

Use of Contemporary Practices in Census Mapping: The Philippine Experience

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Abstract: The role of maps in a census is undeniably very crucial for the undertaking's success or failure. Maps serve as guide for enumeration and as platform for census data products. Recognizing this, the Philippine National Statistics Office (PNSO) ensures that mapping operation is given utmost consideration and attention in the carrying out the agency's mandate of conducting censuses. In its conduct of this year's Census of Population (POPCEN 2007), the PNSO made sure that its mapping programs have been properly laid out and implemented. Originally scheduled in 2005 as a mid-decade census, POPCEN 2007 has been moved to its current date of operation due to budgetary constraints. This coming 2010, the PNSO will again embark on a decennial Census of Population and Housing (CPH) as mandated by law. This paper presents the past experiences of PNSO in conducting mapping operations for the censuses. Specifically, it focuses on the development of GIS capabilities at the PNSO way back in 1994 up to the present. Aside from tackling technological advances achieved in the past, this paper includes plans for the future particularly for the 2010 CPH.

1. BACKGROUND

To have an idea of the extent of census mapping in the Philippines, it is imperative to show the geographic make-up of the country, the composition of the mapping unit of PNSO, and the current status including advances made in the mapping operation.

1.1 The Philippines

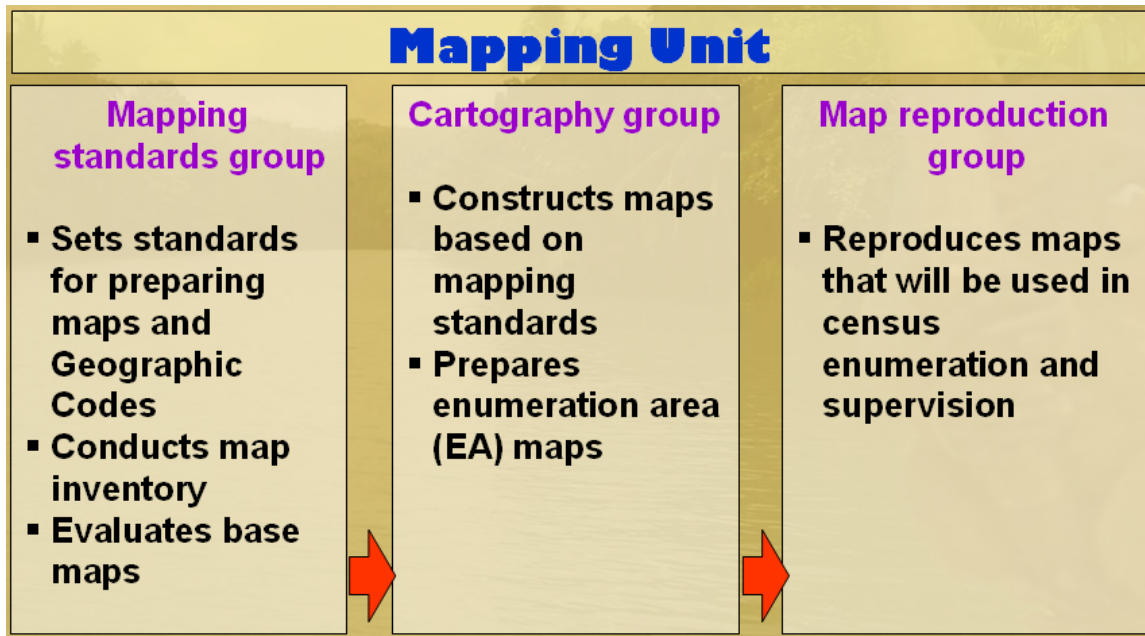
The Philippines is an archipelago composed of 7,107 islands half of which remain unnamed. The country's land area is about 300,000 square kilometers. Its projected population based on the results of 2000 CPH is 88.7 million for 2007 and 93.5 million for 2010. The country has 17 administrative regions broken down into 81 provinces and provinces broken down into 116 cities and 1,500 municipalities. The cities and municipalities are further subdivided into approximately 42,000 barangays. Barangay is the smallest administrative unit of the country and is also the geographical unit where the census enumeration area (EA) is derived. Barangays with projected household population not exceeding 500 will be considered as EAs. On the other hand, those barangays with more than 500 households shall be delineated to come out with EAs with expected number of households of 300 but not exceeding 500. Delineation takes into account natural boundaries and landmarks.

1.2 The PNSO Mapping Unit

The PNSO Mapping Unit (MU) is composed of three groups namely:

1. Mapping Standards Group;
2. Cartography Group; and
3. Map Reproduction Group

The figure below shows the work description of each group.



Currently, there are 21 permanent MU personnel. Of this number, only 10 are involved in the modern methods of mapping (GIS-based mapping). During census years, PNSO hires about 1,000 personnel on temporary basis basically for sketch map updating. To date, MU is using Manifold in preparing GIS-based maps. In addition, 37 GPS hand-held units have been bought mainly to provide positional accuracy to sketch maps. This number, however, is not sufficient for nationwide deployment.

2. THE PAST CENSUSES EXPERIENCE

The PNSO started using Geographical Information Technology (GIT) tools way back in 1994. Using the DOS-based Atlas Draw/Graphics, the MU started digitizing the Army Map Survey (AMS) Topographic Maps. Due to rapid technological advances in the GIT tools over the past decade, other GIS softwares were also used such as Atlas GIS and ArcView. These tools were used to come up with the Municipal Level Base Maps. These Base Maps are the source of the Barangay Maps that the PNSO has been using up to now. However, these GIS-based Barangay maps contain only boundaries and have no street patterns and landmarks when first created.

2.1 2000 Census of Population and Housing (2000 CPH)

Use of Aerial Photography

During the 2000 CPH, a mapping innovation was introduced with the use of digitized maps translated from topographic aerial photos of all barangays in Metro Manila. This project was a result of the agreement signed between the PNSO and BayanMap Corporation (BMC), a domestic and private corporation.

Anticipating the need to come up with comprehensive digitized maps, BMC undertook an extensive field survey in the barangays of Metro Manila to gather basic map information such as house numbers, street names, and other relevant map information to supplement the quality of the digital translation. About 1,700 barangays in Metro Manila, comprising of about 4,900 EAs, were taken aerial photographs for the digital translation. Eventually, BMC provided PNSO with the printed copies of the digitized maps and household list of barangays.

2.1.1 Problems Encountered

1. Due to unforeseen volume of paper maps, EA maps from BMC (BMC maps) were received very late. Just more than fifty (50) percent were received at the start of the operation resulting to delayed operation in most parts of Metro Manila.
2. The BMC maps were not detailed in terms of street names, landmarks, buildings, and other notable features.
3. BMC maps were also inaccurate in terms of labeling and caused more confusion among the hired teacher-enumerator.
4. More importantly, PNSO was provided with paper maps only. Digitized maps were not provided by BMC.

2.2 2007 Census of Population (2007 POPCEN)

Use of Global Positioning System (GPS) Technology

As mentioned earlier, the 2007 POPCEN was initially planned to be conducted in 2005 as a mid-decade census. In preparation for this mid-decade census, 40 units of GPS receivers (Garmin Etrex) were donated by USAID in 2003 to be used in updating the sketch maps. The GPS receivers were used to provide positional accuracy to the boundaries and to capture the coordinates of the landmarks both natural and man-made. In 2004, a pilot activity was made in Quezon City, a highly urbanized city situated at the northeast portion of Metro Manila. During this activity, coordinates of over 2,000 buildings with establishment were recorded and uploaded to *Manifold* via a USB port. Another aspect of this activity is the updating of road networks through road tracking. Each team, composed of a driver and GPS recorder, was deployed in the field to do road tracking using a GPS hand-held receiver.

Use of Satellite Image Maps

The PNSO took advantage of the available satellite images of Metro Manila and other urban areas in the Philippines via Google Earth. Some of the images downloaded have undergone conversion to GIS maps using Manifold. Studies were conducted to compare the coordinates of common landmarks using both GPS and GIS (Manifold). Some discrepancies were observed but these are within tolerable range.

2.2.1 Problems Encountered/Envisioned

The following were the problems encountered during the pilot activity in the use of GPS and the problems envisioned from the experiences gained in this activity:

1. The devices were weather-dependent. The units that the MU used did not work very well during rainy/cloudy days. Also, the units did not work properly in the presence of high-rise buildings.
2. The activity was field-work intensive.
3. The activity was quite expensive. Meal, transportation, and gasoline allowance plus per diem have to be provided to the personnel involved.
4. At present, only 37 of the original 40 units are available. This number is not enough to update all sketch maps.

With regards to the use of satellite image maps, the following were the problems encountered:

1. Some available images were cloud-blurred.
2. Not all parts of the country have satellite images. No images can be found in most of the rural areas.

3. 2010 CENSUS PLANS

The lack of attribute information and other identifiable features such as physical natural landmarks in the rural areas and basic urban features such as road networks and buildings resulted to very minimal use of GIS-based maps in pre-enumeration and enumeration phase of the past censuses. Use of these maps was limited to data dissemination of census results. Pilot studies on the use of the modern methods in census mapping have been made in the past and the results were very encouraging. The challenge now is how to apply the knowledge learned from these experiences in the preparation of accurate EA maps for the 2010 Census of Population and Housing. The following plans are proposed by the PNSO particularly the Mapping Unit for the 2010 Decennial Census of Population and Housing:

1. Conversion of satellite images into GIS maps to replace the old sketch-map based GIS maps. This activity has been on-going since the last semester of 2006. However, only portions of Metro Manila have been digitized and were eventually used during the enumeration phase of 2007 POPCEN. In preparation for the 2010

- Census, the MU plans to continue the conversion of all available satellite images from Google Earth. This will result to high quality and very accurate EA maps.
2. For EAs where no satellite images are available, intensive updating with the use of GPS receivers will be implemented. However, this activity will be financially constrained since more GPS receivers are needed for its full implementation.
 3. Some Local Government Units (LGUs – municipalities) have GIS maps available in their jurisdiction. The office should capitalize on the GIS development in these LGUs by acquiring features of their GIS that are useful in census mapping in exchange for our census data.