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Final Report

Census Mapping/GIS Expertise for National Population Commission for Census 2005

Covering the period 16 October 2005 to 23 June 2006

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Summary

This is the final report concerning the project on delivering EU Census Mapping/GIS expertise for Census 2006 (initially referred to as Census 2005 scheduled to be hold between 29th November and 3rd December 2005) to the Director of the Cartographic Department (CD) of the National Population Commission (NPopC) as defined in the Terms of Reference (ToR) FWC AMS 451 Lot 3. The main aim of the present project, initially scheduled for covering 180 days during the period September 2005 to April 2006, with three intermediate leaves, has been defined as providing expertise to assist the preparations for the main census, initially planned to take place by end of November 2005. On 22 September 2005 President, Chief Olusegun Obasanjo announced postponement of the national population and housing census to be taken place from 21st to 25th March 2006. In consultation with the Director Carto the project period was rescheduled to cover the period half October 2005 to July 2006, so that the rescheduled main census could be fully covered and also preparation and monitoring of the Post Enumeration Survey (PES) could be conducted. Consequently, most of the work done was related to preparing and monitoring the Main Census and PES. Three intermediate leaves covered the periods: 16/12/05-07/01/06; 10/02/06-28/02/06 and 21/04/06 -13/05/06. In total 178 days (130 work days and 48 weekend days) were spent on site while 8 days were spent on international travel.

Contents

1. Introduction

The main aim of the present project, scheduled for covering 180 days during the period September 2005 to April 2006, with three intermediate leaves, has been defined as providing expertise to assist the preparations for the main census, initially planned to take place by end of November 2005. A GIS expert had completed a first assignment from February to August 2005 and significantly helped the preparations for the Trial Census which took place by the end of August 2005. On 22 September 2005 President, Chief Olusegun Obasanjo announced postponement of the national population and housing census to be taken place from 21st to 25th March 2006. In consultation with the Director Carto the project period was rescheduled to cover the period half October 2005 to July 2006, so that the rescheduled main census could be fully covered and also preparation and monitoring of the Post Enumeration Survey (PES) could be conducted. Consequently, most of the work done was related to preparing and monitoring the Main Census and PES. Three intermediate leaves covered the periods: 16/12/05-07/01/06; 10/02/06-28/02/06 and 21/04/06 -13/05/06. In total 178 days (130 work days and 48 weekend days) were spent on site while 8 days were spent on international travel.

2. Summary of Activities

In addition to on-going managing obligations, the main activities carried out during the project period include:

- Developing and giving a course on satellite imagery interpretation for enumerators (the course developed is presented in Appendix A)
- *Preparing and participating in Locality workshops*
- Development of Rightsizing Procedure (see Appendix B)
- Major revision of the enumerator instruction manual (see also recommendations given in the final report of the a first assignment February to August 2005)
- Development of a production line for image EA maps to be used during the main census (see Appendix C)
- Preparing and conducting training of main census master trainers, 16th – 19th January 2006 in Kaduna.
- *Monitoring visits to the North-West Geo-political zone*
- Preparing and conducting training of PES master trainers, 26th – 29th May in Jos**,** Plateau state
- Monitoring the enumerator selection test
- Identification of Training Needs of the Cartographic Department (Appendix D)
- *Monitoring and evaluating the PES training of enumerators and supervisors*
- Monitoring of the PES

The topics listed in italic will be treated below in greater detail. When indicated above documentation of other topics will be treated in the Appendices.

With the help of donor money the cartographic department of NPopC has heavily invested in hardware, software and geo-data, in particular very high resolution satellite imagery, and established a GIS Laboratory in Gonder Street. The aim of the use of satellite imagery in a population and housing census is threefold:

1. As an aid in the Enumeration Area Demarcation Exercise
2. A means for quality control of the population and housing figures collected during enumeration; by confronting the number of buildings recorded on the satellite image with those counted during enumeration
3. Creation of a geo-referenced enumeration area (EA) digital map database

The creation of a digital EA map database is a complex geo-information project and it is a general experience that complex geo-information projects tend to fail in the long run if one or more of crucial factors are insufficient present or lacking. Therefore, we present in a separate Section a number of recommendations to arrive at a sustainable EA digital map database.

3. Locality Workshops

Identification, naming and classification of localities are crucial for the collection and dissemination of soci-economic statistics, including census data. However, the generation of an exhaustive list of all localities in Nigeria is hampered because the definition of locality appeared to contain ambiguous elements. In order to explain and clarify the operational use of the term locality and to reach a common understanding of its concept workshops were held - one in each of the six geo-political zones of the country- from 5th November 2005 to the end of December. In co-operation with the cartographic department we prepared the workshops and participated in three of them: Jos (Plateau State), Ada (Osun State), and Port Harcourt, (River state). As an example, the presentation as given in Jos is attached (Appendix E).

4. Monitoring Visits to North-West Geo-political Zone

From 2 – 6 February 2006 I carried out monitoring visits to the North-West Geo-political zones. A report on our findings has been widely distributed within the NPC, including all Technical Advisers. Follows a summary of main recommendations:

- The State Directors (SD) should carry out inspection of all LGA offices and training venues in their state to check their status of preparedness and readiness. Their reports should be sent to HQ.
- For each LGA in their state SDs should make a calculation how much storage place is required for storing all the Census Materials and the resulting tabulated information should be provided to the concerning LGAs.

- Resources should be activated to equip the LGA storage places with shelves and/or cabinets.
- The DPCs should be instructed from HQ on the set-up of a production line, to warrant optimal processing of all census forms without delay.
- The DPCs should be instructed how to equip and arrange their census form archive room.
- As part of their training programme facilitators should get a demonstration of scanning and editing of the census forms.
- To monitor the quality of training of enumerators and supervisors, HQ should implement thorough quality control procedures for application during the training.
- It should be made clear to the states what arrangements and provisions have been made by the HQ for the replacement of enumerators. There will be enumerators appointed who will not be able to attend the training and/or participate in the census exercise because of, for example, illness or accident.
- Instructions to State Quarters should be accompanied by budgeting proposals.
- In order to facilitate the training of enumerators, an inventory should be made per LGA how many EAs are on grid sheets, on line maps, are fair drawn and how many are on image maps.
- A directive should go out to the States to check rigorously the quality of photocopied EAmaps (a checklist has already been distributed to the SDs). If the quality is below standard, new photocopies should be made with the photocopying machine provided.
- A directive should go out to the States to separate the photocopies of EA maps from the original ones, which should be stored in another building.
- A directive should go out to the States to keep the rooms where computers and other high-tech equipment are installed clean and cool. Dust and heat affect operation of high-tech equipment badly and shorten their lifetime, sometimes severely.

5. Monitoring and Evaluating the PES training of Enumerators and Supervisors

From 15 – 17 June 2006 I carried out monitoring and evaluation visits to Delta State where we observed training at the training centres of the following LGAs: Oshimili North, Oshimili South, Aniocha South, Ndokwa West (Kwale), Ughelli North and Aniocha North. A report on our findings has been distributed within the NPC and based on this report measures have taken by the Chairman. The main conclusions of our monitoring and evaluation are:

- Overall I noted a deficit in interview skills. The enumerators just read out the questions in sequential order, without interpreting them. Maybe the one hour scheduled for instructing the enumerators on interview techniques for fertility and mortality questions was too short.

- Payment remains an issue and may cause considerable problems. When enumerators find out that others receive additional money, they may loose motivation and make complaints to the press and other media resulting in a compromised PES.

The last conclusion is based on the following observation:
Accidentally I found among other papers within the class room a request signed by the comptroller and directed to the LGA chairman for additional allowances for all PES functionaries. The amounts requested were considerably. I queried the comptroller about the request and he said that the arrangement was already made and that the letter was to formalize the arrangement. Since additional payments by governmental organisations and others may compromise the PES I urged the comptroller to abandon the request.

6. Towards a Sustainable Geographical EA Framework

6.1 Introduction

With the help of donor money the cartographic department of NPopC has heavily invested in hardware, software and geo-data, in particular very high resolution satellite imagery and EA maps drawn to scale in paper format, and established a GIS Laboratory in Gonder Street. One of the main aims of the use of satellite imagery in a population and housing census is the creation of a geo-referenced enumeration area (EA) digital map database. The successful operation of any geo-information system depends on a number of factors including:

- Availability of Hardware/Software (H/S)
- Availability of (geo-)data
- Availability of human resources, who can operate the system and process the data
- Proper embedment of the system in the organization as a whole
- Timely maintenance/replacement of hardware, software and data
- Availability of a long-term budget.
- Proper embedment of the system within a National Geospatial Data Infrastructure (NGDI).

The creation of a digital EA map database is a complex geo-information project and it is a general experience that complex geo-information projects tend to fail in the long run if one or more of the above crucial factors are insufficient present or lacking. It is also a general experience that when high-technology systems were implemented in African countries they often *failed*. H/S and geo-data are readably available at CD (Cartographic Department). Although there are delays in the delivery of Very High Resolution Satellite imagery, in particular because of heavy, nearly permanent cloud cover in the South parts of Nigeria to date about 50% of the EAs are covered by very high resolution satellite imagery and this amount of data is already beyond present processing capacity.

Especially in developing countries it may be frequently observed that the implementation of geo-information in an organizational context may fail because of reasons, including:

- Lack of understanding of the concepts of geo-information. Today's use of geo-information requires that within the organisation sufficient knowledge and skills are available on geomatics, including land surveying, GPS, Geodesy, photogrammetry, remote sensing, satellite mapping, databases and GIS.
- It may also happen that one heavily invests in Hardware/Software and that tasks can not be carried out because of lack of data.
- When in addition to H/S sufficient data is available, it frequently occurs that one confuses data with information that means that there is a long, often labour-intensive way required to arrive from the data at the required information. For that highly skilled human resources are necessary.

At present H/S and data are available. However, the risk that the creation of a digital EA map database for the whole of Nigeria may fail is high because of lack of human capacity, lack of maintenance/replacement provisions, and improper embedment of the system in the entire organization and within a NGDI. In the sequel we will treat the above topics in greater detail.

6.2 Human Resources

The complex process to arrive from collection of geo-spatial data at digital information, which is suited for dissemination to decision makers, the general public and others, can be subdivided into six stages:

1. Collection of geometric data, such as EA boundaries, and of thematic information with a spatial component, such as the number of households living in building
2. Processing of the collected data such that it can be stored on computer accessible media, such as hard disks and CDs.
3. Embedding of the data in a proper database management system (DBMS) for easy retrieval and analysis of data. A proper design of the DBMS is a labour intensive work but essential.
4. The actual analysis of the data
5. Communicating the analysis results by transferring them to representations in map, graph and table format; the design of the associated representations requires thorough insight into cartographic visualization theory
6. Dissemination of data and information, preferably over the internet

The human resources to cover the knowledge and skills necessary at all six stages include:

- For the collection of data and its processing (stages 1 and 2) engineers at HND level and academic level who are well-trained in surveying, photogrammetry, remote sensing, geo-reference systems and geo-information processing

- Engineers at HND level and academic level who are well-trained in geo-information technology to cover the needs as mentioned in stage 3
- Geographers, demographers and the like at HND level and academic level who are knowledgeable in analyzing data by using statistics and tools like geographical information systems (GIS) and other computer assisted tools
- Cartographers in the restricted sense at HND level and academic level who are well-trained in the presentation and visualization aspects of communicating geo-information
- Computer, network specialists and printers to cover stage 6

All the personnel, either concerned with data acquisition from digitizing maps or with creating visualizations in map format, will use modern information and communication technology (ICT) for carrying out their tasks. It is therefore critical essential that all staff members are sufficiently knowledgeable and skilled in using today's computer facilities. Furthermore, maintenance and warranting well-functioning of all hardware and software components requires (helpdesk) support by staff members who are educated in general ICT.

The present staff has basically an HND and academic background in geography, demography, planning and cartography (cartography used here in the restricted sense of producing visualizations from available geospatial data). Accordingly, the background of the present staff primarily covers stages 4 and 5. Stages 1, 2 and 3 require an engineering way of approaching problems and arriving at solutions.

Covering the knowledge needs and skills required in the stages 1, 2 and 3, using existing human resources in the Cartographic Department, would thus require a complete re-education of a selected group of staff members. Given the above it becomes more feasible to reinforce, at least in the short term, the knowledge and skill base of the existing staff in their specific domain of knowledge, covering essentially stages 4 and 5. That means, on the shorter term, capacity strengthening can be achieved by providing the present staff members:

- Elementary knowledge on modern ICT tools
- Training in the use of modern geo-ICT tools, including GIS and remote sensing image processing systems
- Elementary knowledge on geo-data sources, such as GPS, High Resolution and Very High Resolution satellite imagery and to derive from these geo-data information for storage in a DBMS.

Appendix D treats the short term training needs of NPopC's Cartographic Department. For the long run recruiting personnel with the proper engineering background can than strengthen capacity in particular for covering the needs in stages 1, 2, 3 and 6.

6.3 Maintenance/replacement provisions

It is a general experience within Nigeria that once a technical environment has been constructed, maintenance of equipment, installations and so on is performed at substandard level. The economical and technical life span of computer equipment is 3 to 5 years, provided that maintenance is carried out on a regular basis and operation conditions are optimal. Because the operation conditions in tropical environments are harsh (temperature, humidity, dust), a replacement scheme based on a 3 years life span would be required. Also software needs maintenance because regularly up-dates will be released by the manufacturers, virus scanners and fire-walls have to be updated too, as is also the case for operating systems. Since hardware and software maintenance capacity is not available at the cartographic department, the required expertise should be contracted out on a long-term basis. Pending the approval of the 2006 budget, maintenance service of GIS laboratory at Gonder Street should be quickly contracted out. Any delay in the appointment of maintenance personnel endangers the well-functioning of the laboratory and its sustainability in the long run.

6.4 Embedment in the Entire Organization

The introduction of (geo-) ICT in an organization may necessitate breaking the walls between departments, erected during the past. Organisationally the NPopC is present at four geographical levels:

- Headquarters in Abuja
- 7 DPCs
- 36 States + FCT
- 774 Local Government Areas

A sustainable GIS laboratory requires that all resources are distributed/present optimally at all four levels.

The hardware and software capacity is not sufficient at Headquarters level (Gonder Street) for carrying out the bulk work of producing digital EA maps from the available data (EA paper maps, satellite imagery, etc.). Human resources and equipment are available at State level to assist in that work. However, it became clear during EAD work and other preparations for the main census that the State level is not the most appropriate level for carrying out complex information technology tasks. The reasons for that are:

- Although 2 cartographers at state level have been trained in digital cartography, many of them could not manage the job to transfer paper maps into digital format
- When people are working with new types of equipment it is necessary that the pool of skilled people is large enough to enable transfer and exchange of knowledge
- The supporting facilities at state level are often suboptimal or even poor. Often there is lack of power causing slow progress of the work. At state level the number of computers

is relatively low and the climate in which electronic equipment runs is often far from optimal (usually no A/C; dusty air, improperly cleaned rooms, etc.)

- Maintenance of the computer equipment at state level appears to be a cumbersome undertaking

The Digital Processing Centres, seven in total, have been recently well equipped with computer equipment, A/Cs and other facilities for processing the millions of questionnaires generated during the main census and PES. Furthermore, well trained people knowledgeable in ICT are available who are now involved in processing the census questionnaires. According to estimates the processing of the census questionnaires will probably be completed within one year. To make optimally use of the available human resources in the long run, it would be very appropriate to carry out the creation of the geo-referenced digital EA framework, of which the creation is estimated to take 5 years, at the DPCs. What is needed, in addition to capacity building, is the installation of GIS software at the servers present in the DPCs. It would also be beneficial when seven of the senior digital cartographers, which are presently nine in total, become head of the Cartographic Department at DPC level. They do have the knowledge to co-ordinate and supervise the work. Furthermore they have worked together for a long time and can exchange ideas, issues and so on during regular meetings. They can also visit international workshops and conferences in order to keep them selves technologically up to date.

Recommendations:

- Emphasize should be put on creation of the geo-referenced digital EA database at DPC level
- The GIS laboratory at Gonder Street should be used as training and development centre, headed by one of the digital cartographers

6.5 Embedment in a National Geo-spatial Data Infrastructure

NPopC is not the only organisation in Nigeria which collects and disseminates geo-information. Therefore it is important that the creation of the geographical EA database is carried out in compliance with the data and standards of other National organisations. One of the main issues is standardization; the subdivision of geographical units, such as roads and buildings, into classes should be done according to a unified classification system, also used by other organizations. Annotation, that means naming of localities, roads, streams, and buildings, will also be part of the geographical EA database. Therefore, the creation of the database offers a unique opportunity to arrive at uniform spelling of different types of geographical units. The selection of the geodetic reference system should also be chosen carefully. To date, for the whole of Africa a project is on-going to establish a continent-wide geo-reference frame, called AFREF. It is strongly recommended to adopt that reference system, because it will ease exchange of geo-information in the future and integrated use of

cross-boundary geo-information, which is necessary for sustainable development of Sub Saharan countries. The creation of a digital geographic EA frame data base could result in several interesting spin-offs:

- A geo-referenced building database for the whole of the national, suited maybe for creating a property tax system
- A database of precise boundaries between Local Government Areas and between States. This data base could be a valuable source for the Nigerian Boundary Commission to prevent future boundary disputes and could even be a source for freezing the boundaries by law
- An accurate database of roads and other topographical features in the country
- Digital maps of the major towns and cities in Nigeria. This can be offered as a service to the general public, but also for emergency planning, disaster management, and optimal route determination by transport companies.

7. Main Conclusions and Recommendations

The following issues are essential prerequisites for establishing a sustainable geographical digital EA database by the cartographic department:

- Permanent capacity building by training and educating existing staff and enforcement of the staff by recruitment of general ICT specialists and geomatics specialists, including surveyors and IT maintenance personnel
- Organizing of the EA database production work at DPC level
- Maintenance and replacement of equipment should be permanently in focus
- The creation of the geographical EA database should be carried out in compliance with data available at other National Organizations and the standards used there.
- The GIS laboratory at Gonder Street should be used as training and development centre, headed by one of the digital cartographers
- Provisions should be made to enable updating of very high resolution satellite images
- The cartographic department is well on its way to establish a digital EA database covering the whole of Nigeria. However, in order to continue and to succeed it is necessary that long-term budget becomes available for capacity building, maintenance of equipment, updating of data and so on.

Appendix A

Use of Satellite Imagery for Enumeration Area Demarcation

A satellite image is a snap-shot of a part of the earth surface captured from space and taken at a certain time. The very high-resolution images we are using (pixel size 1m) are taken from a height of around 700km above earth surface. The imagery may be in black and white (panchromatic) or colour. The image maps that you are going to use have been indexed for easy orientation and they are reproduced in A0 and A3 sized copies. The original colour images may be reproduced in black and white or in colour. They are neither provided with legend nor annotated. Hence, you have to identify the features on the imagery, which will help you to orientate yourself in the field. The first thing to do is to start from known and proceed to unknown features (working from the large to the small). The administrative boundaries of localities, LGAs, state and country should be marked out clearly when applicable in the office prior to going to the field (see also under paragraph *field procedure* point 11).

Clues for Identification of Features on Imagery

Broadly, features can be distinguished into man-made and natural features. Furthermore, features are either linear or cover an area. Examples of *linear* man-made features are roads, railways and channels. Man-made area features are football fields, parks, agricultural farms, plantations, orchards and buildings.

Man-made features have *regular* **shape**: a building is often rectangular or at least shows straight boundaries, which will meet each other perpendicularly, this is also often the case for agricultural farms and orchards. Linear man-made features are also characterized by regular shape like straight lines and smooth curves.

Irregular shapes often characterize natural features. A natural linear feature, such as a stream, may appear as a jagged line. Also natural area features such as bush and forest will often show irregular boundaries. Furthermore, natural features show much greater variation in **tone** than man-made features. The variation in tone is called **texture**, whilst tone refers to the brightness (black, white, grey level) of the image area covered by a feature. The texture of cultivated land and grass field is smooth, whilst the texture of bush and forest is rough. Some features may show up in a dark tone, like water bodies and streams, whilst others like roads, show up in bright tones.

In addition to tone is **colour.** Colour provides an important clue. Cultivated land, forest and bush will show up as green, when captured during the growth season, and as brown when captured during the dry season. Buildings at the other hand may show-up in any colour, thus, for buildings colour is not an important clue: shape and size are much more important to identify buildings.

The function or use of a feature may be often identified from its **size**. For example, when you have identified a feature as a building, the size may give you an indication whether it is an office building, a factory or a living house.

For identifying whether a building is an office or a factory, neighbouring features may give a clue. For example, when surrounded by other large buildings or the neighbourhood

appears to be residential, it is most likely an office. Identifying a feature by first identifying features in its vicinity is called **arrangement**.

In summary, shape, size, tone, colour, texture and arrangement are very important visual clues you use to identify features. Also, pattern could be used to identify features.

Procedure for Ea Delineation On Satellite Imagery

Annotation of the Imagery
The aim of annotation is to facilitate identification. What do we mean with it? Annotation means to affix texts on the satellite images. Features to be annotated are:

- all roads, streets and pathways that have names
- all rivers, streams and other water bodies that have names
- all buildings used in describing any EA boundary (either by house number or name of owner) see also under paragraph *field procedure* point 10
- all prominent buildings such as churches, mosques, schools, hospitals, and palaces
- landmarks and recreational grounds, such as parks, swimming pools, stadium and football fields

Field Procedure

1. The first thing to do is to study - in the office - the image map of the area you are going to delineate and take note of any recognizable features and areas on the image map. You may not be entirely familiar with the area you are working on.
2. Roughly divide the area among the supervisors
3. Thereafter, the supervisor and his team move to the field (the area) with the image map for ground truthing (confirmation) of the recognised features you have identified on the image map
4. Orientate the image map to the terrain. This means aligning some identifiable features on the image map with those on the ground so that the other features such as roads, streets and houses will be pointing in the same direction as the corresponding features on the ground
5. Find out and affix the correct names of the roads, streets and other prominent features to be annotated as mentioned in the section on annotation of the imagery
6. The total boundary of any EA should be wholly on one and only one sheet of image map. No partial EAs are thus allowed. There may be more than one EA on an image map, however no EA should cross a map sheet
7. Beginning with the first EA on the image, follow the procedure for building numbering and listing on Form EAD IA and the estimation procedure on Form EAD IB (this is the normal procedure as described in the EAD manual). This should be done for every EA on the image
8. Identify the boundary of each EA according to the normal procedure, that means after determination of the estimated population threshold (500 persons in densely populated area) look for identifiable features, such as road, street, and footpath which are suitable as EA boundary and mark the boundary with red pen on the image map
9. Indicate the starting point of each EA on the imagery with a legible marker.
10. Indicate on the image building number (street no.) or name of owner of house that would be useful for easy identification of turning points of the EA boundary
11. Ensure that the delineated EA boundary does not cut across any administrative boundary e.g. locality and LGA

12. Make a sketch of the EA in the corresponding Form EAD IB on the space provided and describe the EA boundary
13. The supervisor should examine the returns of the demarcators and subsequently transfer the field returns to the composite sheet (Master sheet) of the imagery covering the entire city, town or LGA. Note that the master sheet should have been prepared in the office through matching and cellotaping together the adjoining sheets covering the entire area
14. For very high densely populated areas where the EA image map area is too small to clearly distinguish and mark out EAs an enlarged line map should be drawn, using the normal procedure. Choose a proper scale.

Geographical Coding

1. At the completion of delineation on the Master sheet assign codes to the EAs according to the normal procedure as described in the EA manual. When the imagery does not cover the whole area and EA numbers are already assigned to the line map EAs, just proceed with numbering
2. Write the EA code for each EA with a red pen to properly identify the EA.

Supervisory Area

1. SAs should be delineated on the Master sheets. Ensure that the rules on the establishment of SAs are applied (see EAD manual)
2. Assign 4-digit codes to the SAs and circle the codes to distinguish them from the EA codes using a blue pen.

Notes

1. In special cases such as when a (big) building consists of more than one EA, the EA codes or range should be written within the space covered by the building
2. While being in the field temporary EA identification codes should be determined and filled in on the form EAD 1A & 1B for each EA delineated
3. When in doubt, please consult your HOD Technical (EAD State Coordinator).

NPopC, Abuja, 26 October 2006

Appendix B

Instruction Manual on Right-Sizing

Introduction

As a result of the creation of approximately twice as many EAs as the number of enumerator teams (ET) available a so-called rightsizing exercise had to be launched. The rightsizing exercise consists of four main stages:

1. Allocation of number of ETs to the states (HQ activity; finished)
2. Based on the number of ETs allocated to states, allocation of the number of ETs to LGAs (State Activity; in stage of finalization)
3. Grouping of EAs into larger units to be assigned to ETs (workload right-sizing; ongoing)
4. Certification of the EA grouping per LGA by 5 men crews

Your work as part of the workload right-sizing team will be mainly concerned with stages 3 and 4 and this instruction manual covers the work you have to do in these stages.

Workload Right-sizing

What do we mean with workload right-sizing? Workload right-sizing is grouping EAs into, preferable contiguous units, which can be readily well covered by one ET during the main census. The final output of the right-sizing should be added to the existing EAD register. For that you need to create two extra columns to the right, one containing the header ET and one the header Supervisor. The grouped EAs to one team are identified by putting the Serial Number of the ET in the added column to the right of the table. In addition you add two other columns, one is the population estimate resulting from demarcation (PE estimate) and corrected population estimate (PE correct) The table below shows a clarifying example. (Note that for convenience, some columns of the EAD register have been left out in the table below).

S/N	SA code	Sa name	EA code	EA name	Left out	PE estimate	PE Correct	ET	Supervisor
			0002					1	1
			0004					2	1
			0006					3	2
			0008					1	1
			0010					1	1
			0012					3	2
			0014					2	1

Workload

The workload per ET is basically determined by:

- Given time span for the main census (census period)
- Population within the EA(s) assigned to the ET
- Total area of the EA(s) assigned to the ET
- Accessibility of the EA(s)

The time approved for carrying out the census is fixed to 5 days. The population living within each EA has been estimated during the demarcation exercise of which the fieldwork has now been fully completed for the whole of Nigeria. It is well known that the population estimated during the demarcation is not very reliable. The population density is a main indicator for the area coverage of an EA. Terrain characteristics and the number and

quality of roads largely determine the accessibility of an EA. Terrain characteristics involve, amongst others, relief (flat, hilly, mountainous), density of streams and rivers, presence of swamps and so on. The local members of the team will usually have sufficient knowledge on these features.
The two main prerequisites, which should necessarily be fulfilled before you can commence your work in the LGA assigned to you are:

- The base map of that LGA should have been completed
- Phase 3, described above: workload rightsizing - should have been completed for that LGA.

At this very moment (1 December 2005) we face the major problem that completed base maps cover only 444 out of 794 LGAs. Furthermore, many states have no or at best only a few LGAs right-sized. In addition, many right-sizing exercises have been carried out administratively and not graphically, i.e. without using base maps. Furthermore, the right-sizing exercise is misunderstood by some states such as Ogun State, and Taraba state, just to mention a few. This situation will affect your work when you are going to the states. Although the initial plan was that you carry out a verification of the workload right-sizing done by the states (stage 4), the poor performance of many states forces us that you will be mostly concerned with stage 3, i.e. the actual workload right-sizing activity. Your basic assignment reads thus as follows:

Basic Assignment
Instructing and guiding the team members in the states to arrive – for all the LGAs in the state – at a digital registration of ETs and other necessary information in columns added to the EAD register.

Procedure
Above we outlined the four basic factors, which determine the workload of an ET: census period, population, area and accessibility. Census period has already been predefined and can not be readjusted. Of the 4 factors the population is the most critical one. However, the estimated population determined during demarcation is often unreliable. Therefore, we have to think about a tractable method to improve the population estimate per EA. For that we introduce the concept of correction factor. That means that we correct the estimated population resulting from demarcation for overestimation or underestimation; usually we will be confronted with overestimation. In order to obtain the correction factor we have to carry out sampling of a few EAs. However, it is very likely that the overestimation or underestimation will not be homogeneously distributed over the entire LGA. In order to cope with that, you have to divide the LGA into smaller areas, which we call *Geographical Units*. Because you will take 12 EA samples, you should not create more than 12 Geographical Units. The outlining of the geographical units on the base map should be part of your report. The resulting procedure reads as follows (see also the sketch added as last page):

- Divide in the office on a base map (e.g. topographic sheet or image map) on basis of the local knowledge the LGA into geographical units (GU) in terms of population density. Distinguish 3 levels (classes) of population density:
    - Very Densely populated
    - Medium Densely populated
    - Sparsely densely populated
- Of course, it may occur that just one class of population density will be present in the LGA. This will result in just one geographical unit. When there are two classes of

population density present in the area, this may result in minimum 2 and maximum 12 geographical units.

- Determine in which GUs you take one or more demarcated EAs as a sample to estimate the population (you should take in total samples of 12 EAs). You should estimate the population in the selected EA according to the procedure described in the Training and Reference Manual for Enumeration Areas Delineation, from page 69 onwards. Since you have two days to carry out the sampling and assuming that you split up the 5-member team into two teams of 2 or 3 individuals and each team will sample 3 EAs per day, you will be able to sample in total 12 EAs.
- Compute the correction factor for each GU as described below, and multiply the estimated population from demarcation of all EAs within that GU with the correction factor in order to determine the corrected estimated population

Computation of the Correction Factor

The correction factor has to be computed for every GU separately, and next applied to the population figure of every EA in that GU.

In case of 1 sample in the GU

Compute the correction factor by dividing the corrected population estimate (the population you estimated yourself) by the demarcated population estimate. In the table below you will find an example:

Corrected Population Estimate	330
Demarcated Population Estimate	480
Correction factor	0.69
Population of an EA in that GU	510
Corrected Population for that EA: 510 x 0.69 =	352

In Case of 2 samples in the GU

Divide the corrected estimated population by the first GU by the demarcated estimated population. Do the same for the second sample. Add the resulting and divide by 2. The outcome is the correction factor. In the table below you will find an example:

Corrected Population Estimate for sample EA 1	270
Demarcated Population Estimate for Sample EA 1	460
Correction factor for Sample EA 1	0.59
Corrected Population Estimate for sample EA 2	310
Demarcated Population Estimate for Sample EA 2	490
Correction factor for Sample EA 2	0.63

The correction factor is computed as:

0.59 + 0.63 = 1.22. Divide 1.22 by 2, with as result 0.61. The correction factor to be applied to all the EAs in that GU is 0.61. In case of 3 or more samples, the procedure is straightforward. For those who are mathematically literate the formula to apply reads as:

$$CF = \frac{1}{N}\sum_{i=1}^{N}\frac{CP_i}{DP_i}$$

With:

- CF: correction factor
- CP: corrected population estimation of the ith EA
- DP: demarcated population estimation of the ith EA
- N: number of sampled EAs in the GU

List in the EAD register, for all EAs in the LGA the estimated population resulting from demarcation and the corrected population estimate.

Classifying Accessibility

Another important factor you will use in the workload right-sizing exercise is accessibility as defined above. Classify for that purpose each of the geographical units in the LGA with the help of the local team members into three classes:

- Good accessibility
- Medium Accessibility
- Bad Accessibility

Grouping of EAs

After having carried out the above you are now requested to group EAs together so that one ET can cover the workload during census. Use for criteria the table as shown below.

	Population Density		
Accessibility	High	Medium	Low
Good	550-650	450-550	350-450
Medium	450-550	400-500	300-400
Bad	350-450	350-450	250-350

Allowed Population Range for one ET, given the three classes of population density and the three classes of accessibility characteristics

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- Take care that the total number of ETs in an LGA does not exceed the allocated number. This means that grouping of EAs may be an iterative process.
- Take care also that the number of ETs does not exceed the number of EAs.
- EAs can not be split up
- No EA should have more than one ET assigned
- It is not necessary that grouped EAs belong to the same SA, nor is it necessary that a whole number of SAs is assigned to one enumerator supervisor.

Reporting

You should write a report on your results and (unresolved) problems. A copy of the final right-sizing report for each LGA should be submitted to: honorable federal commissioner, state director and director carto.

1 December 2005
Mathias Lemmens
EU GIS/Mapping Advisor

Appendix C

Production of Satellite Image EA Maps

NPC Internal MEMO

From: Mathias Lemmens
GIS/Mapping Advisor

To: Chairman, through DG

Subject: Production of Satellite Image EA Maps

Date: 21 November, 2005

As decided by the Action Plan Committee image EA maps of 40,000 EAs will be used by enumerators during the main census. The production of the EA maps will be carried out centralized at the GIS Laboratory in Gonderstreet. The deadline of finalizing the production and reproduction (4 per EA image map; 3 per SA map) is set to 31 January 2006. In order to warrant timely production of the EA/SA image maps the following issues require thorough consideration:

- The production of one EA image map takes about 30 minutes for an experienced digital cartographer
- The number of digital cartographers available at the Head Quarter is 10
- The number of mapping systems (computer + ArcMap software) available is 10
- Assuming that one digital cartographer can produce daily 16 EA maps, the team of digital cartographers will be able to produce 160 EA maps per day. So, it will take about 250 working days to produce all the image EA maps as required for the main census, which is too much given the time constraints

In order to warrant a timely production of image EA maps, we recommend adoption of an improved production line as follows:

- A substantial part of the work to create an image EA map is the typing of the EA boundary description. Secretaries at the state quarters should do the typing of the EAD boundary description in Word documents. These documents can be sent by email to the HQ and by copy/paste commands included in the EA maps. It may be expected that this adaptation to the work procedure will reduce the workload of the digital cartographers with approximately 40%
- In order to produce all 40,000 image maps within the approximately 70 days available from now to the deadline, around 600 EA image maps have to be produced daily
- Production of image EA maps should therefore be done in shifts 24/24 hours per day, 7/7 days per week, using the 10 mapping systems available
- In order to enable production in shifts the workforce of 10 digital cartographers at the HQ has to be extended with about 40 fair drawers coming from the states and stationed at HQ Abuja. It may be expected that a fair drawer will be able to produce around 25 image EA maps in one day, given that secretaries do typing of the EAD boundary description. So, around 750 image EA maps can be produced per day, provided 7 wording days a week, i.e. 5250 maps per week. So around 8 weeks are necessary to produce all the image maps, giving sufficient redundancy to cope with unforeseen delays.
- The digital cartographers should in addition to being productive themselves supervise the work of the fair drawers
- The project will start on 12-12-2005 and end on 05-02-2006

Other important issues, which should be considered, concern:

- Continuity of power supply, i.e. sufficient fuel for the generator (about 4 drums a week are necessary), whilst delivery of power by NEPA should be warranted by all means
- Availability of sufficient toner should be warranted
- Around 200,000 A3 paper sheets are required to produce and reproduce all image maps
- Around 50,000 A3 envelopes for collection of the reproduced EA image maps have to be made available of which 5,000 at short term
- The three fire-resistant cabinets at Gonder street are sufficient to store the image maps
- An officer responsible for controlling the amount of work done, the level of used and available consumables and so on, should be appointed

The above results in the following budget justification:

	Subject	Days	Units	Price/ Day	Price/ Unit	Total (Naira)
1	Transport To and From Abuja		39		K10-K20	690.000
2	Daily Transport to Gonder Street	56	50	300	16800	840.000
3	Accommodation Allowances	56	40	3500	196000	7.840.000
4	Shift Allowance Supervisors	56	10	2000	20000	1.120.000
5	Shift Allowance Digital Cartographers	56	40	1500	60000	3.360.000
6	Refreshment Provisions	56	40	10000	250	560.000
7	5000 Envelopes (250 x 200)		250		350	87.500
9	Generator Servicing					100.000
10	Generator Fuel (4 drums/week)		32		17600	563.200
11	Generator Operator	56	1	500		28.000
12	Secretaries		37		25000	925.000
13	Contingency (5% of total)					805.685
	Total				**Naira**	**16.919.385**

Please, kindly request to make the necessary provisions and approval of above budget justification to enable implementation of the production line described.

Appendix D

Training Needs of NPopC's Cartographic Department

By Dr. Mathias Lemmens
Census GIS/Mapping Advisor
Abuja, 17/05/2006

Introduction

One of the tasks assigned to NPopC's Cartographic Department includes the establishment of National Geographic EA Sampling/Digitizing of EA maps. As a preparation of the Census 2006 line maps and satellite image EA maps covering together the whole of Nigeria have been created. Furthermore Very High Resolution and High Resolution satellite imagery for nearly the whole of the country are available as a gift from DFID. The image base is at presently continuously extended by images provided by NASRDA by a sponsorship from the Nigerian government. The establishment of the National Geographic EA Sampling framework requires the conversion of the present EA data in paper format to digital format for storage in a database management system (DBMS) and upgrading of that data. Many of the tools are available (many of them sponsored from donor money) or budgeted as part of the 2006 contract components.

The conversion and upgrading of the amount of data involved is a laborious and time-consuming activity of which the duration should be counted in years rather than in months and which requires skilled people (it is estimated that the establishment of the national geographic sampling frame will take at least 4 years). One of the main deficits at present for carrying out this extensive activity is lack of cartographic/surveying people within the commission who are sufficiently well trained in the methodology of digital cartography, geographical information systems (GIS), the use of digital (cartographic) equipment and modern land-surveying.

The training of members of the cartographic department is an important step towards further capacity building of the NPopC and to arrive at a sustainable Census framework.

Training I: Basic Computer Training

Basic computer knowledge is an essential prerequisite for carrying out more advanced IT tasks. The average computer literacy of the staff is in comparison with international standards rather low. Therefore the general computer literacy of the staff should be enhanced by means of a basic computer course. The total number of staff members which require enhancement of IT skills is 120 and the contents of the course should cover the subjects as indicated in Table 1.

	Subject	Class (hours) Theory [h]	Lab (hours) practicals [h]	total (hours) total [h]	Total (days) total [days]
1	Computer Hardware	4	4	8	1
2	How Computers Work	4	4	8	1
3	MS Office Software	4	12	16	2
4	Making your own Program	4	12	16	2
5	Basics of Word	4	12	16	2
6	Basics of Excel	4	12	16	2
7	Basics of Access	4	12	16	2
8	Basics of email	2	6	8	1
9	The Internet	2	6	8	1
10	Integrating Files	2	6	8	1
	Total	34	86	120	15

Table 1, Enhancing Computer Literacy (120 staff; 3 weeks)

The duration of a basic IT course should not last less than three weeks. The staff members should be trained in classes not bigger than 16 people. The cost of such a course is budgeted at Naira 180,000 per person, including fee and allowances. The total budget necessary for this course is Naira 21,6Million.

Training 2: Principles of digital geo-information

A second basic prerequisite for carrying out the above tasks is knowledge on the principle aspects and essentials of digital geo-information. The duration of such a basic geo-information course should last not less than three weeks. Eighty staff members should be trained in classes not bigger than 10 people. The cost of such a specialized course is budgeted at Naira 240,000 per person, including fee and allowances. The total budget necessary for this course is Naira 19,2Million. Table 2 provides an overview of the minimum issues the geo-information course should contain.

	Subject	Class (hours) Theory [h]	Lab (hours) practicals [h]	total (hours) total [h]	Total (days) total [days]
1	Geo-information	4	4	8	1
2	Coordinates and reference systems	4	4	8	1
3	Vectors and Rasters	4	12	16	2
4	GPS	4	12	16	2
5	Photogrammetry/Remote Sensing	4	12	16	2
6	Digitization of Maps	4	12	16	2
7	Database Management Systems	4	12	16	2
8	GIS	4	20	24	3
	Total	32	88	120	15

Table 2, Principle Aspects of Geo-information (80 staff; 3 weeks)

Training 3: Modern Land surveying

The updating of EAs will require substantial fieldwork, involving in particular land surveying activities. For that it is necessary that in each state at least one staff member is thoroughly trained in the principals and essentials of modern land surveying and the use of land surveying equipment. The duration of such a basic geo-information course should last not less than 5 weeks. Forty staff members should be trained in classes not bigger than 10 people. The cost of such a specialized course is budgeted at Naira 480,000 per person, including fee and allowances. The total budget necessary for this course is Naira 19,2 Million. Table 3 provides an overview of the minimum issues the land surveying course should contain.

	Subject	Class (hours) Theory [h]	Lab (hours) practicals [h]	total (hours) total [h]	Total (days) total [days]
1	Principles of land surveying	24	16	40	5
2	Measuring closed traverse	2	6	8	1
3	Reference systems	8	16	24	3
4	Principles of adjustment	16	16	32	4
5	Measuring withTotal Stations	8	16	24	3
6	Computing coordinates	4	12	16	2
7	Putting Survey data in the computer	4	12	16	2
8	GPS	4	12	16	2
9	Use of ArcSurvey	4	20	24	3
	Total	74	126	200	25

Table 3, Land Surveying (40 staff; 5 weeks)

Training 4: Creating Databases from Digitizing Maps

The digitization of EAs will be partly done from digitizing line maps and partly from satellite imagery. For that 40 staff members need to be trained in digitizing line maps and creating maps from satellite images. The duration of such a basic geo-information course should last not less than 5 weeks. The classes should be not bigger than 10 people. The cost of such a specialized course is budgeted at Naira 480,000 per person, including fee and allowances. The total budget necessary for this course is Naira 19,2 Million. Table 4 provides an overview of the minimum issues this course should contain.

	Subject	Class (hours) Theory [h]	Lab (hours) practicals [h]	total (hours) total [h]	Total (days) total [days]
1	Maps versus Images	8	8	16	2
2	Principles of scanning	4	4	8	1
3	Reference systems	8	16	24	3
4	Heads-up-digitization	4	12	16	2
5	Mastering ArcGIS	8	32	40	5
6	Creating a Database	8	16	24	3
7	Principles of Digitizing	4	12	16	2
8	Annotation	4	12	16	2
9	Printing	4	12	16	2
10	Image/map Enchancement	4	20	24	3
	Total	56	144	200	25

Table 4, Digitizing line maps and satellite images (40 staff; 5 weeks)

Al courses are local. In summary the training needs involves the following courses.

		Total Naira
1	*Basic Computer Training (120 staff; 3 weeks)*	21,6 Million
2	*Principles of Digital Geo-information (80 staff; 3 weeks)*	19,2 Million
3	*Modern Land surveying (40 staff; 5 weeks)*	19,2 Million
4	*Creating Databases from Digitizing Maps (40 staff; 5 weeks)*	19,2 Million
	Total	79,2 Million (US$ 0,6 Mln)

Appendix E

NATIONAL POPULATION COMMISSION

NATIONAL WORKSHOP ON LOCALITY IDENTIFICATION AND CLASSIFICATION

POSITION PAPER

PRESENTED AT JOS, PLATEAU STATE THE CHOSEN CENTRE FOR NORTH CENTRAL GEO-POLITICAL ZONE ON 5TH NOVEMBER 2005

1. Introduction

The listing of localities for the 1991 census brought forward some major problems namely: disaggregating, aggregation and the subsuming of localities. There were cases where it was difficult to disaggregate and identify distinct smaller localities that make up the larger settlement or city. In this situation population figures for prominent parts of major cities like Ibadan Metropolitan area such as Bodija, Sabo, etc as was done in the 1952/53 and in the 1963 censuses were left out.

In other cases major urban centres were so disaggregated into smaller localities that the name of the major centre either disappeared in the population figures or got incredibly reduced. For example, segments of cities and towns, housing estates, barracks, etc emerged as localities in many LGAs while the well known names of these localities were hardly mentioned. Cities like Kaduna and Lagos were hardly mentioned while Enugu, Onitsha and Kano were tremendously reduced to a small fragment of the city.

The third problem is that of subsuming villages and towns into one name. The population figure for a group of settlements was published under the name of one of the towns and the rest subsumed as "others". For example, in Abaji Area Council of the FCT, out of 32 localities for which population figures were published, 23 were listed with given names and others. Another example is Abuja Municipality of FCT where out of 130 localities with population figures, 82 were published as named localities and others. This was not acceptable to many Nigerians. The other extreme is where all the little but distinct localities in an LGA were subsumed into one bigger settlement. For example in Abeokuta South LGA there was hardly any other locality but Abeokuta.

After publishing the provisional figures in 1991, attempt was made to re-classify localities into primary, secondary and tertiary. But this was rather an ad-hoc attempt. Indeed the classification was not properly standardized for all parts of the country. So it was left inconclusive. It is in a bid to avoid a repeat of this anomaly that this workshop is being organized with a view of reaching a common understanding with the LGA chairmen, traditional rulers and indeed all Nigerians.

2. Aims and Objectives

Ordinarily a locality is a distinct population cluster or an inhabited place or settlement. But these may be confused with either the smallest divisions or urban agglomerations in the

country. So the aim of the workshop is to explain and clarify the operational use of the term locality. The aim is to reach a common understanding of the concept locality in the 2006 census in Nigeria.

The first objective of the workshop is to ensure transparency. The Commission wants to assure the Nigerian public that all localities have been demarcated and members of the public are encouraged to alert the Commission of any localities omitted. Thus the first objective is to assure complete total demarcation of all localities by letting the Local Government Area Council Chairmen to compare the locality list they submitted to the Commission with the list of localities completely demarcated.

The second objective is to reach a common understanding on the classification and identification of localities in the published census figures. Rather than keeping the Commission's definition in-house and let the public guess or contend about the context of the locality concept, it is better to build on an acceptable understanding.

In a nutshell, the Commission hopes to prepare the mind of Nigerians on localities for which population figures will be published. It will be practically feasible to publish population figure for every locality except those smaller than one enumeration area, in which ease, the figure will be grouped with the figures for other localities that make up the enumeration area. Nevertheless, the names of all localities in all such a group will be listed.

3. Definition of Locality

Locality is the base for all human socio-economic and political activities. Locality is therefore, in addition to the State and Local Government Area, an essential entity for which census figures are disseminated. However, the definition of locality in census taking contains inherently ambiguous elements. In order to focus thoughts consider the definition of locality as given by the United Nations in the publication: *Principles and Recommendations for Population and Housing Censuses, revision 1, United Nations, New York, 1998*, pag. 64.

> For census purposes, a locality should be defined as a distinct population cluster, (also designated as inhabited place, populated centre, settlement and so forth) in which the inhabitants live in neighbouring sets of living quarters and that has a name or a locally recognized status. It thus includes fishing hamlets, mining camps, ranches, farms, market towns, villages, towns, cities and many other population clusters that meet the criteria specified above. Any departure from this definition should be explained in the census report as an aid to the interpretation of the data.

According to the above definition the basic criteria defining a locality are:

1. A locality is a distinct population cluster
2. inhabitants live in neighbouring sets of living quarters
3. the population cluster should bare a name or is recognized as a locality.

The UN definition does not include criteria on minimum number of inhabitants required neither on minimum area size. Locality does not necessarily correspond with a centrally determined division of the country in geographical units for administrative purposes. The above UN publication clearly states:

> Localities as defined above should not be confused with the smallest civil divisions of a country. In some cases, the two may coincide. In others, however, even the smallest civil division may contain two or more localities. On the other hand, some large cities or towns may contain two or more civil divisions, which should be considered as segments of a single locality rather than separate localities.

The main characteristics of a locality in Nigeria therefore are:

- A locality may be part of another locality
- A locality may be completely surrounded by another locality (enclave), but is not a part of that locality
- One locality may consist of two or more localities; so a locality can be part of a bigger locality, and that locality can be part of another bigger locality and so on.
- The area of localities of the same hierarchy do not overlap
- A locality which is part of a bigger locality can not be a part of other adjacent localities.
- One locality cannot be disjointed by another locality.
- A locality can be an economic unit
- A locality may cross LGA boundaries or span one or more LGAs.
- A locality may encompass a whole state but do not cross State boundaries.

To cope with the fact that a locality may be part of another locality and so on we introduced a hierarchy, which consists principally of three levels:

- primary locality
- secondary locality
- tertiary locality

It was recognized in an early stage that localities exists which do not have the status of primary locality but because of their geographical remote location and isolation from the primary locality (parent locality) it actually should belong to, or have a lower status of a locality. For that purpose we introduced a fourth level called sub-primary locality.

A sub-primary locality is a part of a primary or a secondary locality. Primary locality may through urbanization become part of a secondary locality. Similarly, the secondary locality may become part of a tertiary locality. The following examples illustrate the situation described above:

a. Idi-Araba is a sub-primary locality in Ilasamaja which is in Mushin which is in Lagos metropolis.
b. Ajao-Estate is a sub primary in Oshodi town in Oshodi LGA in Lagos metropolis.
c. Unguwan Sanusi is a primary locality in Tudun Wada which is in Kaduna.
d. Havin banki is a primary locality in Kawo locality in Kaduna metropolis.
e. Ndiakwu is a sub primary in Otolo which is a primary in Nnewi.
f. Umunakwa is a sub primary in Ifite in Oraifite.

The above four hierarchical levels of locality are defined as follows:

- *Sub-primary locality is a small settlement*, which does not exist independently on its own in terms of ruler-ship, social, political and economic activities. There is always a substantial distance separating it from the parent settlement.
- *Primary locality* is a locality that has been existing throughout its history by a distinct recognized name and in which the inhabitants consider themselves to be all under one ruler-ship. Its distance friction with neighboring localities could be closed up through urbanization.
- *Secondary locality* is a town which has grown historically to engulf other settlements with autonomous traditional ruler (as in the East), Cities/Towns (as in the West) and District (as in the North). However, a secondary locality is one which usually does not cover more than three LGAs. It ranks behind tertiary locality in terms of international prominence in socio-economic activities, physical spread, and its dominance in the economic life of the Country.

- *Tertiary locality* is an urban conurbation which covers several LGAs and sometimes even a whole state. It is usually a dominant regional business attraction center of the country.

4. Enumeration Area Demarcation and the Classification and Identification of Localities

Enumeration Area (EA) demarcation is the foundation of all modern census taking. Even in Nigeria, there is hardly any population enumeration during the last several censuses without the help of detailed EA maps.

The EA maps help the enumerators to easily identify their assigned Enumeration Areas. They are also given to Supervisors to support logistics and control tasks. They are used in monitoring the progress of census operation which enables supervisors to identify problem areas and implement remedial actions. Thus EA maps support data collection and help to monitor census enumeration.

Population Census Enumeration must be done on the basis of definite, manageable units of inhabited places. The units of Enumeration Areas (EA) must be locality based. Each EA must be associated with some localities before enumeration commences, and one needs to know the status of each locality, be it urban or rural. This is needed for planning the logistics of the enumeration as well as for planning the distribution of the census questionnaire(s).

Refining the Locality List

As earlier mentioned the National Population Commission intends to generate a more comprehensive and thoroughly classified list of localities for the next census. For this purpose, the Census Technical Group (CTG) of the Commission decided in 1998 to source three avenues to generate this new locality lists, namely:

1. The 1991 locality lists (the tabulation lists)
2. A list of all localities in each LGA, to be acquired from the LGA Council Chairman, and;
3. A list of localities identified during the EAD fieldwork.

This proposal of the CTG has now been successfully carried out and they have become useful resource materials for today's workshop. The locality list of the 1991 census though lacks proper classification and identification, the list of localities submitted by the LGA Chairmen have been found to have political aberrations. However, these have become very valuable checks of completeness and duplications for the 2006 census localities list generated from the field demarcation exercise. Furthermore, this third source of locality list is expected to be more current but must be counter-checked with the other two lists as well as on a spatial relation and interdependency scale. Analytical presentation of the findings from the different sources of locality list in the next section of this paper may further elucidate issues on the subject.

5. Comparative Study of Some Results of the Outcome of the Three Sources of Locality Lists

The major problem with localities nationwide is the issue of providing suitable global classification. Other problems include multiplication, dismembering and unnecessary fragmentation in attempts to classify them. Below are tables for each of the States and the FCT in the North Central geo-political zone of the country except Kwara State.

Clearly there seem to be no regular pattern in the number of localities in the LGAs of the different States even though it is clear that the number of localities for the 1991 census is in all cases lower. This is obviously due to the grouping (aggregation) of localities mentioned earlier in the text. Another comment about the number of localities is that the submissions from the Local Government Councils have more conspicuous oddities.

Number of Localities in Selected LGAs in the North Central Geo-Political Zone of Nigeria.

	LGAs	# Locality in 1991 Census	# Locality LGA Chairmen Submission	# Locality 2006 Census
Benue State	ADO	128	663	139
	AGATU	-	262	91
	APA	-	135	92
	BURUKU	-	447	412
	GUMA	140	477	349
	GWER-WEST	107	368	179
	LOGO	-	295	217
	OGBADIBO	-	92	92
	TARKA	53	109	144
	VANDEIKYA	196	-	355
FCT, ABUJA	ABAJI	31	116	116
	GWAGWALADA	61	123	162
	KUJE	37	88	104
	KWALI	53	133	130
KOGI	AJAOKUTA	41	121	78
	OKEHI	26	58	14
	OKENE	10	90	13
	YAGBA WEST	16	659	37
NASARAWA	DOMA	85	211	278
	KEANA	71	-	192
	KOKONA	169	469	291
	NASARAWA	167	1156	398
	TOTO	137	172	204
NIGER	CHANCHANGA	5	3053	10
	GBAKO	150	972	355
	GURARA	59	415	150
	KATCHA	115	423	326
	TAFA	34	272	64
PLATEAU	BARKIN-LADI	140	506	296
	BASSA	135	320	210
	BOKKOS	210	344	259
	KANAM	164	358	267

	KANKE	225	-	217
	LANG TANG SOUTH	42	57	88
	PANKSHIN	192	184	383
	SHENDAM	236	285	474

The most important comment about the localities is the classification used in the submission from the LGA Councils. Some were grouped into just two classes: Towns and Villages. Others were grouped into Districts, Wards, Village Areas, and Hamlets. Still other LGA Councils grouped their localities only by Wards. Thus it is clear that even for a geo-political zone there is no common classification. Infact in some cases some Councils listed Railway, Clinics, and Streets as localities. Each Council classified localities to their convenience and tastes.

The general message for the 2006 Census in Nigeria is that localities have been defined geographically, adapting international definition to the Nigerian situation. Second, the general public and in particular Local Government Councils and Traditional Rulers are encouraged to draw the attention of the Commission to any observed or perceived omission of localities in their domain. Interested parties may visit the Commission's office to check the complete inclusion of all localities in their LGAs of interest.

6. Conclusion

The compilation of comprehensive locality lists and classification are essential pre-censal cartographic activities. They help to create a proper frame for EA demarcation. Although efforts were made to generate comprehensive locality lists for the previous censuses in Nigeria, these attempts did not reach conclusive decision. For the 2006, census therefore attempt have been made to standardize by classifying individual localities essentially on their hierarchical bases and functional status without holistic spatial considerations including number of inhabitants and areal extents.

A combination of field demarcation, survey questionnaires, findings, the list of localities submitted by LGA Chairmen, and the 1991 compilation of locality lists has thus been used to generate the authentic locality lists for the 2006 census results dissemination.

It is hoped that at the end of this workshop, stakeholder and participants would have been sufficiently informed on the correct definition of locality as will be adopted for the dissemination of the 2006 census results.