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**United Nations Expert Group Meeting on**  
**Handbook on Geospatial Infrastructure in support of Census Activities**  
**7-10 April 2008, New York**

**Report of the Expert Group Meeting**  
**on the**  
**Handbook on Geospatial Infrastructure in support of Census Activities**

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## I. Introduction

### Background and objective of the meeting

1. The United Nations Expert Group Meeting to Review the Handbook on Geographic Databases and Census Mapping was convened in New York, 7-10 April 2008. The meeting was organized by the United Nations Statistics Division (UNSD) in support of the 2010 World Programme on Population and Housing Censuses.
2. The objective of the meeting was to critically review the draft Handbook on the use of geospatial tools in support of census activities. This is a revision of the 2000 Handbook on Geographic Information Systems and Digital Mapping<sup>1</sup> produced to support the activities of the 2000 World Programme on Population and Housing Censuses.
3. The Handbook provides detailed technical and operational guidance on the recent developments in technology, methods and standardization related to geographic information and census mapping, which have been reflected in the recently published *Principles and Recommendations for Population and Housing Censuses, Revision 2*,<sup>2</sup> adopted by the United Nations Statistical Commission in February 2007, and draws on the experiences of countries in using geospatial technologies with census mapping operations.
4. The meeting brought together 8 experts from national statistical offices, the consultant responsible for preparing the draft Handbook, as well as representatives from WHO, OCHA and ECA. (See Annex 1 for the list of participants.)

### Opening of the meeting

5. The Meeting was opened by Jeremiah Banda, Chief of the Demographic and Social Statistics Branch, on behalf of Mr. Paul Cheung, Director of the United Nations Statistics Division. (See Annex 2 for the statement of Mr. Cheung.)
6. Mr. Jean Michel Durr, Chief of the Demographic Statistics Section, made a statement on behalf of the Section.

### Organization of the meeting

7. The meeting was dedicated to the review of the draft Handbook. The draft document was reviewed from beginning to end, section by section. There were two sessions each day and country experts introduced and chaired the respective sessions. Experts brought

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<sup>1</sup> United Nations publication, Sales No. E. 00.XVII.12.

<sup>2</sup> United Nations publication, Sales No. E.07.XVII.8.

out parts of the text that were unclear or contentious and made concrete suggestions for changes, with the purpose of improving, clarifying and building upon the text.

8. The Rapporteur of the meeting was Mr. Dozie Ezigbalike, from ECA.

## **II. Summary of discussions**

9. Many suggestions were offered for improving the draft Handbook and clarification was sought on many parts of the draft. Many of the points raised were straightforward for which solutions were quickly agreed upon, but others sparked some discussion and further inquiry. Only the more salient discussions are included in this summary. Comments are organized such that general ones pertaining to the entire Handbook are presented first, under the heading ‘General Comments on the Draft Handbook’. These are followed by discussions for each part of the Handbook (Parts One through Five; and Annexes).

### **General Comments on the Draft Handbook**

10. There was a general discussion on the specific audience of the publication and it was recommended that the Handbook target both census practitioners and the heads of statistical agencies.

11. Related to this, it was also suggested to start with an introductory executive summary aimed specifically at heads of statistical agencies, followed by chapter 2. To support this change, participants suggested the addition of a chart on the organization of the Geographic Unit with possible country examples that convey to executives and heads of NSOs that no push-button solution exists, but rather that a flexible framework can be applied.

12. The experts discussed the provisional title that was suggested for the draft Handbook and agreed upon the following title: “Handbook on Geospatial Infrastructure in support of Census Activities”.

13. There was also a general discussion on the specific format of the Handbook, mainly as to whether it should be a cookbook or a manual. The group agreed that the Handbook should be simple, address main concerns and be written in a self-contained “cookbook” format that targets both technical and managerial census personnel.

Experts stressed that the introduction should explicitly detail what has changed from the first revision and the rationale for the new revision and emphasize results and efficiency gains from developing a geospatial infrastructure for census activities.

14. Experts suggested that efficiency arguments be merged with cost benefits (investments and benefits) and that critical success factors for geospatial implementation be expanded. They stressed to re-organize the sequence of the Handbook to better reflect the integration of GIS and other geospatial tools into the census mapping process, but suggested tempering the stress on the geodatabase as playing a central role but instead rather a support role in census activities.

### **Part One (Introduction/chapter 1)**

15. The experts suggested including introductory information on what the Handbook is and is not about. It was also suggested by the experts to move the section for statistics agency heads to Chapter 2.

16. The experts elaborated on the fact that the revision should explain how to exploit GIS and other geospatial technologies in order to modernize census operations and add efficiency to the census as a whole. This included explaining how geospatial tools can help improve data quality and lower costs in subsequent censuses.

17. The experts added a point that the census geodatabase be created so that it would integrate and/or evolve into a data collection infrastructure for the entire country and possibly contribute to the National Spatial Data Infrastructure..

18. The experts proposed the addition of an organizational chart illustrating the role and functions of the geographic divisions of an NSO. The representative from South Africa also proposed the addition of a table in which the reader would be able to find out to which stage of the all census process and to which function each of the section of the Handbook are addressed to. In the same spirit, the representative from WHO also proposed the creation of a new set of figures based on the current figures 1.1, 2.5 and 4.1 in order to provide the users with an example of how the different steps in the process can be linked together in order to form a comprehensive chain of operations.

19. The Handbook should approach census-related GIS and mapping activities within the scope of pan-government information infrastructure, with emphasis on institutional collaboration through the vehicle of Spatial Data Infrastructure (a National SDI at the country level). In addition, Experts stressed that Metadata is critical and should be developed, particularly in the absence of standards; but if standards are available, we should use them early in the process.

### **Part Two (chapter 2) - Constructing an enumeration area (EA) level database for the census**

20. Experts expressed that more emphasis be given on the criteria for the delineation of enumeration areas. Also, best practices for boundary management needed to be defined in greater detail. Further to this point, with specific concern to administrative boundaries, it was emphasized that NSOs should have easy access to the administrative boundary spatial datasets as these boundaries are critical in their impact on population in terms of

economic and social development, elections, etc. In the spirit of building an SDI for the country and in case the creation and maintenance of this specific layer would not fall under the responsibilities of the statistical office, collaboration with the governmental institution in charge of this activity should be established. Also, experts stressed the need to “timestamp” or “freeze” boundaries prior to enumeration.

21. More specifically, the experts discussed the definition of boundaries and whether the mapping authority, NSO or local authority defines the boundaries. There was agreement on the importance of administrative boundaries and their impact on population, election, etc. It was therefore recommended that a proper coding scheme, that is expandable and ensure the unique identification of each object in the geodatabase, should be established regardless of the initial boundary data producer.

22.

23. As part of the discussion on specific reference time for census work and reference time for geography, experts called for the careful coordination and integration of relational data and outputs.

24. In reaction to a discussion by ECA and WHO on the definition of geocoding, experts referred to the 2007 EGM endorsed definition and discussion and agreed to use this definition in the Handbook.

25. Experts recommended that a general listing of the basic content/components of a geospatial database explaining the written requirements be included in the chapter. Within the listing, it was proposed to focus on the enumeration area and the census life cycle.

26. There was considerable agreement on the part of the experts to have the UNSD provide a list of potential software/hardware providers through a web link. This recommendation helped to keep from any possibility of a particular endorsement of products within the Handbook itself. The web link also provided the ability for easy updating and additions. However, experts did insist that emphasis be given to the software functionalities needed for census mapping. It was emphasized by the experts to look at capabilities of hardware very carefully (e.g. testing, adjusting schedules for printing, speed and volume). This would be outlined in a new section on hardware considerations or in Chapter 1.

27. The experts suggested that, although the main editing issues were discussed in the Handbook, several more problematic, high priority and high impact digitizing errors should be singled out and given focus.

28. Concerning quality assurance, problems in constructing a geospatial infrastructure must be addressed from the source, as an iterative process throughout the different stages of construction.

29. One expert expressed that metadata can drive software development and that a standardized metadata structure can facilitate and assist in streamlining geospatial activities. Therefore it is important to consider software options that are flexible to users' needs.

30. Experts recognized that metadata should be developed by NSOs to address two different types: the internal as well as the external demand. Furthermore, a need was expressed regarding the development of metadata for a group of countries with common concerns, for example at regional level (e.g., Regional metadata profiles for Africa, Asia, etc.)-.

### **Part Three (chapters 3) - Integrating fieldwork using GPS and remotely sensed data**

31. The experts recommended that the choice of developing a geospatial infrastructure has to be sustainable and geospatial data, be it produced in-house or outsourced, requires careful consideration since it will influence all future geospatial infrastructure productivity.

32. The section on GPS required more focus on what role GPS plays in the census mapping process. It was also stated that GPS uses and considerations may be cumbersome for boundary delineation without a clearly defined plan. It was suggested that purely technical content on GPS can be moved into an annex. However, experts agreed on keeping in the chapter some specific GPS aspects, such as using GPS to calibrate remotely-sensed imagery, field considerations with regard to functionality such as battery power, etc.

33. Experts suggested emphasizing the practical considerations with the use of remotely sensed imagery stating that planning in advance was critical in obtaining good results. They also suggested to include advantages and disadvantages of remotely sensed data, including air-photos. It was also mentioned that greater resolution in most cases is more critical for high density areas than for low density areas.

### **Part Four (chapter 4) - Use of Geographic databases (maps) during the census**

34. Experts suggested that it would be important to reiterate all the ways geospatial data can support census operations; maps and their use are ways to test the quality of the database; help decide on features in the maps ahead of time; differentiate map production (design, annotation, duration) and map printing.

35. Experts insisted that it be explicitly outlined that geography is integrated in the entire census process and to make sure every step in the process has a quality assurance component and an evaluation component.

36. It was stressed that an explanation of the various roles of the geospatial database during collection and operation be provided- field operations, management information systems, map production, etc.

37. The experts reiterated the notion that the handbook should be designed as guidelines enabling countries willing to make the shift to digital methods, including the building of geographic databases, by providing a range of options for the use of geospatial tools and associated benefits of these options.

### **Part Five (chapter 5) - Geographic databases for postcensal dissemination of results and analysis**

38. It was clarified by experts to take out text which reflected a separation of census process stages. For example, the word post-censal dissemination would not be used as it is an integrative part of the census.

39. In addition, experts advised making the spatial analysis techniques a subsection with some illustrative examples. It was stressed that this chapter should include new application areas, such as the use of demographic data for disaster management and humanitarian response.

40. The experts suggested that spatial analysis techniques be a separate subsection and that it contain more practical examples to be included in the spatial analysis section. For example, looking at urban or rural population access to health facilities or utilities; enumeration-landscape characteristics; locating villages and clustering or dispersion characteristics; network analysis.

41. More broadly, experts added that Chapter 5 consistently refocus on “who’s it serving?”. This included focusing on such items as mechanics, documentation, legal/institutional aspects, etc.

### **Annexes (besides list of participants)**

42. The meeting agreed that wording on the overview of GIS be used from the 2000 handbook but also include some emphasis on GIS as a system and not a software package (example of Figure A.1.1 which needs to be revisited in this regards). Also, all the figures in the annex needed partial updating of numbering and in some cases, although not substantial, the content. Within the technical content on geographic based languages it was agreed to add a section on Unified Modeling Language (UML) instead of data-entity model. Specific definitions will be provided on data dictionary and metadata.

43. The glossary presented in Annex 6 needs to be revisited in order to make sure that it does include all the technical terms contained in the text. Links to potential online GIS dictionary(ies) should also be considered to complement this Annex.

### **III. Conclusions & Recommendations**

44. The Group of experts recognized the importance of the Handbook content which provides a comprehensive overview on the contemporary geospatial technologies and methods used to improve census mapping operations, and constitutes useful guidelines needed by many countries planning to conduct their censuses. A number of detailed suggestions for revision of the draft were made by the Group. A summary of comments and recommendations follows.

#### **Focus of the handbook**

45. The Expert Group meeting agreed that the handbook should focus on the geospatial infrastructure and techniques to support the census process. The title of the handbook should reflect this focus. It was, therefore, proposed to be titled: Handbook on Geospatial Infrastructure in Support of Census Activities.

#### **Target Audience**

46. The meeting recommended that the Handbook should target both census practitioners, to provide them with technical guidance and best practices in the implementation of the census process, and heads of statistical agencies to advocate for the use of geospatial technologies for the census and other statistical activities.

#### **Structure of the handbook**

47. The meeting agreed that the structure of the handbook be simple and as practical as possible, and expressed the need for the handbook to attract a wide range of users and to appeal to both census mapping practitioners and executive decision-makers.

#### **Institutional collaboration**

48. The meeting noted that implementing geographic databases to support the whole census process requires several geospatial activities, some of which fall within the expertise and mandates of other government and non-government agencies and organizations. The experts therefore recommended that the handbook should highlight collaboration and partnerships for building and maintaining the geospatial infrastructure to support census activities. The goals and objectives of the collaboration should be clearly spelled out.

#### **Planning**

49. The meeting emphasized the need to have a good and comprehensive plan on how to implement and maintain an effective geospatial infrastructure. To ensure that the geospatial tools serve all aspects and stages of the census process, the plan should start from the outputs and services of the census and then work backwards through the stages and activities to the beginning.

#### **Metadata**

50. The meeting recognized that metadata are critical for the effective and efficient use of geospatial information. The development of metadata should take into account two key user

communities- external and internal users. It was noted that metadata development requires time and planning. National statistical offices should, therefore, be encouraged to use available standards.

### **Quality Assurance**

51. The meeting emphasized the need to develop a comprehensive quality assurance programme to serve as an integral component of the geospatial infrastructure. Developing standard protocols for geospatial data processes will enhance the quality of the geospatial infrastructure in general and the services and products provided in particular.

### **Technology**

52. The meeting expressed the need to define the required functionalities needed in a software/hardware technology for census mapping rather than citing specific technology options. However, as technology options are dynamic they require constant upkeep and information on the various options would be better suited in a link provided on the United Nations Statistics Division (UNSD) webpage or census knowledge base.

### **Dissemination**

53. The meeting stressed that as a strategy, defining a standard census geography product line early in the census planning phase, would be beneficial across all the project phases and also help to make users know what to expect. The dissemination strategy should consider the widest scope of uses and needs with special attention to disaster management and humanitarian response.

### **Handbook Timeline**

54. The meeting urged the United Nations Statistics Division to reformulate the outline and first chapter of the handbook and circulate them among the experts for review and integrate their comments and recommendations as quickly as possible. When finalized, the handbook should be widely disseminated and promoted to help countries in the implementation of their censuses in the 2010 round of Population and Housing Censuses.

### **Addressing systems**

55. The meeting urged UNSD to pay special attention to the development of address systems and dwelling frames to guide some developing countries that are in the process of developing them. There is need to elaborate on the significance, sustainability and portability of such geospatial infrastructures.

### Annex 1. List of Participants

1.	Brazil	Mr. Rafael Castaneda Deputy Director of Geosciences IBGE / DGC
2.	Canada	Mr. Joe Kresovic Assistant Director. Geography Division Statistics Canada
3.	India	Mr. Chinmoy Chakravorty Joint Director, Office of the Registrar General and Census Commissioner, India
4.	Morocco	Mr. Abdellah Sougrati Head of Cartography and GIS Division Direction de la Statistique,
5.	Portugal	Ms. Ana Maria Santos Head of Geoinformation Unit National Statistics Office
6.	South Africa	Ms. Sharthi Laldaparsad Executive Manager Statistics South Africa
7.	St. Lucia	Ms. Sherma Lawrence Central Statistical Department St. Lucia W.I.
8.	United States of America	Mr. Tim Trainor Assistant Division Chief Geography Division, U.S. Census Bureau
<b>Regional Offices/International and other Organizations</b>		
9.	ECA	Mr. Dozie Ezigbalike Chief, Geo-Information Systems Section, ISTD UN Economic Commission for Africa

10.	OCHA	Mr. Paolo Palmero Information Management Officer OCHA, New York
11.	WHO	Mr. Steeve Ebener Project Manager, eHealth World Health Organization
12.	UNSD Consultant	Mr. David R. Rain, PhD Assistant Professor of Geography And International Affairs The George Washington University
<b>United Nations Statistics Division</b>		
13.	UNSD	Mr. Jeremiah Banda, Chief Demographic and Social Statistics Branch UN Statistics Division, New York
14.	UNSD	Mr. Jean-Michel Durr, Chief Demographic Statistics Section Demographic and Social Statistics Branch UN Statistics Division, New York
15.	UNSD	Mr. Amor Laaribi, Demographic Statistics Section Demographic and Social Statistics Branch UN Statistics Division, New York
16.	UNSD	Mr. Charles Brigham Reese Associate Statistician Demographic and Social Statistics Branch UN Statistics Division, New York
17.	UNSD	Ms. Margaret Mbogoni Statistician Demographic Statistics Section Demographic and Social Statistics Branch UN Statistics Division, New York
18.	UNSD	Ms. Diane Stukel Interregional Advisor on Population & Housing Censuses Demographic and Social Statistics Branch UN Statistics Division, New York

## Annex 2 : Organization of work

<b>Day 1:</b>	
9:00 a.m. – 10:00 a.m.	Registration of participants
10:00 a.m. – 10:30 a.m.	Opening of meeting
10:30 a.m. – 1:00 p.m.	General Comments on the Draft Handbook: Structure, orientation, focus  Chapter 1 Managing the geospatial census
2:30 p.m. – 5:30 p.m.	Chapter 1 Managing the geospatial census (cont.) Wrap up, conclusions, recommendations
<b>Day 2:</b>	
9:30 a.m. – 1:00 p.m.	Chapter 2. Constructing a digital enumeration area level database for the census
2:30 p.m. – 5:30 p.m.	- Chapter 2. (cont.) Wrap up, conclusions, recommendations - Chapter 3. Integrating fieldwork with remotely sensed data for a more effective census
<b>Day 3:</b>	
9:30 a.m. – 1:00 p.m.	- Chapter 3. (cont.) Wrap up, conclusions, recommendations - Chapter 4. Using geographic databases to create maps for enumerations
2:30 p.m. – 5:30 p.m.	- Chapter 4. (cont.) Wrap up, conclusions, recommendations - Chapter 5. Using geographic databases for post-censal dissemination of results and analysis
<b>Day 4:</b>	
9:30 a.m. – 1:00 p.m.	Chapter 5. (cont.) Wrap up, conclusions, recommendations Annexes
2:30 p.m. – 5:30 p.m.	Final Comments Conclusions and Recommendations Final Remarks