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*Steering Committee of the International
Monitoring Operation on the Population and Housing
Censuses in Bosnia and Herzegovina*

Fifteenth Assessment Report

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List of acronyms

BiH	Bosnia and Herzegovina
BHAS	Agency for Statistics of Bosnia and Herzegovina
CoM	Council of Ministers of BiH
CMIS	Central Monitoring Information System
CSO	Civil Society Organisation
DB	District Brčko
EA	Enumeration area
FBiH	Federation of Bosnia and Herzegovina
FOS	Federal Office of Statistics (FBiH)
EI	Entity Instructor
EN	Enumerator
EUPHC 2	Technical assistance to Population and Housing Census Phase II
GIS	Geographic Information System
ICEI	Department for International Cooperation and External Information
IMO	International Monitoring Operation
IMO MG	International Monitoring Operation, Management Group
IMO SC	International Monitoring Operation, Steering Committee
IT	Information Technology
LFS	Labour force survey
MCC	Municipal Census Commission (Census Commission of the units of local self-government)
MI	Municipal Instructor
PES	Post Enumeration Survey
Q	Question
RS	Republika Srpska
RSIS	Republic Srpska Institute for Statistics
SA	Statistical Area
SI	State Instructor
TA	Technical Assistance
TAP	Technical Assistance Project
TOR	Terms of Reference

INTRODUCTION AND BACKGROUND

1. A Population and Housing Census shall take place in Bosnia and Herzegovina (BiH) in accordance with the Law on the Census of the Population, Households and Dwellings in Bosnia and Herzegovina in 2013 as adopted by the Parliamentary Assembly of Bosnia and Herzegovina on 3 February 2012. The Council of Ministers of Bosnia and Herzegovina has invited the European Commission to organise the international monitoring of the Census. Therefore, the European Commission, the Council of Europe and the Council of Ministers of Bosnia and Herzegovina signed on 18 April 2012 a Memorandum of Understanding to agree upon the following:

- The general objective of the International Monitoring Operation (IMO) of the Population and Housing Census in Bosnia and Herzegovina is to monitor the compliance of the whole Census exercise, from the preparation to the data dissemination, with:
- International standards on population and housing censuses as defined by UNECE and Eurostat, and as adopted by the Conference of European Statisticians as Recommendations for the 2010 Censuses of Population and Housing;
- Regulation (EC) No 763/2008 on population and housing censuses, and its implementing measures;
- The Fundamental Principles of Official Statistics, adopted by the UN Statistical Commission, as well as the European Statistics Code of Practice, promulgated by the European Commission;
- Standards on data protection and confidentiality, as provided for in the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data of the Council of Europe, and the relevant European Union regulations in force.

2. The Operation will be carried out by a Committee of International Organisations, the Management Group (IMO MG) assisted by a Senior Census Expert, experts in population censuses, one or more experts in information technology and persons monitoring the census enumeration in the field.

3. The Senior Census Expert, the Census Experts and the IT Experts will assess the compliance of the Census in Bosnia and Herzegovina with the requirements listed in the Memorandum of Understanding, but they will not provide technical assistance.

4. Under the guidance of the Committee and the Senior Census Expert, the Census Experts shall:

- Examine the technical preparation of the Census including the pilot Census and post-enumeration survey, in particular the drafting of questionnaires and manuals;
- Monitor the collection, processing and dissemination of Census data, verifying the accordance with the requirements defined above;
- Control the fair and proper computation at all levels and whether the confidential nature of the individual data is fully guaranteed;
- Investigate any other matter with relevance for the Census.

5. The Management Group has designated Mr. Jean-Michel Durr as Senior Census Expert and Mr. Roberto Bianchini, Mr. Bent Noerby Bonde, Ms. Meryem Demirci, Ms. Kateri-

na Kostadinova-Daskalovska, and Mr. Guido Pieraccini as experts in population censuses. The Senior Census Expert and the Experts in population censuses form the IMO Steering Committee (IMO SC) of international experts.

6. The first mission of the IMO SC was conducted from 23 to 26 April 2012. The objective of this mission was to assess the preparations for the population and housing census in their main components, including the preparation of the pilot census. The report of the SC was sent by the Senior Census Manager on May 12 to the IMO MG.

7. The second mission was conducted from 26 to 29 of June 2012. The objective of this mission was to assess the progress made since the first mission in preparations for the population and housing census, including the preparation of the pilot census.

8. The third mission took place on 17 and 18 of September 2012 and was conducted by two members of the SC, namely, Mr. Jean-Michel Durr and Ms. Katerina Kostadinova-Daskalovska. The objective of the mission was to assess the implementation of recommendations made in previous reports and to assess the preparation of the pilot census, planned for October 15-29.

9. The fourth mission took place between 10 and 29 of October 2012 and was conducted successively by the members of the SC (5 days each, except the senior expert from 10 to 19 of October). The objective of the mission was to observe the conduct of the pilot census in the field. In addition, a team of four observers, composed of Lidija Naumovska, Gabor Rosza, Jean-Paul Sardon and Per Schöning was present during the whole period of the pilot census. Each of them covered several municipalities, in order to observe the pilot census field operations in all the 60 enumeration areas (EAs) sampled in the pilot.

10. The fifth mission took place from 19 to 21 of November 2012 (3 days) and was conducted by one member of the SC, Ms. Katerina Kostadinova-Daskalovska. The objective of the mission was to observe the conduct of the Post enumeration survey (PES) of the Pilot census in the field. The expert covered all 6 EAs (in 6 municipalities) sampled in PES sample in order to observe the PES field operations.

11. The sixth mission took place from 10 to 13 of December 2012 and was conducted by four members of the SC: Mr. Roberto Bianchini, Mr. Bent Noerby Bonde, Ms. Katerina Kostadinova-Daskalovska and Mr. Guido Pieraccini. The objective of the mission was to hear from the Statistical Institutions about the lessons learned from the Pilot Census and to assess whether the preparations are on level that could allow conducting a census in April 2013.

12. The seventh mission took place from 12 to 15 February 2013 and was conducted by one member of the SC, Mr. Roberto Bianchini. The objective of the mission was to assess the situation on the progress of preparation and implementation of the IMO recommendations in the new context of the postponement of the census, with a focus on the achievement of the deadlines regarding cartographic preparations. A second objective was to collect information and materials for a more detailed assessment on the progress of census preparatory activities to be made by all members of the SC in March 2013.

13. The eighth mission was conducted by the complete SC from 18 to 22 March 2013. The objective of the mission was to assess in detail progress made in the preparations with regard to the milestones given after the sixth mission in December 2012, when the SC recommended to postpone the census to October 2013.

14. The ninth mission was conducted by two members of the SC, Jean-Michel Durr and Katerina Kostadinova-Daskalovska from 22 to 25 April 2013. The objective of the mission was to assess the progress made in the preparations with regard to the milestones given in the sixth mission and updated in previous missions.

15. The tenth mission was conducted by the full SC from 28 to 31 May 2013. The objective of the mission was to assess whether the progress made in the preparations was sufficient to consider that the country was ready to conduct a census in October 2013.

16. The eleventh mission was conducted by three members of the SC, Mr. Jean-Michel Durr, Mr. Bent Noerby Bonde and Mr. Guido Pieraccini from 16 to 19 July 2013. The objective of the mission was to assess whether the preparations were still on track after the positive assessment of the 10th mission to conduct a census in October 2013. A special focus was put on the preparation of data processing.

17. The twelfth mission was conducted by four members of the SC, Mr. Roberto Bianchini, Mr. Bent Noerby Bonde, Ms. Katerina Kostadinova-Daskalovska and Mr. Guido Pieraccini from 3 to 6 September 2013. The objective of the mission was to assess the state of play regarding to forthcoming census field activities (including PES) and data processing activities following the field activities as well as the overall census preparations in accordance to the Census milestones and SC recommendations and advices given through the previous missions and SC reports.

18. The thirteenth mission was conducted by five members of the SC: Mr. Roberto Bianchini and Mr. Guido Pieraccini from 27 September to 4 October, Ms. Katerina Kostadinova-Daskalovska from 4 October to 11 October; and Mr. Jean-Michel Durr and Ms. Meryem Demirci from 11 October to 18 October. The objective of the mission was to monitor the enumeration of the census, including its final preparations and final operations. During this mission, the SC was assisted by a team of 27 international observers, deployed all over the country.

19. The fourteenth mission was conducted by one member of the SC: Ms. Katerina Kostadinova-Daskalovska from 1 to 3 November 2013. The objective of the mission was to monitor the conducting of the Post-enumeration survey following the Census. During this mission, the SC was assisted by a team of 5 international observers, deployed all over the country from 1 to 10 November.

20. The fifteenth and present mission was conducted by one member of the SC: Mr. Guido Pieraccini from 17 to 18 December 2013. The objective of the mission was to assess that the data processing system was functional and in accordance with the SC recommendations.

21. The expert wish to express his gratitude to the directors and staff of the Agency for Statistics of Bosnia and Herzegovina (BHAS), the Statistical Institutes of the Federation of Bosnia and Herzegovina and Republika Srpska (RS) for their availability and collaboration, and to the staff of Council of Europe for the organisation of the mission.

EXECUTIVE SUMMARY

22. The selection of appropriate premises for storing the census materials has been finalized in time, before the end of the fieldwork. It is the opinion of the SC that the selected place fulfils the requirements, including security: a private guard controls who is entering in the

place 24 hours a day; the access to the archive is limited to the archivists and the door of the archive opens with fingerprint recognition.

23. The space in the processing center is well distributed and separate places are dedicated to different activities: the archive room to store the census materials, the server room for the central server of the whole data processing system, a large space for the preparation of the scanner materials, a separated space for the scanning operation and a vast room for the completion operators, coders and manual data entry.

24. The recommendations provided by the SC in their 10th report are now implemented in the e-flow platform. One of the most important recommendations was not to code any field during the e-flow process: all the codification will be performed in a successive phase.

25. A pre-test of the e-flow platform was performed using some real questionnaires. The results are satisfactory, reaching the standards for this kind of operation.

26. Specific manuals and training materials are finalized for the different actors involved in the data capture phase: scanner operators, completion operators, supervisors and coders.

27. The recruitment of the personnel is planned to be finished by the end of January and personnel training will begin from mid-January. Then, a real test of the e-flow platform will start and will last approximately two weeks.

28. From the beginning of February it is planned to start the real data processing.

29. The solutions proposed by the Agency to ensure security and confidentiality of data are efficient and adequate, but the SC strongly recommends that at the end of the data processing the images be destroyed and the personal data be removed from the Census database.

30. In conclusion, the SC considers that the preparation of the data processing phase is progressing well and in accordance with the SC recommendations. In the coming months the SC will closely monitor the census data processing to assess its compliance with international standards and best practices.

DATA PROCESSING CENTRE

31. The procurement procedure to select the premises for the census data processing operations has been finalized in time, before the end of the fieldwork. It is the opinion of the SC that the selected place fulfils the conditions for the storage and the processing of the census materials, including security: a private guard controls who is entering in the place 24 hours a day; the access to the archive room is limited to the archivists and the door of the archive opens with fingerprint recognition. The space it is well distributed and has separate places for the archive, the central servers, the scanning preparation, the scanning equipment and for the completion operators. At the time of the mission all the network requirements was fulfilled and only the backup to the server located in the Brčko district was still undergoing testing.

E-FLOW PLATFORM

32. The recommendations provided by the SC in their 10th report are now implemented in the e-flow platform. One of the most important recommendations was not to code any field during the e-flow process: all the codification will be performed in a successive phase.

33. The SC strongly recommended, and the three Institutions agreed, not to perform any manual modification on the paper questionnaires before scanning, and capture the questionnaires as they are. All the checks and modifications will be applied in automatic or semi-automatic way after the scanning.

34. The Agency currently does not own the source code of the platform and is not able to do any change to the system without the help of the external company hired to develop the platform.

35. An alternative data entry application was developed with the support of the TA Project to process those questionnaires that are damaged or not properly recognized by the Data Capture System. The data entry application was revised, introducing the same changes that were recommended for the e-flow platform in the SC 10th report.

36. A Pre-test of the e-flow platform was performed using some real questionnaires. The results of this process were then compared with the same questionnaire entered through the application for data entry. The main results of this comparison are showed in the following tables:

Not-empty-fields through manual entry application: 30759 or 55.9072 [%]

Empty-fields through manual entry application: 24259 or 44.0928 [%]

Not-empty-fields through eFlow platform: 30772 or 55.9308 [%]

Empty-fields through Eflow platform: 24246 or 44.0692 [%]

Eflow values that are missed in manual entry: 30 or 0.123665 [%]

Manual entry values that are missed in Eflow: 17 or 0.0552684 [%]

Type	Total Joined field	Diff	%
CHECKBOX	19328	0	100.00
NUMERIC	7994	9	99.89
STRING	2464	55	97.77

The results of the test are satisfactory, reaching the standards for this kind of performances.

37. The success of the Data Capture process depends to a certain extent on the training of the staff involved in the capturing operations. Specific manuals and training materials are finalized for the different actors involved in the data capture phase: Scanner operators, Completion operators, Supervisors and Coders. The plan is to finish the recruitment of the personnel by end of January and begin training from mid-January.

38. After the training the real test of the e-flow platform will start and will last for a couple of weeks. From 1st of February it is planned to start the real data processing.

Recommendations

39. It is recommended to carefully review the estimation of the time needed for the whole data processing phase on the basis of some realistic estimations coming from the final e-flow test. The current estimations that the Agency has done seem to be optimistic.

CODING

40. A global strategy was developed on how to perform the coding of the three main international classifications adopted for the census (ISCO, NACE and ISCED) and an ad-hoc application called g-Code is under development to approach this issue.
41. The g-Code application for coding the occupation is ready and tested with the pilot census data. The application is composed of two parts. A first part is running in background and - on the basis of a thesaurus derived from the last LFS survey – attempts to automatically code the wording of the answer. A second application is used to manually code the wordings that are not automatically coded.
42. The codification of Municipality, Settlement, Country, Citizenship, Ethnicity, Religion and Mother tongue will be also performed with the g-code application: the same approach used for the codification of the Occupation is adopted.
43. The validity between Municipality and Settlement will be checked at this stage.

Recommendations

44. Estimation of timing and resources needed for coding should be produced as soon as possible.

DATA EDITING AND DATA CORRECTION

45. The application that performs contingency controls is now developed. This application checks inter-records consistencies (relation between P1, P2 and P3, relations with the reference person, etc.) and identifies the usual resident population. Nevertheless, a review and a finalization of these rules should be performed, also taking in account that it is part of the bigger process of data editing.
46. A discussion was initiated between the three institutions on the opportunity to use some statistical methods for data correction. The option suggested by the SC of using the Fellegi-Holt approach and the related hot-deck imputation methods it is still under consideration by the institutions.
47. In order to correctly perform data editing and data correction, the statistical institutions believe they need some technical assistance from international experts who could help them in conceptualizing the work.
48. The solution proposed to avoid any alteration of data through automated correction of logical errors is to share the set of rules defined at least with a group of professionals coming from the three Statistical Institutions. Scripts for automatic correction of logical errors must pass substantial testing before being approved for use. The algorithms shall be tested on real census material coming from the whole country. Every correction of census data performed through any application must be tracked into the Census database and should be reversible.

Recommendations

49. Define an appropriate global strategy to approach the editing and correction of the Census micro-data.

50. The SC should be able to assess, and eventually re-run on the initial Census database the set of rules defined for automated correction of logical errors. Concerning the correction of logical errors, the SC still strongly support the use of sophisticated statistical methods for data correction, like the Fellegi-Holt approach and the related imputation methods.

CENSUS DATABASE AND PROTECTION OF PERSONAL INFORMATION

51. Protection of personal information is a central issue during and after the data processing. Personal information should be processed according to strict rules of individual data protection and used only for the essential statistical purposes planned within the census data processing. During the processing of census data, names could be useful for two main purposes: identify duplicate records and perform the record linkage of the census individual data with the PES records.

52. Disclosure of personal data can partially happen in different phases of the data collection and data processing but the two main situations in which this can happen systematically are: i) accessing the questionnaire images; ii) accessing the digital data in the Census database.

53. The solution proposed by the Agency to avoid situation of type i) is that only the e-flow platform will access to the images collections via an application embedded into the platform and not accessible directly by the operators. At the end of the e-flow process of a specific EA both the tiff and jpeg images generated by the scanning will be encrypted while the original files will be deleted.

54. The solution proposed by the Agency to avoid situation of type ii) is that all the Census applications should encrypt personal data when writing them to the Census database. This encryption will be performed with a key known only to application, not stored in database. Such solution should prevent access to personal data in database from System administrators and any other users.

55. The solution proposed by the Agency to avoid any alteration of data in the Census database is to prevent any changes to the database not made through an application, and if not prevented, then discover them. For this purpose the Census database must log all changes to a location where database administrator cannot alter them.

Recommendations

56. The SC thinks that the solutions proposed by the Agency are efficient and adequate, but strongly recommend that at the end of the data processing the images be destroyed and the personal data be removed from the Census database. Indeed, since the paper questionnaires will be archived, there is no need to maintain any digital version of them for historical reasons.