



## **Economic and Social Council**

Distr.: General  
21 June 2010

Original: English

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### **Economic Commission for Europe**

#### **Conference of European Statisticians**

#### **Group of Experts on Population and Housing Censuses**

##### **Thirteenth Meeting**

Geneva, 7-9 July 2010

Item 3 of the provisional agenda

##### **Plans for census quality evaluation**

### **Pilot Census in Poland**

#### **Note by the Central Statistical Office, Poland**

##### *Summary*

A pilot census has been carried out in Poland on 1 April 2010 to 31 June 2010, a year before the population and housing census. This paper presents some background information about the next census in Poland, including the way administrative sources will be used, and how census data will be processed. Finally, information is provided on the plans on census publications and other census products.

## I. Introduction

1. A year before the population and housing census, a trial census has been carried out. It took place on 1 April 2010 to 31 June 2010 and included 16 administrative units at the LAU2 level. During the trial census approx. 160 thousand persons and 42 thousand dwellings were included.
2. The aim of the trial census was to check the new technological and organisational solutions. For the first time in Poland 28 administrative sources were used in order to obtain the values of the census variables, both at the stage of creating a specification of census units (population and housing census) and for qualitative comparisons. Due to a stable system of identifiers (PIN Personal Identification Number) it was possible to merge data from different registers and from statistical surveys, including sample surveys.
3. Apart from a wide application of administrative sources, the newest technologies for obtaining data were used, as a result of which paper forms were completely dropped and replaced by hand-held terminals. Census enumerators equipped with terminals carried out the census on the basis of electronic forms, replacing paper.
4. Due to the use of digital maps it was possible to manage the census enumerators performing field work with the use of GIS (Geographic Information Systems) tools, where devices with GPS showed on-line on an orthophotomaps the current position of a given enumerator and the address point to which they are to go in order to carry out the census.
5. Moreover, for the first time the Internet was widely applied in order to allow self-enumeration. It pertained in particular to persons who at a given moment were outside their place of residence or even outside the borders of the country and who were subject to census obligation. In the case of the Internet self-enumeration, the visit of the enumerator was no longer necessary, which caused a decrease in the costs of the census.
6. Apart from a direct interview by the enumerator or the Internet self-enumeration, the process of obtaining census data was supported by telephone interviews, with the use of the CATI method.
7. The whole process was managed by regional centres at the NUTS2, supported by the appropriate managing software based on GIS technologies.
8. As a result of the trial census it was confirmed that the use of administrative registers and modern technologies for obtaining data will make it possible to reduce the number of enumerators working in the field by over ten times – from approx. 200 thousand in the last census in 2002 to approx. 20 thousand in the 2011 census. This will allow a reduction in census costs by approx. PLN 140 million, i.e. approx. EUR 32 million.

## II. Legal basis

9. In relation to the national population and housing census, the legal Acts currently in force are the following:
  - (a) Regulation (EC) of the European Parliament and Council No. 763/2008 of 9 July 2008 on population and housing censuses (EU Official Journal No. L 218 of 13 August 2008).
  - (b) The Act on the National Population and Housing Census in 2011 of 4 March 2010 specifying national requirements and the scope of the rights and responsibilities of entities participating in the census.

(c) The Act of 29 June 1995 on public statistics, where the legal basis and the subject matter of censuses was regulated in a general manner.

### **III. The implementation model of censuses**

10. Poland, as in most European countries, will use the mixed model consisting of merging the data from administrative registers with the data obtained from direct statistical surveys. We claim that this method is safer and more effective, taking into consideration the present level of development of administrative sources, their quality, and the degree of advancement of methodological work concerning the estimation and imputation of missing data in administrative sources.

11. Poland, however, is one of the first countries in the world to prepare a totally innovative method consisting of using several of the most modern techniques for collecting census data simultaneously. This pertains mainly to technologies replacing paper with electronic carriers, enabling more effective data collection and abandoning the use of paper in censuses. They include Internet technologies allowing for self-enumeration through the Internet with the use of an electronic form launched both on-line and off-line. A technology making it possible to carry out interviews on-line by phone (the CATI method) was implemented. Also the enumerators, equipped with appropriate hand-held devices, can use electronic forms without the need to use paper. Hand-held devices make it possible to collect and deliver data on-line and to use digital maps, which eliminates the necessity to use paper maps and situation sketches. A combination of digital maps and aerial photographs with in-built GPS receivers revolutionises the possibilities of preparing and managing the census process before and during the census, and facilitates the carrying out of multi-dimensional spatial analyses with regard to the census results.

12. All the above-described technologies were at the same time applied and successfully checked during the trial census. Due to the positive results of the trial census, in the actual census in 2011 four channels for obtaining census data will be created:

- (a) Administrative sources;
- (b) The internet – self-enumeration (CAII);
- (c) Telephone interviews (CATI);
- (d) A census with the participation of enumerators with the use of hand-held terminals (CAPI).

13. The last three channels will be supported by on-line electronic forms.

### **IV. The use of administrative sources**

14. The following forms of using information systems in censuses are planned:

- (a) Direct data source for surveys;
- (b) Information source for preparing a specification of entities included in the census (an address and housing sampling frame, agricultural farms);
- (c) Additionally, the source of information for:
  - Imputation;
  - Data estimation;
  - Comparisons and determining the quality of data.

15. The issue of using data from administrative sources requires an in-depth recognition of information resources which can be found in these sources. An analysis of all the sources and variables potentially useful for the censuses was carried out. The necessary metadata on approximately 300 administrative registers were collected, of which the 30 most useful ones were selected. For each of these registers separate records were opened, and all variables from these sources were subject to the utility analysis. The variables were evaluated with regard to their conformity, in terms of definitions and classification, with the dictionaries existing in Polish and EU statistics. Appropriate weights were determined both for the variables and administrative registers from which these variables come from, taking into consideration their utility and quality. The knowledge concerning the quality and utility of variables from different registers at present is a basis for the rules of merging data, and their estimation and imputation in the operational base of microdata created. The result of this work is invaluable knowledge concerning the utility and possibility of integrating different registers of public administration which the statistical service now has at its disposal.

16. In the next census in Poland it is planned to apply approx. 28 sources from Government and Local-Government administration, and from administrators outside public administration such as real estate administrators, housing co-operatives, power distribution plants and telecommunication operators. All the administrators of databases approached the need for statistics related to censuses with understanding and provided access to their information resources for preparation work. At present the statistical service is already in possession of the necessary data from administrative registers for the purposes of a trial census and at present it is preparing for the campaign of obtaining data from administrative registers for the purposes of the population and housing census in 2011.

## **V. Address as a universal link of administrative data**

17. One of the basic aims of the national register of the official territorial division of the country (TERYT), kept by the President of the Central Statistical Office, is to ensure an unambiguous identification of territorial entities at various levels of specificity, such as: voivodship, powiat, gmina, city/town, locality, statistical region, census district, street, building, and dwelling.

18. TERYT enables the collecting of data for the above-mentioned spatial objects and provides conditions for comparing them and carrying out analyses, which constitutes a substantial factor in the implementation of the Directive INSPIRE 2007/2/EC of the European Parliament and Council of 14 March 2007, establishing the structure of spatial information in the European Community (EU Official Journal L 108 of 25.04.2007, pp. 1-13).

19. In order to guarantee the technical conditions required by this directive with regard to modern technologies and information standards, and taking into consideration the technological needs of the forthcoming census, the Central Statistical Office has undertaken work in order to ensure the spatial identification of the included objects on the basis of digital maps and GIS technologies. The result of the modernisation will be obtaining a numerical description of gmina, powiat and voivodship boundaries (NUTS1, NUTS2, NUTS3, LAU2) and supplementing address identifiers with geographical coordinates x,y of these address points (centroids of buildings).

20. Introducing x,y coordinates of address points for unit statistical data will make it possible to change the previous system of spatial identification of these data and to move from area classification (census districts) to point classification. This has a key, even revolutionary, meaning for the application of geostatistics. Changing the classification will

allow a more flexible grouping of data in national censuses for the smallest areas. It will also make it possible to create a base of microdata of a spatial nature enabling the carrying out of spacial analyses of various phenomena, concerning, for instance:

- (a) Demography (e.g. the average distance between children's and parents' residence, commuting to work, school, distance to hospital etc.);
- (b) Urbanisation and planning (e.g. useful in determining the boundaries of urban agglomerations, metropolies, and the drawing up of land development plans);
- (c) Agriculture and environment (analysing the structure of crops, environmental pollution);
- (d) The economy (e.g. analysing the effects of burdensome road and industry investments).

21. Classification of the analyses conducted by points with coordinates x,y will also make it possible to become independent of burdensome changes in the regional division of the country, usually resulting in changes in census districts and laborious recalculations. This will facilitate a comparative analysis of time series, regardless of the changes taking place in this division. An additional advantage is the possibility of the aggregation of data both in the structure of the NUTS administrative division and the GRID divisions prepared within the GEOSTAT project.

## **VI. Data processing**

22. The process of data processing will start from collecting administrative sources from data administrators' registers in the field defined by the appropriate legal Acts. The Polish statistics has the right to access all unit data stored in information sources of the public and commercial sectors. The obtained data include necessary identifiers and personal data supporting the process of merging unit data from different sources.

23. The unit data obtained from registers are converted into statistical registers, simultaneously being subject to the process of cleaning, standardisation, de-duplication and standardisation of data. The process is carried out in the DQS SAS environment. At the same time, metadata are collected on the quality of input data obtained from registers, the applied cleaning procedures and the final quality obtained after applying DQS procedures.

24. The cleaned data are loaded onto the Operational Microdata Base as successive logical layers corresponding to the obtained registers.

## **VII. Description of OMB - layers**

25. The basic structure of data in the OMB is a layer. It is a set of records, each of which relates to one census unit (a person, a dwelling, a household). The records include the values of census attributes derived from source data collected from respondents or defined in a different way (e.g. in the process of imputation). Layer can differ between one another with a set of attributes whose values are presented in a given layer. In the first step of processing, before beginning the census, on the basis of source sets and the census frame the layer referred to as a master record is created, consisting of the initial value of the selected subset of census attributes. The values from this layer are transferred to the CAPI, CATI and CAII processes. After completing the census with the use of the CAPI, CATI and CAII processes, on the basis of information collected in the processes proper layer in the database are created. The layer which have already been saved in the system can serve as

the basis for creating new, internal layer in which new attributes (derived from the existing ones) can be added.

## **VIII. Procedures and rules of the Golden Record**

26. The Golden Record is a layer from which values, after anonymisation, will be transferred for further processing within the Analytical Microdata Base, and is created from many input layer. The census attributes for this layer can be selected from various layer already existing in the system. The selection of the attribute takes place on the basis of the so-called confidence coefficient applied to the attributes gathered in a given layer. For instance, the confidence coefficient can provide information that, for a given attribute, the value collected in the CAXI process should be utilised first and, if this is not available, the value derived from registers, and if that is not available, the value calculated in the imputation process. The values of the Golden Record can also be defined as a result of the imputation process started for this layer.

## **IX. Depersonalisation (personal data safety) and export to the Analytical Microdata Base**

27. Data for all census units belonging to the sampling frame are transferred to the output files of the Golden Record of the Operational Microdata Base. Next, each census unit is ascribed a unique and random statistical identifier, which is saved to the output file of the Golden Record and the so-called temporary transition table. The identifier makes it possible to restore the collocation of data to the proper census units. The transition table will be destroyed after finishing the census.

28. After that the output file of the Golden Record will be exported to the Analytical Microdata Base. Due to the anonymisation process, the users of the Analytical Microdata Base will not be able to associate data with census units.

## **X. Statistical analyses**

29. In this process, on the basis of objective theoretical and statistical knowledge, operations on data sets will be carried out for the purpose of summarising and describing data, and exploring data in search of links, structures, systems, factors and concentrations, as well as testing statistical hypotheses and generalising results. With the use of the appropriate information technology tools, various types of data compilations and statistics in the form of tables, statistical measures and graphics will be generated. In particular, the following groups of operations can be adopted in the process:

- (a) Statistical description;
- (b) Correlation analysis;
- (c) Variation analysis;
- (d) Regression analysis;
- (e) Model analysis;
- (f) Dimension reduction;
- (g) Classification;
- (h) Non-parametric tests;

- (i) Statistical inference;
- (j) Spatial analyses.

## **XI. Control census**

30. Following the basic census, a survey is carried out on the basis of a selected sample of census entities. Its objective is to check the completeness of the full censuses conducted, the level of reliability of variables obtained from census, and, moreover, the impact of various variables (e.g. data-origin source; enumerator, register, respondent) on the quality of obtained data.

## **XII. Spatial analyses**

31. The users of the Analytical Microdata Base will be able to download metadata on geographical areas according to the vector of area boundary, for example, territorial and statistical division units. The definitions of areas will allow the aggregation of data for the dimensions specified.

## **XIII. Census products**

32. Products will be defined based on the methodology used to describe so called “hypercubes” introduced by Eurostat. A full list of hypercubes was described in the following documents:

- (a) Regulation (EC) No. 763/2008 of the European Parliament and Council of 9 July 2008 on population and housing censuses;
- (b) Regulation of the Commission (EC) No. 1201/2009 of 30 November 2009 implementing Regulation (EC) No. 763/2008 of the European Parliament and the Council on population and housing censuses as regards the technical specifications of the topics and of their breakdowns;
- (c) Regulation of the Commission (EC) implementing Regulation (EC) No. 763/2008 of the European Parliament and of the Council on population and housing censuses in the field of a programme of data and metadata deriving from a population and housing census transferred to Eurostat (draft);

33. It is assumed that there will be several forms of presenting the products.

## **XIV. Publications (forms, types, portals for advanced users)**

34. Dissemination will take place through specialised interfaces, which will be developed according to standards required by external users. The following interfaces can be distinguished:

- (a) SDMX – according to the standard developed by Eurostat, used mainly for the purposes of integration with the Census Hub;
- (b) Web-Service – used by Local-Government units and economic entities;
- (c) An analytical and reporting tool – includes a set of functionalities making it possible to define reports and analyses in a flexible manner.

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