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Trends in national institutional arrangements in geospatial information management

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Note by the Secretariat

Summary

The present paper contains the report of the Working Group on Trends in National Institutional Arrangements for consideration by the Committee of Experts on Global Geospatial Information Management.

At its fourth session, held in New York from 6 to 8 August 2014, the Committee of Experts adopted decision 4/106, in which it welcomed the report prepared by the Working Group on Trends in National Institutional Arrangements, including its draft terms of reference, work plan and road map. The Committee of Experts noted the strategic importance of national institutional arrangements, particularly given that Member States are at different stages of geospatial development and that institutional and policy frameworks are dependent on legal and fiscal arrangements and governance models which are different across the globe. It encouraged Member States with experience in implementing the issues highlighted to join the Working Group and/or provide examples of their experiences. The Committee of Experts requested the Working Group to continue to work with Member States and regional and international entities and to report to it on progress made at the next session of the Committee.

The report contains information on the work undertaken by the Working Group and its three task groups during the intercessional period, as follows: production systems analysis, coordinated by Spain; funding structures, dissemination systems and data policy models, coordinated by Mexico; and the structure of geospatial information management organizations and the role of volunteered geographic information, coordinated by Singapore. The work of the task groups focused on the analysis, diagnosis, and identification of best practices across the three areas of work mentioned below. The report presents the findings from the analysis undertaken of the data received from four global questionnaires covering the three areas of work: (a) geospatial information business model analysis; (b) structure of geospatial information management organizations; and (c) the role of people as users and producers of geospatial information.

I. Introduction

1. The issues related to institutional arrangements in geospatial information management, have been on the discussion agenda of the global community since May 2012 at the United Nations Global Geospatial Information Management (UN-GGIM) Hangzhou Forum in China. Thereafter the issues were considered at the second session of the Committee of Experts in August 2012. Further in July 2013, the Committee of Experts considered report E/C.20/2013/5/Add.1, and requested that a Working Group on Trends in National Institutional Arrangements be created to continue working on identifying best practices and sets of institutional models and legal frameworks for geospatial information management. The Working Group, chaired by Spain was created, with representatives from 11 Member States: Columbia, Jamaica, Japan, Mexico, Mongolia, Nigeria, Pakistan, Republic of Korea, Singapore, Spain and Tuvalu. At the fourth session of the Committee of Experts, the Working Group presented the group's terms of reference, a road map and two year work plan (E/C.20/2014/5/Add.1).

2. In August 2014, the Committee of Experts welcomed the report and associated documents prepared by the Working Group and encouraged Member States who had experiences in implementing the issues concerned to join the Working Group. Further, the Working Group was requested to continue its work with Member States, regional international entities and report back to the Committee of Experts at its fifth session.

3. This report contains information on the work undertaken by the Working Group and its three task groups during the intercessional period, and presents the findings from the analysis undertaken of the data received from four global questionnaires covering the three areas of work: (a) geospatial information business model analysis; (b) structure of geospatial information management organizations; and (c) the role of people as users and producers of geospatial information. The Committee of Experts is invited to take note of the report, and express its view on the way forward based on the next steps and recommendations tendered by the Working Group on National Institutional Arrangements in Geospatial Information Management. Points for discussion and decision are provided in paragraph 49.

II. Activities of the Working Group and related Task Groups on Trends in National Institutional Arrangements for Geospatial Information Management

4. At its fourth session, held in August 2014, the Committee of Experts encouraged Member States with experience in implementing the issues highlighted to join the Working Group and/or provide examples of their experiences and also requested continuation of the work with Member States and regional and international entities (decision 4/106, E/C.20/2014/5/Add.1).

5. The Working Group has subsequently met twice, once during the fourth session of the Committee of Experts in August 2014 and the second, with Caribbean representatives, during the 1st UN-GGIM-Americas regional meeting in September 2014, in Mexico. These meetings are reported on in Section II, paragraph 8. The Working Group has conducted its activities virtually, largely by e-mail and

telephone. The membership of the Working Group has increased since its inception, up from 11 Member States to 25, with one being observer, and an additional six from academia and international geospatial organisations. The Member States are: Australia, Austria, Bangladesh, Belgium, Chile, Columbia, Ecuador, France, Guyana, Italy, Jamaica, Japan, Mexico, Moldova, Mongolia, Nigeria, Norway, Pakistan, the Republic of South Korea, St Kitts and Nevis, Singapore, South Africa, Spain, Tuvalu and the United Kingdom. Other Working Group members are GSDI, GEO, EuroGeographics, ISPRS, Carleton University Canada, Lueven University Belgium and Commonwealth, Scientific and Industrial Research Organisation Australia. Based on the Working Group's Road Map and Working Plan, three task groups were created. Task Group 1, Production Systems Analysis chaired by Spain, Task Group 2, Funding structures, Dissemination Systems and Data Policy Models, chaired by Mexico, and Task Group 3, Structure of Geospatial Information Management Organisations and the Role of Volunteered Geographic Information, chaired by Singapore.

Task Group Members

Task Group 1 (TG1)	Task Group 2 (TG2)	Task Group 3 (TG3)
Spain	Mexico	Singapore
France	Austria	Austria
Italy	France	Bangladesh
South Korea	Italy	Belgium
Singapore	Jamaica	France
	Singapore	Guyana
	Spain	Japan
	ISPRS	South Korea
	CSIRO	Carleton University
		GSDI
		CSIRO

6. Since their creation the Task Groups have been undertaking a five phase work plan consisting of analysis, diagnosis, identification of best practices, consultation and submission.

7. **Terms of Reference of the Working Group:** The draft Terms of Reference for the Working Group on Trends in National Institutional Arrangements (NIA-WG) for Geospatial Information Management were revised by the Working Group at its first meeting held during the fourth session. Further it was reviewed by the Bureau of the Committee of Experts, re-revised and subsequently endorsed by the Bureau.

8. **Working Group Meetings:** The Working Group first met on Thursday 7th August, 2014 during the fourth session of the Committee of Experts. The meeting was attended by 25 persons, 18 Member States and five accredited geospatial entities. The terms of reference were discussed and recommendations for its revision tendered. Also addressed was the creation of sub groups which were subsequently termed Task Groups. In addition, the working definition of the term *Institutional Arrangements* was agreed upon. General discussions focused on critical areas of work such as, the creation of a best practice list, the identification of key indicators for creating spatial data infrastructures and a proposal to have a workshop to address the creation of geospatial information management institutional arrangements and business models. Attendees were encouraged by the Chair to participate in the Task Groups.

9. An informal meeting of the Working Group was held on 23 September 2014 in Mexico City, Mexico, during the Latin America Geospatial Forum and 1st session of UN-GGIM Americas. Eight persons were in attendance. The major objective was to gain consensus from the members of the Working Group in the Americas on the proposed work plan in order to move ahead. The Chair spoke on the achievements of the Working Group and presented a proposal detailing activities and time frames within which the three Task Groups would be expected to undertake their tasks. Discussions centred on the approach that should be adopted by the Task Groups, how institutional arrangement typologies should be defined, the preparation of a questionnaire to determine the current institutional situation in national geospatial information management entities and National Mapping Agencies, and the need for feedback mechanisms among Task Groups and the overall Working Group. The meeting concluded with a seven point decision and follow-up plan of action.

10. Surveys Preparation and Execution All three Task Groups conducted the analysis phase of their work by preparing questionnaires which were circulated globally to Member States for their responses. Task Group 3 prepared and executed an initial questionnaire entitled, Structure of Geospatial Management Organizations that focused on the organizational structures, types of leadership and policies in geospatial information management organizations. The questionnaire was circulated to Member States from 20 January 2015 to 27 February 2015. Fifty one Member States responded, of which 31% were from the Americas, 29% from Europe, 22% from Africa, 10% from Arab States and 8% from Asia-Pacific.

11. To achieve the objectives of the Working Group, three additional surveys were needed, one from each Task Group. To reduce the number of questionnaires sent to Member States, a combined questionnaire was prepared and circulated to Member States from 25 February to 27 March 2015. The questionnaire was focused on the objectives of each Task Group, which are as follows:-

- TG1: production systems of geospatial information (GI)
- TG2: funding systems, dissemination and data policy of GI
- TG3: the role of citizens as users and producers of volunteered geographic information (VGI) and its impact on GI systems.

12. The topics considered in this survey were selected based on the results from a questionnaire executed within the Working Group which had the objective of identifying the national institutional arrangements that best satisfied the proposed 17 United Nations sustainable development goals. Geographical names, administrative units, cadastral parcels, transport networks, hydrography, elevation, land cover, imagery and settlements were the themes selected to be used in the questionnaires. The selected themes were considered very important in terms of geo-location which is fundamental for referencing static and dynamic people, objects and activities for many commercial businesses, and private and public activities.

13. The combined questionnaire was circulated to Member States with 59 responses to date, a response rate of 30%. The responses to the questionnaires are not equally distributed across UN-GGIM regions with most coming from European Member States; with regional distribution as follows: Africa 10%, Americas 21%, Arab States 8%, Asia-Pacific 15% and Europe 50%.

14. The results and the conclusions reached from the survey and analysis undertaken by the three Task Groups are available in the background paper related to this report.

III. Findings from the Surveys

15. This section highlights the main conclusions derived from the analysis of the responses to the surveys conducted by the Working Group. The findings are presented per Task Group.

(a) Task Group 1

16. In regards to the methods used for geospatial data creation and update, it was found that the most used method was semi-automatic, the exception being for imagery, where automatic methods were most important. In addition, responding organisations indicated that geospatial data creation and update were being done almost exclusively internally, with its own production resources, with little or no support from the crowd, through volunteered geographic data.

17. Responses to the approach used for the creation and update of geographic data indicated that the approach varied between the bottom-up approach, which means production at the maximum scale or resolution, and that of an independent production for each scale or resolution.

18. The analysis also revealed that medium scales between 1:25.000 and 1:50.000 are the most common production scales used, with the exception of cadastral parcels which are prepared at larger scales.

19. The update period most used for most of the referenced themes is 5 to 10 years. For the majority of Member States updates are done only for parts of their territory, instead of the complete territory. In addition, there are no differences between the numbers of Member States that update all the themes identified.

(b) Task Group 2

Funding Structures

20. Geospatial information acquisition, processing and dissemination processes continue to be expensive. National geospatial information agencies and other public sector institutions are completely undertaking these functions, with no participation from other sectors.

21. The monies allocated for the production of geospatial information and its relation to gross domestic product is not well known for most of the responding Member States, as only seven respondents answered this question. The responses to the question on the model for the return on investment derived from services, rent or sale of geospatial information was similar to the former question; the number of answers was very low.

Dissemination Systems

22. Given existing technological advances, 64% of the responding Member States still use physical media to disseminate geospatial information.

23. The responses received indicate that a very low percentage of Member States have implemented cloud technology as a method for accessing and discovering geospatial information. Although the technical concept is known, this is probably

due to the fact that its adoption requires a comprehensive cost-benefit analysis on the pros and cons of migrating geospatial information to this platform.

24. On the question of dissemination mechanisms to satisfy population needs, it was observed that it is necessary to implement new ways beyond the official web pages. Other means such as electronic magazines, social networks, advertising, TV or radio are little used.

25. The analysis revealed that there is little knowledge about best practices, and therefore only 35% of responding Member States apply best practices related to the dissemination of geospatial information, which is mostly reflected on the issues of geographical names, land use and settlements.

26. It was noted that for elevation datasets there is still a high level of restricted access. This could limit its use and exploitation as an available and necessary layer for the creation of different cartographic products and geo-informatics solutions.

Data Policy Models

27. Concerning the legal framework for the collection, generation, analysis, processing, dissemination and/or receiving geospatial information, 40% of the responding Member States still do not have a legal framework. Among Member States having legal frameworks 72% of them are aligned with international standards.

28. The application of a legal framework to regulate the collection, generation, analysis, processing, dissemination and/or receiving geospatial information, is still not mandatory at national, regional or local levels and across public or private industry, therefore hindering interoperability.

29. Within each responding Member State, there is still much work to do in terms of developing policies and strategies related to geospatial knowledge and information governance. In addition the results show that 53% of responding Member States have no political strategy related with these issues.

(c) Task Group 3

Findings from the Survey on Structure of GIM organisations

30. While most Member States have national geospatial information management initiatives, nearly half of them are still in development or at the inception stage. Twenty percent of the responding Member States have also indicated that a national mapping agency is providing overall leadership for geospatial information management.

31. Sixty three percent of the responding Member States have indicated that they have carried out or planned for significant changes for their national institutional arrangements (NIA). These changes include the implementation of new policies to address data quality and availability; the establishment of new committees to reorganize existing activities for better synergies; and to increase participation to ensure wider representation and foster closer relationships with stakeholders.

32. While participation in NIA has traditionally been led by the government, there is room for greater participation from academia, non-government organisations and the private sector. In particular, academia and the private sector can supplement the government's role in the creation and provision of geospatial data; skills training; and in research and development. Exhibit 1 (annex) provides a possible blueprint for Member States to strengthen the various roles, expertise and collaborative partnerships with the various stakeholders.

33. To achieve an effective geospatial information management organization, responding Member States emphasized the importance of coordination and collaboration among entities; infrastructure and technological facilitation; and the use of geospatial information for policy and decision-making. The top priorities in governance policies include more data sharing; an open data environment; and the adoption of data and service standards.

34. The survey on geospatial information management structures has helped to identify six key drivers for an effective organization. They include: 1) stronger coordination, participation and collaboration among entities; 2) infrastructure and technological facilitation; 3) use of geospatial information for policy and decision-making; 4) data sharing; 5) an open data environment and 6) the adoption of data and service standards.

35. National geospatial information agencies are in the early stages of introducing and making use of volunteered geographic information. While citizens are critical volunteered geographic information contributors and users, domain experts, non-government organisations and the private sector also play major roles. In particular, the main purpose for adopting volunteered geographic information has been for change detection and reducing the costs of data collection.

36. The main advantages of volunteered geographic information as stated in paragraph 35 has to be examined against its weaknesses, which are in the areas of data quality and data assurance. In addition, the shortage of expertise and participation in volunteered geographic information were identified as the main weaknesses in the data contribution process.

37. In addressing these weaknesses, national geospatial information agencies can establish systems to verify volunteered geographic data and provide programs for managing certified datasets. They can also educate, advocate and facilitate the understanding and importance of volunteered geographic information and provide communication channels between producers and volunteered geographic information users.

38. Volunteered geographic information would likely be a major emerging source for rapidly collecting geospatial data, change detection and updating of datasets. However, there are concerns about the shortage of quality assurance and general participation. The challenges, moving forward, is to identify the advantages and weaknesses of volunteered geographic information from both the data and contributor's perspectives, and to encourage Member States to develop best-practices on the collection, quality-assurance and application of volunteered geographic information.

IV. Next Steps and Recommendations

39. The understanding of, and highlighting the need for, strong institutional arrangements for geospatial information management is the main objective of the Working Group. There are still many challenges in establishing and maintaining institutional arrangements within national government frameworks. The goal therefore, is for national geospatial information authorities to understand these factors and to design structures that will provide the framework to serve their mandate and the needs and objectives of their stakeholders.

40. In line with its objectives over the next years, the Working Group is preparing an agreed compendium of characteristics/criteria to determine effective geospatial institutional arrangements, taking into account the close linkages with legal, policy and statistical institutional arrangements, publication(s) detailing best practices in geospatial institutional arrangements, and an approved index or indices for evaluating and monitoring the status and/or evolution of geospatial institutional arrangements.

41. Given the lower than anticipated response rate to date, the Working Group proposes that the questionnaires be re-circulated to allow more Member States to participate and thus generate more conclusive results from the analysis. The proposed new deadline for submitting completed questionnaires is 30 September 2015.

42. The Working Group intends to prepare an objective assessment of the geospatial information management systems in the different countries using the results from the surveys, (the combined answers from the initial surveys and those received up to 30 September 2015), and the information from the report on “The Status of Topographic Mapping in the World” (Konecny, ISPRS). This will be undertaken with the consensus of the NIA WG, by selecting some indicators, combined with a segmentation of countries across a United Nations index, such as the Human Development Index (HDI), which would allow the Working Group to identify the best practices on geospatial information management on a range of countries.

43. Consolidation of user requirements and of core data scoping will have to be carried out in 2016 in order to extend the nine land topics studied in this first analysis phase during 2014/2015, to other land themes. In addition, marine and atmosphere are to be considered as topics for future work.

44. The Working Group aims to complete the diagnosis phase and identification of best practices, to identify the main trends related to production systems, funding structures, data dissemination systems, data policy models, organizational structures and role of the volunteered geographic information as stated in the work plan. This work will use the UN-GGIM paper “Future trends in geospatial information management: the five to ten years vision” as reference. The final report with the complete conclusions is expected to be delivered by the end of January 2016.

45. The Committee of Experts is asked to encourage Member States to actively participate in the work agenda of UN-GGIM, particularly in activities relating to the Sub-Tasks of the Working Group on National Institutional Arrangements.

46. The Working Group intends to define a strategy and identify a forum to elaborate on the discussion of the major findings related to funding structures, data dissemination systems and data policy models and show the scenario that prevails in different regions as a reference for the analysis and perspective of the situation of each Member State.

47. The six key drivers for an effective geospatial information management organization identified in Section III, paragraph 34 could be used to further develop a self-assessment tool for Member States to assess the effectiveness of their national geospatial information agencies. To do so, we recommend identifying Member States who had performed well in some or all of these areas as possible candidates for best practice case studies. Together with the assessment tool, it should help Member States take practical steps to achieve synergies with their stakeholders and to strengthen the aspects of geospatial information management.

48. The volunteered geographic information survey was the first-step taken to understand the strengths and weaknesses of volunteered geographic information. Future steps to identify best practices could help with deeper investigation into the pros and cons from both the data and contributor's perspectives. Additional steps also include encouraging Member States to develop the best practices on the collection, quality assurance and application of volunteered geographic information.

V. Points for discussion

49. The Committee of Experts is invited to:

(a) Take note of the report and the work of the Working Group and its three Task Groups inclusive of the combined background paper;

(b) Express its views on the way forward based on the next steps and recommendations proposed by the Working Group to address its mandate relating to national institutional arrangements;

(c) Approve the approach to:

(i) Recirculate the questionnaires and encourage Member States to respond in order to achieve a higher representative sample and more informed results;

(ii) Convene a technical meeting at an appropriate time in 2016 to expand the discussion on geospatial information institutional arrangements, inclusive of legal and policy frameworks, and to prepare a compendium of characteristics/criteria which determine effective geospatial institutional arrangements; and

(d) Encourage Member States to actively participate in the work program of the Working Group.

Annex 1

