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Support to the Israeli Central Bureau of Statistics in Improving the Quality of Official Statistics

MISSION REPORT

on

Component D
Methodological and geo-spatial tools for improving the quality and efficiency of field surveys

Activity D.2
Preparation of design for methodology to allocate interviewers' workload in multi-field surveys

Implemented by

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List of Abbreviations

BC	Beneficiary Country
CSO	Central Statistical Office – Statistics Poland
CAPI	Computer-assisted personal interviewing
CATI	Computer-Assisted Telephone Interviewing
CAWI	Computer-Assisted Web Interviewing
CAII	Computer-Assisted Internet Interviewing
CAxI	Common name for all above methods of data collection
PAPI	Paper-Assisted Personal Interviewing
EU	European Union
GIS	Geographic Information System
ICBS	Israeli Central Bureau of Statistics
IT	Information Technologies
MS	Member State (of the EU)
ToR	Terms of Reference

Executive Summary

The overall purpose of this activity was to discuss optimal country division strategy for sampling and preparing workload for interviewers for better monitoring and management of the fieldwork in real time by using geo-spatial tools. The goal was to choose the best size of statistical units stable network covering whole country of Israel, not only to prepare multi survey workload to achieve better efficiency of interviewer work and high response rates, but also to identify under-coverage areas in the preparation stage and nonresponse areas in the midst of data collection for reallocate resources to optimal treatment of under-coverage and nonresponse. In addition, the experts also revisited and discussed the recommendation and outcome from the previous mission on optimization of management and monitoring of multi field surveys.

Presentation of organizational solutions for interviewer network in both the Israeli Central Bureau of Statistics (ICBS) and the Central Statistics Office of Poland (CSO), despite the differences in the scale of the research, pointed to the many similarities that allow for the formulation of valuable proposals for further work aimed at optimizing the organization of surveys. Polish experiences associated with the implementation of previous censuses as well as intensive use of GIS technology at all stages of the statistical production process was met with great interest by the ICBS. Attention is paid to the differences in the size of the interviewer network resulting from population size and the scope of research representations. This provides a solid foundation to formulate reliable conclusions regarding the possibilities for improving the effectiveness of the interviewer network of the ICBS, in particular in the use of components of GIS for monitoring and management of the interviewer network in ICBS.

Findings:

1. The main objective of the mission was to discuss how to convert from survey interviewer to a regional interviewer. It is most emerging issue, because interviewer network has been established on the basis like:
   - Supervisors work by survey, and not in several surveys (exceptions: Jerusalem)
   - Interviewers work by survey, and not in several surveys (exceptions: interviewer in Eilat)
   - Different Computerized system (management and questionnaire software) for each survey

   It was found that the ICBS have advanced thoughts and ideas on the issue of changing such system into multi survey system allowing interviewer and supervisors to execute all surveys allocated to the statistical units or enumeration areas supporting by the use of GIS tools for monitoring and management of network interviewer

2. In above consequence another objective of the mission was to discuss the basic rules concerning country division into the stable (in space and time) network of the medium size of statistical units and the small size of enumeration area.

3. Also conditions necessary to build a spatial data infrastructure in the ICBS allowing for the construction of a system for monitoring and managing network interviewers with the support of GIS tools has been discussed.

4. The use of GIS applications for the dynamic allocation of address points to interviewers was discussed. In Israel, all individuals or households are either connected to exact x,y coordinates or a defined statistical geographical areas (statistical units). This means that the spatial databases operated by the ICBS (address and statistics) contain all the necessary data for creating proper country division system enabling preparing effective multi survey workload and spatial analysis to support the workload preparation and interactive management of interviewers in the field.

5. The selection of interviewees is done with a two-stage selection. A number of smaller units are selected in the first step. Their definition may depend on the specific study (statistics office or administrative unit). A number of persons or households in the selected administrative units are selected in the second step. This means that the selected administrative units are the basically building blocks in an optimal allocation of interviewees for the interviewers. Specifically, could the following process be supported in GIS solution:
    - Selected administrative units can be divided into smaller units (building blocks), e.g. if there are large. For example 8-10 interviews. Or because of different restrictions.
    - When the new building blocks are defined, the GIS tool optimized the distance from their centers to interviewers residence. Possible weights, besides the distance, could here be the numbers in building block or accessibility. In this process, blocks are put together, which together provide the minimum distance to interviewers, when accepting a normal working loud for the interviewers.
    - There may be different restrictions on the allocation e.g. languages, religion or the concrete survey. These restrictions may result in the best solution not is the one with the shortest possible distance, but a little longer. These restrictions must be included in the allocation process, and there consequences estimated.

6. In the MS experts opinion, the ICBS staff has the necessary knowledge and experience that enables the IT departments to build on the base of getable GIS tools (the ArcGIS packet from Esri or any other commercial or open source GIS tools) a relatively simple IT system independently that will allow to present the statistical phenomena on maps based on data collected in spatial databases and makes spatial decisions for survey management.

7. Possible use of the GIS modules of the ArcGIS like COLLECTOR and SURVEY123 Workforce, Explorer, Navigator and Operations Dashboards applications has been discussed and pointed as the proper solutions reaching ICBS needs concerning workload management.

8. The necessary condition to introduce or build the right IT tools is a precise functional requirements for this tools defined by the ICBS Survey Department for workload and reallocation of the interviewers tasks based on geospatial presentation of the maps. This implies the need for good cooperation between the data collection department and the IT department.

9. Reviewed process of the reorganization of field works in the direction of change in the profile of interviewers and controllers from one-tasking profile into multi-tasking profile with the possibility of handling in the country several surveys simultaneously. By spatial grouping selected samples from several surveys (supported by GIS tool) it will be possible to optimize traffic interviewers in the field and, consequently, increase the efficiency of

field operations regarding data collection (more surveys at lower cost travel). To empower efficiency also considered extension of working hours from 5 to 7 (or 8) hours.

10. It was agreed that the implementation of GIS solutions to monitor and manage the network of interviewers will take place step by step and implementation will precede the necessary pilot actions carried out by the ICBS.

Challenges:

In opinion of the MS Expert constructing stable system of country division establishing small area like statistical units and enumeration areas (similar to created temporary for last census) is the main challenge. Such system could be suitable for geocoding and preparing workload for interviewers. Also most of the currently offered GIS tools by commercial market or open sources can utilize such small statistical area for supporting implementation of the interviewer's workload

1. General comments

This mission report was prepared as part of the Twinning Project "Support to the Israeli Central Bureau of Statistics (ICBS) in Enhancing the Quality of Official Statistics". This was the third missions in component D devoted to design for methodology to allocate interviewers' workload in multi-field surveys

The overall purpose of this activity was, based on previous assessment and indicator choice, to develop a methodology for optimizing the multi-field workload allocation using geo-spatial tools taking into account the constraints dictated by each survey (reference time, time allocated to filling in the questionnaires etc.).

The main activities of the mission were:

- ***Israeli Central Bureau of Statistics (ICBS)*** *presented and demonstrated their latest development multi-field workload allocation using geo-spatial tools taking into account the constraints dictated by each survey*
- ***Central Statistical Office of Poland (CSO)*** *presented how mapping and GIS can help field operation, how to establish precise and stable division of country and presented ArcGIS tools suitable for allocation of workload*
- *The expert from CSO and ICBS staff evaluated and discussed the current status at ICBS in multi-field workload allocation using geo-spatial tools.*

Especially, the demonstrations of pilots gave the ICBS and the Twinning Project expert in getting an excellent overview of the present situation regarding use of geo-spatial tools.

The expert would like to express his thanks to all officials and individuals met for their kind support and for the valuable information they provided, which highly facilitated the experts work.

The views and observations stated in this report are those of the consultant and do not necessarily represent the views of the European Union (EU), the Israeli Central Bureau of Statistics (ICBS) or the Central Statistical Office of Poland (CSO).

2. Assessment and results

All of the foreseen activities were carried out following the plans in the ToR; cf. *Terms of Reference (Annex D2 - 1)*. Outcomes were favorable, and results and conclusions are described in the following section.

ICBS presented:

- *Introduction to Activity D2 and current status of recommendation from activity D1 and D3 (Presentation by Nitzan Hacohen)*
- *Methodologies for combining samples in the field surveys – current status, constrains and future plans (Presentation by Tzahi Makovky)*
- *Current situation using GIS' tools for allocation of workload (short re-view from D1 mission) (Presentation by Luba Naidis and Nitzan Hacohen)*
- *The dilemma of multi survey workload (work load integration) surveys constraints (Presentation by Nitzan Hacohen)*

Furthermore, the ICBS Staff gave a demonstration of pilots for workload allocation for multi-field surveys. The pilot was developed as preparation before the mission in close co-operation between the Survey Department, The GIS Department as well as the Methodology Department at ICBS. A second pilot was developed under the mission based on adjustment proposed by MS expert.

The MS experts presented:

- *How mapping and GIS can help field operation, how to establish precise and stable division of country and presented ArcGIS tools suitable for allocation of workload (Presentation by Janusz Dygaszewicz)*
- *Recommendations*

2.1 Current situation at ICBS assessed

ICBS had prepared comprehensive presentations giving the experts an overview of the current situation for field surveys at ICBS. Please find uploaded presentations at www.dst.dk/israel.

2.1.1 Methodologies for combining multiple surveys into one workload allocation

In brief the current sampling frame used at ICBS in the **Household Expenditure Survey** (HES) is a two stage sampling design. At the first stage localities are sampled and in the next stage dwellings are sampled within the sampled locality. The cluster and systematic sampled were discussed.

In the **social survey** samples are based on 86 design groups (Strata) defined by age, gender, religion etc. The allocation between strata is proportional to size in population.

Sampling in **Labour force survey (LFS)** is a Panels survey and the Dwelling Register is used as the main sampling frame. The scheme is 4-8-4 – and each panel is spread over 16 months. Two consecutive months have 6 overlapping panels. There is also overlap between 2 consecutive years in LFS. Each panel is spread over a quarter of locality

Since workloads are built from the sample in panel, they are spread out over a relatively small area.

In LFS the workloads are allocated into week of investigation and the LFS interviewer required finishing the workload in a week or at the latest in the following week

Future planning in combining the **HES** and **LFS** is to design and select each year a "Master sample". For example if LSF has a probability of 1/100 and HES 1/200, a master sample will be selected by the same method (??) described earlier but with a probability 3:200. Then the master sample is divided systematically to LFS and HES. This approach prevents the chance of a dwelling to be selected to both surveys.

The goal for ICBS is to improve field work efficiency in by optimizing the ratio between time spend on interviewing in relation to time used to travel to and from the interviewers home and between survey units. Two indicators have been selected in order to evaluate the effect of implementing multi-field surveys. These are (1) Number of completed interviews per field trip for an interviewer per survey day (2) Investment time per unit.

A simulation demonstrated the payment for travel time could be reduced by at least 60% by combining three surveys into one workload. In the simulation the following parameters were taken into account in the workload allocation: District attributes, interviewer attributes, survey characteristics, interviewer characteristics. The implementation of interviewer characteristics such as home address of the interviewer, languish skills car availability is a parameter that are currently not used in workload allocation but proved to be a very significant parameter to include in order to reduce traveling time of the interviewer.

2.1.2 GIS' tools for allocation of workload

The ready-made tools and GIS solution offered by ArcGIS (Esri) packet was presented by the MS Expert. It is worthy to consider such modules like Workforce, Explorer, Navigator, Collector, Survey123 and Operations Dashboards. The modules mentioned above are developed for supporting all stages of statistical production including preparation of workload allocation for interviewers and for supporting monitoring and management of field work during data collection stage. Also necessary rerouting and dynamic changes in workload can be supported.

Considering the usage of GIS technology in statistics the core business of governmental institutions like ICBS has to be supported mainly by commercial solutions and tools. Some additional functionality and utility could be supported later by open source application after stabilizing core business.

The Data Collection Department in ICBS has to define and precisely describe their needs and expectation of the functionality of GIS tools supporting workload preparation and management procedure. The IT Department has to support customization and implementation of GIS modules into statistical production process for all stages.

2.1.3 Pilots

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3. Conclusions and recommendations

1. Establishing stable country division by introducing Enumeration Area (for example assembled census cells from last Israeli population census) and Statistical Regions (or Units) to be used for drawing samples across all surveys. Such system could be suitable for geocoding and preparing workload for interviewers. Also most of the GIS tools currently offered by commercial market or open sources can utilize such small statistical area for supporting implementation of the interviewer's workload and create boundaries of special areas taking into account the country barriers, forbidden zones, difficult to rich areas and other obstacles. Such system is also suitable for monitoring & management of field work as well as for reallocation of workload (easy to manipulate).

2. For harmonization of the Israeli statistics with EU and global statistics (Eurostat and UNECE) it is recommended to keeping division system in accordance to Global Statistical Geospatial Framework (GSGF) and taking into consideration insights coming from comparison of statistical and geodetic systems of country division presented in "The 10 Level Model".

3. For preparing workload it is recommended to collect all sampled addresses into the proper Enumeration Area using x,y coordinates and EA boundaries and next start to construct unified workflow for multi-surveys interviewer on the basis of the EA geometry.

4. Merge CPR with Building Register and construct "Statistical Population Register" for statistical surveys consisting standardized addresses of dwelling linked with x,y coordinates to be used for drawing samples in all surveys and monitoring progress (check if data from the Integrated Administrative File (IAF) already produced for census could be used)

5. Assign Enumeration Area to interviewers according to optimization of travel distance and best knowledge about country obstacles (for example especially marked or empty EA has to be excluded)

6. For strategic planning and adapting interviewers network to sampled addresses (network tuning) prepare Yearly Workload

7. For operational planning, management and supporting operation in the field use the Monthly, Weekly and possible (the best) Daily Workload

8. The Data Collection Department has to define and precisely describe their needs and expectation of the functionality of GIS tools supporting workload preparation and management procedure. The IT Department has to support customization and implementation of GIS modules into statistical production process for all stages.

9. Considering the usage of GIS technology the core business of governmental institutions like ICBS has to be supported mainly by commercial solutions and tools. Some additional functionality and utility could be supported later by open source application after stabilizing core business.

10. It is recommended to consider customization of the ready-made tools and GIS solution offered by the Esri ArcGIS packet like (Workforce, Explorer, Navigator, Collector, Survey123, Drone2map and Operations Dashboards)

11. Consider timesharing of multichannel data collection in the following order: CAWI, CATI, CAPI.

12. Try to abandon paper questionnaire at all.

Summary of Recommendations:

The main challenges for moving into stable country division will be to establish a common system and methodology including proper assessment of the size of new statistical units (SU) and enumeration areas (EA). In Poland according to law the typical limits of this units is not more than 200 dwellings and 500 inhabitants for Enumeration Area and for the Statistical Units no more than 2,700 people and 999 apartments. It is also rule that one SU can't consist no more than 9 EA. Geometrical size of this units varied according to limits mentioned above. Statistic Poland is responsible for keeping identification systems and geometry of boundaries for all SU and EA. In Israel the NCBS have to decide how to change a law for establishing similar country division system and make such system complementary to administrative system. This division system has to be stable in time and space as long as it is possible. Only necessary changes created by urbanization process can be allowed. Sizes of this unit have to be suitable for statistical purposes and such decision belongs to ICBS. Good fitted smallest statistical area is most crucial for geocoding, rational preparation of sampling frame and preparing of workload allocation. Such system is the basis also for data collection monitoring and management system supporting field surveys conducted by interviewers.

In MS Expert opinion constructing stable system of country division establishing small area like statistical units and enumeration areas is the main challenge for ICBS. After successful implementations of such system any GIS application will be able to support preparation and allocation of the interviewer's workload.