UNITED NATIONS SECRETARIAT

Department of Economic and Social Affairs **December 2008**
Statistics Division **English only**

UNSD-CELADE Regional Workshop on Census Cartography for the 2010 Latin America's census round

Santiago, Chile, 24-27 November, 2008

Table of Contents

I. Introduction

Background and objective of the workshop:

1. The purpose of the Workshop was to highlight the significant additional capabilities of Geographic Information Systems (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 has: (i) introduced the definition of national census geography, including criteria and process of enumeration area (EA) delineation, and coding of geographic areas; (ii) presented an overview on the different stages in the EA-database development, and on GIS-based data analysis and dissemination; (iii) focused on the integration of fieldwork in using satellite/aerial imagery and GPS (iv) facilitated a dialogue among participants from Member 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 international recommendations on contemporary practices in census cartography and use of GIS, as well as the new revised "Handbook on Geospatial infrastructure in support of Census Activities".

Number and list of countries, and organizations represented

2. 17 countries were represented at the workshop (Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guyana, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela). Two international/regional organizations (FAO, CELADE) and four national organizations as well a commercial provider (ESRI and Trimble) were also represented. There were 47 participants in total.

Opening session

3. Mr. Kirk Jaspers, Director of CELADE, welcomed the participants and wished them a successful workshop and a joyful stay in Santiago, Chile. He explained that the workshop came at an opportune time for the countries in the Latin America region as a whole while preparatory activities for the 2010 round of population and housing censuses such as census mapping are either being planned or being implemented in many countries. He expressed the need to enhance capacities in the area of cartography and GIS, a domain that moves very fast, and wished that this workshop will permit exchange of experiences and best practices, and encourage the participants to foster

exchanges among countries in the region, through study visits, staff exchanges between countries, regional training, etc.

4. On behalf of Dr. Paul Cheung, Director of the United Nations Statistics Division (UNSD), Jean-Michel Durr welcomed the participants to the workshop and explained 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 2005-2014. The three essential goals of the programme are to: (i) agree on a set of acceptable international principles and recommendations governing the conduct of a census; (ii) facilitate countries in conducting censuses during the period 2005-2014; and (iii) assist countries in their efforts to disseminate census results in a timely manner. Mr. Durr informed the participants that, as part of the 2010 world programme on censuses, the United Nations Statistics Division has 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 GIS, Global Positioning System (GPS) and optical techniques for census data collection and processing. Participants in those workshops requested UNSD to prepare specific guidelines, including best practices and the strategies for evaluation of different contemporary practices. The present workshop is a complementary activity in relation to this request. The UNSD representative reiterated the purpose of the workshop and the four objectives that were to be achieved. He outlined how the workshop would be structured and reviewed the agenda for the four days.

II. Summary of discussions

International recommendations on contemporary practices in census cartography and use of Geographic Information Systems (GIS)

5. A representative of the United Nations Statistics Division highlighted the main recommendations of the Expert Group Meeting on Contemporary Practices in Census Mapping and Use of Geographic Information Systems, held in New York in May 2007, as well as the recommendations of the Expert Group Meeting on the revision of the Handbook on GIS and Digital Mapping (now re-titled Handbook on Geospatial Infrastructure in Support of Census Activities), also held in New York in April 2008.

6. In the discussion that followed, participants highlighted the recurrent issue many National Statistical Offices - NSOs are facing to attract and retain highly skilled GIS people. One of the main barriers is the inability of NSOs to match the salaries offered by the private sector. It was mentioned that in addition to salary incentives, job

satisfaction could be a key factor towards the success at retention of well skilled people in GIS.

7. The issue of appropriate training was also discussed. It was stated that given the highly dynamic nature of GIS developments in software packages, investments in long-term and continuous training of GIS staff is critical to the success of a GIS unit and to staff retention. The question of exchange of skills is critical in such a fast moving field. Some countries mentioned that there had been mechanisms to sponsor staff exchanges between countries in the past in the region, but the ability to continue to do this was highly dependent on available funding.

8. The handbook on geographic information systems and digital mapping is considered by the participants highly valuable, even in its first edition before revision. Participants expressed the wish to have larger dissemination of the printed version. The handbook will be translated in the six official languages of the United Nations, but translation in other languages can be undertaken by countries.

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

Definition of the national census geography

10. A UNSD representative made a presentation on the national census geography, including definition of national geography, criteria and process of EA delineation, and coding of geographic areas. A census geographic hierarchy involves creating a list of all administrative and statistical reporting units in the country, with the relationships among all types of administrative and reporting unit boundaries defined.

11. It was stressed that every country has its own specific administrative hierarchy, that is a system by which the country and each lower level set of administrative units (except the lowest) are subdivided to form the next lower level. Criteria and process for ground delineation of enumeration areas (EAs) were highlighted, including the approximate equally sized population of the EAs and their area size allowing them to be accessible and covered by an enumerator within the census period. Building a coding scheme is very important for census data processing. Moreover, it was stressed that, through geocoding, a more meaningful identifier that can be used to link the geographic features (i.e. Enumeration Areas) to the attributes recorded for them, allowing statistical and spatial analysis.

12. Chile, Uruguay, Peru, Honduras, Ecuador and Nicaragua made presentations on the organization of their respective territories with regard to census geography. The countries reported that their experiences in the definition of census areas (subdivision at disaggregated levels) are either related to a national framework or to a well-designed subdivision defined by the NSO, and stressed the impact of this definition in relation to the field work, cooperation of local governments, and dissemination of the information. Most of the countries emphasized the particular issue of the urban-rural identification of census areas and how they are tackling it.

13. The participants agreed that one of the most important major product of the census mapping will be the establishment of a comprehensive frame of enumeration areas which is a pre-requisite for the conduct of a good population and housing census and forms the basis upon which all surveys (both social and economic) are conducted. The question of the delineation of the enumeration areas (EA) was debated with examples from many countries. The criteria that help delineate enumeration areas such as population size of the EA, area size, etc, with variants in urban and rural areas, were thoroughly discussed. The particular issue of urban-rural denomination was raised by many countries. Another problem encountered in the region is that population settlement boundaries are not strictly fixed.

14. It was also emphasized the importance of assuring the entire country coverage of census mapping, without gaps or overlaps, keeping whenever is possible the correlation with other criteria of territorial subdivision.

Constructing an EA-level database for the Census

15. UNSD made a presentation on how to construct an EA-level database for census activities. The presentation started by identifying the components of a census geographic database and stressed the different stages in its development, including geographic data inventory for EA delineation; geographic data conversion through scanning and digitizing; construction and maintenance of topology; integration of various digital data; implementation of an EA database; metadata development and data quality control.

16. Argentina, Peru, and Costa Rica presented their experiences in developing geographic databases for their respective censuses, both in terms of technical capacities involved and organizational aspects within the National Statistical Office. Comments were made about the necessity for the database administrator to be fully aware of the GIS concepts in order to proper organize the database for geographic information purposes.

17. Participants agreed upon the importance of constructing the geographic base for the census, ahead of time before enumeration. Discussions highlighted the census geography products

that derive from a GIS database at all geographical levels of national, provincial, district, locality, and enumeration area. The participants agreed that census mapping will also form a basis for the conducting of socio-economic databases and poverty mapping in the country.

18. The meeting discussed and reviewed different approaches and national experiences in census cartography and emphasized the fact that there is no universal solution that fits for all, meaning that each country should adopt an approach based on its needs and available resources. It recognized however that NSOs can commit resources and efforts to develop census geography as a long-term investment and a continuous process, allowing to develop census geographic databases, statistical GIS databases, spatial analysis and tools for dissemination of census geographic products, and going beyond the production of enumeration area maps for census enumeration and thematic maps for census publications.

Integrating fieldwork using satellite/aerial imagery and GPS

19. UNSD made a presentation on the capabilities offered by satellite and aerial imagery and other geospatial technologies, such as GPS, for the delineation of EA boundaries. It was explained that the main reason to use imagery is to field-validate the EA boundaries that were created in the NSO's GIS lab from the prior census's maps or, when accurate maps are not available, it is done as a basis for EA delineation in the census main office, before conducting fieldwork for completion and validation. Indeed, with the integration of remotely sensed data, geographic analysts and census planners can identify territory most in need of updating (for instance to account for new growth in areas surrounding cities) and distinguish it from areas requiring minimal updating - what is meant by a "change-detection" approach. For planning and logistical purposes, it makes sense to identify these priority areas ahead of time to locate areas of rapid change since the last census and focus on them.

20. A representative from IBGE, Brazil, made a presentation on the use of satellite/aerial imagery and GPS in support of census activities. Censuses operations require huge and coordinated organization, as well as the use of different input, such as satellite/aerial images and GPS for field work. The Brazilian experience of integrating these input are presented here, along with the 2007 Censuses Innovations, and the efforts towards the preparation of 2010 Census. Special emphasis was given on the production and update of census mapping, with its rural and urban segments, heavily based on the use of satellite images (from ALOS, Google Earth and QuickBird) and aerial photographs.

21. Panama and Mexico presented their experiences in integrating field work using geospatial technology (GPS, RS, etc.). The presentations stressed some of the basic use of GPS data and handheld devices data collection in the census, including some examples of GPS use

for EA and administrative boundary delineation, and the location of housing units and collective living quarters, and extraction of other features.

22. Participants made comments about the cost of satellite imagery as well as cost of fieldwork. Even if high-resolution satellite images are expensive, it is possible to share the costs with other partners, especially in the context of the National Spatial Data Infrastructure (NSDI). Since the fieldwork cost is also very expensive and time consuming, a good compromise is to be found between office work and field work.

23. The meeting emphasized the need to develop acquisition mechanisms in order to reduce the significant costs of satellite imagery, aerial photography, GPS and hand-held devices as well as GIS hardware and software. For example, a regional or sub-regional regrouping of data acquisition and maintenance may constitute a market power and convince geospatial technologies providers to reduce their initial costs. It noticed with interest the Brazilian experience in being a focal point for low-cost high-resolution imagery, offered by ALOS, the Japanese satellite, for non commercial use. This example can be emulated by other countries in the region.

Use of geospatial tools during census enumeration

24. UNSD gave a presentation on the use of geospatial technologies in support of census operations during the enumeration phase. The presentation showed how geospatial technology can support census operations during the enumeration phase, including determining the relevant layers for enumerators and supervisors, getting the maps out of the EA database and putting them into the hands of enumerators. The presentation aimed to convey the message that building EAs digitally allows the NSO to have a living document that integrate the work of previous censuses with additional value added from remote sensing and GPS. Accuracy and completeness of census data depend substantially on the quality of the cartographic base maps used by enumerators through a continuous process. It was stressed that a final step before EA maps are distributed to the enumerators is a thorough review of all map products, involving verification of the correctness of administrative boundaries by local administrators and tackling inconsistencies before the final products can be generated. It was recommended the definition of a limit date for NSOs accepting changes in cartographic base maps due to last minute alterations of administrative boundaries.

25. Bolivia and El Salvador presented a review of the different methods used for census area coverage control and measurement, attempting basically to answer the underlying question: is census cartography used for improving census coverage? The main objectives of the cartographic work were to partition the national territory into enumeration areas to ensure the exhaustiveness of the census. The demarcation process is based on a set of rules, such

26. Discussions focused on the issues related to boundary changes, either for administrative units or EAs, as well as the approach to urban/rural delimitation. The importance of dealing with these issues has its impact on census coverage. There was also concern about the recurrent issue of confidentiality, particularly with regard to inadvertent disclosure of individual information at the point-location level. Using two types of geography- one for data collection and another for data dissemination- was recommended.

Statistical analysis and dissemination of census data

27. UNSD presented an overview on the use of geospatial technology and Internet in support of statistical analysis and dissemination of census data. The presentation stressed the fact that one of the main justifications to an NSO investment in a geographic database is its ability to use it for all phases of the census process. It highlighted the management tasks relating to geographic databases after and between censuses and the development and dissemination of output products. The dissemination of census results through maps adds value to statistical data.

28. The presentation 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, are examples of direct applications. The CensusInfo 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.

29. Dominican Republic, Venezuela, Cuba and Guyana made a review of experiences and different approaches of countries to disseminate their census information (policies, restrictions, advantages, etc.) and to distribute census products. They provided some other examples of the use of GIS and geospatial tools for dissemination,

30. The discussion put some emphasis on the specific issues of incorporating changes from the field, the process of aggregating data to dissemination units, database maintenance, methods for analyzing census data spatially and dissemination of geographic census products and services. Additional topics dealing with disclosure and data privacy considerations, marketing, outreach, internet mapping and distribution of census databases were also discussed. The existence of other free dissemination tools as REDATAM was mentioned.

Organizational and institutional issues

31. UNSD made a presentation on the organizational and institutional issues to be considered for geospatial implementation, including the National Spatial Data Infrastructure (NSDI). It was stressed that the most challenging issues in building a geospatial infrastructure in support of census activities are not only technical but also institutional, organizational and managerial. To develop a sustainable census geography program, NSOs should commit resources and efforts and consider it as a long-term investment and a continuous process.

32. Achieving this may require expanding the existing cartographic unit within the NSO to a much larger and more versatile geographic core entity, to be staffed with GIS skills and the capability to serve all census mapping needs. Building this capacity requires training adequate personnel with appropriate skills and providing incentives to retain them. Many participants raised indeed the recurrent issue- that it becomes increasingly difficult to retain the skilled and GIS trained people within NSOs, particularly with the proliferation of the GIS for numerous applications unrelated to the census and often commercially much more attractive and lucrative.

33. Since producing base maps is not a core competency of the NSO, building institutional arrangement to share geographic data with other national organizations, such as the National Mapping Agency, is very beneficial to NSOs. Institutional arrangement permit data sharing and collaboration across government at a variety of levels including national, regional, and local. For example, the construction of a national census geospatial database can be employed in many different national contexts for numerous purposes. These examples show that NSOs gain to be participate actively in building the National Spatial Data Infrastructure. Indeed, the Workshop encouraged the active participation of the NSO, in partnership with other national authorities, in the development of a national geographical information capacity, including the National Spatial Data Infrastructure (NSDI).

34. Colombia, Paraguay and Brazil presented their experiences in GIS project administration and management within the National Statistical Offices. More specifically, the representative of Brazil made a presentation on the basic concepts of a Spatial Data Infrastructure, with particular emphasis on National Spatial Data Infrastructure with some examples already implemented in different countries. The presentation has elaborated on the processes of structuring the Brazilian SDI, that is coordinated by the National Commission of Cartography – CONCAR, through the legal framework established by a Presidential Decree proposed by CONCAR. CONCAR's and IBGE's actions towards a NSDI construction are also shown. After the meeting, it was known that the proposed decree had been signed by the President of Brazil and published on 28 November, 2008.

35. An extensive discussion focused on the involvement of NSOs in the building of a National Spatial Data Infrastructure and the benefits resulting from such an effort. Participants noted

that the situation of NSDI development in countries of the region was quite different. For example, 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. The Workshop encouraged the active participation of the NSO, in partnership with other national authorities, in the development of a national geographical information capacity, including the National Spatial Data Infrastructure (NSDI). Integrating statistical data into the NSDI and in particular when correlating this data with other data layers can provide new insights in important national issues such as natural resources, environment, education, health, etc.

Data capture, processing and analysis: PDAs-GPS in census cartography

36. Ms. Gina Ghio (Chile) and the ESRI provider in Chile made presentations on the concepts of GPS and PDA's advantages and disadvantages in the process of census cartography creation and updating, and provided some examples to illustrate their technical presentations.

37. Participants discussed the types of PDAs, as well as key specification features currently available on the market, relative advantages and disadvantages, and the criteria for making choice of the PDAs. It was noted that having extensive training prior to the deployment of PDAs is essential. It is critical that the vendor provide post implementation support – for both technical and hardware aspects. It was observed that PDA is the technology that is likely to be increasingly integrated in census data capture in the near future, but that in the short run, paper forms for data collection might still well suited for many countries in the region.

Satellite images and aerial photographs

38. Mr. Carlos Patillo (Chile University), presented the concepts related to the acquisition of satellite images and aerial photographs, their advantages and disadvantages, and ran exercises to illustrate the technical presentation.

39. Discussions on the use of satellite/aerial imagery and GPS technologies and their application as a tool for updating statistical maps before execution of the censuses were extensive. It was stated that, in rural area maps, features such as villages and roads were surveyed and coordinates of new feature were registered by handheld receivers. In urban area maps, differential GPS (DGPS) method was used and the map blocks of cities were updated accordingly.

40. It was also stressed the importance of considering the geodetic reference system when updating statistical maps.

Spatial analysis

41. Mr. Luis Carvacho, Chile, presented the concepts of spatial analysis and new methodological issues in census data use of spatial analysis, and run exercises to illustrate the technical presentation.

42. Participants discussed some examples of spatial analysis applications that can be relevant to statistical activities such as determining buffer zones around a point (such as a hospital), calculating the population living within a certain distance from this point, as well as the average distance. It was emphasized that advancements in GIS applications have led to the incorporation of spatial statistics tool which not only allow measuring geographic distributions but also analyzing patterns, mapping clusters and modeling spatial relationships.

Internet and census data

43. A representative from INE, Chile, presented examples and experiences of the treatment of census data for dissemination through the Internet (web mapping, Internet data processing, etc.) Future developments of the GIS would include its use in national surveys and censuses (sample design, workload, allocation, spatial analysis etc..); its adoption with the web as part of the dissemination strategy through integration of interactive maps; its use for the enhancement of the quality and the presentation of the EA maps and thematic maps; and its use to relate socio- demographic and economic characteristics to the housing and living conditions of the population by merging records of the Housing and Population Census enabling a more comprehensive analysis of the census data.

44. Discussions were raised about the use of internet for data collection. It was observed that the use of internet for data collection is promising but in the short run, other means of data collection are still suited for many countries. However, they recognized that its adoption with the web as part of the dissemination strategy through integration of interactive maps is a very useful tool to disseminate census information to reach out to more many users.

Best practices in the use of GIS and census mapping

45. UNSD representative made a presentation on success factors for a GIS-based census mapping project, indicators to measure census coverage using cartography, and best practices. Open source software can offer an alternative to vendor products and the presentation gave an overview of the best solutions available. 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.

46. Colombia and Chile made presentations on their country experiences and gave information on their best practices, including the development of Geoportals.

47. Discussions on how GIS can assist in the process of census/surveys data capture were extensive. Census data are spatial in its nature and GIS allows one to link a data value (e.g. census datasets) to a geographical feature (e.g. enumeration area) with improved capacities for collection, storage, management, analysis and reproduction of spatial data. It was recognized that GIS provide the tools to create thematic maps and EA maps to assist and support census processes.

Commercial suppliers' demonstrations

48. ESRI and Trimble providers in Chile presented their approach and practical solutions to census mapping issues and provided concrete examples on the use of GIS and GPS in support of census activities.

III. Recommendations & Conclusions

49. The workshop recognized the advantages of using the contemporary geospatial technologies and geographical databases at all stages of population and housing census process. 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.

50. The participants emphasized the need to develop geographical coding schemes that can respond to the requirements of the use of contemporary technologies as well as maintain historical overview of small areas. If possible, efforts should be made to ensure that census geo-coding is consistent with existing coding systems like local administrative units to allow comparability of information and to pay special attention to urban and rural enumeration considerations.

51. The meeting discussed the best ways to improve skills and acquire expertise in the use of geospatial technologies for census geography. While it recognized that a well-trained staff is a key factor for the success of GIS-based census mapping projects, it highlighted the inability of NSOs to attract and retain highly skilled GIS staff as a chief concern. It was suggested that innovative measures could be taken towards this issue – that an overall strategy should be established within the NSO, including provisions for human resources and the empowerment of the GIS unit within the NSO. In that regard, it was also noted that in addition to salary incentives, job satisfaction is a key factor towards the success at retention.

52. The meeting recognized the new developments in satellite imagery and ortho-photos and their support to digital mapping and emphasized the need to develop acquisition mechanisms in order to reduce the significant costs of satellite imagery, aerial photography, GPS and hand-held devices. For example, the meeting noticed the current availability of low cost high-resolution satellite imagery, as such provided by the Japanese ALOS satellite mission through non-commercial distribution nodes, which can represent an important source of data for the census geography activities.

53. At the national level, the Workshop encouraged the active participation of the NSO, in partnership with other national authorities, in the development of a national geographical information capacity, including the National Spatial Data Infrastructure (NSDI). Integrating statistical data into NSDI opens new horizons, based on the possibility of correlating this data with all other SDI data layers, such the ones related to natural resources and the environment.

54. National experiences in the region show that the combination of methods and software (commercial and open source), such as using GPS in certain areas and differential GPS in others, or ortho-photos and satellite imagery depending on the character of the area proved to be a successful answer to differences in rural and urban areas. In this context, the participants showed an interest in the use of hand-held devices and particularly of PDAs equipped with GPS receiver for census data collection. This can especially contribute to the geocoding of schools, hospitals and other important infrastructure elements, as a side benefit of the census operations.

55. The meeting called upon the countries of the region to adopt a dissemination strategy for statistical information in order to fully inform policy decision making, and requested NSOs to develop tools for dissemination of census geographic products, and go beyond the production of enumeration area maps for census enumeration and thematic maps for census. The dissemination strategy should consider the widest scope of uses and needs with special attention to marketing aspects of the census geographic products as well as copyright issues. Integrating NSO efforts to national initiatives towards establishing NSDI is seen as a very efficient way of improving statistical data dissemination. In this sense, the meeting recognized the importance that NSOs work on statistical and spatial metadata specification and generation in order to allow data exploration in the context of NSDI.

56. It was acknowledged that building a geospatial infrastructure in support of census activities require technical as well as human capacities that may not be available currently in some countries in the region. Therefore, it was suggested that there could be other mechanisms for empowering capacities through bilateral exchanges between countries, study visits, regional coordinated trainings and contact networks. In that regard, participants urged the UNSD and the UNECLAC to facilitate the exchange of experiences, for example through

the 2010 World Programme on Population and Housing Census website, or other convenient means.

VI. Evaluation

57. The evaluations received for the workshop were positive. The feedback from the participants was extensive and outlined the interest of the participants who expressed clearly their enthusiasm and excitement to participate for the first time in the region in a Workshop that is fully dedicated to census cartography and the use of geospatial technologies. Although the large number of responses detailed many useful elements of the workshop, the most useful elements according to the participants was the sharing of country experiences, the discussions about building a census geography programme, and technical presentations on the use of geospatial technologies. Overall, the participants were appreciative of the content of the workshop and suggested that technical workshops on other aspects of the census activities be provided.

V. Annexes

Annex I. Agenda of the Workshop
Annex II. List of participants

Annex I: Agenda of the Workshop

Time	*Topic*		
	Monday November 24, 2008		
	Opening		
8:30 – 9:00	***Registration of participants***		
9:00 – 9:30	**Opening remarks** UNSD, CELADE, CEA-CEPAL		
9:30 – 11:00	**Session 1 – International recommendations on contemporary practices in census cartography and use of Geographic Information Systems (GIS)** Objective: UNSD presents the recommendations gathered in the last Expert Group Meeting, held in New York in May 2007, as well as the new revised "*Handbook on Geospatial infrastructure in support of Census Activities"*. CELADE presents the results of the CEA/CEPAL questionnaire answered by each country early this year. – Presentation by UNSD – Presentation by CELADE – General Discussion		
11:00 – 11:15	***Coffee break***		
11:15 – 13:00	**Session 2 – Definition of the national census geography** Objective**:** UNSD presents an introduction on definition of the national census geography, including criteria and process of EA delineation, coding of geographic areas. Countries present their experiences in the definition of census areas (subdivision at disaggregated levels), either related to a national framework or to a well-designed subdivision defined by the NSO, and the impact of this definition in relation to the field work, cooperation of local governments, dissemination of the information, etc. – Presentation by UNSD presentation – Presentations by countries: A. Chile B. Uruguay C. Guatemala – General Discussion		
13:00 – 14:30	***Lunch***		
14:30 – 16:00	**Session 3 – Definition of the national census geography (cont.)** Objective**:** Countries present a review of the different methods used in the definition of other census management units (Definition of urban/rural areas...) – Presentations by countries: A. Honduras	Presentations by Countries	

Time	*Topic*		
	B. Ecuador C. Nicaragua – General Discussion		
16:00 – 16:15	***Coffee break***		
16:15 – 17:30	**Session 4- Constructing an EA-level database for the Census** Objective**:** UNSD presents an overview on the different stages in the census geographic database development, including geographic data sources for EA delineation; geographic data conversion through scanning and digitizing; constructing and maintaining topology; implementation of an EA database; and metadata development. Countries present their experiences in developing geographic databases for census. – Presentation by UNSD – Presentation by Countries: A. Argentina B. Perú C. Costa Rica – General discussion	UNSD Presentations by Countries	Pres. 3 (UNSD)
	Tuesday November 25, 2008		
9:00 – 11:00	**Session 5 – Integrating fieldwork using satellite/aerial imagery and GPS** Objective**:** UNSD presents an overview of the capabilities offered by satellite and aerial imagery and other geospatial technologies for the delineation/field validation of EA boundaries. Countries present their experiences in integrating field work using geospatial technology (GPS, RS, etc.). – Presentation by UNSD – Presentations by countries: A. Brazil B. Panama C. Mexico – General Discussion	UNSD Country Presentations	Pres. 4 (UNSD)
11:00 – 11:15	***Coffee break***		

Time	*Topic*		
11:15 – 13:00	**Session 6 - Use of geospatial tools during census enumeration** Objective**:** UNSD presents an overview of geospatial technology support to census operations during the enumeration phase, including quality assurance, EA map production and database maintenance. Countries present a review of the different methods used for census area coverage control and measurement (is census cartography used for improving census coverage?) – Presentation by UNSD – Presentation by countries: A. Bolivia B. Haití and/or Suriname C. El Salvador – General Discussion	UNSD Country Presentations	Pres. 5 (UNSD)
13:00 – 14:30	***Lunch***		
14:30 – 16:00	**Session 7 - Statistical analysis and dissemination of census data** Objective**:** UNSD presents an introduction on the use of geospatial technology and Internet in support of statistical analysis and dissemination of census data with a review of experiences and different approaches of countries to disseminate their census information (policies, restrictions, advantages, etc.) and to distribute census products. – Presentation by UNSD – Presentation by countries: A. República Dominicana B. Venezuela C. Cuba D. Guyana – General Discussion	UNSD Country Presentations	Pres. 6 (UNSD)
16:00 – 16:15	***Coffee break***		
16:15 – 17:30	**Session 8– Organizational and institutional issues** Objective**:** UNSD presents the organizational and institutional issues to be considered for geospatial implementation, including National Spatial Data Infrastructure (NSDI). Countries present their experiences in GIS project administration and management within the National Statistical Offices. – Presentation by UNSD – Presentation by Countries: A. Colombia B. Paraguay C. Brazil	UNSD Country Presentations	Pres. 7 (UNSD)

Time	*Topic*		
	– General Discussion		
Wednesday November 26, 2008			
(technological presentations + exercises by GIS experts and providers) It is possible to involve ESRI in presenting exercises using ARCGIS			
9:00 – 11:00	**Session 9 – Data Capture, processing and analysis: PDAs-GPS in census cartography** Objective**:** present concepts of GPS and PDA's advantages and disadvantages in the process of census cartography creation and updating, and run exercises to illustrate the technical presentation. – Presentation by Ms. Gina Ghio, (Chile) – Presentation by ESRI – Exercises (including ESRI involvement)	- Presentation by GIS Expert - ESRI	Pres. A (Expert)
11:15 – 11:15	***Coffee break***		
11:15 – 13:00	**Session 10- Satellite Images and aerial photographs** Objective: present concepts related to satellite images and aerial photographs, advantages and disadvantages, and run exercises to illustrate the technical presentation. – Presentation by Mr. Carlos Patillo, (Chile) – Exercises (including ESRI involvement)	- Presentation by GIS Expert - ESRI	Pres. B (Expert)
13:00 – 14:30	***Lunch***		
14:30 – 16:15	**Session 11 – Spatial analysis** Objective**:** present the concepts of spatial analysis and new methodological issues in census data use of spatial analysis, and run exercises to illustrate the technical	- Presentation by GIS Expert - ESRI	Pres. C (Expert)

Time	*Topic*		
	presentation. - Presentation by Mr. Luís Carvacho (Chile) – Exercises (including ESRI involvement)		
16:15 – 16:30	***Coffee break***		
16:30 – 17:30	**Session 12 – Internet and census data** Objective: Present examples and experiences to the treatment of census data for dissemination through the Internet (web mapping, Internet data processing, etc. – Presentation by INE-Chile – General Discussion	Country presentation	
Thursday November 27, 2008			
9:00 – 11:00	**Session 13 – Best practices in the use of GIS and census mapping** Objective: Presentation of success factors for a GIS-based census mapping project, indicators to measure census coverage using cartography, and best practices in the Region. – Presentation by UNSD - Presentation by Luz Emilse Rincon, Colombia - Presentation by Raul Ponce, Chile, UN consultant – General Discussion	UNSD Country presentation Expert	Pres. 8 (UNSD)
11:00 – 11:15	***Coffee break***		
11:00 – 13:00	**Session 14 – Commercial suppliers' demonstrations** Objective: Presentation by commercial providers of GIS/Remote sensing/handheld solutions for censuses.	Commercial Providers	

Time	*Topic*		
	– Presentation by ESRI, INTERGRAPH, ERDAS, TRIMBLE, and Others – General Discussion		
13:30 – 14:30	***Lunch***		
14:30 – 16:15	**Session 15 - Discussion and adoption of conclusions and recommendations** Objective: Review of all the issues discussed during the previous days.		
16:15 – 16:30	***Coffee break***		
16:30 – 17:30	**Session 17- (cont.) Discussion and adoption of conclusions and recommendations.** – Evaluation by participants – End of the Workshop	UNSD	

Annex II: List of participants

No.	Country Name	Contact Person/Address
1.	Argentina	Juan Carlos Fuchs Coordinador – Sistema de Informacion Geografico Instituto Nacional de Estadistica y Censos (INDEC) Ministerio de Economia y Obras y Servicios Publicos Av. Julio A. Roca 609 Piso 6, Ofic. 608 Ciudad Autonoma 1067 Buenos Aires, Argentina
2.	Argentina	Walter Rodriguez INDEC
3.	Bolivia	Freddy Saavedra Instituto Nacional de Estadistica (INE)
4.	Bolivia	Ramiro Guerra INE
5.	Bolivia	Eduardo Aguirre INE
6.	Brazil	Luiz Paulo Souto Fortes Director, IBGE Av. Brasil, 15671 B III B Parada De Lucas 21.241-051 Rio de Janeiro-RJ-Brasil
7.	Chile	Myriam Villaroel Instituto Nacional de Estadistica (INE)
8.	Chile	Jaime Ruiz INE
9.	Chile	Juan Pradenas INE
10.	Chile	Soledad Valle INE
11.	Chile	Carolina Chávez INE
12.	Chile	Raúl barraza INE
13.	Chile	Iván Soto Durán INE
14.	Chile	Carolina Goeminne INE
15.	Chile	Javier Fuentes Torrejón INE
16.	Costa Rica	Douglas Guell Vargas Coordinador del Proceso de Desarrollo Conceptual de Cartografia Censal Instituto Nacional de Estadisticas y Censos (INEC) 450 m. al oeste De la Rotonda de la Bandera, San Pedro,

		Edificio Ana Lorena 5 piso Apartado 10163-1000 San Jose, Costa Rica
17.	Costa Rica	Alexander Campos Vega INEC
18.	Cuba	Enrique Frometa Sánchez Jefe de Grupo sistema de Informacion Geográfica Oficina Nacional de Estadisticas de Cuba (ONE), Calle Paseo No. 60 entre 3ra y 5ta, vedado, Plaza de la Revolución, Ciudad de la Habana, Cuba
19.	Dominican Republic	Hector Marrero ONE
20.	Dominican Republic	Victor Valdez ONE
21.	Ecuador	Rosa Catalina Valle Piñuela Instituto Nacional de Estadistica y Censos Juan Larrea No. 15-36 y Jose Riofrio Quito, Ecuador
22.	El Salvador	Rafael Barrientos MINEC
23.	El Salvador	José Roberto Herrera Ramirez Ministerio de Economia DIGESTYC Avenida Juan Bertis No. 79 Ciudad Delgado, El Salvador, C.A.
24.	Guyana	Clitus Dias Senior Cartographer Bureau of Statistics 125 Parade & Barrack Sts. Kingston Georgetown, Guyana, S.A.
25.	Honduras	Gerardo Hernan Torres Delgado Instituto Nacional de Estadistica (INE) Lomas del Guijarro, edificio Plaza Guijarro, 5to.piso,Tegucigalpa, M.D.C., Honduras, C.A.
26.	Mexico	Mario Rubén Chavarría Espinoza INEGI
27.	Panama	Hector Antonio Cedeño Barrios Sabjefe de Cartografia Direction Nacional de Estadisticas y Censos
28.	Paraguay	Andrés Ramirez Insfrán Jefe Departamento Cartografia Direccion General de Estadistica Encuestas y Censos Naciones Unidas esq_Saavedra Fernando de la Mora-Zona Norte C.C. 1.118, Paraguay
29.	Peru	Carlos Avrelio Santur Alberca Director Ejecutivo Cartografia y Geografia Instituto Nacional de Estadistica e Informatica Av. General Garzon No. 658 Lima 11, Peru

30.	Republica Dominicana	Juan Antonio Arias Tejeda Eax. Cartografia Oficina Nacional de Estadisticas (ONE) Av. México esq. Leopoldo Navarro, Edif. de Oficinas Gubernamentales Juan Pablo Duarte, Piso 9, Santo Domingo, D.N., República Dominicana
31.	Uruguay	Alicia Maria Abayian Fernandez Jefe Unidad Cartografia Instituto Nacional de Estadistica (INE) Rio Negro 1520, C.P. 11100 Montevideo, Uruguay
32.	Uruguay	Diego Umpiérrez INE
33.	Venezuela	Ana Margarita Cañizales Bergel Gerente Instituto Nacional de Estadistica Avenida Boyaca, Edificio Fundación La Salle, Piso 4, Maripérez, Caracas, Venezuela
Internacional/Regional Agencies		
34.	FAO	Rodrigo Perez
35.	CELADE	Dirk Jaspers_Faijer Director CEPAL/CELADE
36.	CELADE	Alejandra Silva CEPAL/CELADE
37.	CELADE	Raul Ponce CEPAL/CELADE
38.	CELADE	Magda Ruiz CEPAL/CELADE
39.	CELADE	Ernesto Espinoza CEPAL/CELADE
40.	CELADE	Laura Garcia CEPAL/CELADE
Private/ Chilean Organizations		
41.	ESRI Chile	Juan Enrique Silva
42.	CPSRIG-Chile	Carlos Patillo
43.	SELPER-Chile	Gina Ghio
44.	PUC Chile	Luis Carvacho
45.	SNIT Chile	Cristian Enrique Silva
United Nations Statistics Division (UNSD)		
46.	UNSD	Mr. Jean-Michel Durr, Chief Demographic Statistics Section Statistics Division DC2-1556 United Nations, New York, NY 10017
47.	UNSD	Mr. Amor Laaribi Demographic Statistics Section Statistics Division DC2-1568 United Nations, New York, NY 10017