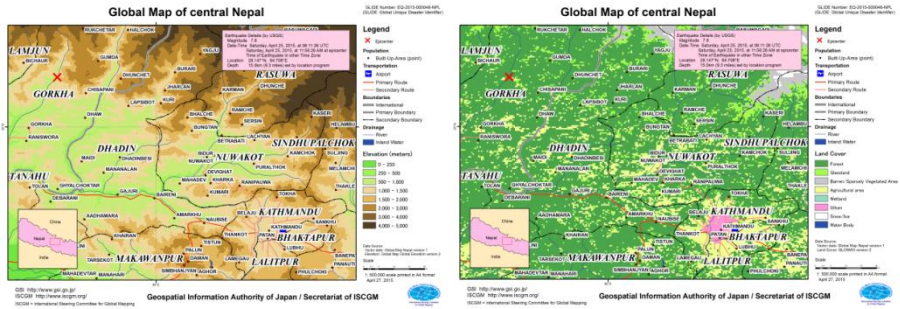


Figure 4: Example of disaster status map posted on Relief Web (Earthquake in Nepal in April 2015)

Further, GSI and collaborating organizations developed global versions of Global Map in three layers, namely Elevation, Land Cover and Vegetation. The Global Elevation version 2 was developed by GSI in 15 by 15 arcsecond (about 500 meters at the Equator) grid by using Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010) prepared by the United States Geological Survey.

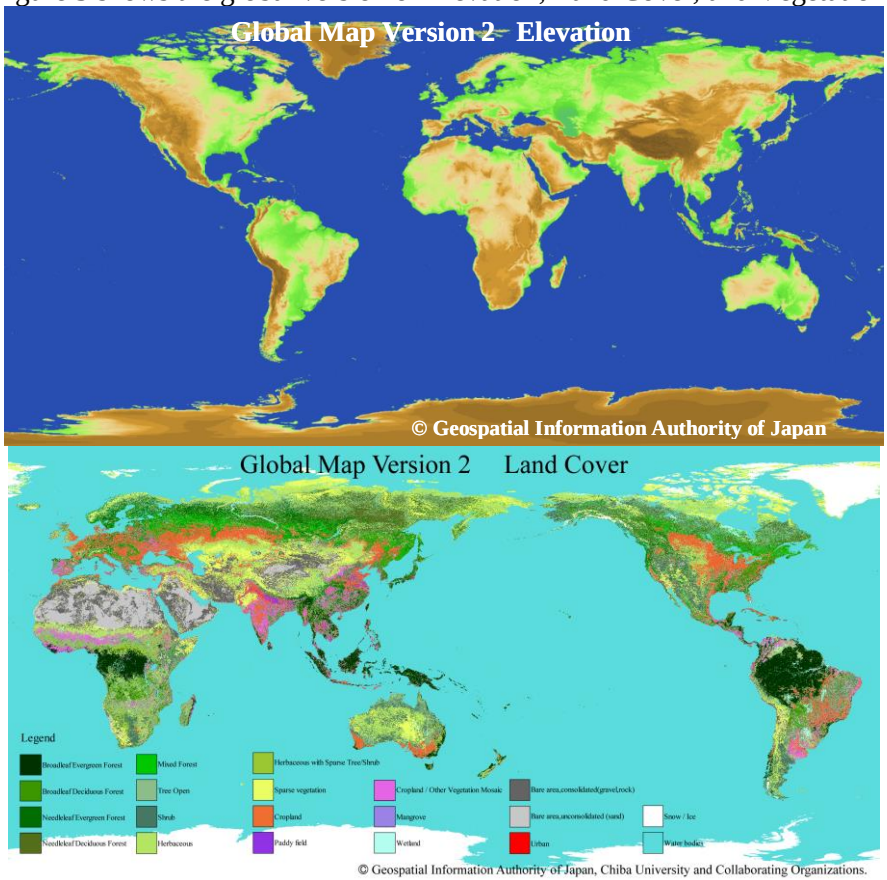
The Global Land Cover version 2 (GLCNMO2) and the Global Vegetation version 2 were also developed in 15 by 15 arcsecond grid by GSI, Chiba University, and collaborating NGIAs using imagery obtained by the MODIS sensor on board the earth observation satellites, Terra & Aqua. These data were developed using the data acquired in 2008. The outline of the methodology for the development of the Global Land Cover version 2 and its accuracy of classifications are reported in Tateishi et al., (2014).

The Global Land Cover data are classified into 20 categories, such as Forest (Phenology, e.g., Broadleaf and Deciduous Forest, are also classified.),

Herbaceous, Cropland, Bare area (rock and sand) and Urban, defined by Land Cover Classification System (LCCS) of the United Nations Food and Agriculture Organization (FAO).

The Global Vegetation is coded by the percentage of trees against ground surface (Percent Tree Cover) in 0-100 percent units when one views the tree canopy from directly above. For trees whose Percent Tree Cover has seasonal changes such as deciduous forest, the Percent Tree Cover value of the highest growing season is used.

Figure 5 shows the global version of Elevation, Land Cover, and Vegetation.



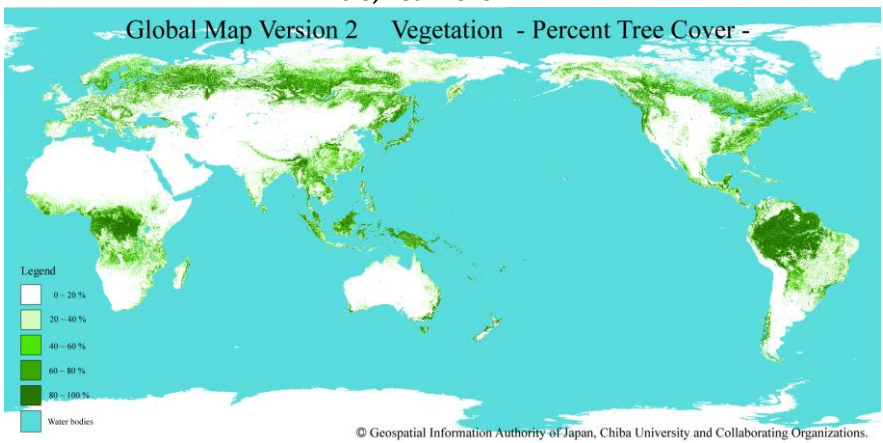


Figure 5: Global Map Global Version Vegetation, Land Cover and Global Version Vegetation (Version 2)

Ubukawa et al., (2013) reported a case that one can clearly identify temporal changes on the ground by repeatedly monitoring the Global Land Cover data. According to that report, decrease of Forest (green) and expansion of Urban (red) in Brazil's Amazon Region during 2003-2008 can be easily identified by simply aggregating land cover classes. Since the Global Land Cover data has high classification accuracy, it is useful to understand large-scale changes.

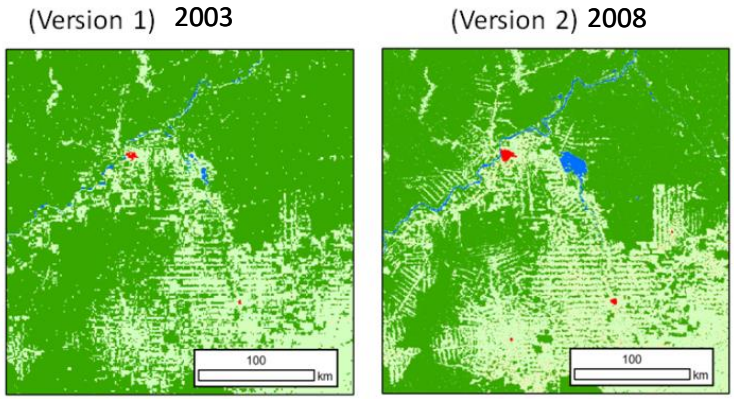


Figure 6: Global Map Global Version Land Cover (Brazil/Amazon) [Ubukawa et al., (2013)]

Currently, the ISCGM Secretariat is developing a prototype data for the next version of Global Land Cover data using the data acquired in 2013. After

verified and corrected by the participating organizations of the Global Mapping Project, it will be released as the next version in early 2016.

3. NEW ACTIVITIES

Geospatial information has been increasingly used in every phase of disaster risk reduction. For example, hazard maps enhance the preparedness of people against disasters. "Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030" of the Third UN World Conference on Disaster Risk Reduction (WCDRR) in Sendai, Japan in March 2015, also clearly recognizes the importance of geospatial information, particularly in understanding disaster risks. The excerpt of SFDRR 2015-2030 concerning geospatial information is shown below (underlined by author).

National and local levels; (para 24):
(c) Develop, periodically update and disseminate, as appropriate, location-based disaster risk information, including risk maps, to decision makers, the general public and communities at risk of exposure to disaster in an appropriate format by using, as applicable, geospatial information technology;
(f) Promote real-time access to reliable data, make use of space and in situ information, including geographic information systems (GIS), … to enhance measurement tools and the collection, analysis and dissemination of data;

Global and regional levels; (para 25)
(g) Enhance the scientific and technical work on disaster risk reduction and its mobilization through the coordination of existing networks and scientific research institutions at all levels and in all regions,… disseminate risk information with the best use of geospatial information technology …;

In response to these emerging trends and needs of geospatial information, the ISCGM Secretariat has been developing web portals of Catalogue Service for Global Thematic Maps for easy access to different global thematic maps, and for Urban Hazard Maps to share hazard maps and risk maps. Currently, prototype versions of these two portals are being posted on the web for further improvement before their official release. (See Figure 7)

Catalogue Service for Global Thematic Maps (prototype version)
http://csgtm.iscgm.org/

Urban Hazard Maps Web Portal (prototype version)
http://www.iscgm.org/uhm/

Figure 7: Diagrammatic illustration of Catalogue Service for Global Thematic Maps and Urban Hazard Maps Web Portal

4. FUTURE DEVELOPMENT PLANS

At its 21st meeting, ISCGM agreed to support the secretariat's initiative of developing and maintaining Urban Hazard Maps Web Portal. Currently, however, only a limited number of urban hazard maps that have been found on the web are available on the Web Portal. The ISCGM Secretariat plans to cooperate with NGIAs and disaster management authorities in the world and encourage them to help enrich the contents of this Portal by the distribution of quarterly Global Mapping Newsletters, which are delivered to the members in 183 countries and regions, and by inviting them to ISCGM annual meetings.

In addition, the ISCGM Secretariat will continue its efforts of collecting best practices of geospatial information applications and services for disaster risk reduction in different countries, and make them available from the Urban Hazard Maps Web Portal.

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