

Current Status of Global Mapping Project: Release of Global Map Version 1.0 and Start of Phase II

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BACKGROUND

At the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, Agenda 21, an action program for addressing global environment challenges while continuing to support sustainable economic development, was adopted. Eight chapters of Agenda 21, especially Chapter 40 on "Information for Decision Making," describe the need of geographic information for sustainable development.

However, geographic information of scientific quality available in those days was still insufficient to provide adequate understanding of actual state of the global environment. Consistent, reliable and accurate geographic information must be developed and such information must be easily accessible to the public including decision makers and global environment researchers. In this context, the Ministry of Construction of Japan advocated the Global Map concept in 1992.

As the first international meeting on the Global Mapping, International Workshop on Global Mapping was held in Izumo, Japan in November 1994. As a result of the workshop, "The Resolution of Izumo Conference" was adopted, which consists of eleven items. Among them are: (1) Promoting the preparation of Global Map by the year of 2000, (2) Periodical updating of Global Map, (3) Promoting technical cooperation for realization of Global Map, (4) Establishing the Steering Committee for promotion and coordination of Global Mapping.

The Second International Workshop on Global Mapping was held in Tsukuba, Japan in February 1996. The main objective of the workshop was to establish the International Steering Committee for Global Mapping (ISCGM). Consequently, it was resolved to establish ISCGM chaired by Prof. Estes consisting of fourteen directorates from thirteen National Mapping Organizations (NMOs), to set the secretariat of ISCGM in GSI and to appoint four advisors. The number has increased to eighteen members and seven advisors now.

Thanks to the various activities for getting international agreement implemented by ISCGM and related organizations, the need of the Global Map for addressing global environmental issues has been well confirmed among international community, particularly at the United Nations. The paragraph 112 of the "Program for the further implementation of AGENDA21," adopted document of UN General Assembly, June 1997, states "A supportive environment needs to be established ... to facilitate public access to information on global environment issues ... using ... such tools as geographic information systems and video transmission technology, including Global Mapping."

CONCEPT AND CONTENTS OF GLOBAL MAP

ISCGM defined the Global Map as "a group of global geographic data sets of known and verified quality with consistent specifications, which is a common asset of mankind with scientific quality for world-wide distribution at marginal cost." This definition clarifies three

basic and important ideas about Global Map: i) global coverage; ii) consistent specifications; and iii) easy accessibility.

(1) Global coverage

Most countries have national mapping organizations for mapping programs to ensure base map coverage of their own countries. Likewise, it is necessary to have global coverage of geo-spatial information to provide baseline data sets of our planet. To detect changes of the earth, frequent update of the data is also important. As for spatial resolution, Global Map has one-kilometer resolution on the ground.

(2) Consistent specifications

Better understanding of the earth sometimes requires direct comparison between one part to the other part of the world. However, if the geodetic datum, mapping accuracy, classification criteria etc. are not consistent worldwide, accurate understanding of the state of the earth may not be realized. For example, total area of forest or desert would be different if the classification criteria are not consistent between countries or regions.

(3) Easy accessibility

Even though global geo-spatial information is developed with consistent specifications, it would be almost useless unless it is made widely available to the international community and used among different sectors of the society. There exist a few data sets whose distribution is prohibited or limited to a specific community due to national security, political sensitivities and other reasons. Similar to the idea of national digital geo-spatial data framework, the Global Map should be open to the public and distributed at marginal cost. The spatial resolution of one kilometer on the ground would cause little concern for national security, as we are anticipating sub-meter pixel resolution imagery from commercial high-resolution satellites.

INTERNATIONAL STEERING COMMITTEE FOR GLOBAL MAPPING

ISCGM was established to realize and enhance Global Mapping project in February 1994. It had 14 members and 5 advisors. Number of participants has increased to 18 members and 7 advisors now. Eighteen members are the heads of NMOs of Australia, Bangladesh, Canada, China, France, Iran, Japan, Kenya, Republic of Korea, Malaysia, New Zealand, Niger, South Africa, United Kingdom and U.S.A. and representatives from SCAR and EuroGeographics. Advisors are representatives from international organizations and academic institutions such as UN, UNEP, UNU and ICA (Vice President Dr. Milan Konecny). ISCGM has three working groups to discuss more detailed plans. WG1 works for development of strategic action plan, WG2 for specifications, and WG3 works for data policy.

ISCGM has held following seven meetings since its establishment to discuss action plan, specifications, data policy etc. for smooth implementation of Global Mapping Project;

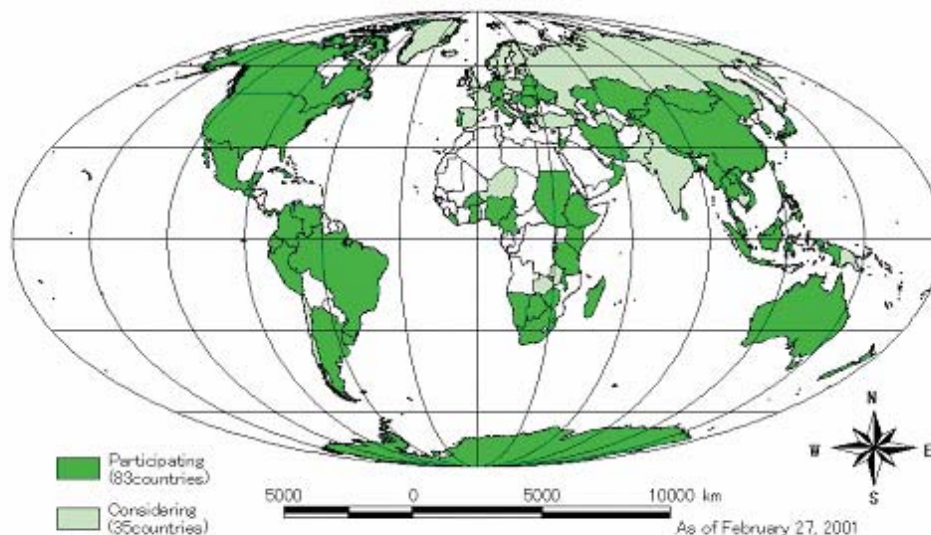
- * First ISCGM Meeting in February 1996 in Tsukuba, Japan
- * Second ISCGM Meeting in November 1996 in Santa Barbara, USA
- * Third ISCGM Meeting in November 1997 in Gifu, Japan
- * Fourth ISCGM Meeting in June 1998 in Sioux Falls, USA
- * Fifth ISCGM Meeting in November 1998 in Canberra, Australia
- * Sixth ISCGM Meeting in July 1999 in Cambridge, UK
- * Seventh ISCGM Meeting on March 16, 2000 in Cape Town, South Africa

The next meeting is scheduled on May 25, 2001 in Cartagena, Colombia.

Complete coverage of the Global Map will only be realized by the participation of all the national mapping organizations of the world. In November 1998, the UN sent a letter of

Prof. Estes, Chairperson of ISCGM, inviting NMOs of respective countries and regions to Global Mapping Project with a recommendatory letter of Mr. Habermann, Director of The UN Statistics Division, to heads of NMOs. The Global Mapping Initiative is a voluntarily based international collaboration activity. There are three levels of participation. Level A country will develop Global Map(GM) of her and other countries. Level B country will develop GM of her country. Level C country will provide data needed for development of GM. Currently, 83 countries and regions have participated in the project and 35 are now positively considering. The area covered by participated countries and regions exceeds 60% of the whole land mass and more than 80% are covered by including considering countries and regions. Member organizations participated in the project are mainly National Mapping Agencies because they have source of information of core geographical data as a result of their original duty. The Scientific Committee on Antarctic Research

Current Participation in Global Mapping Project



(SCAR) participates in the project and is developing GM of the Antarctica.

ISCGM sets the period of the first phase of the GM development to the year 2000, whose target is to make the Global Map version 1.0 available. Member organizations have been producing GM of their own territories, while GSI and USGS EROS Data Center have created global data set by converting existing global data, V-map Level 0, GLCC and GTOPO30. GSI, as a level A country, has also been developing GM of Asian countries collaborated with National Mapping Agencies of respective countries. As a result, Global Map version 1.0 for five countries was released on 28 November 2000 when the declaration was made in the Global Mapping Forum 2000 in Hiroshima. It is expected that some forty countries will complete development of GM by the time of Rio+10 conference.

GLOBAL MAP SPECIFICATIONS

Global Map Specifications was firstly adopted at the Fifth ISCGM Meeting in 1998 and a minor amendment was made at the Seventh ISCGM Meeting in 2000. Full text of the Global Map Specifications is available at: <http://www.iscgm.org/gm-specifications11.pdf>

(1) Data Format

Format for vector data shall be Vector Product Format (VPF) by United States National Imagery and Mapping Agency (NIMA), and for raster data, Band Interleaved by Line (BIL) with separate header be used. The vector data consists of four layers such as transportation, boundaries, drainage and population centers, and raster data consists of elevation, vegetation, land cover and land use as well.

(2) Geodetic Datum and Ellipsoid

Global Map Specifications adopts combination of International Terrestrial Reference Frame 1994 (ITRF94) and the Geodetic Reference System 1980 (GRS80) ellipsoid as current world geodetic system.

(3) Tiling

To manage the large amount of data, the Specifications adopts tiling system. Size of one tile is five degrees in latitude by five degrees in longitude in case the tile is located between zero degrees and forty degrees in latitude. There is no overlap or gap between tiles.

GLOBAL MAPPING FORUM 2000 AND RELEASE OF GLOBAL MAP VERSION 1.0

Global Mapping Forum 2000 was held at International Conference Center Hiroshima in Hiroshima City, Japan from 28 - 30 November, 2000 getting together 250 specialists of geographic information and environmental science from 33 countries.

During the Forum, starting of provision of Global Map Version 1.0 was declared. At the same time, WWW server of the ISCGM became operative and provision of the Global Map data was officially started. Data started to be provided on the Internet at the time of the declaration were the Global Map Version 1.0 of five countries: Japan, Lao P. D. R., Nepal, Sri Lanka and Thailand. They are the data that have been completed by this time and ISCGM Secretariat got agreements on the conditions of provision. (Philippines was added in December.) Global Map Version 0 data, which had been converted from existing global geographic information (GTOPO30, GLCC) according to Global Map Specifications, were also released. Non-commercial users such as governmental institutions, research organizations as well as private researchers can download these data via internet free of charge. In addition, more than 10 countries are nearly to complete their data for the Global Map Version 1.0. More than 1,200 users have registered with the download page of ISCGM and data have been downloaded more than 8,400 times since its release. Global Map Homepage is: <http://www.iscgm.org/>

From the afternoon of the first day to the morning of the third day, 30 oral and 20 poster presentations were made. Delegates of various positions, such as representatives of the United Nations among international organizations, heads of NMOs of respective countries, researchers of academia, and representatives of international research institutes made significant presentations on the situation of the Global Map development of each country, present status of geographic information, regional development with geographic information, and application of the Global Map to disaster mitigation and global change research. Through these presentations, strong impressions were given to the participants that the Global Mapping has become a big international project with an international attention; the Global Map has been developed firmly throughout the world; and applications of the Global Map has been started to various fields.

At Concluding Session held at the end of the Forum, "Hiroshima Statement for Global Map" was adopted unanimously. Mentioned in the Statement are: 1) to celebrate the release of Version 1.0 of the Global Map, 2) to thank 81 countries who have participated in

the Global Mapping Project, 3) to encourage those countries not yet committed to join the Global Map to join, 4) that challenge is to maintain and enhance the Global Map and to implement policies that result in the widest possible access and use of the product; and 5) to appreciate the hospitality of the citizens of Hiroshima and that more sustainable and truly peaceful world through the Global Map is encouraged by tireless pursuit for peace of the citizens of Hiroshima.

GLOBAL MAP AS THE FRAMEWORK OF GLOBAL INITIATIVES

The Global Mapping Project has originally been started to provide necessary geographic information for addressing global environmental issues. However, because of its nature that it is a set of base geographic data, it can be used for not only global environmental purposes, but also for all applications that include geographic contexts. Owing to the release of Global Map Version 1.0, it has come to attract attention from various global initiatives such as Global Spatial Data Infrastructure (GSDI), UN Geographic Information Working Group (UNGIWG), Global Information and Early Warning System (GIEWS) by FAO, Digital Earth Initiative etc. as one of the most realistic projects that provides substantial global framework dataset.

The Global Spatial Data Infrastructure (GSDI) effort is roughly defined as encompassing "the broad policy, organizational, technical and financial arrangements necessary to support trans-national or global access to geographic information." To date, GSDI activity has been principally comprised of a group of individuals representing national mapping agencies, international organizations, and standards organizations. Four GSDI Conferences have been held since 1996 and the most recent Conference (GSDI4) held in March 2000 at Cape Town, South Africa, resolved "the GSDI resolves to strengthen relationships to with activities such as Digital Earth and the International Steering Committee on Global Map (ISCGM). Wherever possible, written statements of cooperation will be established to clearly delineate the partnerships necessary to advance the use SDI's as a core of critical decision-making at the local, national, regional and global levels". Fifth GSDI Conference is scheduled in May 2001 at Cartagena, Colombia, in conjunction with the 8th Meeting of ISCGM.

UNGIWG was established in March 2000 to coordinate activities and to formulate guidelines and policies concerning geographic information within the UN system. One of the principle objective of the Working Group is to undertake the development and maintenance of the United Nations Geographic Database – a global database consisting of basic cartographic elements and toponymic information that would serve as a common geo-referenced framework on which information from various sources can be integrated for analysis. The ultimate goal of these initiatives is to make geographic information available to all UN staff for more efficient operations and better decision making. The first phase of the database initiative is to integrate existing global datasets from both within and outside the UN system. The substansive work of the Global Mapping Project will be an important contribution to the proposed database (Chow and Pinther, 2000). Global Mapping community looks at the UN Geographic Database Initiative as one of the major applications of the Global Map. Secretariat of ISCGM is closely communicating with UN Cartographic Section to establish a sound channel of cooperation.

Digital Earth has been, until recently an initiative led by the U.S. National Aeronautics and Space Administration(NASA), focusing upon the technology, applications, and organizational constructs needed to bring to life former Vice President Al Gore's vision of a "Digital Earth" in February 1998 for the future and the way citizens would interact with global information resources to better comprehend the complexity of our planet and our interactions with it.

Kline, Estes and Foresman (2000) stressed the importance of “synergy” of Global Mapping, GSDI and Digital Earth Initiative. They claimed that a “C⁴ challenge”, communication, cooperation, coordination, and collaboration, are essential for all these efforts.

GLOBAL MAPPING PROJECT PHASE II

Phase I of the Global Mapping Project was successfully completed in 2000. Global Map will be updated and upgraded in the next phase. One of the advantages of Global Mapping initiative is the big number of its participating organizations. This advantage makes it possible to assure reliability of the final product through proper verification implemented by each NMOs in the world.

Besides, recent progress in space technology gives us opportunity to revise global scale geographic datasets in more consistent way. MODIS sensor borne on TERRA satellite launched by NASA in December 1999 makes us possible to update GLCC dataset in 250m resolution. GLI sensor borne on ADEOS-2 satellite of National Space Development Agency of Japan (NASDA) planned to be launched soon is also expected to be used for GLCC update. SAR interferometry data obtained in SRTM conducted in February 2000 can be used to update GTOPO30 in higher resolution.

ISCGM is also discussing capability to include more data layers into GM specifications in the next phase. New layers under consideration are Landform classification, Watershed boundary and Plant ecosystem/Landform boundary.

8th ISCGM Meeting will be held on 25 May 2001 in Cartagena, Colombia focusing on outlining of the target, strategy and action plan for the Phase 2 of the Global Mapping Project. An enthusiastic discussion is expected at the Meeting.

CONTINUATION OF GLOBAL MAPPING

The founding chairperson of ISCGM Dr. John E. Estes, Professor of the University of California, Santa Barbara, passed away on March 9th, 2001. The Vice Chairperson Mr. Peter Holland, General Manager of the Australian Surveying and Land Information Group, has been filling the role of acting chairperson until the determination of the new chairperson. Despite the loss of the great leader of Global Mapping, ISCGM will continue actions to accomplish its objectives and realize its principles with international cooperation and collaboration.

REFERENCES

Akiyama, M., Kidokoro, M., Hoshino, Y. and Une, H. (2001): Promotion of Global Map Project. *Paper submitted to the Seventh United Nations Regional Cartographic Conference for the Americas, E/CONF.93/INF.5.*

Chow, A. L. K. and Pinther, M. (2000): Global Geographic Information for United Nations Operations. *Abstracts for Global Mapping Forum 2000, 3p.*

Digital Earth: Home Page. <http://www.digitalearth.gov/>

Fukushima, Y. (2000): Implementation of Global Mapping. *Bulletin of the Geographical Survey Institute, 46, 17-31*

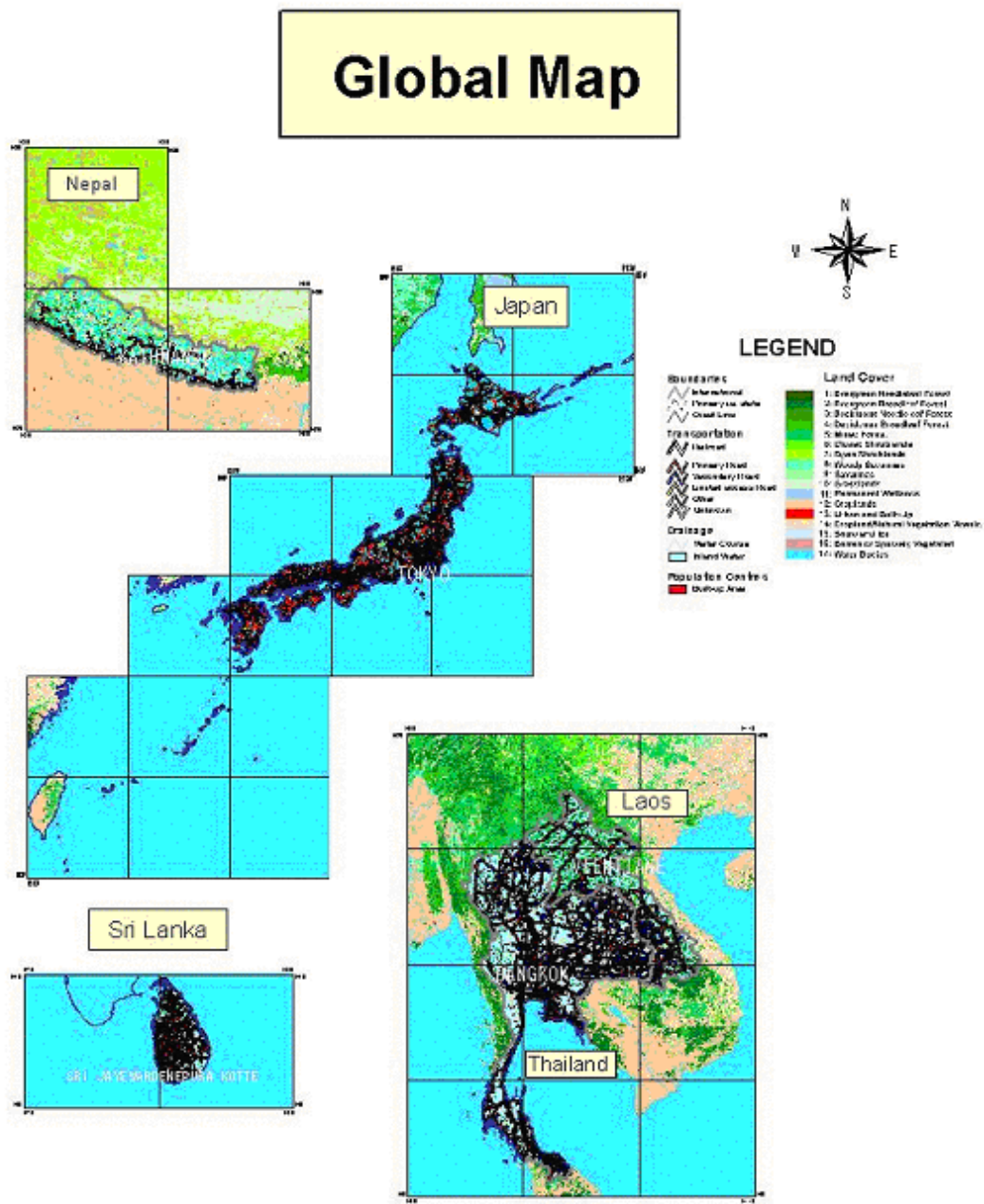
Global Spatial Data Infrastructure: Home Page. <http://www.gsdi.org/>

International Steering Committee for Global Mapping:
Home Page. <http://www.iscgm.org/>

Kline, K. D., Estes, J. E. and Foresman, T. W. (2000): Synergy: The Importance of Relationships. *Conference Papers and Presentations of 4th Global Spatial Data Infrastructure Conference*. <http://www.gsdi.org/capetown/program.htm/>

Maruyama, H. (1998): History of Activities for Getting International Agreement on the Development of the Global Map. *Bulletin of the Geographical Survey Institute*, 44, 63-90.

United Nations Cartographic Section: UNGIWG.
<http://www.un.org/Depts/Cartographic/ungis/ungis.htm/>



Global Map data of Japan, Sri Lanka, Thailand, Nepal and Laos are displayed. In the data, Land Cover layer and major vector layers, such as Boundary, Drainage and Transportation are overlaid. Maps of respective countries, Global Land Cover Characterization (USGS, 1997) and satellite image files were used for the production.



Fig. 2 Example of Output Image of Global Map Version 1.0