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**Results of tests with regard to methodology, technology, participation, and other aspects**

## **Pilot Census in the Republic of North Macedonia**

### **Note by State Statistical Office of the Republic of North Macedonia\***

*Summary*

In the frame of the preparatory activities for the largest and more comprehensive statistical operation - the next Census of Population, Households and Dwellings in April, 2020, the State Statistical Office (SSO) of the Republic of North Macedonia in the period from 14 June to 30 June conducted the Pilot census, which is also part of the planned activities within the framework of IPA MB 2015, the EU project.

During the Pilot census, the use of the new combined census method (combination of data from multiple administrative data sources with field data) was implemented. For the first time, practical and widespread use of administrative sources for census purposes was used as well as new organisation and new technologies of data acquisition.

The paper gives an overview of the experience and lessons learned in conducting the Pilot Census in June 2019. The present paper describes the basic characteristics of the methodology approach and architecture of the IT Census system, the activities connected with implementation and some of the main results obtained from the Pilot census.

The Pilot census is as similar to the actual census as possible, but it still has to be viewed as a lesson and critical issues and problems encountered in the Pilot census must be corrected well in advance of the start of the main Census. This is a big challenge for the SSO - facing many innovations in a short time in order to produce quality census data.

### **I. Introduction**

1. The State Statistical Office (SSO) of the Republic of North Macedonia in the frame of the preparatory activities for the next Census of Population, Households and Dwellings in April 2020, in the period from 14 June to 30 June 2019 conducted the Pilot Census, which is also part of the planned activities within the framework of IPA MB 2015, the EU project.
2. In all population censuses carried out so far, the traditional method was used with direct enumeration by trained enumerators. Due to the fact, that we didn't conduct the 2011 Census and

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to avoid the problems faced during the 2011 Census, for many years, in the SSO, as an institution responsible for conducting the population census, consideration has been given to changing the methodological approach for conducting the census from a traditional to a combined census method.

3. The application of the combined census method imposes certain conditions and solutions that are essential for completion of the preparation process. A thorough assessment was made of the current state of the SSO regarding the planning and possible use of administrative sources to produce census data. Namely, (within the Twinning Project, 2015 and IPA 2015 MBP), expert and technical support was provided for evaluation and analysis of the possibilities for application and assessment of the quality of the available administrative data sources for census purposes. Also, the existing legislation has been assessed positively, i.e. the Law on State Statistics (Articles 24 and 25) provides a solid legal basis for the use of administrative data sets by the SSO for statistical and census purposes.
4. The combination of registers and full enumeration in the field allows complete geographical coverage and conceptual detail for the topics that are collected, whether they are available in the registers or not. It also allows maximum flexibility in the content of the data collected, reducing response burden and finally and most importantly the quality of the output data from the census is improved.

## **II. Objectives of the Pilot census**

5. Basic aim of the Pilot Census 2019 was timely testing all methodological, organizational and IT solutions for implementation of the 2020 Census of population, households, and dwellings. Census system developed by outsourcing company.
6. The main objectives of the Pilot Census are:
  - a) To test the new application planned for the enumeration of census units (persons, households and dwellings) in accordance with new combined census methodology, then new organization and new technology using electronic questionnaires (CAPI) on handheld devices (laptop) for data acquisition;
  - b) To test the data transfer from laptops in a form necessary for further processing of data in the database in the SSO;
  - c) To test how much the participants in the field enumeration have mastered the operation with the application and the feedback from them to improve the application;
  - d) How much time will be required for enumeration;
  - e) How the population will accept this type of enumeration.

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

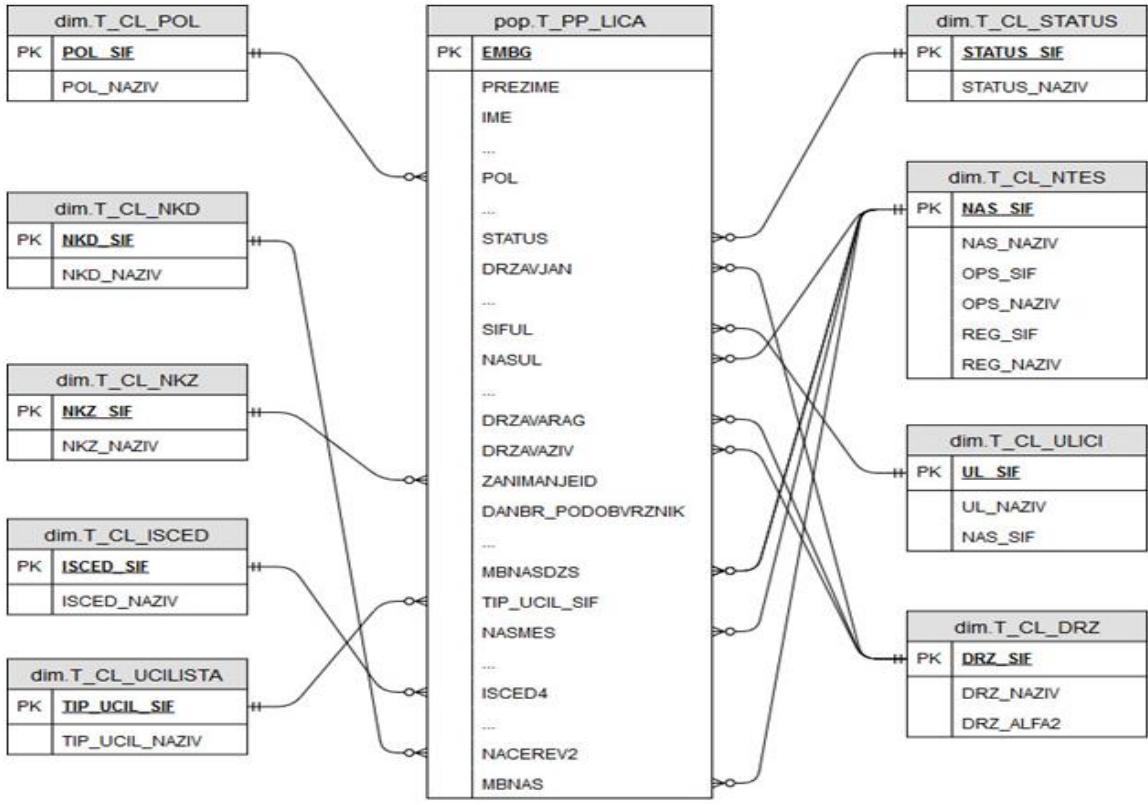
7. A combine census is a method of producing data on census unit: population, households and dwellings by statistically linking together existing administrative and statistical data sources with data from fieldwork enumeration.
8. Prerequisites for undertaking such a project are:
  - (a) Legislation which enables the linkage of data from different sources (Statistical Office of the Republic of North Macedonia, has in accordance with Articles 24 and 25 of the National Statistics Act the right to collect, use and link data from different administrative and other collections for statistical purposes only);
  - (b) Establishment of appropriate administrative and/or statistical sources with unique identifier (e.g. PIN- Personal identification number);
  - (c) Appropriate topics in the sources which cover all demands of users and legislation.

## A. Structure of the Pre-census data base

9. One of the key elements of designing the pre-census data base is statistical data integration. The possible administrative sources were identified and the possibility of using them in terms of availability, content and quality was assessed. Methodological investigation was made of the content of individual administrative sources, the structure of databases, description of variables, classifications used and harmonisation of concepts from different sources
10. Six institutions were chosen, whose databases when networking with each other form the skeleton of a statistical pre-census database on population.
  - Ministry of Interior - holder of the register of citizens of the Republic of North Macedonia.
  - Employment Agency - where beside the employees, there are also unemployed persons - job seekers.
  - Ministry of Education and Science - holder of registers of students in primary and secondary schools.
  - Ministry of Labour and Social Policy – holder of register for social transfer.
  - Public Revenue Office – holder of register for income and taxes.
  - Available databases from the statistical surveys carried out by the State Statistical Office.
11. The database is prepared on the Microsoft SQL Server 2017 platform.
12. Loaded data from six administrative databases (IBM, DB2, MS Access, MS Excel, MS SQL Server) are described in the separate tables (adm, stat, dim, pop, eror) on the Microsoft SQL Server platform. Each table has a detailed description of the content and is checked in terms of quantity and quality.
  - ADM table contains data from six administrative databases, before they are used to create the pre-census database on population;
  - STAT table contains data produced by the SSO statistical source;
  - DIM table contains all code lists and classifications needed to clarify and control the loading data from administrative and statistical sources;
  - ERROR table contains defined types of errors and recording errors in loading data;
  - POP table, i.e., the final integrated table T\_PP\_LICA, contains data for each person that will be automatically taken during the period of enumeration in the field.
13. The first step in building the pre-census database is to collect and merge unique PINs from the six administrative registers.
14. Validation of the PIN consists of checking the number of characters in the identifier, compliance of the check digit and the possibility of occurrence of the date of birth in the calendar that is encoded in the identification number.
15. In the pre - census data base of people holding a personal identification number, it is necessary to calculate the variables gender and age due to the need for further validation necessary.

Table 1

Diagram of the pre-census database



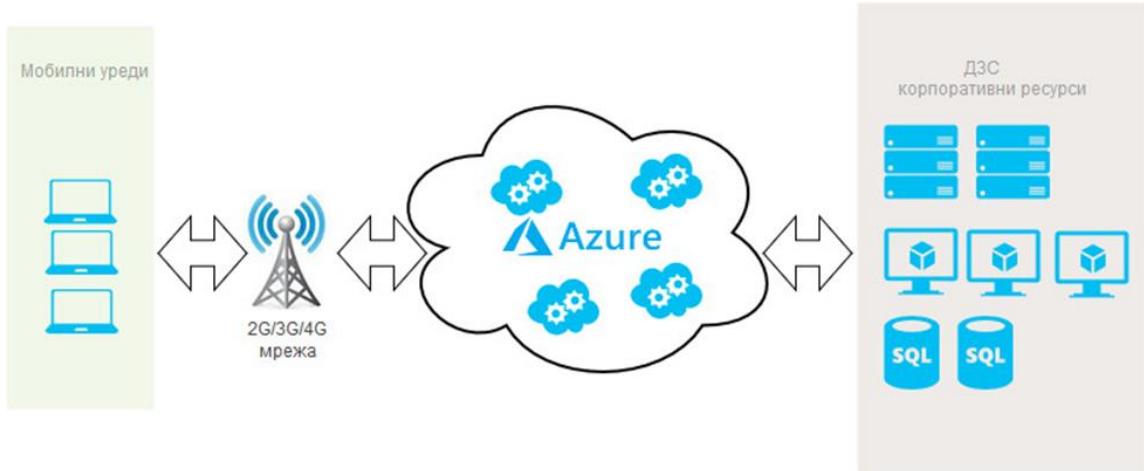
## B. Architecture of the IT Census system

16. To enable the optimal application of advanced IT and telecommunications technologies for the purposes of the census, the SSO established an IT Census System, supplied by 3 (three) IT firms' contractors - that provided software solution and IT assistance for all operations within the census with direct two-way data transfer for the Pilot census.
17. The system contains the modules for:
  - Address data
  - Building data
  - Dwelling data
  - List of members of household
  - Enumerated person
  - Household data
  - Control module
  - Module for user administration
  - Validation rule
18. IT Census System comprised several solutions ensuring a high level of security and confidentiality of the processed data as well support to the field management and monitoring activities.
19. For territorial distribution of the census data, the system provides two ways for using address data:
  - the first way allows downloading the address data of a particular centroid using GIS visualization - not tested during the Pilot Census
  - the second way tested during the Pilot Census using address data from prepared shapefile through appropriate controls (Dropdown list and Text Box) and using appropriate coding lists with data

for: municipality code, settlement code, EA code, street code, street name, house number and address building i.e., address data on entrance level, - without GIS visualization.

Figure 1

#### Architecture of the IT Census system



### III. Implementation of the Pilot Census

20. The Pilot Census was conducted on a sample of 3000 households in 32 randomly selected enumeration areas (EA), i.e., in each of the 8 Statistical Regions (2 ( EA ) in urban and 2 ( EA ) in a rural settlement) in 13 municipalities: Skopje - Kisela Voda, Zelenikovo, Gostivar, Kichevo, Struga, Prilep, Dolneni, Sveti Nikole, Kumanovo, Radovish, Valandovo and Shtip.
21. Due to the presidential elections in April, the implementation of the Pilot Census, originally planned for April 2019, was postponed for June 2019. Also due to the complaint procedure of one of the companies that participated in the public competition, the start of the application preparation was slightly delayed. Nevertheless, thanks to the commitment and support of the management team, the employees in the SSO and the qualifications of the persons engaged from the outsourced company, the Pilot Census was conducted in June 2019.
22. The definitive content of census e-questionnaires (modules) has been adopted and the content of the application solution from a methodological point of view is fully aligned with the UN/Eurostat Recommendations and EU Regulations. The collection of data from the population was fully electronic, without paper questionnaires.
23. In the field activities of the Pilot Census participated:
  - 32 enumerators - mostly new employees in the SSO who had no previous experience or participation in Census and 16 state instructors from the SSO
  - Supervisors
  - People for technical support
  - Other support staff engaged in SSO - who successfully tested the methodological and organizational - technical aspects of enumeration
24. All participants had 3 days of training. The delay affected the duration of training from 5 to 3 days.
25. The enumeration was conducted in Macedonian and Albanian language. The application allows easier implementation of demand for questionnaires to be available in different languages.
26. During the Pilot census, the participants had the opportunity to contact the support team by telephone or e-mail with any questions they had about the methodology or any technical issue. The support team worked in two shifts and all help requests were registered.
27. In the Pilot Census were enumerated in total:

- 3 839 buildings,
- 4 572 dwellings,
- 3 184 households
- 10 267 persons.
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## V. Communicating the Pilot Census

28. It is important, that the public opinion should identify with the possibility of using the administrative data sources for the census purposes. The right setting of the public opinion is an advantage, to trust in the beneficial decisions of the SSO - to use the new combined census method, new organisation and technology (using laptops) for the census.
29. In order to enable a positive attitude of the society towards the Pilot census, a leaflet on the purposes of the Pilot Census was prepared and distributed in the 13 municipalities where the Pilot Census was conducted. Representatives from SSO visited the majors of the 13 municipalities, explaining what the Pilot Census is and asking for support in terms of popularisation of the Pilot Census among the people, together with the local media. This was a very successful activity because the people were well informed about the Pilot Census.
30. The media coverage was very good and positive. We ended the Pilot Census with a Press Conference, sharing the experiences from the operation. Results consisted of a positive attitude of the population and successful realisation of the Pilot Census.

## IV. Lesson learned from the Pilot census

31. The Pilot Census of Population, Households and Dwellings in the Republic of North Macedonia conducted in June 2019, was successfully completed within the deadline. All activities planned for the Pilot Census were completed on time and the State Statistical Office is satisfied with this operation.
32. Certain elements in the application need to be modified, the scope and size of some enumeration areas were determined, and most importantly, the enumerators and state instructors employed in the State Statistical Office handled well the role of enumerators and successfully carried out the entire field activity.
33. The results show no signs for need of change in the methodological part for the main Census. We recognise the need for future development of the application and structure of the database and in this period, we are focused on those activities. Except what has already been mentioned, the SSO is analysing the field organisation and other small technical issues, as well as the method of selecting and training the enumerators and regional instructors.
34. Regarding the Internet connection, we didn't face serious problems. In case of problems with Internet connection by SIM cards, enumerators used private Wi-Fi networks. In order to eliminate any problem with Internet connection, we are planning to ask the Internet provider for a list of settlements with no Internet connection. For those settlements, special laptops will be prepared for offline enumeration. The company that developed the application is assigned to develop a special solution for those cases and to provide protection of the individual data and procedures to send these data to the main database once the Internet connection is accessible.
35. We did not face any problems with electric power during the Pilot census. Laptops were working 6 - 7 hours without any problem. Also, there is always a possibility to ask the household for plugging in the laptop to charge during the enumeration, or for the enumerator to be able to go home to recharge (since the enumerator will be selected from the same settlement where the enumeration is taking place) and continue later.
36. The results of the Pilot Census will not be published. Now we are working on an analysis of the results that will help to discover and will enable correction of all the flaws identified in order for us to be fully prepared for the next year's Census. The software solution is being improved based on the remarks from the pilot census.

37. Since the purpose of the pilot census is to check the census methods, instruments and the organisation of work, the aim of processing the data collected is not to estimate the values of measurable characteristics. As a result, the data collection questionnaires are checked for questions that are incomprehensible or difficult to answer, software malfunctions and other problems interfering with or endangering the census, which should be avoided during the real census.
38. As the questionnaire and the software need modifications (GIS visualisation, off line method and testing the application in Microsoft Azure)) after the Pilot census, we needed another test. This ‘mini pilot census’ will take place in November 2019 in 16 EA for one week. The participants of the mini census will be the staff of SSO. Based on the remarks from the Pilot census we can start the preparatory work for this ‘mini pilot census’.

## V. Conclusion

39. The preparatory activities within the scope of work of the State Statistical Office for the largest statistical operation - the Census of Population, Households and Dwellings in the Republic of North Macedonia, which will be conducted next year in the period from 1 to 21 April - are intensifying.
  40. The State Statistical Office considers that it has the capacity, experience and knowledge and is fully prepared to meet the challenge of carrying out the next Census of Population, Households and Dwellings in April 2020. In line with international recommendations and standards SSO continues with the activities for preparation of the main census activity to be implemented in April 2020.
  41. The Pilot census was carried out one year before the actual Census and it is as similar to the actual census as possible. However, it still has to be viewed as a lesson and critical issues and problems encountered in the Pilot census must be corrected well in advance of the main census.
  42. Usage of new technologies, a new approach to censuses, the abandonment of paper, data collection through on-line electronic channels and the wide use of data from administrative registries requires enormous organisational, intellectual and financial efforts, which are applied into the Pilot census. The support of the government administration, local government, as well as the society is also crucial. Everyone involved in the organisation of the census is aware of the importance of this task.
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