



UNITED NATIONS SECRETARIAT

**Department of Economic and Social Affairs
Statistics Division
New York**

**November 2007
English only
ESA/STAT/AC.145**

 2010 World Population and Housing Census Programme

**Report of the United Nations Sub-regional Workshop on Census
Cartography and Management**

**Bangkok, Thailand
15 – 19 October 2007**

INTRODUCTION	3
OBJECTIVES OF THE WORKSHOP	3
ATTENDANCE.....	3
OPENING SESSION.....	3
<i>United Nations Economic and Social Commission for Asia and the Pacific</i>	3
<i>United Nations Statistics Division</i>	4
PROCEEDINGS AND DISCUSSIONS.....	4
REVIEW OF UNITED NATIONS PRINCIPLES AND RECOMMENDATIONS FOR POPULATION AND HOUSING CENSUSES.....	4
CENSUS MANAGEMENT AND PLANNING	5
REVIEW OF EGM ON CONTEMPORARY PRACTICES IN CENSUS MAPPING AND USE OF GIS.....	5
CENSUS MAPPING USING CONTEMPORARY TECHNOLOGIES IN PARTICIPATING COUNTRIES	5
COUNTRY PRESENTATIONS.....	6
<i>Afghanistan</i>	6
<i>Bhutan</i>	6
<i>Cambodia</i>	6
<i>China</i>	6
<i>India</i>	7
<i>Indonesia</i>	8
<i>Iran</i> ⁸	
<i>Malaysia</i>	9
<i>Nepal</i>	9
<i>Pakistan</i>	10
<i>Philippines</i>	10
<i>Sri Lanka</i>	11
<i>Viet Nam</i>	11
GIS FUNDAMENTALS/ GIS DATABASE DESIGN	12
DATA COLLECTION AND DATA CONVERSION	12
SPATIAL STATISTICS APPLICATIONS AND ISSUES AND THE USE OF GEOSPATIAL TECHNOLOGIES	12
SPATIAL STATISTICS APPLICATIONS	13
DISSEMINATION ISSUES.....	13
CENSUS MANAGEMENT & PLANNING FOR THE USE OF GEOGRAPHIC INFORMATION SYSTEMS	13
THE ROLE OF POPULATION AND HOUSING CENSUSES IN DISASTER MANAGEMENT	13
RECOMMENDATIONS AND CONCLUSIONS.....	14
GENERAL	14
PRINCIPLES AND RECOMMENDATIONS FOR POPULATION AND HOUSING CENSUSES.....	14
CENSUS PLANNING AND MANAGEMENT	14
IMPLEMENTATION OF GIS IN POPULATION AND HOUSING CENSUSES	15
POPULATION AND HOUSING CENSUS AND DISASTER MANAGEMENT	15

Introduction

Objectives of the workshop

1. The purpose of the Workshop was to highlight the capabilities of Geographical Information System (GIS) and other geospatial technologies in census mapping activities, including preparation of enumeration, enumeration operations, advanced analysis and dissemination of census data, and how to successfully implement and use these technologies. More specifically, the workshop: (1) presented an overview of GIS fundamentals and census geography concepts, including geo-coding systems, and critical links between census mapping and disaster management; (2) focused on practical data collection and conversion to digital format, and on GIS-based data analysis and dissemination; (3) demonstrated practical examples of GIS use with appropriate software; and (4) facilitated a dialogue among participants from participating countries on census mapping with GIS, experiences and practices, with a focus on institutional, organizational, financial, capacity building and implementation issues. The first part of the workshop was dedicated to a review of the United Nations Principles and Recommendations for Population and Housing Censuses, a discussion on census management and planning and the relationship of the population and housing census and disaster management.

Attendance

2. Sixteen countries were represented in the workshop (Afghanistan, Bhutan, Brunei Darussalam, Cambodia, China, India, Indonesia, Iran, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Viet Nam). International organizations: United Nations Office for Coordination of Humanitarian Affairs (UN OCHA), United Nations Children Fund (UNICEF), for a total number of 31 participants.

OPENING SESSION

United Nations Economic and Social Commission for Asia and the Pacific

3. Mr. Ilpo Survo, on behalf of Mr Pietro Gennari, Director of the Statistics Division of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), welcomed the participants and wished them a successful workshop. He reminded that population and housing censuses provide crucial information for a number of purposes, including policy planning. Therefore, the improvement of population census data requires adherence to international statistical standards, good planning, a significant capacity building and accompanying infrastructure.
4. In preparation for the previous, 2000 round of censuses, an ESCAP project evaluated emerging technologies in census operations. The results were conveyed to regional census offices through technical workshops and guidelines on using selected technologies, including the use of Geographical Information System (GIS). Since then the information technology (IT), including space-based and location-based applications, has evolved considerably. Furthermore, there has been a dramatic increase in the use of GIS technology and digital maps in the region. Therefore, it was most appropriate that this Workshop was focusing on GIS.
5. ESCAP, together with its regional and national partners, is placing increasing importance on disaster preparedness and management. In this regard, the representative of ESCAP expressed his satisfaction to have in the programme a half day dedicated to using GIS and census data for disaster management.
6. ESCAP has attempted to create a Regional Census Programme for which country advice was sought. As a result a Programme of three components, namely on (i) promoting Global Census

Principles and Recommendations, (ii) building a migration data system around population censuses, and (iii) supporting the effective use of information technology in population censuses, was drafted and submitted for donor funding. That programme was designed on the basis of establishing a regional network of experts in thematic areas for knowledge sharing. An Expert Group Meeting will be held in December in Bangkok to guide the further work on these issues.

United Nations Statistics Division

7. On behalf of Dr. Paul Cheung, Director of the United Nations Statistics Division (UNSD), the representative of UNSD welcomed the participants to the workshop. He outlined that this workshop is part of the 2010 World Programme for Population and Housing Censuses, as initiated by the United Nations Statistical Commission in March 2005 for the period 2005 to 2014. The three essential goals of the World Programme are: (i) to agree on a set of acceptable international principles and recommendations governing the conduct of a census; (ii) to facilitate countries in conducting censuses during the period 2005-2014; and (iii) to assist countries in their efforts to disseminate census results in a timely manner.
8. In the recent past, the United Nations Statistics Division conducted several workshops, in which participants expressed the necessity for countries to take into account the technological advances made since the previous round, especially in the area of Geographical Information Systems (GIS) and Global Positioning System (GPS). Participants in those workshops requested UNSD to prepare specific guidelines, including best practices and the strategies for evaluation of different contemporary practices.
9. Mapping is one the most critical activities of a population and housing census. Accurate delineation of enumeration areas and production of good quality maps ensure proper enumeration of population and housing units, without omission or duplication. Moreover, geographic information systems provide excellent vehicles for dissemination and analysis that give the full dimensions of the census data.
10. Furthermore, constituting detailed and constantly updated geographical databases is not only costly, but also time consuming and skill demanding. It is, therefore, necessary that countries share experiences of the pre-conditions, in terms of financial and human capital and skills, for the launching as well as the sustainability of the projects they undertake in this domain.
11. The UNSD representative highlighted the collaboration between the UNSD and the ESCAP for the preparation of this workshop and expressed his appreciation to the colleagues for hosting the meeting and providing facilities. In his opinion, it exemplifies the way the UNSD and the Statistics Divisions of the Regional Commissions have to work together in supporting the implementation of the 2010 round of Population and Housing Censuses for the benefit of the countries.

PROCEEDINGS AND DISCUSSIONS

Review of United Nations Principles and Recommendations for Population and Housing Censuses

12. United Nations Statistics Division presented the *Principles and Recommendations for the 2010 round of Population and Housing Censuses, Revision 2*, with special emphasis and elaboration of major changes compared with the version prepared for the 2000 round of censuses.
13. The participants noted the changes in the classification of living quarters as one of the more significant changes in this revised version of international standards. The discussion focused also on the new core topics, especially those related to fertility and mortality. It was emphasized that the new approach in the *Principles and Recommendations*, combining the core topics with recommended tabulations, presents a more consistent guideline while bringing the issues of the outputs up front. It was also noted that some countries in the region are moving from the *de facto*

to the *de jure* approach and there would be seeking guidance to ensure smooth transition and comparability between censuses.

14. Continuing the discussion on pertinent classifications, it was outlined that the current status of several international classifications needs further elaboration and support for implementation.

Census Management and Planning

15. The United Nations Statistics Division presented standards on census management and planning, with an emphasis on quality assurance and risk management. Quality management has been a raising issue during the 2000 Round of Population and Housing Censuses and countries are more and more sensitized to introducing quality management strategies in the preparation of their next census. Furthermore, census mapping is a complex and resource demanding process and therefore requires particularly attention to quality assurance considerations and risk management
16. The discussion raised the issue of staff selection and training, especially in very large countries such as China. Some countries call in teachers to serve as enumerators, or survey interviewers to supervise field operations. In all cases, participants noted, proper and adequate training represents the most demanding challenge.
17. The question of the delineation of the enumeration areas (EA) was debated and participants asked about the existence of international recommendations in regard the size of an EA. The criteria used are usually the size in terms of households or population in regard to the time allotted for the data collection, and the distance to be covered by an enumerator. Dissemination considerations can lead in certain cases to delineate smaller enumeration areas, and to give more than one of these small EAs to an enumerator.
18. The participants expressed their interest in the evaluation of census coverage through Post Enumeration Surveys (PES) and in the methodology of these operations. The workshop discussed the ways to ensure independence between the census and the PES, the possibility to correct the census results using coverage ratios given by the PES, and the sample frame. It was noted that the sample frame should take into consideration the whole country and the different populations, including the most difficult to enumerate, to provide accurate estimation of the coverage ratio.

Review of EGM on Contemporary practices in census mapping and use of GIS

19. Participants supported the conclusions and recommendations of the United Nations Expert Group Meeting on Contemporary Practices in Census Mapping and Use of Geographical Information Systems, recognizing the significant improvements in efficiency brought by these new technologies.

Census mapping using contemporary technologies in participating countries

20. The major issue, when elaborating on the state of the art of implementation of GIS for census geography in the region, participants noted, was the lack of adequate, continuous and comprehensive training. While some national statistical authorities were able to ensure the proper training at some occasions, in general this was the biggest hurdle to overcome in taking full advantage of the GIS technology. The workshop also underscored that there is no lack of labor force with more than adequate technical background available for training in GIS – it is simply the inability to ensure continuous training that prevents national authorities in faster implementation of GIS.
21. Once the training was completed and the use of GIS for census purposes on track, participants noted, another challenge related to the retention of skilled staff needs to be confronted. Indeed, with the proliferation of the GIS for numerous applications unrelated to the census and often commercially much more attractive and lucrative, it becomes increasingly difficult to retain the qualified staff.

Country presentations

Afghanistan

22. The presentation by the Central Statistical Office of Afghanistan provided information on past and current work related to census geography. The most recent application of contemporary approaches dates from mid-2005 when training and increasing mapping capacity at local level became available. As a result, over 2,000 topographic map sheets were digitized and geo-database for local administrative boundaries was established. Another major accomplishment refers to instituting hierarchical geo-codes for national and local administrative areas down to the sub-village level.
23. As for the ongoing activities, this geo-database will be used for delineation of enumeration areas for the Population and Housing Census and for generating census enumerators' maps. In addition, it will represent a basis for data dissemination for census and surveys.

Bhutan

24. In preparation for the 2005 Population and Housing Census, the Central Statistical Office of Bhutan undertook a comprehensive project in implementing GIS for census mapping as well as other mapping related applications. Using Geographical Position System (GPS) devices, every single structure used for housing in the country was assigned with geographical coordinates. In addition, all topographical maps were digitized providing different layers (natural features, roads, etc.). In the last phase, a geo-database was created that generated over 6,800 enumerators' maps.
25. An on-line dissemination feature using GIS software, hardware and data migration was developed. The benefit of having an on-line, GIS server was explained along with a description of the types of geographic indicator maps available to users. The presentation concluded with a detailed display of the on-line capabilities of the Bhutan Map server. The Map server provided through the CSO of Bhutan allows users to query and display a comprehensive geographic datasets and various scales. The presentation was accompanied by another associated presentation on common statistical results generated for census purposes produced using GIS.

Cambodia

26. In the preparation for the 2008 Population and Housing Census, the National Institute of Statistics of Cambodia has a census mapping project underway. It consists of dispatching mapping teams throughout the country and preparing hand-drawn maps of each enumeration area, while at the same time using GPS to identify the center of the village and the listing of the households. The process also involves digitizing the village boundaries as well as boundaries of administrative units; it also consists of assigning a unique bar-code and label to each EA for coverage checking, progress tracking and other activities and building a database of all EA.
27. In further phases, the EA Database will be merged with the existing digitized maps of village and administrative boundaries with overlays of natural features to provide a board for disseminating geo-referenced census results.

China

28. The presentation by the National Bureau of Statistics of China focused on the development and use of GIS for census mapping in China. The National Bureau of Statistics China conducts the Population Census (2010) and Agriculture Census (2017) every ten years. The Economic Census is conducted every five years (2008). As the Census is organized in accordance with administrative divisions (province, city, county/district, town, village/block and enumeration areas), the local government and local statistics officials, during these activities, inherently take

on an important role. This is especially the case when it comes to census mapping. Previously, hand-drawn census maps were used since available digital maps were too small scale to provide sufficient details, or they were considered out of date. However, in the past 5 years, many cities generated high-quality, large-scale digital maps, through surveying and aerial photography. The methods for the digitizing of this imagery in a GIS are, in some instances, developed in-house by the local statistics office. Census data are linked with spatial data, by adding hand-drawn EA boundaries above the new maps as an overlay.

29. Usually the local bureau of statistics and their selected commercial company/companies develop and manage these spatial databases and management systems which are funded by the local government. Such systems include GIS software such as SuperMap, ArcGIS, and MapInfo. An illustration of the use of GIS was provided for Qingshan District, Baotou City, which incorporates a GIS developed in-house as well as a commercial software platform. The resulting GIS is used internally, and not open to the public due to issues involving privacy protection and the restrictions associated with disseminating spatial data.
30. Due to the variability in the accuracy of census maps and systems used in the different cities (e.g. scale, paper maps, digital maps); there is a need to develop uniform standards that can be used throughout the country. Land use in big cities changes often and the necessary large scale maps needed for updating are restrictively expensive for local governments to purchase. As this is the case, the National Bureau of Statistics is developing a uniform standard for census mapping that encompasses a framework, approach, software and funding availability.
31. All surveying and mapping activities are under the supervision of the State Bureau of Surveying and Mapping (SBSM) in China. Therefore a closer cooperation is needed between SBSM to support census mapping and develop standards of the basic map elements for census mapping (imagery etc.). For spatial analysis and display for census purposes a platform is proposed to be constructed and named Economic and Social Statistic GIS (ESSGIS). The Census Center of National Bureau of Statistics is responsible for developing and managing the platform. This new platform is geared for census mapping, management of the census database, analysis of the data, and data dissemination. Also under development is a project to create simple cost-effective software for use in census mapping that minimizes the need for manual drawing. This specific, census-based software is to be developed by SuperMap GIS Technologies. The application for funding for these activities mentioned is currently underway and it is hoped that a trial using these constructed technologies will be evaluated during the 2008 Economic census of China. Planned implementation of GPS and PDA units are also underway for census mapping activities in China.

India

32. The presentation by the representative of the Office of the Registrar General and Census Commissioner of India focused on disaster mitigation strategies using housing census data. It detailed the types of small area datasets that are useful in disaster management and provided an overview of the different natural disaster zones in India. Approximately 54% of area of India is prone to earthquakes, 12% percent to floods and 8% to cyclones and these fact increase the importance of making census data available at the smallest possible level.
33. In addition, the content of the census has to meet the needs of the disaster managers and that was taken into account in preparation of the census of India. Therefore, data from the housing census, pertaining to the characteristics of housing, such as material of external wall or floor, housing amenities and access to drinkable water presented at the district level enable proper planning in case of disaster. The case in point was the state of Tamil Nadu, India, and the set of maps at district level providing overlays related to housing conditions and, in indirectly, the level of vulnerability to natural disasters.

Indonesia

34. The presentation by the Central Bureau of Statistics of Indonesia focused on issues and methods pertaining to census mapping activities in preparation for the 2010 Population census. The main tasks of Statistical Mapping Sub-directorate are in the management of regional statistical offices in sketching maps of enumeration areas and administrative areas (province, regency/city, sub-district, and village), aiding and assisting regional statistical offices in the coding of administrative areas and enumeration areas, archiving enumeration area and administrative area sketch maps, digitizing and updating administrative boundaries based on administrative area sketch maps, and making census maps for publication.
35. Map availability in BPS range from sketch maps to guide enumerators; province by regency/city; regency/city by sub-district; sub-district by village; village by enumeration area. All areas are guided by the administrative area coding system which follows a village/sub-district/regency-city/province breakdown.
36. The development of the digital map began in 1994 in collaboration with the National Coordinating Agency for Survey and Mapping to obtain digital map of Indonesia by regency/city (scale 1 : 250,000). The digitizing of sub-district boundaries inside each regency/city polygon (based on sketch maps of regency/city by sub-district) was conducted as well as the digitizing of village boundaries inside each sub-district polygon (based on sketch map of sub-district by village). GIS Software was used to digitize these administrative area boundaries. Recent program and planning involve upgrading the accuracy of administrative area digital maps. GPS readings will be used for delineating administrative area boundaries based on a topographic map provided by the National Coordinating Agency for Survey and Mapping or sources such as Google Earth. A comprehensive statistical web-based GIS is also planned for development. The reason for upgrading the accuracy of the administrative area digital map is to provide accurate geo-referencing for more efficient spatial analysis as well as to provide users a comprehensive and spatially accurate digital map. The geo-referenced digital map will improve the accuracy of statistics related to area and distance and improve geo-statistical analysis capabilities.
37. In planning for preparation of 2010 Population Census there is a need to review the enumeration area used to reflect neighborhood association since many people are not familiar with the current one used. Reforming enumeration areas and sketching maps of enumeration and administrative areas will be conducted in 2008 and 2009. The priority regencies will be sub-districts/villages areas which are predicted as unchanged until Population Census 2010. The delineation of boundaries of enumeration and administrative areas using GPS is to begin in 2009 with priority give to big cities.
38. A study for delineating boundaries using GPS was conducted in 2006 and 2007. Findings concluded that, at times, boundaries of enumeration/administrative areas cannot be traced or that weak to no GPS signal existed in densely populated areas. In these cases where the administrative area boundaries can not be delineated with GPS, delineation by on-screen digitizing of a purchased topographic map or imagery such as Google Earth may be used. It should be noted that the maps required are costly. GPS data processing was also found to be difficult and training is necessary. Ideally 1 GPS receiver is used to delineate 10 villages. All considered, some 7230 GPS receivers are needed, which is not financially feasible and requires assistance of external agencies and institutions to implement this method of making enumeration area maps for 2010 Population Census round.

Iran

39. The presentation by the Statistical Centre of Iran (SCI) detailed the national experiences in the application of contemporary technologies. This included GIS, GPS, and remote sensing (RS). Remote sensing technology (IKONOS and QUICKBIRD) was used for updating urban maps before execution of any census by using satellite images. The necessary corrections such as

atmospheric and geometric corrections were applied by National Cartographic Centre of Iran (NCC) and consequently, the modified and processed images were delivered to the SCI. The satellite images were placed in the background of the urban maps in order to compare them with the maps and find any changes or newly appeared features in them and changes and new features were then digitized.

40. GPS technologies and their application were used as a tool for updating statistical maps before execution of the censuses. In rural area maps, features such as villages and roads were surveyed and coordinates of new feature were registered by handheld receivers. Maps were also modified by standard cartographic operations. In urban area maps, differential GPS (DGPS) method was used and the map blocks of cities were updated accordingly. GIS provided the tools to create thematic maps and EA maps to assist census processes. During the 2006 Population and Housing Census, thematic maps were created simultaneously for controlling the progress of the Census. Regarding Delineation of EAs, SCI has largely focused on cleaning up and making maps GIS-ready; preparing attribute tables (the work volume for each block and village); creating shapefiles and linking attribute tables; delineating EAs and supervising areas by using specific software suites.
41. The presentation also included the use of a Personal Digital Assistant (PDA) for the purpose of Consumer Survey. PDA's were used by the SCI staff mainly for providing the list and addresses of samples; preparing maps in shape file format; linking samples attributes tables to shapefiles; data collection. This experience will be further elaborated and evaluated in terms of feasibility for future data collection exercises.

Malaysia

42. The presentation by the Department of Statistics of Malaysia outlined the development of GIS with regard to the 2010 Population and Housing census. As a first step, a concept of two main types of small areas was established – administrative areas and statistical areas. Administrative areas have gazette boundaries, and refer to a state, administrative district, mukim-sub district and local authority area. Statistical areas are defined by the Department of Statistics and refer to census districts (CD) and enumeration blocks (EB). In the 2000, the total number of CD's was 550, with 52,877 EB's.
43. Preparation of census maps started in 1998 in a decentralized manner but with standardized guidelines. After the 2000 Census the updating of the census maps in the inter-censal period was assigned as a crucial component. This will lead to generating, for 2010 Census, EB maps, each consisting of 80-120 housing units and 500-600 persons. Using GIS software, the plan is to move from hand sketched EB maps used in 2000 Census to completely digitized EB maps for 2010. A part of this project is to assemble a census geo-referenced database that will be used for dissemination census results.
44. The dissemination of statistics from other sources, such as surveys and administrative records already uses the advantages of GIS for producing thematic atlases and maps, leading to a conclusion that GIS represent an essential information technology component in dealing with collection, managing and analyzing spatially referenced data.

Nepal

45. In the introduction to his presentation, the representative of the Central Bureau of Statistics (CBS) of Nepal outlined that GIS played a key role in production of EA maps. For generating thematic maps of census data and for analysis and dissemination of census results. As for the historical overview of census mapping, Nepal started to conduct population and housing censuses before 1950's without maps. Since then, the production of census maps evolved and the most recent process started in 1998 to produce maps down to the municipality level with ward boundary delineation. To achieve that, the existing topographic maps were digitized. The 2001 Census took

full advantage of GIS for post-census cartographic activities, by preparing a set of thematic maps at lowest level for dissemination of census results.

46. In the preparation for the 2011 Population and Housing Census and based on previous experiences, it was realized that the use of contemporary technology should be centered on preparing EA maps, as these are crucial to achieve complete coverage and enumeration throughout the country and greatly enhances the tracking of the enumeration activities. In producing EA maps, the Central Bureau of Statistics will use high definition images and topographic sheets produced by the national Survey Department. By combining the features of GIS software and by using the GPS for delineating the enumeration areas, the end-result would be an enumeration area map that will display not only the boundaries of the enumeration areas, but other relevant features as well, such bridges, roads, temples, rivers, parks and so forth, thus increasing the precision of the enumeration and the coverage. It has to be outlined that the CBS, in producing these EA maps, uses some of the already available, free of charge, satellite imagery, such as Google Earth.
47. As for the dissemination of geo-referenced census results, based on positive experiences in the previous census, CBS will continue this practice while at the same time exploring currently available techniques to enhance the end product, such as establishing geo-database and on-line dissemination.

Pakistan

48. The representative of the Office of the Chief Census Commissioner of Pakistan described the census cartographic work within the office. Organizationally, cartographic work is solidly embedded in the structure of the office, with a Joint Census Commissioner for Geography, heading two units, one for delineation of enumeration areas and the other for producing maps. The work focuses on updating of maps for administrative units (mauza/deh/village – over 50,000 in total), updating of urban area maps, finalization of list of areas, delimitation of census areas and geo-coding of census areas.
49. As far as census mapping goes, the current work is based on maps prepared for the previous census (1998) and updated in this inter-censal period on the field by census staff and staff of the revenue department. As for urban areas (around 500 in total) these updates are performed by census staff.
50. The delimitation of census areas is performed along the boundaries of administrative areas, with the smallest being the census block (approximately 150-175 housing units). Each census block is assigned with a unique nine-digit code indicating the census district (the highest aggregation), census charge and census circle, respectively. The process of digitizing maps is now underway and it is expected that field maps for census charge (second-level aggregation of enumeration areas) will be computer generated.

Philippines

51. The National Statistical Office of the Philippines presented experiences in census mapping. From the institutional point of view, the National Statistical Office includes a Mapping unit, with three groups: one for mapping standards, second for map production and the third for reproducing census maps. In the pre-census period over 1,000 staff are hired for mapping activities, while the permanent staff numbers around twenty.
52. Mapping techniques vary. In some areas of Metropolitan Manila, for the Census 2000, topographic aerial photography was used as a basis for census mapping – however, problems were encountered during this exercise related to the late delivery of maps from contractors, inaccurate delineation and lack of street names and landmarks. As for other areas of the country, census mapping was based on sketch-map approach with problems ranging from the lack of accuracy of base maps and lack of street and landmark identifiers.

53. In the 2007 Mid-decade Census, the strategy revolves around using Google Earth satellite imagery and converting these into GIS maps. However, Google images are not available for all areas of the country – most rural areas are not covered and some images are color-blurred. In addition, GPS hand-held units are tested as a mechanism for correcting inaccuracies – however, the number of these units has to be increased manifold and they are weather depended and field-work intensive.
54. Based on these experiences, the strategy for the 2010 Population and Housing Census evolves around acquiring sufficient number of GPS units, maximizing the use of satellite imagery and capitalize on contemporary development of GIS, especially at the level of local government units, thus setting solid foundation for subsequent statistical exercises.

Sri Lanka

55. The representative of the Department of Census and Statistics of Sri Lanka focused the presentation on the role of census in disaster management. Although disaster management is reactive in nature, prevention planning and community preparedness are crucial in mitigating the impact of natural catastrophes. And the population and housing census is a crucial source of data. In that respect, a set of census variables is identified as of particular significance, such as population by sex, age, ethnicity, religious affiliation, occupation, education, marital status, as well as series of housing census indicators such as type of building, material used for construction, availability of basic amenities.
56. These data need to be available at the level of a census block or a grid the size of 150 meters. With such approach, the affected population by the disastrous 2004 tsunami was accurately estimated thus enabling more efficient coordination of relief efforts. In addition, combining census data with information on hazardous areas enables disaster management more detailed planning of the rescue efforts and target population. In refining this technique, using a combination of factors, such as hazard zoning, population density and characteristics, media usage and combining it within a GIS framework, leads to developing overlays by giving weights and ranks to various factors resulting in identifying areas where risk awareness should be raised.
57. In conclusion, population and housing census plays a vital role in disaster management operations as it is the main source of data on population and buildings at small area level. However, census data have to be incorporated in different models including other factors such as hazard and land use data. GIS plays an exceptional role with its ability to integrating different data and producing comprehensive and easy-to-use maps.

Viet Nam

58. In presenting experience in Viet Nam in census mapping and household listing, the representative of the General Statistics Office of Viet Nam (something is missing?). The characteristics of the census mapping activities of Viet Nam for the 1999 Census and in the preparation of the 2009 census are linked to the approach of combining the refining of census maps with the household listing. Namely, the mapping activities usually start several years before the census date; however, the main mapping effort starts six months before the census. The country is divided manually into enumeration areas after which the drawing of the census maps starts. Each sketch map shows boundaries, streets, buildings and geographical features such as rivers, hills, trees and so forth.
59. For the 2009 Census the basis for census mapping would be amassing up-to-date maps for provinces districts and communes and then assigning local offices to validate the accuracy of the maps. In the next step, sketch maps of EA will be drawn with help of local officials. A coding scheme for EA is already developed. In the next step the household listing will be undertaken, providing the basic information on each housing unit and its inhabitants, including household number.

60. At this moment different approaches for digitizing and storing of EA maps is underway with the basic goal of ensuring sound sampling frame for post-Census statistical exercises and, at the same time use of GIS for dissemination of census data at small areas level.

GIS Fundamentals/ GIS Database design

61. The United Nations Statistics Division presented the Geographical Information Systems fundamentals and concepts, with a focus on the information cycle, the notion of projection and the difference between the two fundamental types of data: raster and vector. The conceptual model for a geographical database was also presented. The participants noted that United Nations Statistics Division could provide much needed support to national statistical authorities if it produces guidelines in regard the specifications of census maps, such as the scale and standardized icons.
62. An extensive discussion focused on the balance between the costs of developing digitized maps and the benefits resulting from such an effort. Participants noted that the situation in countries of the region was quite different. In some countries, the authority for producing geographical maps of any kind rested with the major civil divisions (provinces) while in other it was centralized at the country level. Similarly, the existence of the central cartographic agency at the national level and the delineation of authority for producing maps at the county level were not identical across the region; it also makes estimation of the costs of digitizing the process more complex as it involves a number of different agencies.

Data Collection and Data Conversion

63. UNSD made a presentation on the concepts and methods used for data collection, from existing maps, aerial photography, satellite images, and on methods used for data conversion (scanning, digitizing). The workshop conducted an exercise of manual digitizing, providing an opportunity to participants to acquire hands-on experience.

Spatial Statistics Applications and Issues and the use of Geospatial Technologies

64. UNSD introduced the concepts of modeling geo-database and especially the duality between geographical objects and other data. The participants could train to build a geo-database and to use the basic functionalities of GIS through a practical exercise.
65. An overview of the software packages available was presented to the participants. Many commercial suppliers exist, but a few dominate the market. Some issues are to be taken into consideration as the cost, ease of installation, training needs, documentation provided, maintenance and vendor support. Participants outlined the cost issue than can be prohibitive for some countries.
66. UNSD presented the concepts and methods for geocoding. Each country has to develop a geographical coding scheme for the hierarchical structure of civil divisions as well as enumeration areas. Data collection may be realized through two main categories of methods, matching collection or direct collection. The principles of the Global Positioning System (GPS) and the advantages of this technology were presented. GPS offers an easy way to capture data in the field, even if the signal may be obstructed in some dense urban or wooded area.
67. The representative of Trimble in Thailand presented different kind of GPS devices that can be used, with different levels of accuracy, from 20 meters to half-centimeter. Prices are directly linked to the accuracy. The presentation outlined the possible problems and the different methods used for differential correction. The Trimble representative concluded that GPS technology is an efficient technology for census mapping because it is a fast and accurate mean to capture digital coordinates as well as attributes. He concluded that countries may take decision according to the level of requirement and budget available. Participants expressed their concern about the price of

such devices, in regard to the number of devices needed to cover a country, and also about the duration of batteries when staff has to work all the day in the field.

Spatial Statistics Applications

68. Open source software can offer an alternative to vendor products and a presentation from UNSD gave an overview of the best solutions available.

Dissemination Issues

69. The UNSD recalled the importance of census dissemination, as emphasized in the *Principles and Recommendations for Population and Housing Censuses*, and presented some of the applications of geospatial technologies for the dissemination of a census. Area selection, user-defined areas or interactive delineation of areas, for example school districts or electoral boundaries, are examples of direct applications. It is possible to determine buffer zones around a point, as a hospital, and calculate the population living within a certain distance from this point, as well as the average distance. The visualization of area of influence, or spatial smoothing modeling techniques can help to give more power to map visualization. The Census Info project, based on the development of new functionalities for DevInfo, was presented as a possible country customizable tool for the dissemination of the 2010 round censuses.

Census Management & Planning for the use of Geographic Information Systems

70. The critical junctures and prerequisites related to the use of Geographical Information Systems for population and housing censuses were emphasized in the presentation by the United Nations Statistics Division. In the ensuing discussion regarding the time period needed to develop census mapping, on how best to capture nomadic population and on developing best vehicles for disseminating data.
71. As for the dissemination of data, the workshop is looking forward to further guidance from the United Nations Statistics Division regarding the optimal and most appropriate way of incorporating the recommended tabulations from the *Principles and Recommendations for Population and Housing Censuses, Revision 2*, in dissemination mechanisms, such as DevInfo.

The role of population and housing censuses in disaster management

72. The issue of relationship between the population and housing census as a baseline data for mitigating consequences of disasters was elaborated through presentations from United Nations Statistics Division, United Nations Office for Coordination of Humanitarian Affairs (OCHA), United Nations Children Fund (UNICEF), India and Sri Lanka.
73. The introductory presentation focused on basic concepts and definitions of disasters and population at risk, elaborating the prerequisites that a population and housing census must meet in order to generate data necessary for planning disaster management.
74. The presentations from OCHA and UNICEF provided concrete examples of providing humanitarian help after disasters and the overwhelming importance of data – baseline data that are usually coming from the population and housing census, rapid assessment data collected by humanitarian teams and follow-up surveys of affected areas. Special emphasis was placed on the availability of coding schemes, as well as their uniformity across different segments of government (statistics, infrastructure, local government).
75. India's presentation focused on using existing data collected by population and housing census in assessing the population at risk, combining the information on housing conditions and state of the robustness of the housing stock, the size of population leaving in these houses and their geographical locations relative to the areas most likely affected by disasters.

76. The presentation of Sri Lanka provided an example of the successful provision of necessary statistics following the devastation of the 2005 tsunami. This enabled relief agencies to ensure quick support to the affected population.

RECOMMENDATIONS AND CONCLUSIONS

General

77. The workshop recognized the advantages of using the contemporary Geographical Information Systems in all phases of conducting the population and housing census. In conclusion, the implementation of these technologies is recommended for all national censuses in the region in the 2010 round of censuses, given national circumstances. In addition, it is of paramount importance to ensure these activities on a continuous and universal basis as they are crucial for many more components other than censuses and official statistics.

Principles and Recommendations for Population and Housing Censuses

78. The participants welcomed the revised *Principles and Recommendations for Population and Housing Censuses* and concluded that they present a clear and unambiguous international standard. The workshop took special note of and expressed support to the new output-oriented character of the recommendations. The participants noted the changes in the classification of living quarters and concluded that the new classification is better suited to reflect the situation on the ground for most countries in the region. While recognizing the necessity to apply unified definitions of the place of usual residence to achieve regional and international comparison, the workshop concluded that there needs to be additional elaboration on practical obstacles, especially in cases when the breadwinner spends extended periods of time away from his family. It was also noted that countries in the region are moving from the *de facto* to the *de jure* approach and they would be seeking guidance to ensure smooth transition and comparability between censuses.
79. Participants expressed concern regarding the implementation of international classifications, more specifically ISIC, ISCO and ISCED given the fact that the version of ISCO will most likely be issued in the middle of the 2010 round of censuses and would leave little room for implementation at the national level. Similarly the workshop noted continuous difficulties in implementing ISCED given the extensive need for harmonization. In conclusions, it was noted that the most recent release of ISIC is accompanied by a set of regional and sub-regional workshops that are designed to ensure full support for national implementation; furthermore, the current *Principles and Recommendations for Population and Housing Censuses* recommends the use of existing release of ISCO as well as the 1997 release of ISCED.
80. Participants noted with interest the elaboration of alternative approaches to censuses and discussed their applicability in the region. In conclusion, the workshop encouraged the United Nations Statistics Division to closely follow the implementation of these alternative approaches and to provide regular overview of lessons learnt.

Census Planning and Management

81. Participants expressed their wish to benefit from international guidelines and examples of national implementation of Quality Assurance of Risk Management plans and requested that the United Nations Statistics Division collect, elaborate and post them on its website.
82. In regard the Post Enumeration Survey, and more generally, the methods of evaluating the population and housing census, participants suggested that the UNSD elaborate specific and detailed guidelines.

Implementation of GIS in Population and Housing Censuses

83. Participants concluded that the level of development of the capacity to apply contemporary geography-related technologies for population and housing censuses differs from one country to the other¹. Yet, in the line of the general recommendation², the workshop concluded that it is of crucial interest to start the process as soon as possible, if not for the 2010 census round, then with a view for the 2020 one.
84. The major issue, when monitoring the state of the art of implementation of GIS for census geography in the region, participants outlined the lack of adequate, continuous and comprehensive training as a major obstacle. While some national statistical authorities were able to ensure the proper training at some occasions, in general this was the biggest hurdle to overcome in taking full advantage of the GIS technology. The workshop also underscored that there is no lack of labor force with more than adequate technical background available for training in GIS – it is simply the inability to ensure continuous training that prevents national authorities in faster implementation of GIS.
85. In addition to the difficulties related to training, participants emphasized the inability of retaining trained staff as the GIS technology and, consequently, GIS technicians, become a hot sought-after commodity addressing a number of applications in different fields. Quite often the compensation offered to trained technicians cannot be met by national statistical authorities.
86. On the subject of census maps, the participants noted that United Nations Statistics Division could provide much needed support to national statistical authorities if it produces guidelines in regard the specifications of census maps, such as their scales and standardized icons.
87. The workshop concluded that, although the price invariably increases with the complexity of the digital maps in terms of the number of layers that are super-imposed (with the road network, geographical features, and so forth), from the point of view of long-term use of these maps as well as from the point of view of meeting broader government needs, it would be extremely beneficial to invest more at the beginning of the project and harvest better benefits along the road.
88. The participants concluded that there is no single answer to the question on how long before the enumeration itself the maps should be ready. While it is doubtless that the maps must be ready when undertaking the training of the enumerators, the exact moment prior to that would depend on national circumstances, but should not be too far in the past as the population tends to shift its location depending on different factors (season, natural factors and so on). In countries with significant nomadic population a combination of methods needs to be taken in consideration as the best approach.
89. In the context, national experiences in the region show that the combination of methods, such as using GPS in certain areas and differential GPS in other, or hands-on digitizing depending on the character of the area proved to be a successful answer to differences in rural and urban areas.

Population and Housing Census and Disaster Management


90. The workshop recognized that the population and housing census represents an invaluable source of data for mitigating the consequences of disasters as it provides detailed and small areas statistics related to persons and housing. It was concluded that national statistical authorities need to closely coordinate their work with relief agencies at national and international level and develop standards for providing data used as baseline when disasters strike. In doing so, there is a need to develop protocols to protect the confidentiality of individual records while providing crucial data as needed.

¹ For detailed information of state of the art of the level of application as well as institutional and organizational overview, please see Annex 3.

² Please see para. above.

91. The participants concluded that the United Nations Statistics Division should explore the possibility, together with the United Nations Economic and Social Commission for Asia and the Pacific, of developing closer guidelines regarding the format of preparing and maintaining relevant small area statistics as per needs of disaster management.

Appendix 1.

United Nations Statistics Division
United Nations Economic and Social Commission for Asia and the Pacific
 **2010 World Population and Housing Census Programme**
Sub-regional Workshop on Census Cartography and Management
Bangkok, Thailand
15 – 19 October 2007

Programme of work

Monday, 15 October 2007

8:00 – 9:00	Registration of participants
9.00 – 10.00	Opening remarks Administrative Matters
10:00 – 11:45	1. Review of United Nations <i>Principles and Recommendations for Population and Housing Censuses</i> <div style="border: 1px solid black; padding: 5px;"><p>Presentation of revised international standards for conducting population and housing censuses.</p></div> <ul style="list-style-type: none">– Presentation by UNSD– General discussion
11:45 – 13:00	Lunch Break
13:00 – 14:30	2. Quality assurance, census management and planning <div style="border: 1px solid black; padding: 5px;"><p>International recommendations and standards on quality control, census management and planning.</p></div> <ul style="list-style-type: none">– Presentation by UNSD– General discussion
14:30 – 15:30	3. Presenting and discussing the report of the Expert Group Meeting on Contemporary Practices in Census Mapping and Use of Geographical Information System (GIS) <div style="border: 1px solid black; padding: 5px;"><p>Presenting the report of the Expert Group Meeting held in May 2007 in New York assessing the current state of the art of the use of contemporary technologies in countries in the region.</p></div> <ul style="list-style-type: none">– Presentation by UNSD– General discussion

15:30 – 17:00

4. Assessing the use of contemporary technologies for census geography in the participating countries

Presentation of the findings from the questionnaire disseminated prior to the workshop followed by general discussion on the situation of census mapping using GIS in participating countries as well as associated issues and difficulties and restraining factors for the use of this technology.

- **Presentation by UNSD**
- **General discussion**

Tuesday, 16 October 2007

9:00 – 10:00

5. GIS fundamentals and database design

Present GIS concepts, definitions, and characteristics, geographic databases modelling, and data structure (Vector vs. Raster); Pre-requisites to and instructions on how to build a GIS project.

- **Presentation by UNSD**
- **General discussion**

10:00 – 11:45

6. Data collection and data conversion

Discuss different data collection methods such as Global Positioning System, imagery acquisition, and local knowledge as well as data conversion such as scanning or digitizing; introduce a GIS platform and conduct a digitizing exercise such as EA creation and splitting.

- **Presentation by UNSD**
- **Exercise 1 on Manual Digitizing (35 min)**
- **ArcScan Demo (10 min)**
- **General discussion**
- **Presentations will be followed by Q&A sessions**

11:45 – 13.00

Lunch Break

13:00 – 15:00

7. Spatial statistics applications and issues and the use of geospatial technologies

To present and discuss applications and issues with new approaches in census geography, including the use of Geographical Information Systems in census mapping, data collection and dissemination and to demonstrate some of the capabilities of the various platforms. EA design: different factors/considerations; Practical examples of delineating EAs; Advantages and constraints of these technologies with regard to the production of EA maps.

–

- **Introduction of File Geodatabase followed by Exercise 2 on Creating File Geodatabase (30 min.)**
- **Presentations by UNSD on GIS software options (15 min.)**
- **Exercise 3 on the use of these technologies for EA mapping (30 min)**
- **General Discussion**

15:00 – 17:00

8. Demonstration of spatial statistics applications

Practical examples of geo-coding from direct collection using GPS, geo-coding features in a GIS, and integration of data; advantages and constraints of these technologies with regard to geo-coding.

- **Presentations by UNSD and Trimble**
- **Presentation by UNSD (20 min)**
- **Exercise 4 on GPS data integration (20 min.)**
- **Demo by ESRI on Field Data Collection Utilizing ArcPad (software for hand-held devices) (30 min.)**
- **General discussion**

Wednesday, 17 October 2007

9:00 – 10:00

Demonstration of spatial statistics applications – continued

Practical examples of segmentation using object oriented technology, basic spatial analysis such as buffer, nearest neighbour, advanced spatial analysis such as spatial autocorrelation and probability thresholds. Dissemination Issues introduced.

- **Presentations by UNSD (Opensource Technologies/brief introduction to Object-based image analysis) (15 min)**
- **Definiens presentation on segmentation (30 min)**
- **General discussion**

10:00 – 11:45

9. Dissemination issues

Discussion on the issues involving authoring maps and data, metadata requirements, technology issues

- **Presentations by UNSD and others**
- **Exercise 5 on Post-enumeration (30 min)**
- **ESRI ArcReader demo (10 min)**
- **General discussion**
- **Presentations will be followed by Q&A sessions**

11:45 – 13.00

Lunch Break

13:00 – 17:00

10. Case studies: National experiences in use of GIS

Presentation of national experiences on the use of contemporary practices in census mapping using GIS, GPS, Remote Sensing, etc.

- Afghanistan
- Bhutan
- Cambodia
- China
- Iran
- Malaysia
- Nepal
- Philippines
- General discussion

Thursday, 18 October 2007

9:00 – 11:00

11. Census management and planning for the use of Geographic Information Systems

Discussion on the institutional and organizational issues related to commercial and non-commercial technologies and purpose and responsibilities in the selection of geospatial statistics technologies.

- **UNSD - Introductory presentation based on workshop questionnaires**
- **Indonesia**
- **Pakistan**
- **Viet Nam**
- **General discussion**

11:00 – 11:45

12. The role of population and housing censuses in disaster management

Objective: Focus on the role that the population and housing census has to play in cases of extreme disasters. Discuss and emphasize the flexibility of aggregating data at a small area level for identifying endangered populations as well as the necessity to harmonize coding schemes across relevant government authorities for unique identification of small areas. Attention will be given to the advantages of geo-referencing of inhabited areas in case they are affected by disasters of any kind. Leading regional disaster management agencies will be invited to present the needs for statistical data in their work.

- **General points – presentation by UNSD**

11:45 – 13:00

Lunch Break

13:00 – 16:15

The role of population and housing censuses in disaster management - continued

- **Presentation by United Nations Office for Coordination of Humanitarian Affairs (OCHA)**
- **Presentation by United Nations Children Fund (UNICEF)**
- **National experiences in this field – presentation by India**
- **National experiences in this field – presentation by Sri Lanka**
- **General discussion**

16:15 – 17:00

13. 2010 World Population and Housing Census Programme: Activities and products

- **Presentation by UNSD**
- **Presentation by ESCAP**
- **Discussion**

Friday, 19 October 2007

9:00 – 11:00

14. Presentations and demonstrations

Presentations and demonstrations by corporate (commercial) providers of GIS/Remote sensing solutions for censuses

- **Presentation by ESRI**
- **Presentation by Leica**
- **Presentation by Nokia**
- **Presentation by Trimble**

11:00 – 11:30

Adoption of the final report, recommendations and conclusions

11:30 – 11:45

Filling evaluation questionnaires

11:45 – 12:00

Closing

Appendix 2.

DIRECTORY OF PARTICIPANTS

AFGHANISTAN

Mr Esmatullah Ramzi
Statistical Advisor
Central Statistics Office
Ansari Watt Kabul
Afghanistan
URL: <http://www.cso.gov.af>

BHUTAN

Mr Thinley Jyamtsho Wangdi
Senior Statistics/GIS Officer
National Statistical Bureau
Post Box No. 338
Thimphu
Bhutan
URL: <http://www.nsb.gov.bt:8080/index.jsp>

BRUNEI DARUSSALAM

Ms Marilyn Linggi Teo Lai
Assistant Director, Department of Statistics
Department of Economic Planning and
Government Block 2A Condominium Jalan Ong
Sum Ping Bandar Seri Begawan BA 1311
Brunei Darussalam
URL: <http://www.depd.gov.bn>

Ms Hajah Faridahisma Haji Bakar @ Haji Ismail
Assistant Statistician
Department of Economic Planning and
Development Block 2A Condominium Jalan
Ong Sum Ping
Bandar Seri Begawan BA 1311
Brunei Darussalam
URL: <http://www.depd.gov.bn>

CAMBODIA

Mr Has Bunton
Deputy Director-General
National Institute of Statistics, Ministry of
Planning
386 Blvd. Monivong Phnom Penh
Cambodia
URL: <http://www.bps.go.id>

IRAN (ISLAMIC REPUBLIC OF)

Mr Dehnavi Behnam Nasuhi

Mapping Expert
Statistical Centre of Iran
Dr. Fatemi Ave. Tehran 141 4663111
Iran (Islamic Republic of)
URL: <http://www.sci.org.ir/>

MALAYSIA

Mr Norezan Bin Wahid
Director, Population and Housing Census
Division Department of Statistics
Level 6, Block C6
Federal Government Administrative Centre
62514 Putrajaya, Malaysia
URL: <http://www.statistics.gov.my>

Mr Muhamad Fadzil Bin Ismail
Assistant Director, Population and Housing
Census Division
Department of Statistics, Malaysia
Level 8, Block C6, Parcel C
Federal Government Administrative Ctr. 62514
Putrajaya, Malaysia
URL: <http://www.statistics.gov.my>

MONGOLIA

Ms Bideriya Tserenkhand
Director, Data Processing and Technology
Department National Statistical Office
Government Bldg. III Baga Toiruu-44
Ulaanbaatar 210620A Mongolia
URL: <http://www.nso.mn>

NEPAL

Mr Shailendra Ghimire
Statistics Officer
Central Bureau of Statistics
P.O. Box 11031
Ramshah Path, Thapathali
Kathmandu, Nepal
URL: <http://www.cbs.gov.np>

PAKISTAN

Mr Abdul Hamid Khan
Joint Census Commissioner (Geography)
Population Census Organization 69-E
Adeel Plaza Blue Area
Islamabad, Pakistan
URL: <http://www.statpak.gov.pk/depts/pco/index.html>

PHILIPPINES

Mr Vincent Morris Olaivar
OIC - Division Chief, Databank and Info
Services Division
National Statistics Office
Solicarel Bldg. I
R. Magsaysay Boulevard
Sta. Mesa, Manila, Philippines
URL: <http://www.census.gov.ph>

SRI LANKA

Ms D.B.P.S. Vidyaratne
Director General
Department of Census and Statistics No. 15/12,
Maitland Crescent
P.O. Box 563, Colombo 7, Sri Lanka
URL: <http://www.statistics.gov.lk>

THAILAND

Mr Nirat Ruadreo Technical Art
National Statistical Office
Lam Luang Rd.
Bangkok 10100, Thailand
URL: <http://www.nso.go.th>

Ms Patama Amornsirisomboon
Senior statistician
Economic and Social Statistics Bureau, National
Statistical Office
Ministry of ICT Lam Luang Rd. Bangkok 10100
Thailand
URL: <http://www.nso.go.th>

Mr Songpon Maisalee
Senior Computer Technician, ICT centre
National Statistical Office, Ministry of ICT
Lam Luang Rd.
Bangkok 10100
Thailand
URL: <http://www.nso.go.th>

VIET NAM

Mr Thuc Do
Vice Director General General Statistical Office
2 Hoang Van Thu St. Hanoi, Viet Nam
URL: <http://www.gso.gov.vn>

Mr Van Cam Mai
Deputy Director, Department for Population and
Labour Statistics
General Statistics Office 2 Hoang Van Thu
Hanoi, Viet Nam
URL: <http://www.gso.gov.vn>

UNITED NATIONS SECRETARIAT**UNITED NATIONS STATISTICS
DIVISION**

Mr Jean-Michel Durr
Chief, Demographic Statistics Section
Two United Nations Plaza DC2-1556
New York, NY 10017 USA
URL: <http://unstats.un.org/unsd/>

Mr Srdjan Mrkic
Senior Statistician, Demographic Statistics
Section
Two United Nations Plaza DC2-1564
New York, NY 10017 USA
URL: <http://unstats.un.org/unsd/>

Mr Charles Brigham Reese
Census Cartographer, Demographic Statistics
Section
Two United Nations Plaza DC2-DESA
New York, NY 10017 USA
URL: <http://unstats.un.org/unsd/>

**UNITED NATIONS CHILDREN'S FUND
(UNICEF)**

Mr Jesper Moller
Project Officer -Emergency Info Planning,
Monitoring and Evaluation
United Nations Children's Fund (UNICEF)
UNICEF East Asia and Pacific Regional Office
19 Phra Atit Road P.O.Box 2-154 Bangkok
10200 Thailand
URL:

**OFFICE FOR THE COORDINATION OF
HUMANITARIAN AFFAIRS REGIONAL
OFFICE FOR ASIA PACIFIC (OCHA)**

Mr Craig Williams
Regional Information Management Officer
Office for the Coordination of Humanitarian
Affairs Regional Office for Asia Pacific
(OCHA)
United Nations
Conference Centre
Rajdamnern Nok Avenue
Bangkok 10200, Thailand
URL:

WORLD FOOD PROGRAMME (WFP)

Mr Axel Pustan
Regional VAM, Spatial Data Analyst
The United Nations World Food Programme
(WFP) 7th Floor Wave Place Building
55 Wireless Road Patumwan
Bangkok 10330, Thailand

URL: <http://www.wfp.org/>

Mr Michael Sheinlanan
Senior Regional Programme Advisor
The United Nations World Food Programme
(WFP) 7th Floor Wave Place Building
55 Wireless Road
Patumwan, Bangkok 10330, Thailand
URL: <http://www.wfp.org/>

**UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION
(UNIDO)**

Mr Tetsuo Yamada
United Nations Industrial Development
Organization (UNIDO)
P.O. Box 300
A-1400 Vienna, Austria
URL: <http://www.unido.org/>

OTHER ENTITIES

Mr Sukit Viseshsin
Spatial Products Department Manager
ESRI (Thailand) Co., Ltd. 202 Nanglinchi Road
Chongnonsee, Yannawa Bangkok 10120
Thailand
URL: <http://www.esrith.com>

Mr Inderjit Claire
Vice President Sales RMSI Private Limited A-7,
Sector 16
Noida, 201301
India
URL: <http://www.rmsi.com>

Ms Rudjit Jongcharoenkitchai
Marketing Manager
Ultimate Positioning Co.,Ltd.
Room 5A, 3332 Viwatchai Building
Phahonyothin Road, Chomphon, Jatujak,
Bangkok 10900, Thailand
URL:

Mr Shanmugam Ganeshkumar Enterprise
Solutions Manager
Leica Geosystems Geospatial Imaging
25 International Business Park #04-55/58
German Centre Singapore 609916
URL:

ESCAP SECRETARIAT

Mr Ilpo Survo
Chief, Statistical Information Services Section,
8th Floor, United Nations Building Rajdamnern
Nok Avenue
Bangkok 10200, Thailand

URL: <http://www.unescap.org/stat/>

Mr Joel Jere
Statistician, Statistics Development Section,
Statistics Division
United Nations ESCAP
8th Floor, United Nations Building Rajdamnern
Nok Avenue
Bangkok 10200, Thailand
URL: <http://www.unescap.org/stat/>

Appendix 3. Overview of major findings of UNSD GIS questionnaire

Country	GIS Unit	Staff: Full, Part, Ad-hoc	Collaboration with other internal/external departments	Clear use of spatial data (Yes, Ad Hoc/ Standing)/No	National Spatial Data Infrastructure	Currently producing base maps	Working on key issues related to census mapping	Are census mapping data Lacking in your country	GIS in Office	Initiative to improve the quality of census mapping data	Geocoding Activities	Special method for the delineation of EAs	Produce and disseminate maps	Training
Bhutan	Yes	1, 12, 30	Yes	Yes, Standing		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Brunei	Yes	10,0,0	Yes			No	Yes	Yes	No	Yes	No	No	No	No
Darussalam	Yes	53,0,0	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Cambodia	Yes	9,0,0	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
China	Yes	300,0,30	Yes	Yes (Standing)	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
India	Yes	16,0,0	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No
Indonesia	Yes	25,0,0	Yes		No	No	Yes	No	Yes	No	No	Yes	Yes	Yes
Tan	Yes	58,000,0	Yes		Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Malaysia	No	3,0,0	Yes		No	No	No	Yes	No	Yes	Yes	No (planning)	No	No
Nepal	Yes	9,0,0	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Pakistan	Yes	215,0,0	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Philippines	Yes	21,0,1000	Yes	Yes (Ad hoc)	No	Yes	Yes	Yes	Yes	Yes	No	Yes		No
Sri Lanka	Yes	30,0,0	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	
Thailand	Yes	70,0,0	Yes		No	No	Yes	No	Yes	Yes	No	No	Yes	No
Viet Nam	No	20,0,0	Yes	No	No	No	Yes	No	No	No	No	No	Yes	No

No Answer

YES

NO