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Transitions in census methodology; plans, experiences and innovations

Territorial preparation for the 2021 Census of Slovakia

Note by the Statistical Office of the Slovak Republic*

Summary

The territorial Preparation for the 2021 Census of Slovakia was based on the use of several administrative data sources and involved a range of actors. In addition to the Statistical Office of the Slovak Republic, key players were the Ministry of the Interior of the Slovak Republic and the Office of Geodesy, Cartography and Cadastre of the Slovak Republic. The success of the Territorial Preparation project is indisputable. This is also evidenced by the subsequent population and housing censuses and the implementation of the population census, which are based on the Territorial Preparation.

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NOTE: The designations employed in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

I. Concept of Territorial Preparation

1. The aim of the Territorial Preparation (TP) was the integration of administrative data sources and a field survey. The concept of territorial preparation significantly contributed to the creation of a set of all inhabited and habitable structures, which, in addition to administrative sources with reference address points, also included statistical address points.

II. Territorial Preparation for 2021 Census

2. The Territorial Preparation for the 2021 Population and Housing Census (hereafter referred to as "2021 Census") was based on the use of several administrative data sources (hereafter referred to as "ADS") with the aim of identifying all dwellings in which the inhabitants of the Slovak Republic could live at the decisive moment of the census.

A. Administrative data sources

3. Six ADS were used for the purposes of Territorial Preparation, namely:
- (a) the Address Register (AR), the administrator of which is the Ministry of the Interior of the Slovak Republic,
 - (b) the Register of Natural Persons (RNP), the administrator of which is the Ministry of the Interior of the Slovak Republic,
 - (c) the Information System of Cadastre of Real Estate (ISCRE), which is managed by the Geodesy, Cartography and Cadastre Authority of the Slovak Republic,
 - (d) Basic base for geographic information system (BB GIS), the administrator of which is the Institute of Geodesy and Cartography,
 - (e) Basic database from the 2011 Census,
 - (f) Statistical address points created by the Statistical Office of the Slovak Republic.

B. Phases of Territorial Preparation

4. The initial phase of Territorial Preparation involved importing administrative data in a valid form. The importation of administrative data sources was implemented using a set of geoprocessing tools available as an extension of ArcGIS Pro - a so-called 'thick client'¹. The Address Register was directly integrated into the Territorial Preparation system, and changes made in the Address Register were updated every 24 hours in the Territorial Preparation system. Another tool built into the ArcGIS Pro extension was a tool for extracting ADS. The tool was used when new, up-to-date data from administrative data sources were imported, which had to be incorporated into the registered data. Address matching tools are used to find identical addresses within multiple administrative data sources that have been extracted into the Address Pool. Thus, a Territorial Preparation dataset was created, which contains feature classes registered as resulting addresses and dwellings, which form the output of Territorial Preparation. The feature classes in the dataset have the ETRS89 coordinate system and the UTM34N cartographic representation set.

¹ a form of client-server architecture in which the computer does not require a network-based connection to a server.

5. For the purposes of Territorial Preparation, spatial data were defined, which are the Slovak Republic (SK, NUTS1), the code and name of the region, district, municipality, part of the municipality, basic residential unit, street name, inventory and reference number (if the municipality has a street system in place) and coordinates of the address point.

C. Address points and addresses

6. The aim of the Territorial Preparation was to identify, through the integration of spatial data in the mentioned administrative data sources, the maximum possible set of addresses. From the entire set of approximately 4 million addresses obtained from the Address Register, the Register of Natural Persons, the Information System of Cadastre of Real Estate and the Basic database from the 2011 Census, it was possible to identify 1,867,015 unique addresses. 1,519,240 addresses are spatially located in the respective municipality and 347,775 records are those that could not be located. Of these, 59,403 are from the Address Register and 276,496 from the Cadastre of Real Estate. Missing X, Y coordinates were filled in by municipalities during the Housing Census. Those that could not be completed even during the Housing Census were completed in processing using ESRI geocoding.

D. Statistical address points

7. In addition to the aforementioned registers (AR, RNP, ISCRE, BB GIS, CENSUS 2011), a database of statistical address points (hereafter referred to as "SAP") was also created. This database was created for all inhabited buildings that do not or cannot have a properly-assigned address point with inventory number in the Register of Addresses, according to Act no. 125/2015 (Collection of Laws of the Slovak Republic). This achieved the geolocation of inhabited non-conventional structures. Such objects are mainly unapproved family houses, mobile homes (caravan, houseboat, trailer), structures used in emergencies, not intended for living (shack, shed, garage, warehouse, shelter), recreational objects (hut, garden cabin, cabin), specific cases of the house type 'family house', specific cases of the house type 'apartment building - entrance of an apartment building', and apartment building entrances, if more than one apartment building entrance is identified on the title deed but only one address point is assigned in the AR.

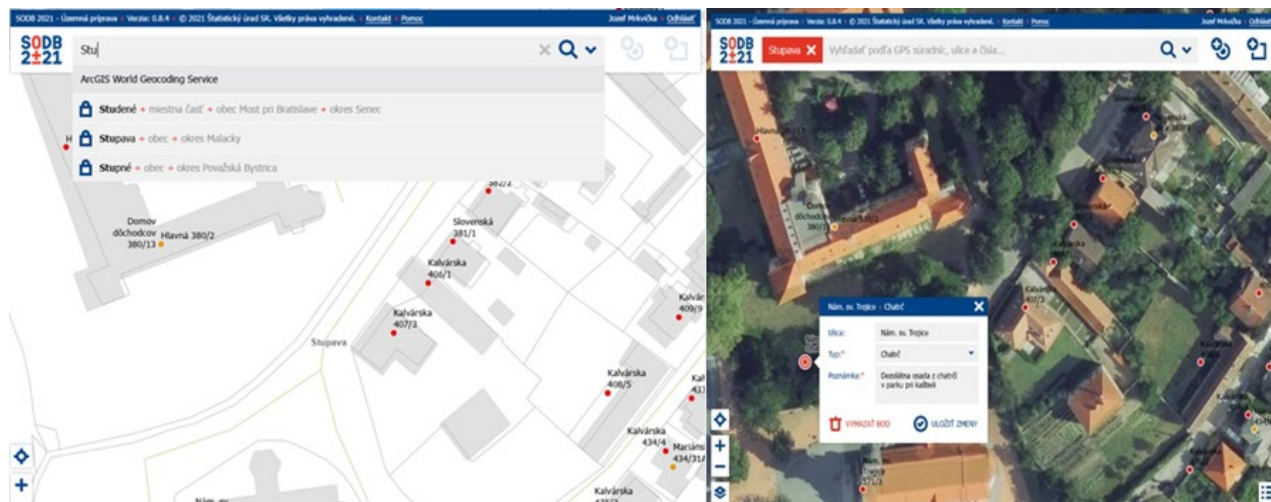
E. Applications for Territorial Preparation

8. Territorial Preparation web and mobile applications (figure I) were created to identify dwellings that were subject to the creation of a statistical address point. The application contains a central map component that enables basic work with the map, identifying features in the map and switching underlying maps. The user has the option to search and zoom in on the selected address. Search is possible based on several criteria, e.g. name of the village, name of the street, inventory and reference number, or X, Y coordinates. To create statistical address points, an authorized person in the municipality identified non-conventional dwellings and provided the relevant data to the territorially relevant regional office of the Statistical Office, which marked the dwelling in the TP web application. Every inhabited non-conventional dwelling that could not be identified (e.g. the correct type of dwelling could not be identified based on the information provided) had to be verified directly in the field and marked using the TP mobile application.

9. Both the web and mobile application operated on the principle of plotting address points for dwellings: even if it was not possible to assign a census number and an address point in the Register of Addresses, inhabited dwellings should have been counted during the census of houses and flats. Every employee at the regional Statistical Office had access to the

application and, after requesting the municipality to assign a SAP, entered the point into the web or mobile application. Points plotted through the application were directly projected into the "Addresses" layer in ArcGIS Pro. The data collected that way were subjected to further processing in ArcGIS Pro, where they were assigned statistical inventory numbers that clearly identified these dwellings. The statistical census number was supplemented in the form of 1,000,001 to 1,000...n within one municipality.

Figure I.
Application for creating SAP



F. SAP creation review

10. During Territorial Preparation and the ongoing Housing Census, 14,617 statistical address points were identified in 879 municipalities in Slovakia. The highest number of SAP were recorded in the Region of Prešov, where there are 5,011 SAP in 162 municipalities. It is followed by Region of Košice with 4,597 SAP in 160 municipalities, Region of Banská Bystrica with 1,179 SAP in 156 municipalities, Region of Bratislava with 979 SAP in 34 municipalities and Region of Žilina with 874 SAP in 92 municipalities. They are followed by Region of Trnava - 862 SAP, Region of Nitra with 643 SAP and Region of Trenčín with 472 SAP (table 1). The non-approved family house was the most common type of non-conventional dwelling assigned a statistical address point with 5,995 dwellings or 41.01 per cent of the total number of SAP. The second most frequent dwelling type was the hut with 4,674 records or 31.98 per cent. In some cases, the type of non-conventional dwelling could not be determined. Dwelling type could not be identified for 3,351 dwellings, representing 22.93 per cent of SAP. Recreational objects made up 3.17 per cent of SAP and mobile homes made up 0.92 per cent of SAP.

Table 1
Number of municipalities in regions with SAP occurring

<i>Region</i>	<i>Number of municipalities</i>	<i>Number of SAP</i>
Bratislava Region	34	979
Trnava Region	104	862
Trenčín Region	56	472
Nitra Region	115	643
Žilina Region	92	874

Banská Bystrica Region	156	1,179
Prešov Region	162	5,011
Košice Region	160	4,597
Total	879	14,617

G. The result of the Territorial Preparation

11. The result of the Territorial Preparation is a list of addresses, which consists of the maximum set of all possible inhabited and habitable objects (family houses, apartment buildings, cottages, garden cottages, schools, etc.) obtained from ADS and field survey (SAP) together with the geographical layer of address points of these objects on the map base (Figure II).

Figure II.

Register sources in ArcGIS Pro



Image description: Overlay of layers Construction from ISCRE (yellow polygon), Building from BB GIS (light red polygon), red points (address points from AR), black points (SAP created in web or mobile application of TP), yellow points that are overlapped with black dots (processed by the SAP on the side of the SO SR in ArcGIS Pro).

H. Sustainability

12. The Territorial Preparation was processed on the reference date of the Census (1 January 2021). The system is designed for sustainability—it is possible to update the Territorial Preparation every year.