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Development of a global map for sustainable development

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Note by the Secretariat

Summary

The present paper contains the report of the working group tasked with considering the development of a global map for sustainable development. At its second session, held in August 2012, the Committee of Experts on Global Geospatial Information Management noted the importance of reliable geospatial information in the context of sustainable development, as set out in "The future we want", the outcome document of the United Nations Conference on Sustainable Development, held in Rio de Janeiro, Brazil, from 20 to 22 June 2012. In recognizing the need to provide the information base to inform the sustainable development agenda, the Committee of Experts requested that a working group be formed, comprising Member States, international organizations and the private sector, to guide the work involved in developing a global map for sustainable development. Established in December 2012, the working group initiated a dialogue with the United Nations initiative on Global Geospatial Information Management at a special session convened to address the issue during the Second High Level Forum on GGIM, held in Doha, Qatar, from 4 to 6 February 2013. In its report, the working group describes the dialogue held in Doha; provides the agreed terms of reference of the working group; introduces an initial road map for consideration; provides a peer review of the existing Global Map project; considers urban hazard and disaster mapping as a key input into the development of the global map for sustainable development; and describes planned activities to meet the needs of Member States and international organizations. The Committee of Experts is invited to take note of the report and to express its views on the development of a global map for sustainable development.

* E/C.20/2013/1

I. Introduction

1. Geospatial information services and enabling platforms have matured and become key contributors to improved decision making and policy formulation, and have enhanced the capability for governments, international organizations and researchers to analyze, monitor and report on sustainable development and other global concerns. The outcome document of the United Nations Conference on Sustainable Development (Rio+20) 'The future we want' specifically recognized the importance of "reliable geospatial information" in the areas of national disaster risk reduction strategies and plans, and for sustainable development, policymaking, programming and project operations.

2. Based on the Committee of Experts' commitment to the effective management of geospatial information globally, the second session of the Committee discussed the potential and need for an operationally ready global geospatial information platform of authoritative and consistent geospatial data and information that should be built and managed by the Member States and operated under the supervision of the Committee of Experts. The Committee agreed on the need to create a global map for sustainable development to provide the information base to inform sustainable development, so that the agenda, strategy and monitoring might be based on a body of trusted, reliable and authoritative geospatial data. The Committee further agreed that a global map for sustainable development would build on the existing Global Map project, be technical in nature, and will not address issues of political concern.

3. In adopting decision 2/108 (E/2012/46, page 7), the Committee requested a new working group[1] be formed to guide the work of a global map for sustainable development. In accordance with this decision, the working group for a global map for sustainable development (GM4SD), initially comprising twelve Member States, six international organizations and two private sector companies, was established and approved by the Bureau of the Committee of Experts in December 2012.

4. In providing guidance, the Committee requested the working group to take note of the following principles:

(a) Member States should be the custodians of key datasets, and update them for sharing;

(b) The platform should be developed in a cost-effective manner with distributed systems and open standards to ensure interoperability, while avoiding duplication; and

(c) A phased, modular approach should be taken to achieve the vision of global map for sustainable development step by step, identifying the users and their needs.

5. This report summarizes the activities of the working group since its establishment and proposes its planned activities for consideration by the Committee. Points for discussion and decision are provided in paragraph 21.

[1] The Committee originally requested a 'steering committee' be formed in its decision. However, in order to avoid potential misunderstanding with a steering committee of existing initiatives, the new body has been named as a Working Group.

II. Interim report to the Second High Level Forum on GGIM

6. The Committee requested (decision 2/108) the working group to present an interim document at the Second High Level Forum on Global Geospatial Information Management in Doha in February 2013 that would:

(a) Provide the current status and overlaps in the availability of the geospatial information on the web, and the value that a global map for sustainable development could add;

(b) Provide a clear understanding of user requirements and appropriate case studies as necessary;

(c) Determine the potential applications of a global map for sustainable development, based on existing global map experiences; and

(d) Review existing portals, such as those adopted by Spain and the United States of America, and assess their applicability as the basis for a global map for sustainable development.

7. The working group conducted research on the subjects requested by the Committee and reported the following preliminary results to the High Level Forum in Doha:

(a) Twenty different global geospatial data sources were visited to assess the current status and overlaps in the availability of the geospatial information on the web. Most data sources include administrative (boundary and geographic names) and topographic (transportation, drainage, elevation, land cover, etc.) data with scales ranging from 1:250k to 1:1m. They are provided free of charge, but some sources have restrictions for commercial uses;

(b) Ten existing portals were reviewed to assess their applicability as the basis for a global map for sustainable development. Most portals adopt open standards and enable users to easily integrate geospatial information, including environment and disaster preparedness, from distributed web services via the internet;

(c) Based on the experiences of Global Map, which has been used for the responses to regional disasters, flood analyses and forest distribution, the potential applications of a global map for sustainable development include disaster mitigation, forest/biodiversity conservation, and water resources management; and

(d) The working group found that more time is needed to have a clear understanding of user requirements and proposed to focus its activities on small projects, including a peer review of the Global Map data and a research on user requirements of urban hazard and disaster mapping to make tangible outcomes in a relatively short period. The International Steering Committee for Global Mapping (ISCGM) has expressed its readiness to conduct a validation project of Global Map data in cooperation with national geospatial information authorities using satellite imagery of the Japanese earth observation satellite, Advance Land Observation Satellite (ALOS), provided courtesy of the Japan Aerospace Exploration Agency.

8. The proposal of the working group was welcomed by the High Level Forum participants, whom recognized that the Rio+20 outcome document had given

important recognition to the role of geospatial information in sustainable development. The implementation of this mandate became important and the Forum welcomed the development of suitable applications through the GM4SD initiative. This was specifically reflected in the Doha Declaration of 6 February 2013, in which the participants resolved "to promote the greater use of geospatial information in sustainable development by supporting the activities under the programme of the Global Map for Sustainable Development (GM4SD) with an initial focus on managing risks of natural disasters to urban populations and developing effective mitigation strategies." The Doha Declaration additionally affirmed the importance of having a stable, credible, and reliable national geospatial information infrastructure in each country built on internationally recognized standards that will integrate, manage, and deliver geospatial information for timely, evidence based and authoritative decision making and policy formulation on location-based development issues, including disasters and humanitarian needs.

III. Terms of reference and preliminary road map of the working group

9. At an informal consultation of the working group held in Doha, the members recognized a need to prepare its terms of reference to clarify the scope and goals of the working group, as well as a road map to layout the process to reach the goals. Draft terms of reference have been prepared through email discussions of the members and the current version is included in Annex 1. In order to achieve the goals in the terms of reference, a preliminary road map of the working group was also prepared, and is included in Annex 2.

10. During the course of discussions on the terms of reference, some members of the working group raised their concern that the term "authoritative data" referred to in the terms of reference, as well as in previous documents of the Committee of Experts, might raise an issue of liability for any errors in the datasets prepared by the Member States. The working group, while acknowledging the importance of such legal implications of the term, considered the topic out of its scope. Therefore, the working group suggests that the Committee of Experts might consider the legal aspect of this particular term during its third session.

IV. Peer review of Global Map data

11. As proposed at the Second High Level Forum in Doha, ISCGM initiated a validation project of Global Map data in cooperation with national geospatial information authorities. The positional (horizontal) accuracy of road network data in RMSE and the completeness of major features of Global Map data of 1:1 million scale were validated with panchromatic imagery of ALOS, which has the spatial resolution of 2.5m and expected positional accuracy of 6.1m RMSE at nadir.

12. At the time of this report writing, 26 authorities expressed their intention to participate in the project and 15 have finished their validation. The average horizontal error of most sample sites is about 100m RMSE. The interim report of ISCGM on this validation is included in Annex 3.

V. Urban hazards mapping

13. Participants of the Second High Level Forum recognized the overwhelming need to use geospatial information to address sustainable development issues, and

particularly took note of the importance of understanding natural hazards and their impact on the population as called for in the Rio+20 outcome document. The Doha Declaration suggested that GM4SD should have an initial focus on the greater use of geospatial information in managing the risks of natural disasters to urban populations and developing effective mitigation strategies. The Forum welcomed the initiative to begin work on urban hazard mapping, the development of appropriate models and the testing of mitigation strategies.

14. In order to progress the urban hazard mapping concept, the Secretariat of UN-GGIM and the National Administration of Surveying, Mapping and Geoinformation of China (NASG) jointly organized the Chengdu Forum on UN-GGIM to be held in Chengdu, China from 24 to 26 April 2013. With the theme 'Development and Applications in Urban Hazard Mapping', the Forum would provide a platform for discussing priority issues related to the development and provision of consistent geospatial information and modeling techniques to enable nations to better understand and implement natural hazard impact mapping and analysis in urban environments. In particular, the Forum would engage with leading experts to share experiences and methodologies in the production, management, analysis, modeling and dissemination capacity of hazard related geospatial information. It was envisaged that one of the outcomes of the Chengdu Forum would be agreement that urban hazard and disaster mapping should be a key input into the development of a road map for a global map for sustainable development by the Committee of Experts.

15. On Saturday 20 April 2013, just a few days before the Chengdu Forum, a magnitude 7.0 earthquake struck the Sichuan Province region of China, claiming the lives of more than 200 people and affected the lives of over 1.5 million people. Due to the close proximity of Chengdu to the earthquake epicenter, and the mobilization of disaster response and recovery activities, the Chengdu Forum was postponed and will now be convened in October 2013. This earthquake and the disaster it caused may have caused a temporary setback on the work of GM4SD in discussing the user needs and requirements of urban hazard mapping. However, it illustrates the obvious and urgent need for the global geospatial community to expedite the work of GM4SD and improve its capability of employing geospatial information to meet the real need of disaster preparedness, mitigation, response and recovery.

VI. Planned activities

16. As indicated earlier in this report, it will be important for the working group to have a clear understanding of the requirements and needs of the sustainable development user community in order to progress the development of a GM4SD. Further work should be guided by the Sustainable Development Goals currently being established by the United Nations. These goals will depend on human and physical geography data and geospatial information to measure and monitor change and progress. Indications are that these goals may take some time to evolve, and that the sustainable development community does not yet know what should be measured and how. However, it is certain that there will be a need to create a network of global data and information that is supported by the tools and technology to create maps and detect change over time in a consistent and standardized manner. In this connection, the working group considers it necessary to closely monitor the development of the UN initiative through the UN-GGIM Secretariat.

17. A special Economic and Social Council (ECOSOC) global forum on "mobilizing science, technology and innovation for sustainable development" convened in New York on 13 May 2013, recognized that science, technology and innovation, as tools that are able to integrate the 3 pillars (economic, social, environmental) of sustainable development, provide an important opportunity to follow up on the Rio +20 outcomes. The forum concluded that science, technology and innovation should be clearly articulated by Governments as important elements of the post-2015 development agenda. For example, science, technology and innovation capacities concerning global climate change and disaster risk reduction must be enhanced, particularly to fill gaps in understanding in order for policy-makers to protect people, livelihoods and ecosystems. Building the resilience of vulnerable communities, while reinforcing local response strategies rooted in traditional knowledge, is essential for climate change adaptation and disaster mitigation.

18. The High Level Report on the Post-2015 Development Agenda 'A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development', published 31 May 2013, called for the global community to put sustainable development at the core to halt the alarming pace of climate change and environmental degradation. The Executive Summary emphasized the need for a 'data revolution' for sustainable development, with a new international initiative to improve the quality of statistics and information available to citizens, actively taking advantage of new technology, crowd sourcing, and improved connectivity to empower people with information on the progress towards the targets (page 14). Of the several cross-cutting issues, the management of cities was identified as being even more important in the decades ahead. The post-2015 agenda must be relevant for urban dwellers, and cities will be where the battle for sustainable development will be won and lost. The most pressing issue will be how to foster a local, geographic approach to the post-2015 agenda (Cities, page 31).

19. In the interim the working group proposes to engage with the national geospatial information agencies requesting them to undertake research on sustainable development user requirements in each of their national governments. National geospatial information agencies could interview experts in their countries on what they need in the studies of urban hazards by showing their geospatial data and services including a geospatial information platform. The regional experience in Europe, through the European Spatial Data Infrastructure with a Best Practice Network (ESDIN), is expected to provide useful guidance in this endeavor. The activity will also contribute to effective discussions during the Chengdu Forum.

20. As the next step of peer review to the data validation, a review of the current Global Map project should be conducted with a particular focus on the latest technologies and achievements in the geospatial information community. In addition, research on other existing global data and similar data development projects, including the 30m resolution Global Land Cover data developed by China, should be undertaken to see if the Global Map project has been keeping up with the latest trends in the geospatial information community.

VII. Points for discussion

21. The Committee is invited to:

(a) Approve the terms of reference and road map of the working group;

(b) Provide guidance on the planned activities of the working group.

Annex 1

Draft terms of reference (Ver.4.2)

1. Vision of GM4SD

GM4SD, as a high quality and authoritative geospatial information platform, will contribute data and knowledge to support informed and coordinated decision-making by policy-makers in Member States and international organizations. The platform will use common standards and specifications to deliver reliable and authoritative global reference datasets maintained by Member States.

2. Scope of GM4SD Working Group

Based on Decision 2/108 adopted by the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) in August 2012, the GM4SD Working Group (hereafter "WG") will consider the technical requirements, specifications and use of GM4SD, but will not address issues of political concern and sensitivity. The WG will develop an initial prototype platform that proves the concept of GM4SD, so that UN-GGIM (representing the global geospatial information community) will be able to consider an actual sustainable implementation of GM4SD in the future, taking advantage of the outcomes of the WG.

3. Goals of GM4SD Working Group

When UN-GGIM reports to ECOSOC on its progress in 2016, and following the requirements of Decision 2/108, the WG will have successfully:

1) Identified intended users and their requirements for GM4SD;
2) Determined the processes and decisions that GM4SD must support;
3) Determined specifications, architecture, and tools necessary to support the needs and requirements of GM4SD, leveraging existing open standards, technology and community best practices and lessons from existing regional initiatives including the European Location Framework;
4) Developed a proto-type geospatial information platform that delivers reliable, authoritative and consistent global reference datasets based on the GM4SD specifications and architecture;
5) Prepared a report that proposes the actions UN-GGIM, representing the global geospatial information community, should take to implement a sustainable GM4SD to achieve the vision, including in developing countries; and
6) Provided a guideline with use-cases, which identifies the potential GM4SD applications, as a tool to support decision-makers, particularly in developing countries, and with a focus on natural disaster management.

4. Working Group Members and their Roles

1) The WG will comprise experts from selected Member States, international organizations and the private sector. Geographical balance and representation will be considered for the selection of members from the Member States. The WG will elect a Chair among the experts from Member States. The Chair makes the final decision on the selection of members.
2) WG members are to contribute to the discussions and the preparation of WG reports to UN-GGIM, taking advantage of their own available resources.

5. Meetings

1) The WG will convene a meeting in conjunction with UN-GGIM meetings, High Level Forums, and other relevant international events.
2) The WG will operate primarily through e-mail.
3) Decisions of the WG will be made by consensus.

6. Secretariat

The UN-GGIM Secretariat will provide secretarial support to the WG.

7. Reporting Procedure

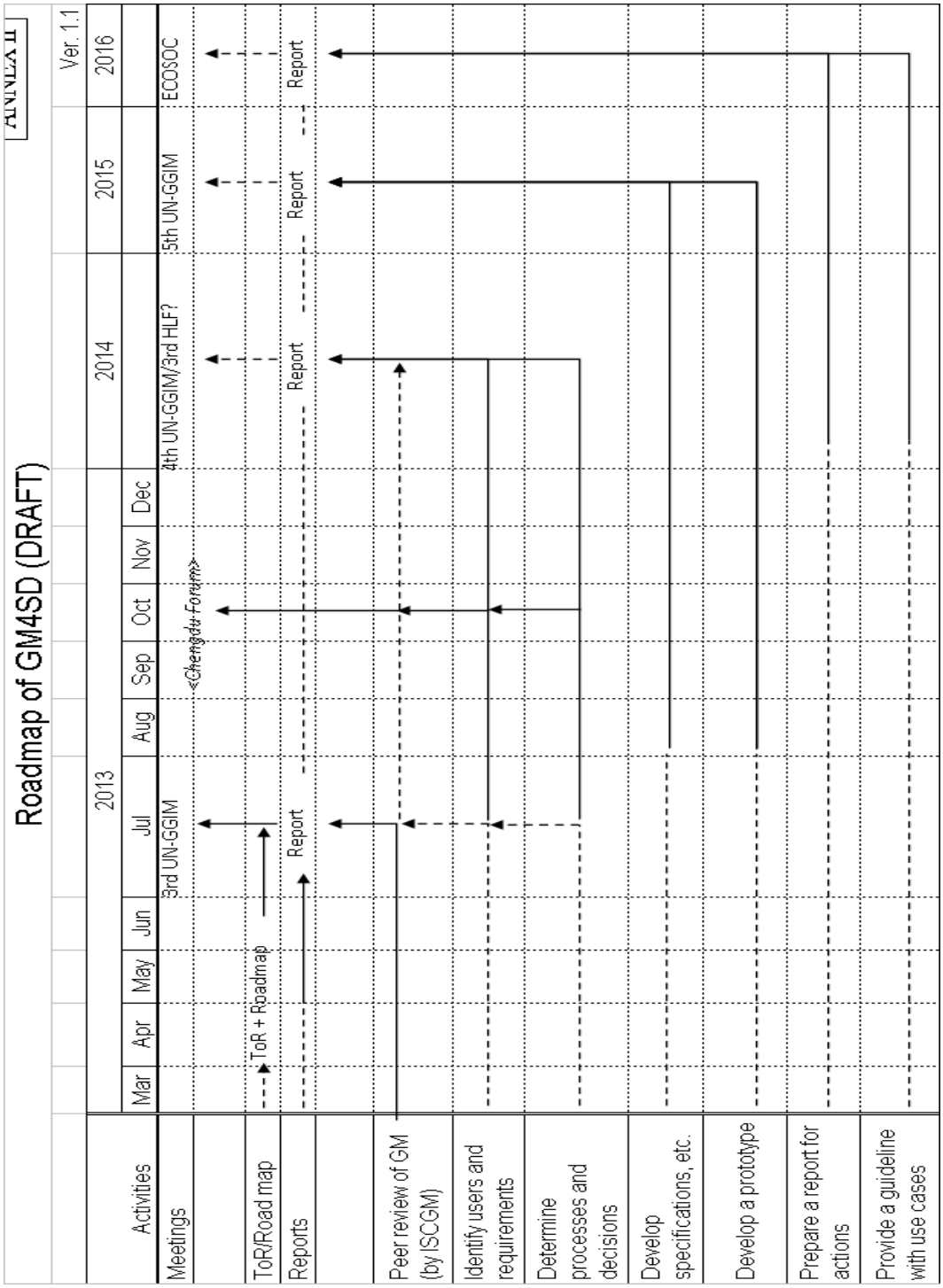
The WG will report to the UN-GGIM meetings.

8. Modus Operandi

The WG will prepare a road map and take necessary actions accordingly to achieve its goals.

Annex 2

Preliminary road map (Ver. 1.1)



Annex 3

Interim report on accuracy verification of Global Map data
ISCGM Secretariat

1. Introduction

At the Second High Level Forum on Global Geospatial Information Management (GGIM) held in Doha, Qatar in February 2013, it was agreed that ISCGM should undertake an accuracy verification project of Global Map data. ISCGM invited geospatial information authorities to participate in the project by reviewing the accuracy of Global Map data of their countries using satellite imagery, provided courtesy of the Japan Aerospace Exploration Agency (JAXA). A total of 26 authorities participated in the project and 15 organizations completed their verification by the end of May 2013.

2. Methodology

The vector datasets of Global Map were assessed by comparing with Advanced Land Observing Satellite (ALOS)/Panchromatic Remote-sensing Instrument for Stereo Mapping (PRISM)[2] data of JAXA, and two types[3] of quality elements, positional accuracy and completeness, were assessed. We chose a scene at around the capital of each country/region for evaluation to assure enough number of evaluating points:

- Positional accuracy (horizontal)
  Ten[4] clearly identifiable features including road intersections were located in both Global Map data and imagery per scene, and the horizontal error was calculated in RMSE (root mean squared error).
- Completeness
  The number of missing features was counted per scene by comparing the Global Map data with satellite imagery.

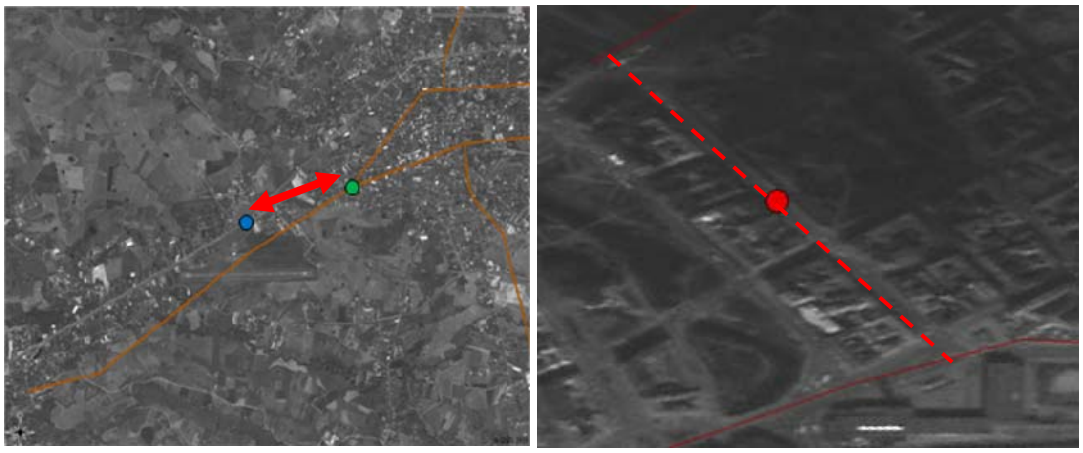


Figure 1: Global Map data overlaid on top of ALOS/PRISM imagery
Left: Positional difference of a road intersection
Right: An example of lack of acquisition of road (indicated by dashed line)

[2] ALOS/PRISM is a panchromatic sensor with the spatial resolution of 2.5 meter and the expected positional accuracy of 6.1 meters RMSE (PRISM L1b2) at nadir (http://www.eorc.jaxa.jp/en/hatoyama/satellite/data_tekyo_setsumei/alos_hyouka_e.html).

[3] Out of five data quality elements defined in ISO 19113 only positional accuracy and completeness were chosen for evaluation due to practical reason.

[4] Although a minimum of 20 points due to be tested in FGDC standard (FGDC-STD-007.3-1998), 10 points are tested because of the limitation of the satellite scene extents (35 by 35 km or 35 by 70 km).

3. Participating Authorities

A total of the following 26 authorities participated in the project:
Australia, Algeria, Azerbaijan, Bangladesh, Botswana, Burkina Faso, Canada, Commonwealth of Dominica, Honduras, Japan, Jordan, Kenya, Republic of Korea, Kosovo, Latvia, Moldova, Mongolia, Nepal, New Zealand, Pakistan, Philippines, Romania, Senegal, Serbia, Sri Lanka, and U.S.A. (alphabetical order)

4. Result

Fifteen authorities completed the assessment and submitted its result to the ISCGM Secretariat as of June 12. The preliminary results of 13 reports have been summarized in Table 1, and two reports are under technical confirmation. Although the horizontal accuracy varies among authority results, almost all results meet the accuracy requirements[5] of the Global Map Specifications. Regarding the completeness, some authorities answered that a few features were missing for respective scenes. From our observation, there seems to be several causes of missing features such as 1) changes over the year; 2) drawing-omission for a small scale; and 3) failure of editing, while it was difficult to quantify each element.

Table 1: Preliminary Result

Authorities	Positional Accuracy RMSE (meter)	Completeness Lack of road acquisition(*)
Japan	117	-
A	94	-
B	87	-
C	98	2 (1.9%)
D	166	-
F	30	3 (0.3%)
G	154	3 (2.2%)
H	242	-
I	121	-
J	57	-
K	127	-
L	1,106	2 (2.2%)
M	9	-

(*) unit for completeness: number of missing roads per scene (ratio)
Scene size: 35 by 35 km except for Country G, H and I (35 by 70 km)

[5] The Global Mapping Specifications describes the accuracies required for Global Map data sets. For the horizontal accuracy, 90% of points shall be within 2 km, which corresponds to 932 meters RMSE. There is no specific requirement on completeness.