

Needs of the Global Map for Global Environment Problems

**Motoyuki Kidokoro
Geographical Survey Institute
Kitasato-1, Tsukuba, Ibaraki
305-0811 Japan**

Summary

The global environment problems have been well discussed since UNCED was held at Rio de Janeiro, 1992. However, currently available geographic information with scientific quality is still insufficient. The global mapping concept was proposed by Ministry of Construction and Geographical Survey Institute (GSI) of Japan in 1992. The International Steering Committee for Global Mapping (ISCGM) was established to promote Global Mapping Project in 1996. The needs of the Global Map was adopted by the UN Conference in 1997.

According to analysis on global environment problems, National Mapping Organisations (NMOs) should continuously provide accurate global homogeneous data by international cooperation with various users for global mapping. NMOs have a leading role to develop the Global Map.

In November 1998, UN sent letter of ISCGM inviting GM project and recommendation letter of UN to heads of National Mapping Organisations(NMOs). Participation to the project has been really good. Development of the Global Map done by GSI of Japan with NMOs in each country is introduced in this paper.

Characteristics of global environment problems

Distribution of global environment problems

Global environment problems have various issues. In the air, the main issue is global warming caused by an increase of carbon dioxide, ozone reduction, acid rain, etc. In the ecosystem of land, there is deforestation, desertification, soil degradation, etc. In the ecosystem of ocean, there is oceanic pollution and reduction of coral reef. The global environment problems appear in large and various areas.

Difficulties in global environment problems

There are difficulties in dealing with global environment problems. The first difficulty is in data because global environment problems are global and long term processes. More data of scientific quality and continuous efforts by many parties is required. The second difficulty is that global environment problems are complex processes. Users of global mapping are interdisciplinary distributed through various research areas. The third difficulty is that the global environment is boarder-less. Therefore, global perspective is required to solve global environment problems.

Information access and data development

Information access and data development is poor in developing countries. There is a possibility in the area, that global environment policy might be determined by international society without enough information from developing countries.

Global environment problems in UN conferences

Agenda 21

Since the declaration of the United Nations Conference on the Human Environment, adopted at Stockholm in June 1972, global environment problems have been a growing concern, commonly shared by the people in the world. Contrary to people's concern, little improvement has been made on the global environment.

The United Nations Conference on Environment and Development (UNCED), held at Rio de Janeiro, 3-14 June 1992, recognised that the increasingly serious environmental and developmental problems facing the world required global solutions, and that solutions to these problems required cooperation between nations and all sectors of society. One of the outcomes of UNCED was Agenda 21, which specifies an action plan for all countries to achieve sustainable development. Eight chapters of Agenda 21, especially chapter 40 on 'Information for Decision Making', describe the need of geographic information for sustainable development.

However, currently available geographic information with scientific quality is still insufficient to provide adequate understanding of the actual state of the global environment (Estes and Mooneyhan, 1994). Accurate geographic information must be developed and such information must be easily available to the public including the global environment researcher.

Climate change

The climate change is one of the main issues of global environment problems. The annual increase of carbon dioxide was 0.4% in 1980's (IPCC, 1995). The increase of temperature is estimated as two degrees centigrade in the year 2100 from the year 1990. The quantified emission limitation was introduced in Kyoto Protocol to the United Nations Framework Convention on Climate Change held in 1997. In the Article 3, it is declared that 'The net changes in greenhouse gas emissions from sources and removals by sinks resulting from direct human land use activities, limited to afforestation, reforestation and deforestation since 1990'. And 'additional human-induced activities related to changes in greenhouse gas emissions and removals in the agricultural soil and land use change and forest categories' will be discussed. This is one of the targets for usage of the Global Map.

Combat desertification

Desertification is another target for usage of the Global Map. The UN convention to combat desertification came into force in 1996. 'Information collection, analysis and exchange' was described in the COP.

Programme for the further implementation of Agenda 21

The necessity of developing core geographic data sets has become widely recognised. 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'.

Current global data sets and the role of National Mapping Organisations

Current global data sets

Significant efforts have been made in preparing core geographical data sets for global environment problems. However, current global data sets, for example, GTOPO30 (Global 30 Arc Second Elevation Data Set), GLCC (Global Land Cover Characterisation data set) and VMAP (Vector Map) Level 0 are not of an homogeneous quality over the globe. Figure 1 is a shaded map from GTOPO30 around Nepal. The discontinuous texture of topographical shade found at the lower right part of the figure is caused by coarse DEM resolution. Figure 2 shows river and road network in DCW. Road network is very sparse in the right lower and left upper part of the figure. These figures indicate that there will be an inhomogeneous quality in current global data sets. GLCC project has been done using NOAA/AVHRR data sets with great effort. However, there is no plan to update the data set.

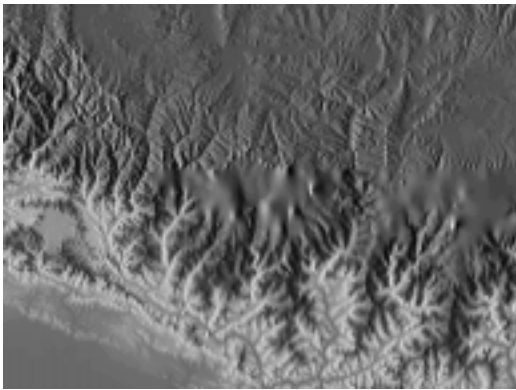


Figure 1 Shaded map in Nepal
(Source GTOPO30)

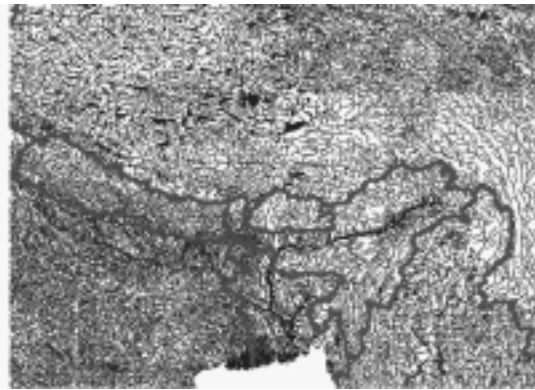


Figure 2 River and road
(Source DCW)

Role of National Mapping Organisations

NMOs, are proper organisations for the global mapping project because they are given a role by each government to provide core geographic data sets for their countries. NMOs have a leading role to develop the Global Map because NMOs have experience and expertise. Because global environment is a global and long-term process, NMOs should continuously provide global homogeneous data with scientific quality by international cooperation with various users for global mapping.

Basic specification of the Global Map

Principles of the Global Map

The International Steering Committee for Global Mapping (ISCGM) defined the Global Map as 'A group of global geographic data sets of known and verified quality, with consistent specifications which will be open to the public, considered a common asset to mankind and distributed worldwide at marginal cost' (ISCGM, 1996a). This definition clarifies three basic and important ideas about the Global Map: i) global coverage; ii) consistent specifications; and iii) open to the public and distributed worldwide at marginal cost.

Global coverage

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

Consistent specifications

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

Open to the public and distributed worldwide at marginal cost

Even though global geo-spatial information is developed with consistent specifications, it will 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 kilometre on the ground should cause little concern for national security, as we are anticipating sub-meter pixel resolution imagery from commercial high-resolution satellites.

Contents of the Global Map

Land use, vegetation and transportation are related to basic human activities. Elevation, drainage system and vegetation are related to natural resources. Boundaries are used for statistical analysis such as population census. Therefore, the contents of the Global Map are land use, transportation, elevation, boundaries, drainage system and vegetation.

Spatial Resolution of the Global Map

The Global Map is designed for global environmental problems. The global environment has a wide variety of issues. Higher resolution is required in regional environments. Coarser resolution is enough for coarser phenomena on the land. ISCGM decided that the spatial resolution of the Global Map is one kilometre or 1:1 000 000 in map scale because one kilometre resolution data can be used for climate analysis for large areas, biome and ecosystem analysis, geomorphic and erosion analysis in atmosphere, biosphere and lithosphere respectively. One kilometre resolution is a compromised solution of requirement for the global environment, technology, capacity, national security and copyright.

Temporal accuracy of the Global Map

Global environment problems are a phenomena caused by human activities and nature. The revision interval of five years is reasonable to keep the Global Map useful and attainable by NMOs.

Implementation of the global mapping project

ISCGM

The International Steering Committee for Global Mapping (ISCGM) was established in February 1996 to realise and enhance the global mapping project. It had 14 members and 5 advisors. Numbers have increased to 17 members and 7 advisors now.

In 1994, establishment of the ISCGM was recommended at the Izumo Workshop. In February 1996, the ISCGM was established at Tsukuba Workshop and the first ISCGM meeting was held. The second meeting was at Santa Barbara held by UN, GSI and UCSB. The Santa Barbara statement was circulated at the Committee of Sustainable Development, 1997. A third meeting was held at Gifu, the fourth meeting was held at Sioux-Falls and the fifth meeting was at Canberra. Specifications version 1 was adopted at the fifth meeting. The next meeting will be held at Cambridge in July 1999.

Home page of ISCGM is available for more information on ISCGM at the following site.

<http://www1.gsi-mc.go.jp/iscgm-sec/index.html>

Exchange views and information with users

The Global Map should be discussed with users to develop user oriented core geographical data sets. A global mapping forum was recommended by 'Interregional Seminar on Global Mapping for Implementation of Multi-National Environment Agreements' held at Santa Barbara in 1997. Two Forums, in Gifu and in Sioux-Falls have been held to bring data users and providers together to facilitate creation of Global Spatial Data Infrastructure (GSDI). A mini-forum was held at Tsukuba in March 1999 for Asia and the pacific region.

Participation of national mapping organisations

United Nations sent the letter of ISCGM inviting to the global mapping project and the letter of Mr. Hermann Habermann, Director of Statistics Division, UN, recommending the Project to the heads of NMOs in November 1998. As of 12th April 1999, 48 organisations had sent their applications for the global mapping project to the secretariat of ISCGM. Because national mapping organisations have a source of information of core geographical data, participation of many countries is crucial for the global mapping project.

Phases of global map development

The global mapping project has two phases. In the first phase, the Global Map shall be developed by the year 2000. However this is difficult to achieve especially in a developing country if there is not enough source of information and budget. For practicality, existing global data sets will be revised in the first phase. The baseline data of the Global Map are VMAP Level 0, GTOPO30 and global land cover characterisation. In the second phase, these data sets are planned to be revised in every five years.

Cooperation with other international activities

The Global Map has relations with many international organisations such as CEOS, CERCO, GSDI, ITO/TC211, MEGRIN, PCGIAP, SCAR-GGI, UN and others. These relations enhance the global mapping project by providing remote sensing images, improving regional or specific coordination, promoting global and regional spatial data framework, meeting with international standards, inter-governmental and academic support.

Global Map development in Asia by GSI

GSI developed DEM of the Global Map in the Amazon Basin. GSI has been developing the Global Map in Asian countries since 1998. It prepared global mapping in the Philippines, Thailand and Vietnam cooperating with each country.

Future actions to be discussed

The secretariat received letters from heads of NMOs to participate in the global mapping project. There are some organisations who expect technical assistance to develop the Global Map themselves. I think that achievable and effective actions or methods are to be discussed at the ISCGM Meeting to help NMOs for steady and smooth implementation of this project.

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