

Methodology and Technology for the 2000 Population and Housing Census of Mongolia

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Introduction

It is clear that the technology and methodology of population and housing census data collection, processing, editing and publishing will depend on the relative development of the statistical system, its preparation of personnel and the economic and financial resources of each respective country.

Developed countries have the possibility of utilizing a modern techniques and technology and good qualified and dedicated staff for conducting the census efficiency and effectively.

Many developing countries as well as those moving from the centrally planned economy to the market economy are faced with economic difficulties and are not able to finance the total cost of a population census with their own resources. Therefore, in some cases, countries have not allocated sufficient funds for data processing within the overall census and survey budget for covering the cost of hardware and software, maintenance, training of personnel, external technical assistance and expendable equipment. Thus, several of them have postponed the census and approached UNFPA and other donors for financial support for carrying out their population and housing census.

World Bank, Asian Development Bank, and UNFPA funded projects- aimed at strengthening capacity of the National Statistical Office of Mongolia in data processing, analysis and dissemination our country has purchased some equipment that will be used in all aspects of census operations- in questionnaire design, data capture, field operation, data processing and dissemination.

Also under the auspices of UNFPA, NSO is going to conduct a Reproductive Health Sample Survey during the last quarter of this year. Through this survey, for the first time we will cover thousands of households and compile comprehensive information in respect to reproductive health and demographic issues. On the other hand, we will not include a comprehensive questionnaire regarding RH in the census questionnaire and will use survey techniques to the census data processing.

In this report, we deal mainly with the technology and techniques of the 1989 population and housing census and with the techniques and technology we are expecting to use in the 2000 census. For the developed countries, they share experience on how they are popularizing and bringing the modern scientific and technological achievements to their population and housing censuses. We are different from them. Of course, we are developing countries and are not able to use such modern technology. Nevertheless, I wish to present the situation of our census methodology and technology, and the level of sophistication we are able to obtain.

Mongolia has conducted population and housing censuses on 8 occasions, and in 2000 we are going to conduct the 9th census. History says, that in the 13th century the powerful Mongolian empire enumerated its population and used the enumeration document for the military and taxation purposes. Bogd Kingdom of Mongolia carried out the first census of this century in 1918, with Russian scientists. Then in 1935, 1944, 1956, 1963, 1969, 1979 and 1989 the State Statistical Office conducted population censuses in Mongolia. For the first 4 censuses data was processed by hand, and 1963 and 1969 the population census data was processed by Czech "Aritma" and Russian "CAM" typing computers. Data processing of 1989 census was done with an IBM 360, a Hungarian Mini and an IBM 370, Model 155 computers. These were not personal computers and needed a huge number of technical service operators and programmers. We have a tradition that statistical institution centralized itself output of previous census. It is connected with the statistical system and supply of techniques, technology and cadres of local branches. For our country we have 22 administrative units, and in each unit except the capital city there are 4-6 statisticians working in the statistical agency. These statisticians are financed by the local budget. So, these statisticians do not really belong to the NSO. Hence, the statistical sophistication of each unit depends on that local province's financial situation. As of today, the local statistical branches are not able to enter and process census data due to a lack of machines and personnel.

Data collection.

In the previous censuses Mongolia used one kind of population enumeration sheet. In the 1989 census we had an additional questionnaire/ sheet for a sample survey of women. In the 2000 census, like the most other countries, we are planning to use 2 kinds of questionnaire for the purposes of alleviating census cost, number of questionnaire and respondents' load. We will use brief and comprehensive sheets. A comprehensive questionnaire will be used for the households selected for the sample survey. For the 1989 census, enumerators visited each household and filled in the forms. For the 2000 census, we are planning to combine this method with the self-enumeration method, that is, to distribute census forms to some households prior to the census then receiving them back. (If necessary a visit can be made to re-ask and check the responses). But for the comprehensive forms, an enumerator will go to selected households and fill them in. To prevent mistakes in the self-enumeration forms we need to explain and give instruction to the public on TV and mass media. We consider that a postal method of enumeration is inappropriate for us, because our country has a vast territory and a weak postal infrastructure.

Error reduction

The quality of population and housing census output will depend on the extent of data entry errors. Each stage of a census has a probability of errors so editing must be an important component of census activity.

It is possible to make errors in the stages of census planning, questionnaire development, filling in of census forms, coding, data entry, tabulation and publishing. Therefore, all participants in census activities, as well as coders and operators will be well-trained and given practice in finding and reducing mistakes. In order to reduce the number of errors at the data entry stage, we will use two approaches. The first method is the random re-entry of a fixed percentage of census forms by skilled keyers. The second method is a computer logic check. A few logical checks will be included in the data entry programs. Further consistency checks will be made in later processing made, to ensure consistency across tabulations.

Data entering

Data entry is an important stage of the census which demands a lot of time and labor force. In Mongolia, as in many countries, keying-in has been the method of choice for data capture. In 1989 census our population reached to 2,1 million and during 9 months, 60 typewriters and operators entered census forms. For the 2000 population and housing census we are planning to hire 50 operators. These will be 2 shifts daily and we expect to finish the forms representing 2,5 million people, in 12 months using 25 workstations. We mentioned above that due to lack of supply of equipment and personnel we are not able to handle the data entering process at the provincial level.

We will enter data directly from the questionnaire. We have never been used Optical Character Recognition or Optical Mark Reading, and will not use them for the 2000 population and housing census.

Data processing

For the 1979 and 1989 population censuses the computer center of the National Statistical Office had 150 staff members responsible for data processing of objective statistics on social and economic conditions in Mongolia.

This center's 32 highly educated and experienced programmers, 37 engineers and technical specialists and 50 operators in charge of data entry and checking managed to process

the population and housing census data quickly without making big changes in personnel, programming, techniques, technology and organization. Data processing of the 1989 census was done by using an East German IBM 360, a Hungarian minicomputer and a Russian IBM 370 Model 155 computer, which had only 4 GB memory. Now the computer center of NSO consists of only 15 staff members, probably an insufficient of personnel to carry out the various data –processing tasks.

***Hardware:**

By the mid 1990s the existing facilities in the National Statistical Office of Mongolia were out-dated and not capable of processing census data in a timely manner and at an acceptable level of quality. The past 5 years, as a result of implementing World Bank, Asian Development Bank, and UNFPA funded projects aimed at strengthening the capacity of the National Statistical Office of Mongolia in data processing, analysis and dissemination of data, our office has obtained some equipment which will be used in all aspects of census operations- in questionnaire design, data capture, field operation, data processing and dissemination.

When selecting the microcomputers we considered the following aspects:

- the capacity to process any amount of census data
- duration of warranty period up to 31 Dec. 2000
- brand name microcomputers
- availability of local technical support
- competitive price
- local procurement

The hardware which we have purchased consists of 20 microcomputers Compaq, Intel Pentium Processor/2.1 GB HDD, RAM 32 /EDO/ 233 MMX. It is understandable that in accordance with technological progress and the speed of census data processing will become more faster than in the past. For the 2000 population census we will use a server with 128 GB memory. Census results will be recorded on CDs, thus then will be more reliable than in 1989.

***Software:**

The experience of Mongolia and other countries in the region shows that integrated packages, such as IMPS, U-SP, ISSA and EPI Info are more suitable for carrying out data-processing tasks for censuses and surveys than programs developed in standard computer language or other available single-purpose packages. While many popular software packages have been developed for the Windows environment, a large number of census and survey processing packages are available for use onof the census. The Windows versions of some modules of IMPS are already available and we expect that the

complete Windows version will be available by the end of the 1999. We will use a common PC for this program. We must focus our attention to learn the program, conduct training and to test it. All our computers are connected to a LAN with Windows NT server V.40 this time, thus we will be able to take advantage of the Windows environment. In addition to this, we are going to organize population data base using MS SQL Server V. 6.5.

To conduct the population and housing census successfully we need to train programmers in the near future. Especially we need to train them in the IMPS, Archive 3.0, MSSQL Server V6.5 packages. We expect that the programming of the 2000 census will be faster than for the 1979 and 1989 censuses. Then 10-15 persons worked almost one year in order to compose the 1979 and 1989 census data processing program using an archaic language. Since the IMPS package has been used at the international level, it gives us possibility to process census data at a high level.

Data dissemination.

The population and housing census will cover a wide range of information concerning demography and socio-economic issues. Therefore, the final aim of the census is to disseminate this information to the various kinds of users. The main users will be ministries, agencies, scientific institutions, NGOs, public organizations and business establishments.

One of the main ways of distributing census output is publishing materials: statistical year book, bulletins, articles on specific themes and articles in newspapers. Also we will supply our main users with CD that recorded output of the population and housing census.

NSO is planning to form a special data base on census output and serve it to users through the computer network.

Also we will include some of the main indicators of census output in the NSO's web page and transfer it by Internet.

According to the users' requests, we will do additional processing of the census and supply them with special tabulations.

GIS (geographic information systems) and desktop mapping technologies provide a new approach to census and survey mapping work, and dissemination of the results. However, the development, implementation and maintenance of those techniques require substantial resources in terms of computers, time, manpower and expertise. In Mongolia we have the ability to use GIS. If we can obtain the programs and have a well-trained staff, through cooperation with other organizations in the development of GIS, we can do detailed graphics, diagrams and maps. But we urgently need to train programmers. We expect to use the packages ESRI and Arcview V.3.0. for GIS.

We consider that around 2002, using GIS technology , our people be able to publish census output in different styles. It will give us more possibility to make in-depth analysis of population information.

As an overall view, the goal of the GIS plan is to facilitate and widen the scope in the use of census data, especially at the small area level.

Among its major objectives are:

1. To produce socio-economic maps based on the population and housing census data.
2. To print and publish census atlas maps as part and parcel of the program of dissemination of census data.
3. To meet other users' requirements in retrieving and featuring census data in the form of maps for specific areas.

Concluding Remarks

Our country's financial possibility, as well as the computers and other equipment that have been supplied by international organizations in recent years will define the techniques, equipment and technology of the 2000 population and housing census.

The main peculiarity of the 2000 population and housing census from previous years is that we will process the census data by using microcomputers and making changes to the selected data processing routines. It is clear that techniques and technology of the 2000 population and housing census will be much better than for the 1989 population and housing census.

Also we are planning to use other countries' advanced approaches and experience to reduce costs and to improve the efficiency and cost effectiveness of processing census data.